D2.2.1 – Report on policy recommendations

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Executive summary

This deliverable provides policy recommendations to support the overarching themes of hydrogen and **electromobility** (hereinafter **e-mobility**) in various countries and the **European Union** (hereinafter **EU**).
The policy recommendations are based on three key areas of analysis: legal and political frameworks, acceptance and best-practice models from the **involved partners** (hereinafter **participated countries**). The document thus identifies possible paths for regulatory, economic and infrastructural developments.

For hydrogen, D2.2.1 include an integrated legal framework for the systemic integration of new technologies, economic viability through targeted public funding, regular updates to existing regulations, ambitious implementation of European guidelines and increased cross-border cooperation.

In the field of e-mobility, the focus is on an application-oriented legal framework that takes new technologies into account, the promotion of technological synergies, economic incentives to accelerate electrification, and Europe-wide standardisation and infrastructure.

The following document is developed as a compilation of the policy recommendations prepared by participating countries, which have been made by the respective partners with accompanying support of PP3 EI-JKU in the development of the reports. The EI-JKU accepts no liability for the correctness and completeness of these EU and country-specific recommendations, as well as the cross-border recommendations developed during the workshop in Alba Iulia.

No table of figures entries found.

The contents of this publication do not necessarily reflect the position or opinion of the European Commission.

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Method

The development of **policy recommendations** (hereinafter **D2.2.1**) on the two overarching topics of hydrogen and e-mobility is based on three key areas: legal (D1.2.1) and political developments, interviews for acceptance analysis (A3.1) and **successful business models** from the participated countries (A2.3; hereinafter **best-practice models**).

The following steps must be carried out for each participating country**:**

At the beginning, the participated countries summarise relevant new legal and political developments in their countries. This analysis is based on current European strategies (in particular The Clean Industrial Deal), the current national developments and the already finished legal analysis (D1.2.1). Each participating country summarises its part of the legal analysis (D1.2.1) and, based on this and the national developments, influencing (**legal & political**) factors (**chapter 2**).

Another component of the basis for D2.2.1 is the findings from nationally conducted interviews (A3.1), which were carried out on the basis of uniform guidelines with a focus on political, legal, economic, technical and social issues. As the complete evaluation of these interviews was not available until D2.2.1 has been finalised, only the legal and political issues from the interviews for each participating country are included in D2.2.1. Each participating country summarises its results and formulates them in the form of influencing (**acceptance**) factors (**chapter 3**).

The third key area of the analysis consists of best-practice models (A2.3) from the participated countries, which have been completed by PP3 for all participated countries. The best-practice models (A2.3) provide practical insight into effective approaches to market introduction and use of new technologies and serve as a basis for formulating influencing **(best-practice)** factors (**chapter 4).**

All influencing (combined) factors in the three key areas are grouped together by topic and classified into fields of action (such as legal framework, financing, infrastructure, market mechanisms, etc.). Within these fields of action, the factors are divided into existing problems and potential solutions. On this basis, concrete policy recommendations are developed for each participating country and for the EU level (**chapter 5**), which are also summarised in tabular form for an overview (**chapter 6**).

For each nation, the respective partners select factors that are suitable for cross-border policy recommendations. These are based on the factors already formulated in the Policy Recommendations (D2.2.1). Three factors are defined for each key area, three each from law and politics (Chapter 2), acceptance (Chapter 3) and best practices (Chapter 4). In the **workshop held in Alba Iulia (19 November 2025)**, small groups for each key area were formed and all factors relating to a key area were reviewed. In doing so, agreement on most

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suitable **cross-border policy recommendations** was achieved. The **factors selected by the partners** that appear suitable for cross-border recommendations for action are presented in tables. The **agreement** reached at the workshop on most suitable cross-border policy recommendations – i.e. implementable in all countries – is summarised in **Chapter 7**.

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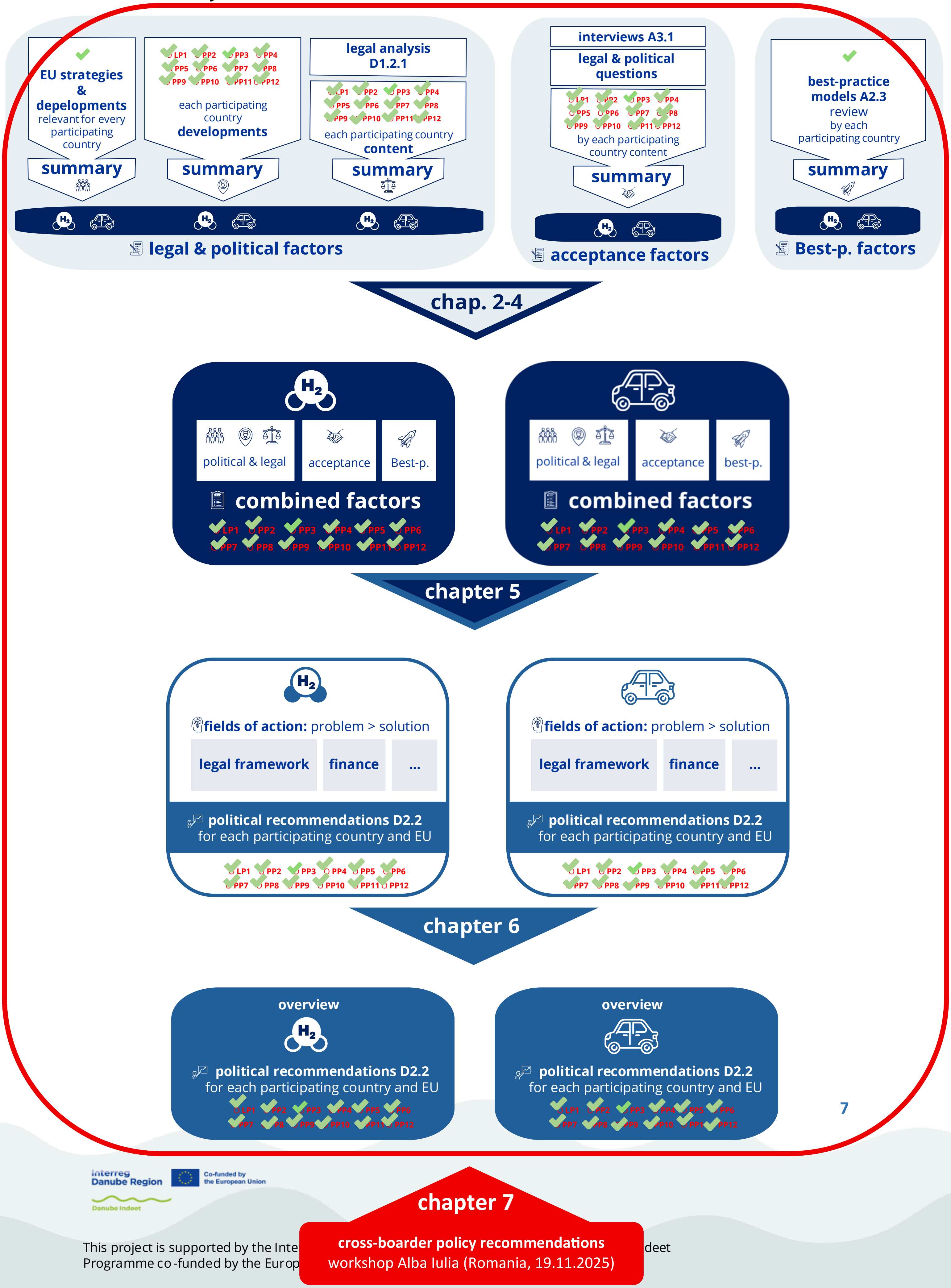

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1. Introduction

The findings from the current legal and political course, as well as from the legal analysis (D1.2.1), interviews with stakeholders for the purpose of acceptance analysis (A3.1) and best practice models (A2.3) each form a part of the key areas of the policy recommendations (D2.2.1). The content is summarised and influencing factors are formulated, from which policy recommendations are derived at national and EU levels.

2. Legal & political factors

The legal analysis (D1.2.1) covers the overarching topics of hydrogen and e-mobility, in particular **vehicle-to-X** (hereinafter **V2X**), from the national perspective of the participated countries and the EU. The focus is on strategies, targets and regulations. How these are structured, which areas they cover and which new developments are emerging in these topics provides information about the potential for the application of renewable energies and resources.
In a **first step**, the participated countries summarise the latest national political and legal developments, focusing on the topics covered by the legal analysis (D1.2.1).
In a **second step**, the participated countries revisit their respective legal analyses (D1.2.1) and summarise the strategically important content.
In a **third step**, the participated countries formulate influencing factors based on the legal analysis (D1.2.1) and the latest political and legal developments. These influencing (**legal & political**) factors identified in this way form part of the basis on which D2.2.1 is built.

2.1. European Union

2.1.1. Recent developments

2.1.1.1. New EU strategy

The EU's overall political strategy for 2024–2029 focuses on a "prosperous and competitive Europe"[1] and places competitiveness at its core.[2] The aim is to overcome the latest challenges (climate change, artificial intelligence and geopolitical tensions) to ensure sustainable prosperity for EU citizens and the success of European companies on the global market.[3] At the heart of the

[1] European Council, Competitiveness compass, The role of the Council in the competitiveness compass, https://www.consilium.europa.eu/en/policies/competitiveness-compass/ (accessed 05.08.2025).

[2] https://www.consilium.europa.eu/en/policies/competitiveness-compass/ (accessed 05.08.2025).

[3] European Comission, EU competitiveness, https://commission.europa.eu/topics/eu-competitiveness_en (accessed 05.08.2025).

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new approach are the Clean Industrial Deal[4], the Action Plan for Affordable Energy[5] and investments in clean energy.
The transition to clean energy requires massive investment. The European Commission therefore wants to increase EU funding, mobilise private investment and make state aid more effective. The next **EU budget** (hereinafter **MFF**) is to become a key instrument of the energy transition. In the short term, the Clean Industrial Deal will mobilise over EUR 100 billion for a clean industry, including EUR 1 billion in guarantees from the current MFF.[6]

- **Hydrogen initiatives**[7]

The reform, which came into force in 2024, provides in particular for the introduction of an EU-wide certification system for hydrogen as a key element, supplementing the existing certification of renewable gases and hydrogen in the **Renewable Energy Directive**[8] (hereinafter **RED**). So the Directive (EU) 2024/1788[9] requires the Commission to specify[10], by August 2026, a methodology for assessing greenhouse gas emissions savings from low-carbon fuels, using approaches similar to those set out in Delegated Regulation (EU) 2023/1185 for **renewable fuels of non-biological origin** (hereinafter **RFNBO**s).
Results, in particular on the assessment of the effectiveness of the hydrogen framework, will be identified and possible barriers to the scaling up of renewable hydrogen use will be fed into the revision of the delegated act[11] on RFNBOs.
The EU Innovation Fund, which is fed by the EU Emissions Trading System, provides 2025 EUR 6 billion in project funding, in particular for the European Hydrogen Bank.[12] In addition, the Commission is taking measures to connect producers and consumers (hydrogen mechanism) and is calling for the use of established platforms such as 'Auctions-as-a-Service'.

[4] Communication from the Commission, Commission work programme 2025 Moving forward together: A Bolder, Simpler, Faster Union, COM(2025) 45 final, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52025DC0045 (accessed 05.08.2025).

[5] Communication from the Commission, Action Plan for Affordable Energy Unlocking the true value of our Energy Union to secure affordable, efficient and clean energy for all Europeans, COM(2025) 79 final, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52025DC0079 (accessed 05.08.2025).

[6] Communication from the Commission, The Clean Industrial Deal: A joint roadmap for competitiveness and decarbonisation, COM(2025) 85 final EZ 4, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52025DC0085 (accessed 05.08.2025).

[7] COM(2025) 85 final, 3.2.

[8] Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources, OJ L 2018/328.

[9] Directive (EU) 2024/1788 of the European Parliament and of the Council of 13 June 2024 on common rules for the internal markets for renewable gas, natural gas and hydrogen, amending Directive (EU) 2023/1791 and repealing Directive 2009/73/EC, OJ L 2024/1788.

[10] European Comission, Commission delegated regulation (EU) specifying a methodology for assessing greenhouse gas emissions savings from low- carbon fuels, https://energy.ec.europa.eu/publications/commission-delegated-regulation-eu-specifying-methodology-assessing-greenhouse-gas-emissions-savings_en?etransnolive=1 (accessed 05.08.2025).

[11] Del Regulation 2023/1184

[12] COM(2025) 85 final, 4.1.

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A new state aid framework[13] for achieving the objectives of the Clean Industrial Deal was published on 4 July 2025, but further detailed provisions are still pending[14]. Investments in renewable energies are to be realised more quickly through simplified tendering procedures. The crucial importance of hydrogen for development is recognised[15], in particular aid for hydrogen technologies as a net-zero technology. [16]
A regulation on public and private procurement is also being planned, which will explore measures to improve access to energy, in particular to hydrogen.

- **E-mobility initiatives**

A change to InvestEU[17] is intended to increase risk-bearing capacity, mobilising up to €50 billion in additional private investment, particularly for clean mobility. [18]
To complete the Energy Union, the objectives of REPowerEU, which promotes clean energy production and diversified energy supplies, will be further supported by the new Electrification Action Plan (planned for the first quarter of 2026)[19]. The necessary investments in renewable energy for the years 2021 to 2030 will be supported with EUR 570 billion and for 2031 to 2040 with EUR 690 billion annually by the Clean Energy Investment Strategy (planned for 2025). Studies commissioned by the EU[20] forecast annual cost savings of EUR 32 billion by accelerating electrification by 40% in 2030 through the use of flexibility from the electrification of the heating, transport and hydrogen sectors, of which EUR 9.7 billion will come from bidirectional charging of electric vehicles[21].

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[13] Press release from the Comission, Commission considers revision of State aid rules for better access to affordable housing, IP/25/1355, https://ec.europa.eu/commission/presscorner/detail/en/ip_25_1355 (accessed 05.08.2025).
Draft Communication from the Commission, Clean Industrial Deal State Aid Framework, https://competition-policy.ec.europa.eu/document/download/45b532ce-53fb-4907-975c-79edaa31a166_en?filename=2025_CISAF_draft_EC_communication.pdf&prefLang=de (accessed 05.08.2025).
further information position paper, The Chamber of Labour (AK), https://www.akeuropa.eu/sites/default/files/2025-05/DE_CISAF.pdf (accessed 05.08.2025).

[14] Communication from the Commission, Framework for State Aid measures to support the Clean Industrial Deal, COM(2025) 3602 RZ 6, https://eur-lex.europa.eu/eli/C/2025/3602/oj/eng (accessed 05.08.2025).

[15] COM(2025) 3602 RZ 4.

[16] COM(2025) 3602 RZ 3, 6, Anhang II.

[17] Regulation (EU) 2021/523 of the European Parliament and of the council of 24 March 2021 establishing the InvestEU Programme and amending Regulation (EU) 2015/1017, OJ L 2021/107.

[18] COM(2025) 85 final, 4.2.

[19] Communication from the Commission, Action Plan for Affordable Energy Unlocking the true value of our Energy Union to secure affordable, efficient and clean energy for all Europeans, COM(2025) 79 final Action 5: Completing the Energy Union, https://eur-lex.europa.eu/legal-content/EN-DE/TXT/?from=EN&uri=CELEX%3A52025DC0079 (accessed 05.08.2025).

[20] SolarPower Europe, Mission Solar 2040 Europe´s flexibility revolution, https://api.solarpowereurope.org/uploads/Mission_Solar_2040_mr_V01_1e46e7d130.pdf (accessed 05.08.2025).

[21] Fraunhofer ISE & Fraunhofer ISI, Study on the „Potential of a full EV-power-system-integration in Europe & how to realise it“, https://www.transportenvironment.org/uploads/files/2024_10_Study_V2G_EU-Potential_Final.pdf (accessed 05.08.2025).

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2.1.1.2. Production of hydrogen as RFNBO

For more sustainable transport within the EU, RED III[22] includes calculation rules for RFNBOs[23], which also include renewable hydrogen[24]. The calculation rules are one element promoting the use of energy from renewable sources. The EU aims to ensure that by 2030, the share of energy from renewable sources in the Union's gross final energy consumption is at least 42.5%[25].[26]

In Delegated Regulation (EU) 2023/1184[27], the EU has laid down binding and directly applicable rules for all EU countries on the conditions under which in particular hydrogen can be considered an RFNBO. This legal act (a study on the effectiveness and promotion of the hydrogen framework has been commissioned with a view to its revision[28]) is considered a milestone for the hydrogen sector, as it regulates the conditions for the production of renewable hydrogen for the first time. These requirements apply not only to production within the EU, but also to third countries.[29]

The EU attaches great importance to hydrogen, as Commission President Ursula von der Leyen emphasised in a speech in early summer 2024, in which she advocated an exemption for e-fuels from the ban on combustion engines from 2030. This indicates a political course in favour of the use of hydrogen derivatives, such as e-fuels, in the transport sector.[30]

2.1.1.3. 2040 climate target

According to the current proposal to amend the EU Climate Law, net greenhouse gas emissions are to be reduced by 90% compared to 1990 levels. This new EU climate target for 2040 takes full account of the current economic, security and geopolitical situation and is fully in line with the EU's new overall political strategy. The 2040 climate target is to be achieved in a new way, including through enhanced flexibility mechanisms that the Commission intends to take into account in future legal instruments. These include limited use of high-quality international credits from 2036 onwards, the use of permanent CO_2 removal under the EU Emissions Trading System (EU ETS) and

[22] Directive (EU)2018/2001, Art 27.

[23] Directive (EU)2018/2001, Art 2 Z36.

[24] Directive (EU) 2018/2001, Art 19 Abs 2.

[25] Directive (EU)2023/2413 of the European Parliament and of the council of 18 October 2023 amending Directive (EU) 2018/2001, Regulation (EU) 2018/1999 and Directive 98/70/EC as regards the promotion of energy from renewable sources, and repealing Council Directive (EU) 2015/652, OJ l 2024/2413, https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=OJ:L_202302413.

[26] Directive (EU)2018/2001, Art 3 Abs 1.

[27] Commission Delegated Regulation (EU) 2023/1184 of 10 February 2023 supplementing Directive (EU) 2018/2001 of the European Parliament and of the Council by establishing a Union methodology setting out detailed rules for the production of renewable liquid and gaseous transport fuels of non-biological origin, OJ L 2023/157.

[28] COM(2025) 85 final 3.2.

[29] European Comission, Questions and answers, Questions and Answers on the EU Delegated Acts on Renewable Hydrogen*, QANDA/23/595, https://ec.europa.eu/commission/presscorner/api/files/document/print/en/qanda_23_595/QANDA_23_595_EN.pdf (accessed 05.08.2025).

CMS, Erneuerbare Energie: EU-Regeln für erneuerbaren Wasserstoff, https://www.cmshs-bloggt.de/rechtsthemen/sustainability/sustainability-environment-and-climate-change/erneuerbare-energien-eu-regeln-fuer-erneuerbaren-wasserstoff/ (accessed 05.08.2025).

[30] *Hartlieb/Gimona*, Austrian Journal of Business Law (ÖZW) 2024, 140, Der Stoff der Zukunft – Wann gilt Wasserstoff als grün? II. B (rdb.at).

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cross-sectoral flexibility. For example, a Member State could offset deficits in the land use sector with above-average emission reductions in the transport or waste sectors.[31]

2.1.2. Legal analysis (D1.2.1)

The legal analysis (D1.2.1) on hydrogen and V2X summarises the current barriers in the political and regulatory framework of the participated countries and the EU. It highlights the existing strategic need for action: specific regulations are still lacking for various sectors.

At this point, the 'barriers' identified in the legal analysis (D1.2.1) are summarised again:

The central challenge in the area of low-carbon hydrogen is highlighted in particular: to date, no uniform methodology for assessing greenhouse gas emission savings has been established at EU level. Without this assessment basis, Member States cannot effectively apply the relevant regulations.
Although the RFNBO Delegated Act created a regulatory framework for the production of renewable hydrogen, it is extremely complex from a legal and technical perspective. This could lead to significantly higher production costs in practice, which is why it is often criticised.
The approval and authorisation of new projects remains difficult, as the underlying technologies are often novel and not yet adequately addressed in many regulatory frameworks.

2.1.3. Legal & political – factors

At this point, influencing factors are formulated based on the legal analysis summarised above (D1.2.1) and recent developments:

- **Recent developments**
  - The promotion of hydrogen is central to the EU and is supported by the introduction of an EU-wide certification system and, in future, by revised delegated regulations on RFNBOs[32], public procurement procedures and aid frameworks.
  - In 2025, EUR 6 billion from the EU Emissions Trading System will flow into the European Hydrogen Bank to promote projects, and the EU will also support the networking of market players.
  - Financial resources through changes to risk-bearing capacity are to mobilise EUR 50 billion, particularly for clean mobility. The EU forecasts potential cost savings of EUR 9.7 billion for bidirectional charging.
  - EU-wide standardisation, in particular of the method for calculating greenhouse gas emission savings, which also applies to hydrogen[33].
  - The planned increase in the EU climate target from minus 90% of net greenhouse gas emissions reflects a more stringent overall political strategy and also takes into account the current economic, security and geopolitical situation.

[31] Press release from the Comission, EU's Climate Law presents a new way to get to 2040, IP/25/1687, https://ec.europa.eu/commission/presscorner/detail/en/ip_25_1687 (accessed 05.08.2025).

[32] Del. Regulation (EU) 2023/1184.

[33] Draft Commission delegated Regulation (EU) of 8.7.2025C supplementing Directive (EU) 2024/1788 of the European Parliament and of the Council by specifying a methodology for assessing greenhouse gas emissions savings from low- carbon fuels (2025) 4674 final, https://energy.ec.europa.eu/document/download/3d3d0214-75f4-4e79-805e-3240526e2082_en?filename=C_2025_4674_1_EN_ACT_part1_v8.pdf (accessed 05.08.2025).

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- **Legal Analysis (D1.2.1)**
  - At the EU-level, the methodology for assessing greenhouse gas emission savings for low-carbon hydrogen (based on Directive 2024/1788) has not yet been established, preventing its application in the Member States and causing legal insecurity whithin the energy security.
  - While the rules for the production of renewable hydrogen (RFNBO Delegated Act) have been set, their complexity may lead to increased production costs.
  - Obtaining permits and securing all necessary approvals remain challenging due to the novelty of the technologies.

2.2. Germany

2.2.1. Recent developments

Germany has made substantial legislative and strategic progress in the fields of hydrogen and e-mobility. According to the legal analysis, one of the key developments is the adoption and ongoing implementation of the **National Hydrogen Strategy (NWS)**, which defines the overall framework for hydrogen policy in Germany. The strategy establishes national targets for scaling hydrogen production, building transport and storage infrastructure, and supporting industrial applications. Furthermore, Germany has introduced the **National Charging Infrastructure Masterplan II**, which updates the earlier plan by incorporating digitalisation measures and enhanced coordination for the development of electric-vehicle charging infrastructure.

Another major legal development is the **Hydrogen Acceleration Act**, which aims to speed up the deployment of hydrogen infrastructure by simplifying administrative procedures, facilitating planning and permitting, and providing investment incentives. Additionally, the continued expansion of support programmes under the **Renewable Energy Sources Act (EEG)** and the **Energy Industry Act (EnWG)** strengthens the legal foundation for integrating renewable energy into Germany's energy system and supports both hydrogen and e-mobility sectors. These efforts are complemented by a strong political commitment to **sector coupling**, which connects the energy, transport, and industrial sectors through the use of renewable electricity and hydrogen technologies.

Beyond these broader policy measures, several specific **legal and regulatory decisions in 2025** have further shaped Germany's framework for hydrogen and storage integration. On **14 July 2025**, the **Federal Network Agency** issued its formal determination setting the **ramp-up tariff for the hydrogen core network (WANDA)** at **€25 / kWh / h / a**, thereby fixing the initial tariff level for access to the planned hydrogen network and providing investment certainty for both network users and infrastructure operators[34]. This determination operationalises how early users of the hydrogen core network will be charged and establishes a transparent framework for recovering infrastructure costs during the initial market phase. The decision followed an earlier **consultation process launched on 26 March 2025**, in which the Federal Network Agency published a draft

[34] https://www.bundesnetzagentur.de/SharedDocs/Pressemitteilungen/EN/2025/20250714_Hochlauf. html

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determination and a key-elements paper for a differentiated tariff system[35]. This consultation provided the methodological foundation for the final tariff ruling and ensured stakeholder participation in designing the financing model for hydrogen infrastructure.

Shortly thereafter, on **15 July 2025**, the **Federal Court of Justice (BGH)** issued a landmark decision (**EnVR 1/24**) concerning the treatment of **battery energy storage systems (BESS)** under German grid-connection law. The Court held that distribution-system operators are entitled to charge **construction-cost contributions (BKZ)** for grid connections of storage installations and that these contributions may be calculated using the same capacity-based model applied to other end users[36]. This ruling confirmed that storage installations are not automatically exempt from connection-cost obligations and provided long-awaited judicial clarity on the applicability of BKZ rules to energy-storage systems. Legal commentaries have interpreted the decision as a precedent-setting judgment, likely to influence how network operators classify and charge both stationary and, by analogy, mobile or aggregated storage assets within V2X and grid-services frameworks[37].

Taken together, these 2025 developments — the **WANDA tariff determination**, the **BGH ruling on connection-cost contributions**, and the **consultation process on hydrogen tariffs** — have immediate regulatory relevance for the further integration of hydrogen and storage technologies into the German energy system. They establish legal certainty for investors and operators, strengthen the link between infrastructure financing and network access, and clarify cost-allocation principles for grid-connected storage. Combined with Germany's overarching strategies on hydrogen and e-mobility, these measures consolidate the national framework for renewable-energy integration and the transition toward a flexible, sector-coupled energy system.

2.2.2. Legal Analysis (D1.2.1)

The legal framework governing hydrogen and e-mobility in Germany is embedded in several national and European legislative instruments that define strategic objectives, responsibilities, and financial mechanisms. The **National Hydrogen Strategy** establishes hydrogen as a central element of the German energy transition and a key instrument for achieving decarbonisation goals, especially in the transport, industrial, and heating sectors. It also acts as Germany's national implementation of the **European Hydrogen Strategy**, ensuring coherence between domestic and European climate policies.

The production, transport, and use of hydrogen are mainly regulated under the **Energy Industry Act (EnWG)** and the **Renewable Energy Sources Act (EEG)**. The legal analysis notes that while hydrogen can be generated from renewable sources, the classification and regulation of hydrogen, particularly regarding grid access and remuneration, are still under development as the market expands. In addition, hydrogen projects receive targeted funding through national and European programmes, including the **Important Projects of Common European Interest (IPCEI)**, which support industrial-scale hydrogen production and infrastructure in strategic clusters.

In the field of e-mobility, Germany follows a comprehensive approach that combines financial incentives, regulatory obligations, and long-term infrastructure planning. The **Electric Mobility Act**

[35] https://www.bundesnetzagentur.de/DE/Beschlusskammern/1_GZ/GBK-GZ/2024/GBK-24-01-2%231_WANDA/englische_Seiten/Downloads/Wanda_Festlegung_DL_EN.pdf?__blob=publicationFile&v=8&utm

[36] https://www.bundesgerichtshof.de/SharedDocs/Pressemitteilungen/DE/2025/2025129.html

[37] https://www.eversheds-sutherland.com/en/united-states/insights/bgh-ruling-allows-building-cost-contributions-for-battery-storage

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(EmoG) provides specific privileges for electric vehicles, such as access to bus lanes and designated parking spaces, thereby encouraging adoption. The **Building Electric Mobility Infrastructure Act (GEIG)** introduces mandatory requirements for pre-installation of charging points in new or renovated buildings, ensuring that the necessary infrastructure grows in parallel with electric-vehicle demand.

The analysis also highlights that while legal provisions for **vehicle-to-X (V2X)** applications are not yet fully developed, the concept is gaining importance in German and European discussions. Bidirectional charging and the use of electric vehicles as mobile storage units are primarily guided by European electricity-market regulations and data-access rules, rather than by specific national legislation.

Strategically, both hydrogen and e-mobility are considered essential components of Germany's decarbonisation and energy-security objectives. Coordination between the **Federal Ministry for Economic Affairs and Climate Action (BMWK)**, the **Federal Ministry for Digital and Transport (BMDV)**, and the **Federal Ministry for the Environment (BMUV)** ensures alignment between energy, transport, and industrial policies. The legal analysis identifies the need for harmonised rules governing hydrogen transport networks, grid connection for electrolysers, and market-participation mechanisms for V2X technologies to enhance coherence and efficiency within the regulatory system.

2.2.3. Legal & political – factors

2.2.3.1. Recent developments for Hydrogen integration

Germany's National Hydrogen Strategy provides a comprehensive roadmap for the production, transport, storage, and utilisation of hydrogen, positioning the country as a European leader in the emerging hydrogen economy. Legal reforms to the Energy Industry Act (EnWG) have enabled the official definition of hydrogen networks and clarified their regulatory classification, thereby addressing gaps between existing gas legislation and the requirements of a future hydrogen infrastructure. National and European funding programmes, particularly the IPCEI, play a crucial role in supporting large-scale hydrogen projects and accelerating market development. A central influencing factor identified in the analysis is the need for closer EU-level coordination in order to harmonise hydrogen certification, ensure the sustainability of production pathways, and enable the integration of cross-border infrastructure across member states.

2.2.3.2. Recent developments for E-Mobility integration

The ongoing implementation of the Charging Infrastructure Masterplan II marks an important step toward a nationwide charging network that supports both private and public electric mobility. The plan also integrates smart-grid functionalities and digital control systems, which will be essential for future V2X applications. **The Building Electric Mobility Infrastructure Act (GEIG)** has strengthened legal obligations for property developers and owners to equip buildings with charging infrastructure or pre-installation capabilities, thereby improving long-term accessibility. In addition, financial incentives and tax exemptions continue to encourage the purchase and use of electric vehicles, sustaining market growth.

The legal analysis emphasises, however, that the regulatory framework for V2X technologies remains incomplete. Clearer rules are required to define the conditions under which electric vehicles can feed electricity back into the grid or participate in balancing and flexibility markets.

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Without these legal definitions, widespread V2X integration remains limited despite strong technological progress and policy interest.

2.2.3.3. Legal Analysis for Hydrogen and E-Mobility integration

The analysis shows that hydrogen and e-mobility policies in Germany share a common legal foundation centred on the integration of renewable energy and the coupling of different sectors. The **Energy Industry Act (EnWG)** and the **Renewable Energy Sources Act (EEG)** form the core legal basis for linking electricity, transport, and hydrogen systems. However, the analysis points out that both laws require continuous adaptation to ensure coherence and technological neutrality as new market models and energy carriers emerge.
Furthermore, the study identifies overlapping administrative responsibilities among authorities as a challenge, underlining the need for streamlined permitting procedures and harmonised technical standards. At the European level, Germany's legal framework is consistent with the objectives of the European Green Deal, the **Fit-for-55 package**, and the **EU Hydrogen Strategy**, all of which seek to establish hydrogen and electric mobility as key enablers of the transition to a climate-neutral economy. This alignment ensures that Germany's national actions contribute to and benefit from the wider European legal and regulatory architecture for sustainable energy and transport integration.

2.3. Austria

2.3.1. Recent developments (July 2025)

On 4 July 2025, the revised draft of the **Electricity Industry Act**[38] (hereinafter **ElWG**) was submitted for review, which is intended to replace the currently legally binding Electricity Act 2010 (Elektrizitätswirtschafts- und -organisationsgesetz 2010, ElWOG). The ElWG was passed by Parliament on 11 December 2025. Due to the timing of its announcement, the final version of the ElWG could not be included in this analysis. The following information refers to the draft dated 4 July 2025. According to the press conference on 12 December 2025, this draft remained 90% unchanged.
The new legal framework for the electricity market aims to facilitate the integration of renewable energy by adapting the market structure to current conditions. To ensure a modern legal framework, the definition of an electricity company in the ElWG now also includes electrolysis and the operation of battery storage systems. The practice of feeding surplus electricity into the grid is taken into account, as are bidirectional charging and self-consumption in a new structure for the approval process.

E-Control is designated as the competent regulatory authority for the hydrogen economy in accordance with Directive (EU) 2024/1788. Electrolysis is covered by the definition of energy storage, and electrolysis plants therefore fall under the term energy storage facilities.

[38] Draft 2025-07-03, Electricity Act, https://www.ris.bka.gv.at/Dokument.wxe?ResultFunctionToken=afd4abd1-846c-4719-9b00-4e46cb6d36c9&Position=1&SkipToDocumentPage=True&Abfrage=Begut&Einbringer=&Titel=&DatumBegutachtungsfrist=07.07.2025&ImRisSeitVonDatum=&ImRisSeitBisDatum=&ImRisSeit=Undefined&ResultPageSize=100&Suchworte=&Dokumentnummer=BEGUT_EA7560E7_C947_4C7F_BF46_43979B222C17 (accessed 05.08.2025).

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Storage facilities are promoted, among other things, by simplifying the approval procedures that fall under the end-customer exemption. The end-customer exemption applies to natural or legal persons who purchase electricity for their own consumption – this also includes the operation of an energy storage facility – or who use electricity from their own supply facility to operate the energy storage facility and thus also cover their own consumption. In order to further promote such cases, a notification requirement under the Trade Regulation Act (GewO) is sufficient and approval under the ElWG is not required.

Electric vehicles are considered energy storage systems if they perform bidirectional processes. In addition, a uniform term for bidirectional charging has been established in the ELWG. Another strategic aspect concerns intelligent charging infrastructure. This enables the dynamic adjustment of current based on electronically transmitted information.
In addition, clearly defined measurement concepts have been introduced to enable flexible use and distribution of energy.

2.3.2. Legal Analysis (D1.2.1)

At this point, the 'barriers' identified in the legal analysis (D1.2.1) are summarised:

The legal analysis (D1.2.1) of the political and regulatory framework for hydrogen and V2X in Austria reveals potential for strategic action in the following areas:
There is no clear definition of energy storage facilities that covers both electrolysers and V2X systems within the meaning of EU law. In addition, significant regulatory changes are expected for storage facilities, which will fall within the scope of the new ElWG.
The financial framework is also unclear: there is uncertainty about system usage fees for storage facilities and financial incentives, which makes investment difficult. Large-scale industrial projects are also faced with complex funding structures, as they have to submit several individual applications in order to meet different funding thresholds. Furthermore, the distribution of roles in **Vehicle-to-Grid** (hereinafter **V2G**) applications has not yet been sufficiently clarified, particularly with regard to tax law aspects such as possible double taxation.
The future use of hydrogen in mobility is also uncertain, as economic considerations in particular pose significant challenges to its introduction. There is also uncertainty about how the decarbonisation package will be implemented at national level.

2.3.3. Legal & political factors

At this point, influencing factors are formulated based on the legal analysis summarised above (D1.2.1) and recent developments:

2.3.3.1. Recent developments for Hydrogen integration

- Regulatory responsibility: E-Control will become the central regulatory authority for the hydrogen economy.
- Integration of electrolysis plants: Electrolysis counts as energy storage within the meaning of the ElWG.
- Electricity companies: Electrolysis will be covered by energy storage, which will now also include this function of electricity companies.

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- Legal certainty for approvals: clear allocation of hydrogen plants to the ElWG or the Trade Regulation Act in the context of the end customer exemption.

2.3.3.2. Recent developments for E-Mobility integration

- Bidirectional and intelligent charging is taken into account by law.
- Bidirectional charging processes in conjunction with an electric vehicle are recognised as energy storage.
- Flexible measuring systems: New metering points enable precise billing even at multiple locations within a customer's facility.

2.3.3.3. Legal Analysis for Hydrogen and E-Mobility integration

- Legal uncertainty due to the pending adoption of the new Electricity Act, which is expected to introduce significant regulatory changes for energy storage facilities.
- Uncertainty regarding financial incentives, particularly in relation to system usage charges for energy storage facilities.
- Complex funding structures for large-scale industrial projects require multiple applications to secure full financing, as individual funding thresholds apply.
- Uncertainty remains concerning the use of hydrogen in the mobility sector. Economic considerations, in particular, pose significant challenges to its adoption.
- Uncertainty regarding the implementation of the decarbonization package at the national level.
- Lack of a clear definition for energy storage facilities, which could encompass both electrolysers and V2G systems.
- Lack of clarity on the division of roles for V2G processes and potential double taxation issues.

2.4. Slovakia

2.4.1. Recent developments (2023-2025)

Between 2023 and 2025, Slovakia has made several important policy and infrastructural advances related to hydrogen, renewable energy, and e-mobility integration. The country’s energy transition efforts are guided primarily by the National Energy and Climate Plan (NECP), the Hydrogen Strategy of the Slovak Republic, and the Integrated National Energy and Climate Plan 2021–2030, which together aim to strengthen the decarbonisation of industry and transport sectors.
The most significant developments include:
Hydrogen policy implementation: Following the adoption of the national Hydrogen Strategy in 2021, the government began implementing pilot hydrogen infrastructure projects, including the JESS Green Hydrogen for Transport project in Trnava and related initiatives for decentralised hydrogen production and storage. The period 2023–2025 marks the first phase of testing hydrogen production through a 1 MW PEM electrolyser, financed by EU funds under the Operational Programme Quality of Environment (EFRR).
Renewable energy expansion: Slovakia continues to focus on expanding renewable sources, especially solar power, through both brownfield and greenfield PV installations. In 2024, the

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completion of additional photovoltaic plants near Jaslovské Bohunice contributed to the energy mix, supporting electricity production for hydrogen generation.
E-mobility infrastructure: The number of public charging stations increased steadily, with municipal and regional projects such as the eGUTS pilot in Senec, which installed 2×22 kW public chargers as part of the city's local action plan to promote electric mobility. Further investments have been coordinated through the Slovak Electric Vehicle Association (SAE) and the Ministry of Economy's e-mobility action framework.
Energy regulation: The Regulatory Office for Network Industries (ÚRSO) and the Ministry of Economy updated rules on connection procedures and distribution tariffs to enable broader integration of renewable generation and electric vehicle charging networks.
Overall, Slovakia's efforts between 2023 and 2025 reflect an increasing focus on building pilot infrastructures and preparing the legal basis for the long-term integration of hydrogen and electromobility into the national energy system.

2.4.2. Legal Analysis (D1.2.1)

The legal analysis conducted in Deliverable D1.2.1 highlighted Slovakia's transitional phase between existing EU-aligned frameworks and new national-level regulations for renewable hydrogen and vehicle-to-grid (V2G) systems.
Key findings include:
Hydrogen Strategy and legal framework: Slovakia adopted its National Hydrogen Strategy in 2021, focusing on decarbonisation of transport and industry. However, it lacks a detailed implementation act defining hydrogen as a commodity or establishing a hydrogen market operator. Legislation for hydrogen infrastructure development remains partially covered by the Energy Act (No. 251/2012 Coll.) and Act on Regulation in Network Industries (No. 250/2012 Coll.), but these acts do not yet contain specific provisions for hydrogen transport and storage.
Electricity and energy storage: The Slovak legislation has not yet transposed the EU definition of energy storage as specified in Directive (EU) 2019/944. Electrolysers and V2G systems are not explicitly recognised as energy storage facilities, which leads to regulatory ambiguity for investors and grid operators.
Mobility and alternative fuels: Slovakia has a national Alternative Fuels Infrastructure Development Plan aligned with EU Regulation (EU) 2023/1804 (AFIR). However, the transposition process is ongoing. Legal incentives for public and private e-mobility infrastructure remain under the competence of municipalities and regional authorities.
Environmental and permitting framework: The permitting process for hydrogen projects is still lengthy and follows the general procedures under the Construction Act and Environmental Impact Assessment Act (No. 24/2006 Coll.). Pilot projects such as JESS Trnava are therefore implemented under regulatory sandboxes established by ÚRSO and SEPS to test new technologies in controlled conditions.
Overall, while Slovakia has strategically aligned itself with EU directives and climate goals, its national legal framework for hydrogen and e-mobility integration remains fragmented, requiring further harmonisation and the introduction of targeted secondary legislation.

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2.4.3. Legal & political – factors

2.4.3.1. Recent developments for Hydrogen integration

Slovakia's hydrogen policy landscape between 2023–2025 is characterised by practical pilot deployments and alignment with EU decarbonisation goals:

- Hydrogen production pilots: The JESS project in Trnava (2024–2026) established a foundation for a decentralised production network of green hydrogen from renewable sources. The project's integration into SEPS's regulatory sandbox provides valuable lessons for energy balancing and grid support services.
- Cross-sector cooperation: Cooperation between the Ministry of Economy, SEPS, and industry actors (e.g., Slovenské Elektrárne) highlights growing institutional interest in hydrogen's potential for balancing services and industrial decarbonisation.
- EU alignment: The Slovak hydrogen framework adheres to Directive (EU) 2024/1788 on gas market decarbonisation and hydrogen certification. However, implementation guidelines for certification and taxation are still pending.

2.4.3.2. Recent Developments for E-Mobility Integration

E-mobility development in Slovakia remains focused on municipal pilot projects and public-private cooperation:

- Municipal e-charging: The Senec project and follow-up activities by the Slovak Electric Vehicle Association demonstrate a successful local-level model for scaling up infrastructure.
- Regulatory update: ÚRSO is considering tariff reforms to incentivise off-peak EV charging and V2G readiness. Integration of e-mobility with renewable electricity production remains a priority within Slovakia's National Recovery and Resilience Plan (Component 3 – Green Slovakia).
- Infrastructure growth: Public charging stations surpassed 1 600 units in 2025, with growing participation from private energy providers such as ZSE Drive and GreenWay.

2.4.3.3. Legal Analysis for Hydrogen and E-Mobility integration

Key influencing (legal & political) factors identified for Slovakia include:

- Lack of explicit legal definition for hydrogen and energy storage.
- Fragmented governance among ministries and regulatory bodies.
- Insufficient incentives for private investment in hydrogen and EV infrastructure.
- Positive development of pilot projects as precursors for national scaling.
- Gradual harmonisation with EU decarbonisation and transport directives.

These factors indicate that while Slovakia is moving in line with EU frameworks, further institutional coordination and legal clarity will be essential for full-scale integration of hydrogen and electromobility into the national energy system.

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2.5. Romania

2.5.1. Recent developments (2023–2025)

In 2023, Romania enacted Law No. 237/2023, establishing for the first time a comprehensive legal framework for hydrogen production, storage, transport, and utilization. The law introduces definitions for renewable fuels of non-biological origin, renewable hydrogen, and low-carbon hydrogen, and imposes obligations on industrial hydrogen consumers and fuel providers to gradually increase their use of renewable fuels and hydrogen. It also sets a mandatory minimum share of renewable fuels in supplied energy from 2030 onwards and introduces certification, safety, and reporting requirements.

Romania has also updated its strategic planning documents. The **Integrated National Energy and Climate Plan (NECP) 2021–2030** emphasizes emission reduction, efficiency, and renewable energy development, including charging infrastructure and future V2G integration. The **Sustainable Development Strategy 2030** aligns transport and energy with climate action objectives.

In terms of e-mobility, Romania offers substantial subsidies for the purchase of EVs, hybrids, and hydrogen vehicles, although amounts were reduced in 2024 due to budget constraints. By the end of 2023, over 42,000 EVs were registered and more than 5,000 charging stations installed, with the target of a station every 60 km on main roads by 2025 and hydrogen refuelling every 200 km by 2030. While V2G is not yet regulated, it is recognized as a promising technology.

2.5.2. Legal Analysis (D1.2.1)

The legal analysis highlights both progress and gaps in Romania's framework:

- **Hydrogen**: The late adoption of a dedicated hydrogen law in 2023 filled a significant regulatory gap but requires effective enforcement and sustained investment to achieve impact. Challenges remain in infrastructure deployment and financial support mechanisms.
- **Sector coupling**: Laws encourage integration of electrolysers and hydrogen infrastructure, supporting decarbonisation where direct electrification is not possible.
- **E-mobility and V2G**: While EV adoption is incentivised, V2G is not legally defined. Compensation and taxation frameworks for energy fed back to the grid are missing.
- **EU alignment**: Romanian legislation is broadly aligned with RED II, AFIR and the Clean Energy Package, but requires further harmonisation with Delegated Regulation 2023/1184 (hydrogen certification).
- **Strategic gap**: The absence of a standalone hydrogen strategy until recently created uncertainty for investors and slowed early sector development.

2.5.3. Legal & political – factors

2.5.3.1. Recent developments for Hydrogen integration

- Law No. 237/2023 establishes a national hydrogen framework, with certification, safety standards, and mandatory renewable fuel shares from 2030.
- Sector coupling supported through regulatory provisions for electrolysers and hydrogen refuelling stations.
- NECP (2021–2030) highlights hydrogen's role in decarbonisation and sector integration.

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2.5.3.2. Recent developments for E-Mobility integration

- Significant subsidies remain for EVs, hybrids, and hydrogen vehicles (although reduced since 2024).
- By end-2023, 42,000 EVs and 5,000 charging stations registered, with EU-aligned deployment targets.
- V2G mentioned in strategic planning but not yet legally regulated.

2.5.3.3. Legal Analysis for Hydrogen and E-Mobility integration

- Uncertainty regarding enforcement and funding for Law No. 237/2023.
- Lack of dedicated framework for V2G, including compensation, taxation, and market integration.
- Potential misalignment with EU Delegated Regulation 2023/1184 on hydrogen certification.
- Risk of slowed adoption due to reduced subsidies for EVs and hybrids.
- Need for proactive long-term hydrogen strategy beyond legislative compliance.

2.6. Serbia

2.6.1. Recent developments (July 2025)

In 2025, Serbia's green energy transition is anticipated to be shaped by a multifaceted set of developments, driven by its overarching goal of aligning with European Union (EU) standards while navigating its own unique economic and geopolitical realities. A primary focus will be on solidifying the policy and regulatory frameworks for both hydrogen and electric vehicles (EVs). This involves the likely introduction of national-level strategies and regulations specifically designed for hydrogen, covering aspects such as production standards, transportation protocols, storage guidelines, and safety requirements. While still nascent, these regulations will be crucial for creating a stable and predictable investment environment for hydrogen technologies.

Alongside regulatory advancements, 2025 is expected to witness a tangible expansion of hydrogen pilot projects across various sectors of the Serbian economy. These projects will serve as real-world testing grounds for evaluating the effectiveness and scalability of hydrogen technologies in diverse applications. Key areas of focus could include integrating hydrogen into industrial processes (such as steel production and chemical manufacturing), deploying hydrogen-powered vehicles in heavy-duty transportation (buses, trucks), and exploring hydrogen's potential for energy storage to complement intermittent renewable energy sources. Recognizing the importance of a supportive infrastructure, 2025 will likely see strategic investments in smaller-scale hydrogen infrastructure . This may involve the construction of hydrogen refueling stations, initially concentrated in industrial zones with high demand or serving specific pilot projects. While widespread hydrogen pipeline networks are unlikely in the short term, initial planning and feasibility studies for such infrastructure may commence. To further accelerate the adoption of green technologies, Serbia will be striving to integrate renewable energy sources more closely with both hydrogen production and EV charging infrastructure. This involves co-locating hydrogen production facilities with solar

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or wind farms, as well as exploring innovative solutions for using renewable energy to power EV charging networks.

A parallel effort to promote electric mobility will continue in 2025, with a strong emphasis on expanding the EV charging network across the country. This expansion will target urban centers, major transportation corridors, and rural areas, with the aim of addressing the existing infrastructure gap and making EV ownership more practical for Serbian consumers. Government incentives, private sector investment, and the involvement of municipalities will be crucial drivers of this expansion. Accompanying the charging infrastructure build-out, Serbia will likely witness a continued rise in EV sales and adoption rates, fueled by a combination of factors. Government subsidies and tax breaks will remain important drivers, particularly for lower-income households and businesses. Furthermore, increasing consumer awareness of the environmental and economic benefits of EVs, coupled with the growing availability of diverse EV models in the market, will contribute to broader adoption. To ensure the electricity grid can handle the increased demand from EV charging, grid modernization efforts will be crucial. This may involve investments in smart grid technologies, upgraded power lines, and enhanced grid capacity to accommodate the surge in electricity demand without compromising grid stability.

To further encourage the industry, the country could look into supporting domestic assembly of these technologies, either by forming strategic partnerships or other foreign investment projects.

These developments are strongly interconnected with Serbia's progress towards EU accession and its broader economic performance. Alignment with EU regulations will remain a key driver, encouraging the adoption of best practices and the implementation of standardized approaches. However, Serbia's ability to attract foreign investment and secure funding for green energy projects will depend on its economic stability and its ability to create an attractive investment climate. Similarly, Serbia's complex relationships with the EU, Russia, and China will continue to exert an influence on its energy policies and investment decisions, shaping its energy mix and its strategic partnerships in the green energy sector.

Interrelation & Synergies:

- Renewable Energy Integration: A key development would involve greater integration of renewable energy sources (solar, wind) with both hydrogen production and EV charging infrastructure. This could improve the environmental performance of both sectors and potentially reduce electricity costs.
- Policy Alignment: Further harmonization of policies and regulations between the hydrogen and electric mobility sectors could be anticipated. This could involve streamlining permitting processes, establishing common standards, and promoting synergies between the two sectors.

Important Considerations:

- Economic Conditions: The pace of these developments would be heavily influenced by Serbia's overall economic performance and its ability to attract foreign investment.
- EU Accession: Progress towards EU accession would continue to be a key driver, encouraging the adoption of EU standards and regulations.
- Geopolitical Factors: Serbia's relationships with the EU, Russia, and China would continue to shape its energy policies and investment decisions.

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2.6.2. Legal Analysis (D1.2.1)

This document examines the regulatory and policy terrain in Serbia related to hydrogen and electric mobility, positioning it within the broader context of Serbia's efforts [39][40][41]to align with European Union (EU) standards as part of its EU accession process, even though the nation isn't a member yet. It stresses how the move towards lower emissions and the adoption of greener technologies, including hydrogen and electric vehicles, plays a key role in Serbian environmental policy.

The document notes that, while Serbia is committed to the European Green Deal's objectives, its legal and policy framework regarding hydrogen energy is still in its infancy. It points out the absence of specific national laws solely focused on hydrogen technology; instead, hydrogen-related policies [42][43]are integrated into broader energy strategy documents and climate action plans, with an emphasis on renewable energy sources like solar, wind, and hydropower. The 2024 National Energy and Climate Plan (NECP)[44] is cited as a key example, highlighting hydrogen's potential role in Serbia's decarbonization strategy. The document mentions new and innovative RES technologies for electricity production will be promoted through pilot projects (small wind turbines, renewable hydrogen production). In terms of legislative instruments, the Energy Law and the Law on Renewable Energy Sources [45][46]are mentioned as relevant, even though they don't specifically address hydrogen.

Turning to electric mobility, the document details Serbia's efforts to promote electric vehicles (EVs) through various policies and incentives. It highlights the Green Agenda for 2021-2030, which focuses on sustainable development, energy efficiency, and clean transport. Subsidies and tax incentives for electric vehicle purchases, as well as subsidies for the installation of EV charging stations, are mentioned as key policy tools. The Law on Air Protection (2016) is cited as a legal instrument that indirectly encourages the use of electric vehicles by tackling air pollution. The Regulation on Charging Infrastructure (2020) and EU's Green Deal's transport policies and the Alternative Fuels Infrastructure Directive are also mentioned.

Despite these efforts, the document acknowledges several challenges and gaps in Serbia's legal framework for electric mobility. These include insufficient charging infrastructure, particularly in rural areas, the high upfront cost of electric vehicles despite government subsidies, and a need for better public awareness programs to encourage EV adoption. The document briefly touches upon

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[39] The Law on Renewable Energy Sources (Official Gazette of the RS, no. 40/2021 and 35/2023) https://www.paragraf.rs/propisi/zakon-o-koriscenju-obnovljivih-izvora-energije.html

[40] Integrated national energy and climate plan of Republic of Serbia by 2030 with a vision for 2050 (Official Gazette of the RS, no. 70/2024) http://demo.paragraf.rs/demo/combined/Old/t/t2024_08/SG_070_2024_002.htm

[41] SERBIA AND 2030 AGENDA, Mapping the National Strategic Framework, vis-a-vis the Sustainable Development Goals https://rsjp.gov.rs/wp-content/uploads/Serbia-and-2030-Agenda_November-2021.pdf

[42] The Law on Renewable Energy Sources (Official Gazette of the RS, no. 40/2021 and 35/2023) https://www.paragraf.rs/propisi/zakon-o-koriscenju-obnovljivih-izvora-energije.html

[43] Draft Hydrogen Strategy for Serbia https://www.h2cluster.rs/nacrt-strategije-za-vodonik-u-srbiji/

[44] Integrated national energy and climate plan of Republic of Serbia by 2030 with a vision for 2050 (Official Gazette of the RS, no. 70/2024) http://demo.paragraf.rs/demo/combined/Old/t/t2024_08/SG_070_2024_002.htm

[45] The Energy Law (Official Gazette of the RS, no. 62/2023) https://www.paragraf.rs/propisi/zakon_o_energetici.html

[46] The Law on Renewable Energy Sources (Official Gazette of the RS, no. 40/2021 and 35/2023) https://www.paragraf.rs/propisi/zakon-o-koriscenju-obnovljivih-izvora-energije.html

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political and economic implications, pointing out that Serbia's energy policies are influenced by its relationships with the EU, Russia, and China.
The document concludes with a call to action, recommending that Serbia expand and refine its legal frameworks for hydrogen and electric mobility, strengthen regional cooperation, increase public-private partnerships to develop infrastructure, and enhance financial incentives for consumers and businesses to adopt green technologies. By addressing these gaps, the document argues, Serbia can position itself as a leader in the region in the transition to a green and sustainable economy.

2.6.3. Legal & political -factors

Factors from legal analysis
The legal analysis discusses Serbia's regulatory and policy framework for hydrogen energy and electric mobility as it aligns with EU standards in its pursuit of EU membership. While Serbia has made strides in adopting green technologies and integrating renewable energy sources, it still faces challenges such as the lack of a clear regulatory framework for hydrogen, insufficient infrastructure for electric vehicles, and the need for greater public awareness. The document emphasizes the importance of aligning domestic policies with EU frameworks, fostering regional cooperation, and attracting private-sector investment to fully realize the potential of hydrogen and electric mobility in Serbia.

- **Legal and Political Factors:**
    - EU Accession Process: Serbia's efforts to align its energy and environmental policies with European Union regulations as part of its EU accession process.
    - Energy Community Treaty: Serbia's legal framework on hydrogen energy is shaped by its obligations to the Energy Community Treaty (signed with the EU) and the EU Clean Energy for All Europeans package.
    - National Energy and Climate Plan (NECP): Serbia's plan outlines intentions to reduce carbon intensity and increase renewable energy share, including hydrogen, aiming for climate neutrality by 2050.
    - Law on Air Protection (2016): A legal instrument supporting Serbia's efforts to tackle air pollution and encourage electric vehicle use.
    - Regulation on Charging Infrastructure (2020): Governs the installation of public charging stations, ensuring compatibility and safety standards for electric vehicle infrastructure.
    - EU Green Deal Alignment: Serbia's transport policies align with the EU's Green Deal, with participation in the Energy Community.
    - Geopolitical Considerations: Serbia's energy policies are influenced by relationships with the EU, Russia, and China, balancing EU alignment with ties to Russia for energy supplies.
    - Regional Cooperation: Serbia can benefit from regional cooperation within the Western Balkans on hydrogen technology development.
    - EU Alternative Fuels Infrastructure Directive: Influences Serbia's development of charging stations, harmonizing with EU standards for cross-border EV networks.
    - Green Agenda for 2021-2030: Serbian Government adopted the Green Agenda focusing on sustainable development, energy efficiency, and clean transport.
    - The Energy Law (Official Gazette of the RS, no. 62/2023)

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  - The Law on Renewable Energy Sources (Official Gazette of the RS, no. 40/2021 and 35/2023)
  - European Agreement on Road Transport

- **Hydrogen Legal & Political Factors:**
  - Nascent Legal Framework & Opportunity: The most significant factor is the current lack of a comprehensive, dedicated legal framework for hydrogen. This creates both challenges and opportunities.
    - Challenge: Uncertainty for investors and developers due to undefined regulations on production, transportation, storage, safety, and environmental impact. Projects may face lengthy approval processes and potential legal hurdles.
    - Opportunity: Serbia has a blank slate to design a framework that promotes innovation, attracts investment, and addresses specific local needs while aligning with international best practices.
  - EU Alignment as a Driver: Serbia's EU accession process is a powerful force pushing for the adoption of hydrogen-friendly policies. This includes implementing relevant EU directives and regulations related to energy, environment, and transportation.
    - Impact: While direct implementation of EU rules isn't immediate, the alignment process necessitates that Serbia gradually incorporate key principles and standards. This would likely result in regulations promoting green hydrogen production, setting emissions targets, and ensuring safety and interoperability.
  - Political Will & Government Support: The level of political commitment to hydrogen and the provision of government support are key determinants.
    - Factors Influencing: Government priorities, budget allocations, public perception of hydrogen, and lobbying efforts from industry stakeholders.
    - Potential Actions: Financial incentives (subsidies, tax credits), streamlined permitting processes, public-private partnerships, and support for research and development.
  - Interplay with Existing Energy Landscape: Decisions about hydrogen will be influenced by Serbia's current energy mix and infrastructure.
    - Considerations: Reliance on coal-fired power generation, existing natural gas infrastructure, and the potential to leverage renewable energy resources (solar, wind, hydropower).
    - Potential Outcomes: Policies that prioritize hydrogen production using renewable energy, explore the use of existing natural gas pipelines for hydrogen blending, and incentivize the development of dedicated hydrogen infrastructure.

- **Electric Vehicle (EV) Legal & Political Factors:**
  - Evolving Legal Framework: Serbia already has some legal instruments in place to support electric mobility (e.g., Law on Air Protection, Green Agenda, incentives for EV purchases and charging stations).
    - Focus Areas: Regulations on charging infrastructure installation and operation, standards for EV batteries, waste management protocols for EV batteries, and incentives to accelerate EV adoption.

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  - EU Green Deal Alignment: Similar to hydrogen, the EU Green Deal serves as a key policy driver.
    - Implications: Policies that promote zero-emission vehicles, set targets for EV sales, and support the development of a comprehensive charging infrastructure network.
  - Geopolitical Considerations: Serbia's energy policies are influenced by its relationships with the EU, Russia, and China.
    - Influence: Dependence on Russian natural gas and the potential for Chinese investment in EV manufacturing or infrastructure projects. Balancing these relationships while pursuing EU alignment is a key political challenge.
    - Potential Scenarios: Serbia could seek to diversify its energy sources, attract investment from multiple countries, and carefully navigate the complex geopolitical landscape.

- **Cross-Sectoral Considerations:**
  - Coordination & Policy Coherence: Achieving synergy between hydrogen and EV development requires effective coordination across different government ministries and agencies.
    - Importance: Ensuring that policies related to energy, transportation, environment, and industry are aligned and mutually supportive.
  - Public Awareness & Acceptance: Public support for hydrogen and EVs is essential for their successful adoption.
    - Strategies: Public awareness campaigns, educational programs, and demonstrations of the benefits of these technologies.
  - Regional Cooperation: Collaboration with neighboring countries can create economies of scale, facilitate cross-border infrastructure development, and harmonize regulations.
  - Social & Economic Impacts: The transition to hydrogen and EVs could have both positive and negative social and economic impacts.
    - Positive Impacts: Job creation in green industries, reduced air pollution, and improved energy security.
    - Negative Impacts: Potential job losses in traditional energy sectors, higher costs for consumers, and challenges for rural communities.

- **Overall, the legal and political landscape for hydrogen and EVs in Serbia is characterized by:**
  - A dynamic and evolving situation.
  - Strong influence from the EU accession process.
  - Complex geopolitical considerations.
  - The need for clear policy direction and government support.

2.6.3.1. Recent developments for Hydrogen integration

- **Potential Developments in Hydrogen Integration (10/05/2025):**
  - Early Adoption in Niche Sectors: Given the challenges with infrastructure and cost, widespread adoption of hydrogen is still unlikely. However, integration in niche sectors, where its unique properties offer a clear advantage, would likely be observed.

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        - Industrial Applications: Focus on decarbonizing hard-to-abate industrial processes like steelmaking, ammonia production, and oil refining. This might involve using hydrogen as a feedstock or as a clean fuel alternative to natural gas. Early adoption could be driven by companies seeking to meet emissions targets or gain a competitive edge in international markets.
        - Heavy-Duty Transportation: Limited deployment of hydrogen fuel cell buses or trucks in urban areas or for specific logistics operations. Government-backed pilot projects would likely lead the way, testing the performance and reliability of these vehicles under real-world conditions. Key cities (Belgrade, Novi Sad) could be the focus.
        - Energy Storage: Exploration of hydrogen as a seasonal energy storage solution for intermittent renewable energy sources (solar, wind). This could involve using hydrogen to store excess electricity generated during peak production periods and then converting it back to electricity during periods of low renewable output.
    - Development of Early Infrastructure: Investment in limited but strategic hydrogen infrastructure would be essential to support these niche applications.
        - On-Site Production: Prioritization of on-site hydrogen production facilities at industrial sites or refueling stations, minimizing the need for long-distance hydrogen transportation. These might leverage existing industrial land and grid connections.
        - Hydrogen Refueling Stations: Deployment of a small number of hydrogen refueling stations in key locations to support fuel cell vehicles in pilot projects or commercial operations. These stations would likely be located in urban areas or along major transportation corridors.
    - Policy & Regulatory Framework Takes Shape: Continued progress in establishing a clear and supportive policy and regulatory framework for hydrogen would be crucial.
        - Incentives: Introduction of financial incentives (subsidies, tax credits) to encourage investment in hydrogen production, infrastructure, and end-use applications.
        - Standards & Regulations: Development of safety standards, permitting processes, and environmental regulations specific to hydrogen technologies.
        - Grid Integration Rules: Establishment of rules for injecting hydrogen into the natural gas grid or using hydrogen for electricity generation.
    - Research & Development Efforts: Increased funding for research and development related to hydrogen technologies.
        - Focus Areas: Improving the efficiency and cost-effectiveness of electrolyzers, developing new hydrogen storage materials, and testing the compatibility of existing infrastructure with hydrogen.

- **Integration with Electric Vehicle (EV) Ecosystem:**
    - Co-Location of Infrastructure: Potential for co-locating hydrogen refueling stations with EV charging stations at strategic locations to provide a broader range of fueling options for zero-emission vehicles.
    - Grid Balancing Synergies: Exploration of using hydrogen production as a means to balance the electricity grid, particularly with the increasing deployment of intermittent

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renewable energy sources and the growing demand from EV charging. Excess renewable energy could be used to produce hydrogen, which can then be converted back to electricity when needed.

- **Potential Challenges & Obstacles:**
  - High Costs: The high cost of hydrogen production, transportation, and storage remains a significant barrier to widespread adoption.
  - Infrastructure Gaps: The lack of a well-developed hydrogen infrastructure limits the scope of potential applications.
  - Technological Hurdles: Continued technological advancements are needed to improve the efficiency, durability, and scalability of hydrogen technologies.
  - Regulatory Uncertainty: Lack of a clear and stable regulatory framework can deter investment and slow down project development.
  - Public Acceptance: Public concerns about the safety of hydrogen and its environmental impact need to be addressed.

Overall Assessment: Until now, hydrogen integration in Serbia would likely be in a nascent stage, characterized by targeted deployments in niche sectors, the development of limited infrastructure, and ongoing efforts to establish a supportive policy and regulatory framework. Sustained government support, continued technological advancements, and effective public engagement will be essential for unlocking the full potential of hydrogen in Serbia's energy transition.

2.6.3.2. Recent developments for E-Mobility integration

- **Potential E-Mobility Integration Developments (10/05/2025):**
  - Charging Infrastructure Growth & Consolidation:
    - More Coverage: Expansion of charging networks, with particular focus on highway corridors and tourist destinations, potentially driven by a mix of government incentives and private investment.
    - Standardized Access: Greater roaming agreements between charging network operators to enable seamless access for EV drivers across different networks, improving user experience.
    - Fast Charging Dominance: A shift towards widespread deployment of DC fast chargers (DCFC) to reduce charging times and improve the practicality of EVs for long-distance travel.
  - Increased EV Adoption:
    - Greater Model Availability: Wider range of EV models available on the Serbian market, spanning different vehicle segments and price points.
    - Government Support Programs: Refined and expanded subsidy programs, tax breaks, and other incentives to encourage EV adoption by individuals and businesses, potentially tailored to specific vehicle types or income levels.
    - Fleet Electrification: Increased electrification of government and municipal vehicle fleets, leading by example and creating demand for EVs.
  - EV-Specific Legislation and Policy:
    - Emission Zones: Implementation of low-emission zones in major cities (Belgrade, Novi Sad) to restrict access for polluting vehicles and promote the use of EVs.

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        - Building Codes: Integration of EV charging infrastructure requirements into new building codes for residential and commercial properties.
        - Parking Privileges: Provision of dedicated parking spaces and other privileges for EVs in urban areas.
    - Workforce Development & Skills:
        - Training Programs: Establishment of training programs and certification schemes for EV technicians, installers, and other professionals to support the growing EV ecosystem.

- **Interplay with Hydrogen:**
    - Limited Direct Competition (Early Stage): In the early stages of both sectors, direct competition may be minimal. EVs would primarily serve shorter-range passenger vehicle needs, while hydrogen could target heavy-duty transport and niche industrial applications.
    - Co-Location of Infrastructure (Strategic): Planning and potential co-location of EV charging stations and hydrogen refueling stations at strategic hubs, offering consumers a choice of zero-emission fueling options. These hubs could also serve as information centers to educate the public about both technologies.
    - Focus on Grid Stability: EVs can become a source of instability with many charging at the same time.
    - Renewable Energy Integration.

- **Potential Challenges:**
    - Cost Barrier: The high upfront cost of EVs may remain a significant obstacle for many Serbian consumers.
    - Range Anxiety: Concerns about limited driving range and the availability of charging stations could continue to hinder EV adoption.
    - Grid Capacity: The increased demand for electricity from EV charging could strain the existing grid, requiring significant investments in upgrades.
    - Policy Uncertainty: Changes in government policies or incentives could create uncertainty for investors and consumers.

Overall, e-mobility integration in Serbia by 2025 is expected to involve continued growth in EV adoption, driven by expanding charging infrastructure, supportive government policies, and increasing consumer awareness. The relationship with hydrogen would likely be characterized by limited direct competition but growing recognition of the potential for synergy in certain areas, particularly in infrastructure planning and renewable energy integration. This will all contribute towards a greener society and help Serbia on its path towards joining the EU.

2.6.3.3. Legal Analysis for Hydrogen and E-Mobility integration

- **Hydrogen Legal Landscape (Potential Developments by 2025):**
    - Initial Hydrogen Strategy/Roadmap: The most likely development is the introduction of a national hydrogen strategy or roadmap. This document would outline Serbia's vision for hydrogen development, set targets for production and utilization, and identify key policy priorities.
      Key Elements:
        - Definition of "green hydrogen" and other hydrogen classifications (blue, grey)

        - Targets for renewable energy sources used in hydrogen production
        - Identification of priority sectors for hydrogen adoption (industry, transportation, energy storage)
        - Measures to support research and development
        - Plans for infrastructure development
    - Regulations on Hydrogen Production & Transport: As the hydrogen sector begins to mature, the government would start enacting regulations governing its production, transportation, and distribution.
      Potential Areas Covered:
        - Permitting processes for hydrogen production facilities (electrolyzers, etc.)
        - Safety standards for hydrogen storage and handling
        - Regulations for transporting hydrogen by pipeline, truck, or other means
        - Environmental impact assessments for hydrogen projects
        - Standards for hydrogen purity and quality
    - Incentive Programs for Hydrogen: Given the high costs of hydrogen technologies, incentives will be critical to stimulate investment.
      Possible Incentives:
        - Subsidies for the purchase of electrolyzers and other hydrogen production equipment
        - Tax credits for using green hydrogen in industrial processes
        - Feed-in tariffs or other support mechanisms for hydrogen-based electricity generation
        - Grants for research and development projects
    - Harmonization with EU Directives: Serbia's EU accession process would drive the adoption of EU directives and regulations related to hydrogen.
        - Focus Areas: Renewable Energy Directive (RED), Energy Efficiency Directive, and regulations on trans-European energy networks.

- **E-Mobility Legal Landscape (Potential Developments by 2025):**
    - Enhanced Charging Infrastructure Regulations: Building upon existing regulations, the legal framework would likely be refined to address challenges related to the deployment and operation of EV charging infrastructure.
      Potential Areas:
        - Standardized charging protocols and interoperability requirements
        - Regulations on pricing and access to charging stations
        - Rules for integrating charging stations with the electricity grid
        - Incentives for private sector investment in charging infrastructure
    - EV Mandates and Incentives: Policies to accelerate EV adoption would likely be strengthened.
      Possible Measures:
        - Gradual phasing out of internal combustion engine (ICE) vehicles
        - Tightening of emissions standards for new vehicles
        - Increased financial incentives for EV purchases
    - Grid Integration & Smart Charging: New regulations could address the impact of EV charging on the electricity grid.
      Possible Actions:

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        - Promotion of smart charging technologies to shift charging to off-peak hours
        - Regulations on vehicle-to-grid (V2G) technology
        - Incentives for investing in grid upgrades to support EV charging

- **Legal Synergies & Cross-Cutting Issues:**
    - Integration of Renewable Energy Standards: Policies promoting renewable energy sources will be crucial for both hydrogen and EVs. Regulations might mandate that a certain percentage of electricity used for hydrogen production or EV charging must come from renewable sources.
    - Land Use Planning: Local governments could integrate hydrogen and EV infrastructure planning into their land use regulations. This would involve designating suitable locations for production facilities, refueling stations, and charging stations.
    - Emissions Trading Schemes & Carbon Pricing: Potential for incorporating both hydrogen and EVs into emissions trading schemes or carbon pricing mechanisms to incentivize the adoption of low-carbon technologies.
    - Permitting & Regulatory Streamlining: Streamlining permitting processes for both hydrogen and EV projects will be important to reduce costs and delays. This could involve establishing "one-stop shops" for project approvals.
    - Circular Economy Principles: Regulations promoting the recycling and reuse of materials used in hydrogen and EV technologies (e.g., batteries, electrolyzers) to minimize environmental impact.

- **Potential Challenges:**
    - Conflicting Regulations: The interplay between different regulations could create unintended consequences or inconsistencies. For example, regulations promoting hydrogen production using renewable energy may conflict with regulations on land use or environmental protection.
    - Lack of Enforcement: Effective enforcement of new regulations will be crucial for achieving policy goals.
    - Geopolitical Factors: As seen the relationship with China, Russia and EU the Serbian energy policies are complex.
    - Policy Uncertainty: Political instability or changes in government priorities could lead to uncertainty about the future of hydrogen and EVs.

In summary, the legal landscape for hydrogen and e-mobility in Serbia by 2025 is expected to be shaped by a combination of EU alignment, domestic policy initiatives, and the need to attract investment and support technological innovation. Success will depend on creating a clear, stable, and supportive regulatory environment that incentivizes the adoption of these technologies and promotes their integration into the existing energy system.

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2.7. Czech Republic

2.7.1. Recent developments (July 2025)

In July 2025, the Czech Republic adopted Act No. 87/2025 Coll., on Energy[47], which for the first time comprehensively regulates hydrogen in the national energy framework. The Act legally defines hydrogen as an energy gas and enables its distribution through the public gas network either as a blend or in pure form. This legislation establishes the legal foundation for future technical standards, certification schemes, and regulatory measures to support hydrogen integration.

The new legislation also addresses the preparation of gas infrastructure for higher hydrogen shares, rules for connecting production facilities, and conditions for its storage and transport. It creates a legal basis for future development of related technical standards, certification schemes, and a system of guarantees of origin. Despite this progress, gaps remain in defining detailed permitting procedures, establishing a national certification system, setting Czech Technical Standards (ČSN) for hydrogen, clarifying the licensing framework for producers, and determining the tax treatment of renewable and low-carbon hydrogen. In line with the recently transposed Renewable Energy Directive (RED III)[48], Czech law now sets binding targets for the share of renewable fuels of non-biological origin (RFNBO) in transport and industry, but the practical implementation and enforcement of these obligations will require further regulatory detail.

2.7.2. Legal Analysis (D1.2.1)

The legal analysis (D1.2.1) of the political and regulatory framework for hydrogen and mobility in Czechia shows that hydrogen has been enshrined in national legislation as an energy gas since 2024, allowing its distribution via the public gas network in blends with natural gas or as pure hydrogen. Production methods are not differentiated, but producers must provide full disclosure of its origin to the market operator. Existing infrastructure can handle blends up to 20 %, with higher concentrations requiring technical modifications. The updated Hydrogen Strategy sets national targets, including 400 MWe of electrolyser capacity by 2027[49], preparing infrastructure for blending by 2028, and developing a regulatory framework with guarantees of origin, certification, and technical standards. The National Action Plan for Clean Mobility focuses on creating favourable conditions for low- and zero-emission transport, including hydrogen fuel cell technologies.

However, significant gaps remain: there is no certification system, no Czech Technical Standards (ČSN), and no licensing framework for hydrogen producers. Approval procedures are unclear, particularly regarding environmental impact assessments, and no unified methodology exists for regional authorities. The tax treatment of renewable and low-carbon hydrogen is undefined, and there is no methodology for integrating RFNBO hydrogen into fuel decarbonisation obligations. Following the national transposition of the revised Renewable Energy Directive (RED III), Czech law now includes binding targets for the share of renewable fuels of non-biological origin (RFNBO) in transport and industry. However, the detailed regulatory provisions, enforcement mechanisms,

[47] Act No. 87/2025 Coll., on Energy, entered into force on 1 July 2025. Source: https://www.zakonyprolidi.cz/cs/2025-87 (accessed 03.09. 2025).

[48] Draft Act on Accelerating the Use of Certain Renewable Energy Sources and on Amendments to Related Acts. Source: https://www.zakonyprolidi.cz/monitor/8061996.htm (accessed 03.09. 2025).

[49] Hydrogen Strategy of the Czech Republic Source: https://mpo.gov.cz/cz/prumysl/strategicke-projekty/vodikova-strategie-cr-aktualizace-2024-schvalena-vladou--282165/ (accessed 05.09. 2025).

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and practical implementation of these obligations are still under development, leaving uncertainty in how they will operate in practice.

2.7.3. Legal & political – factors

2.7.3.1. Recent developments for Hydrogen integration

- Hydrogen classified as an energy gas in national legislation, enabling distribution in blends with natural gas or as pure hydrogen.
- Obligation for producers to disclose full origin of hydrogen to the market operator.
- Gas infrastructure currently supports up to 20 % hydrogen blend without modification; higher shares require technical upgrades.
- National targets include installing 400 MWe of electrolysers by 2027 and preparing infrastructure for blending by 2028.
- Preparation of a comprehensive legislative and regulatory framework including guarantees of origin, certification schemes, and technical standards planned for 2025–2026.

2.7.3.2. Recent developments for E-Mobility integration

- National Action Plan for Clean Mobility promotes low- and zero-emission transport, including hydrogen fuel cell technology.
- Focus on creating favourable conditions for hydrogen technology to advance from R\&D to widespread deployment.
- Consideration of hydrogen electrolysis as a method for energy storage in connection with growth of renewable electricity generation.

2.7.3.3. Legal Analysis for Hydrogen and E-Mobility integration

- Lack of certification scheme, Czech Technical Standards (ČSN), and licensing framework for hydrogen producers.
- Unclear approval rules, particularly regarding environmental impact assessments, and absence of unified methodology for regional authorities.
- Undefined tax treatment for renewable and low-carbon hydrogen compared to fossil-based hydrogen.
- No methodology for integrating RFNBO hydrogen into fuel decarbonisation obligations in the transport sector.
- Implementation of RED III expected to significantly influence the national hydrogen regulatory framework.

2.8. Bosnia and Herzegovina

2.8.1. Recent developments (August 2025)

During the last one year, several new regulatory and administrative decisions were made in the energy sector of Bosnia and Herzegovina.

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Some of the most important developments are as follows:

- Republika Srpska has officially enacted the Rulebook on Renewable Energy Communities ("RECs"), thereby creating the regulatory framework for collaborative production and consumption of renewable energy. A REC is defined as a legal entity established primarily to serve the energy needs of its members, comprising individuals, companies, public enterprises, and local authorities, within a designated geographic area. First, the entity must be incorporated in accordance with the legislation governing the chosen legal form. While EU directives encourage and prioritize non-profit organizational forms and even recommend excluding profit-oriented forms the Rulebook does not exclude profit-oriented entities from acting as a REC. This broader approach is also reflected in the RS Renewable Energy Sources Act, which recognises RECs engaged in electricity supply as a market activity, as well as those performing other energy activities on a commercial basis. Second, formal REC status is granted by the Regulatory Commission for Energy of Republika Srpska (RERS)[50].
- The Government of Federation of Bosnia and Herzegovina has initiated a formal procedure for development of a new FBIH energy strategy. The Government of the FBIH has formally launched the development of new Energy Strategy covering 2025–2035, with projections extending to 2055. This Strategy will establish long–term sector objectives, priorities, and the energy source mix; promote renewables and new technologies; enhance energy efficiency; plan sector investments; and address environmental protection and climate change mitigation. It also aims to encourage market competition, safeguard consumers, and ensure alignment with national strategic policies. The Federal Ministry of Energy, Mining and Industry coordinates this process, which will be conducted under applicable laws and regulations, with completion expected within 14 months from the Government's adoption of the Strategy's Terms of Reference[51].
- Based on the Law on use of renewable energy sources and efficient cogeneration of Federation of BiH, the Rulebook on Renewable Energy Communities of Federation of BiH has been enacted in August 2025. The Rulebook defines the establishment, management and operation of renewable energy communities. The Regulation clearly sets out the criteria that communities must meet, including minimum requirements for obtaining status, technical aspects of operation, and the method of supervision of their operation.
- In Federation of Bosnia and Herzegovina, The Operator for Renewable Energy Sources and Efficient Cogeneration set-up a programme for co-financing household prosumers. The recently enacted Programme on Co-Financing Household Prosumers in FBiH is intended exclusively for individuals who are (co)owners of residential buildings intended to become "home power plants". The Programme defines eligibility criteria for one–time co-financing[52].

[50] Rulebook on Renewable Energy Communities (Pravilnik o zajednicama obnovljive energije), Official Gazette of the Republika Srpska, no. 32/25, https://bdkadvokati.com/

[51] Decision on the Development of the Energy Strategy of the FBiH for 2025–2035, with Projections until 2055 (Odluka o izradi energetske strategije Federacije Bosne i Hercegovine za period 2025 – 2035. godina sa projekcijom do 2055. godine), Official Gazette of the Federation of Bosnia and Herzegovina, no. 1/25

[52] Decision on the Adoption of the Program for Co-Financing Household-Category Prosumers (Odluka o usvajanju programa o sufinansiranju prosumera iz kategorije domaćinstva), Official Gazette of the Federation of Bosnia and Herzegovina, no. 34/25;

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- Customs duty exemptions/reductions for EVs, hybrids, and CNG vehicles - The Council of Ministers of BiH approved a decision to temporarily suspend or reduce customs duties on the import of new electric, hybrid, and CNG cars until 31 December 2025. Pure electric vehicles and CNG cars are exempt from customs duties and Hybrid vehicles have a reduced customs rate of 5%.
- Subsidy programs for EV purchase in Federation of BiH - The government of the Federation of BiH has approved subsidy programs to encourage EV adoption: BAM 1,000,000 split between individuals and companies/entrepreneurs. Individuals can receive BAM 10,000 for fully electric vehicles; BAM 7,000 for plug in hybrids, companies and entrepreneurs can apply for up to two vehicles.
- The draft of the new Law on Electricity of Bosnia and Herzegovina is entering into legislative procedure in the Parliamentary Assembly of Bosnia and Herzegovina.

2.8.2. Legal Analysis (D1.2.1)

At this point, the ‘barriers’ identified in the legal analysis (D1.2.1) are summarised again:

- Complex constitutional structure slow down energy policy - Bosnia and Herzegovina’s governance structure, comprising the State level, two Entities (Republika Srpska and the Federation of BiH), ten cantons, and the Brčko District as condominium, creates a fragmented and complicated regulatory environment, limiting coordinated energy and climate policy.
- Entity-level energy strategies exist, but lack national coordination - Both Entities have adopted energy development strategies until 2035, but there is limited integration at the state level. This complicates the implementation of the Integrated National Energy and Climate Plan (NECP) and alignment with EU targets.
- Renewable energy and energy efficiency laws are in place but under-implemented - While new laws on renewable energy and energy efficiency have been adopted in both Entities, secondary legislation is still under development, and actual implementation remains low (44% for RES and 48% for EE, according to the 2023 Energy Community Report).
- Green hydrogen is recognized in planning documents but lacks detailed measures - The draft NECP acknowledges hydrogen as part of the decarbonization process, but the proposed measures remain vague, lacking concrete targets, funding mechanisms, or a clear timeline for deployment.
- E-mobility is emerging in legislation but remains underdeveloped - The Federation of BiH introduced a legal framework for public and private EV charging infrastructure for the first time in 2023. Republika Srpska has basic provisions through its Electricity Law. However, there is no comprehensive legislative or strategic framework specifically dedicated to e-mobility.

2.8.3. Legal & political – factors

At this point, influencing factors are formulated based on the legal analysis summarised above (D1.2.1) and recent developments:

2.8.3.1. Recent developments for Hydrogen integration

- New Rulebook on Renewable Energy Communities (“RECs“), in Republika Srpska, through creating new regulatory framework for collaborative production and consumption of renewable energy, and also new Energy strategy in FBiH, and Law on Electricity of Bosnia and Herzegovina could help in stimulating initiatives for integration of hydrogen into energy system.

2.8.3.2. Recent developments for E-Mobility integration

- Pure electric vehicles and CNG cars are exempt from customs duties and Hybrid vehicles have a reduced customs rate of 5%, by the Decision of Council of Ministers of Bosnia and Herzegovina.
- The government of the Federation of BiH has approved subsidy programs to encourage EV adoption – this could help and improve e mobility integration I federation of Bosnia and Herzegovina.

2.8.3.3. Legal Analysis for Hydrogen and E-Mobility integration

- Complex constitutional structure slow down implementation of energy policies,
- New laws on renewable energy and energy efficiency have been adopted in both Entities, secondary legislation is still under development, and actual implementation remains low,
- Lack of concrete targets, funding mechanisms, or a clear timeline for deployment regarding green hydrogen,
- E-mobility is emerging in legislation but remains underdeveloped

2.9. Croatia

2.9.1. Recent developments (July 2025)

The **Environmental Protection and Energy Efficiency Fund (FZOEU**) has prepared the 2025 program[53] for subsidizing the purchase of alternative-fuel vehicles, with program conditions published in early August 2025. Backed by EU NextGenerationEU funding under Croatia's National Recovery and Resilience Plan (NPOO), the scheme is designed to stimulate demand for electric and hydrogen-powered vehicles by offering direct financial support to individuals, companies, and public entities. While the official launch date is still pending, the program builds on previous years' strong uptake and represents a continued effort to accelerate fleet decarbonization and wider adoption of sustainable mobility solutions.

The Ministry of Economy and Sustainable Development has announced a new public call[54] for the establishment of **six hydrogen refuelling stations** across Croatia, one in each NUTS-2 region. Published for consultation in late June 2025, the €15 million allocation is financed under the NPOO and marks the first coordinated step towards developing a nationwide hydrogen infrastructure. The planned stations are intended to serve both passenger and freight mobility, aligning Croatia with EU targets under the Alternative Fuels Infrastructure Regulation (AFIR) and providing a foundation for the gradual integration of hydrogen into the transport system.

[53] New Croatian Subsidy Program for Zero-Emission Vehicles, https://alternative-fuels-observatory.ec.europa.eu/general-information/news/new-croatian-subsidy-program-zero-emission-vehicles (accessed 20.08.2025).

[54] Dispatch from Croatia | June 2025 https://www.cleanenergywire.org/news/dispatch-croatia-june-2025 (accessed 20.08.2025).

Amendments to the **Renewable Energy Sources and High-Efficiency Cogeneration Act**[55] (NN 78/2025) entered into force in May 2025, obliging the government to adopt secondary regulations within six months. These implementing by-laws, due by November 2025, are expected to clarify support schemes for renewable electricity, sector coupling, and energy communities, thereby providing legal certainty for investors in hydrogen electrolysis, energy storage, and smart charging projects. This development reflects Croatia's broader strategy to align its legal framework with EU decarbonization goals while addressing persistent barriers such as grid connection delays and complex permitting processes.

2.9.2. Legal Analysis (D1.2.1)

The 'barriers' identified in the legal analysis (D1.2.1) are summarised again:
Legal analysis for Croatia reveals a robust legal and regulatory framework for hydrogen and V2X. The country has a national Hydrogen Strategy aligned with its decarbonization goals, with specific targets for production, utilization, and infrastructure by 2050. The Croatian legal framework, including the Law on the Establishment of Infrastructure for Alternative Fuels, mandates the deployment of public charging points and hydrogen refuelling stations. Croatia's regulations also include a definition of energy storage, however, bi-directional charging (V2G) is still not included in the current Croatian law.

2.9.3. Legal & political – factors

Influencing factors are formulated based on the legal analysis summarised above (D1.2.1) and recent developments:

2.9.3.1. Recent developments for Hydrogen integration

- NRRP-backed H_2 stations: The June consultation proposes six public H_2 refuelling stations with €15m support—clear policy signal for first-wave network coverage.
- Renewables Act amendments (May 2025): The updated law obliges government to align implementing regulations within six months, which can clarify support mechanisms for sector-coupling assets (incl. electrolysers).
- Strategic anchor retained: Croatia's Hydrogen Strategy to 2050 frames staged uptake (pilots → integration), with current domestic H_2 use still concentrated in industrial sites (Rijeka refinery; Petrokemija).

2.9.3.2. Recent developments for E-Mobility integration

- EV purchase support 2025 prepared: FZOEU published program conditions (August 2025) for grants to alternative-fuel vehicles, sustaining demand-side pull for BEVs/PHEVs.
- AFIR compliance trajectory: National AFI law already sets technical specs & deployment obligations; AFIR is directly applicable and continues to shape density and siting along TEN-T.

[55] Croatia updates Act on Renewable Energy Sources and High-Efficiency Cogeneration https://www.interreg-central.eu/news/croatia-updates-act-on-renewable-energy-sources-and-high-efficiency-cogeneration/ (accessed 20.08.2025).

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- Smart metering & flexible billing groundwork: National strategies and DSO programs expand smart metering, a prerequisite for granular tariffs and future V2X business models. (Background context.)
- Flexible measuring systems: New metering points enable precise billing even at multiple locations within a customer's facility.

2.9.3.3. Legal Analysis for Hydrogen and E-Mobility integration

- Pending secondary rules: With NN 78/2025 in force, by-laws due by Nov 2025 will be pivotal for investor certainty (premiums/netting rules, community energy mechanics).
- V2G regulatory blank spot: No explicit V2G provision yet—uncertainty on roles (supplier/aggregator/DSO limits), metering points, taxation (double-count/double-levy risks), and settlement.
- Grid connection cost/rules in flux: NECP update notes the unit connection fee decision was still pending earlier this year; any shift (e.g., €0/kW concepts under discussion) would materially affect charger/electrolyser economics.
- Execution risk on AFI mandates: Although the legal obligation for public charging/H_2 stations exists, delivery capacity (permits, grid readiness, municipal processes) remains the bottleneck.
- Industrial H_2 & mobility economics: Current H_2 use is industrial; mobility use faces scale and cost hurdles until stations and green H_2 supply mature.

2.10. Hungary

2.10.1. Recent developments:

Hungary's National Hydrogen Strategy remains the anchor: targets for low-carbon / renewable hydrogen production and creation of hydrogen valleys, plus emphasis on building predictable regulation and electrolyser capacity via international partnerships. So far a 10 MW electrolyser unit entered production at the Százhalombatta oil refinery operated by MOL Hungarian Oil and Gas Plc.
The Mining Act, the District Heating Services Act, the Electricity Act, the Environmental Product Charges Act and the Waste Act were amended at the end of 2024 making the operation of the electricity grid more transparent and efficient. Amendments made to the Environmental Product Charges Act reduced double administrative burdens on products previously subject to both EPR and environmental product charger, such as batteries, packaging, electrical and electronic equipment, tires and others.
The annual indexation (if inflation remains below 6%) for power plants eligible for feed-in-tariff will be discontinued until the state of danger declared in relation to the war in Ukraine concludes, but no later than 2029, on the other hand they don't have to pay income tax of energy suppliers, the so-called "Robin Hood tax".
Hungary continues to implement strong consumer protection measures keeping gas and electricity prices artificially low for residential customers not reaching a certain threshold in consumption. This in turn hinders energy efficiency investments into residential buildings.
The 12/2025 decree by the Hungarian Energy and Public Utility Regulatory Authority regarding the "energy regulatory sandbox/test environment" for the electricity and gas sectors in Hungary. The regulation establishes the concept of an "energy regulatory test environment" in the electricity and natural-gas sectors. The aim is to encourage innovative solutions that are useful for the Hungarian electricity and gas industries, particularly

solutions that may deviate from certain existing regulatory provisions under controlled conditions. Specifically in the gas sector, one purpose is to facilitate hydrogen-injection into the existing gas infrastructure or development of clean/low-carbon gas networks based on existing natural-gas infrastructure.

Solar investment skyrocketed in the country which have surpassed 8,000 MW built in capacity in 2025. More than 20% of electricity came from PV already in 2024. This is reflected in the National Energy and Climate Plan (NECP) in which the original 6,000 MW goal was updated to 12,000 MW until 2030.

Support for e-mobility is supposed to broaden in late 2025 by not focusing on companies only. The programme provides purchase incentives for EVs up to roughly 10,500 €. The electricity market suffers from missing incentives, such as missing grid fee discount or exemption for energy communities.

2.10.2. Legal analysis

Hungary adopted its National Hydrogen Strategy in 2021 with four main pillars for 2030. It focuses on producing low-carbon and carbon-free hydrogen, building decentralized electrolysis capacity linked to renewable energy, and integrating hydrogen into industry and transport to reduce emissions. The plan sets goals such as expanding FCV market as high as 4,800 hydrogen vehicles, including 20 refueling stations, and also blending hydrogen into the gas grid to a small degree. It also calls for a stronger regulatory framework, though other strategic documents expect hydrogen adoption to be slow, especially in public transport.

The core laws governing the energy market are the Electricity Act of 2007 and the Natural Gas Act of 2008. These set the basic structure for energy markets but currently include little direct regulation of hydrogen. The Climate Protection Act of 2020 sets emission reduction and renewable energy targets – although emission commitments are excluded from 2026. Support schemes for renewables include feed-in tariffs and green premiums (Government Decree 299/2017) and net metering for small household power installations. Guarantees of origin for renewable energy are also regulated.

There is currently no dedicated legislation to promote or certify hydrogen, though the existing strategic framework supports early projects. Pilot hydrogen projects are underway (Bükkábrány Energy Park electrolyzer and Akvamarin hydrogen grid injection), but there is no commercial hydrogen market yet, and the one hydrogen refueling station no longer operates. The national RePowerEU plan notes the need for supportive legal and administrative measures, which have not yet been implemented.

Vehicle-to-grid technology is also in an early stage, with one operational bus charger in Bábolna. The Jedlik Ányos Plan 2.0 and the Hungarian Electromobility Strategy highlight the need for more pilots and new legislation to support electric mobility.

2.10.3. Legal and political factors based on D1.2.1 Legal analysis and recent development:

2.10.3.1. Recent developments for Hydrogen integration

FGSZ Zrt (Hungary's gas transmission system operator) has hydrogen transmission plans, including repurposing existing natural gas infrastructure and investigating system requirements. They conducted non-binding market demand surveys (including for injection/delivery points and cross-border interconnections). FGSZ's involvement suggests planning for hydrogen transport/transmission infrastructure, possibly including hydrogen injection into the gas network.

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National and EU level targets feed into Hungarian policy: green hydrogen targets for industrial replacement, emissions reductions; goals around hydrogen refuelling stations, hydrogen adoption in transport etc., as seen in documents like from the Green Hydrogen Organisation. That is already backed by local developments in the oil industry and also in the ceramic industry, the latter indicate easing paths for industrial use, possibly with regulatory acceptance of hydrogen mixing / combustion in industrial setups. There are several pilot project running now in across several sector in various readiness stages.

2.10.3.2. Recent developments for e-mobility integration

Hungary saw accelerating BEV adoption, with a monthly record of battery-electric vehicle registrations in March 2025 and total green-plated vehicles rising sharply in early 2025. A company-only BEV purchase subsidy launched 5 Feb 2024 materially boosted fleet electrification; the programme (budget ≈€79.1M) offered tiered grants by vehicle price and battery size and experienced very high demand through 2025. Municipal measures (e.g., preferential parking in Budapest) and grant schemes for station operators have complemented national funds, improving urban convenience for EV owners. Certain EU-funded investment, such as public buildings and parks have to consider EV-charging when meeting certain criteria. Hungary’s national EV charging network expansion was supported with a €72 million programme (28 billion HUF), focused on underserved rural areas (“white spots”), supporting not only charging infrastructure, but energy storage and RES-capacities as well. Depending on the location, the subsidy is a discounted loan that can have a non-refundable part as well.
Large industrial investments are reshaping Hungary into a regional EV and e-bus manufacturing hub. BYD has expanded its Hungarian footprint (bus/truck production and a planned passenger EV plant), recently committing significant investment to triple bus output — supported by Hungarian state grants — though EU foreign-subsidy scrutiny was reported. Moreover, Hungary has supposedly become a large battery manufacturing powerhouse in the EU, however production reports don’t match planned numbers.

2.10.3.3. Recent developments for Hydrogen and e-mobility integration

Hydrogen as a fuel for mobility sector did not take off so far in Hungary. The only public H2 fuel station was closed down in 2025 due to it being part of a demonstration program and not being feasible for continuation. However there are studies analyzing green hydrogen production potential as a means of more effective RES utilization, and the Hydrogen Strategy foresees hydrogen mobility at a larger scale in the future. The hydrogen pilots in Hungary however focus more on hydrogen as an energy carrier or on different industries, such as oil refinement, ceramics.

2.11. Montenegro

2.11.1. Recent developments (Oct 2025)

Legislative framework: In March 2025, Montenegro adopted a new Energy Law that modernises the market design and enables active customers, citizen energy communities, and new activities such as aggregation, storage and flexibility services. The law also underpins smart-grid digitalisation and sets the stage for EV-charging provisions through forthcoming secondary

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legislation. Regulators signalled that 2025–2026 will be a period of intensive by-law adoption to operationalise these new concepts (aggregation, storage, flexibility services, community energy).

Renewables support & auctions: Following the Law on the Use of Energy from Renewable Sources (Aug 2024), which introduced market-based support (auctions) aligned with EU rules, the government launched its first renewables auction in July 2025 (quota 250 MW solar, 12-year CfD; ceiling €65/MWh). This marks the start of a planned series of auctions through 2027.

Strategic planning (NECP): Montenegro's draft NECP (Dec 2024) underwent Energy Community review with formal recommendations in March 2025; as of September 2025 the plan was still pending final adoption, with alignment work ongoing.

Hydrogen policy signals: Authorities and industry stakeholders advanced preparatory work toward a Hydrogen Strategy (publicly discussed since early 2024; a draft outline circulated by stakeholders in Aug 2025). At the same time, no binding national H_2 framework is yet in force, hydrogen features in ongoing decarbonisation planning.

E-mobility & AFIR alignment: Through the Transport Community process, Western Balkan partners—including Montenegro—are preparing National Policy Frameworks and technical specifications to align with the EU AFIR (e.g., TEN-T coverage and service-level requirements for public recharging). National implementation steps are being scoped alongside improvements to grid-readiness and permitting.

Incentives & programmes: The Eco-Fund has continued e-mobility support measures (vehicle and charging incentives). By 2021–2024, 261 cars had been subsidised; in 2025, additional sectoral calls (e.g., tourism/hospitality efficiency programmes implemented with the Eco-Fund) indicate the continued use of funding instruments that can also enable charging deployment.

Open items for implementation: As of Oct 2025, secondary legislation is still needed to detail metering, settlement, taxation, and market roles for aggregation, storage, and potential V2X/V2G use cases (e.g., bidirectional charging), as anticipated by the regulator following the new Energy Law.

2.11.2. Legal Analysis (D1.2.1)

Scope and positioning: According to Montenegro's national contribution to the legal analysis (D1.2.1), the framework relevant to hydrogen and e-mobility/V2X is embedded within broader energy, climate and transport legislation and the Energy Community acquis alignment process. The analysis focuses on strategies, targets and regulatory instruments, and how these enable (or constrain) integration of new technologies and sector coupling.

Hydrogen (H_2): D1.2.1 indicates that Montenegro does not yet have a dedicated, comprehensive hydrogen act; hydrogen-related topics are primarily addressed through general energy/RES provisions, environmental permitting, and safety/standards regimes. Definitions (e.g., renewable hydrogen/RFNBO), network access, guarantees of origin/certification and rules for production, storage, transport, and potential grid blending are emerging areas that require transposition or secondary rules under the Energy Community framework. Institutional roles are clear at a high level (policy, regulation, system operation). Still, detailed procedures (permitting timelines, interfaces between authorities, technical codes for H_2 assets) remain to be specified for bankable projects. Pilot-scale activity is feasible under existing generic rules, yet commercial deployment hinges on clearer terminology, market roles and support instruments.

E-mobility & V2X: The legal analysis shows that EV deployment is supported indirectly through energy/transport and environmental policy, with public charging addressed via general licensing, grid-connection and metering/billing rules. Alignment with EU/AFIR requirements (planning, service levels on key corridors, interoperability) proceeds through the Energy Community process; however, bidirectional charging (V2G/V2H/V2B), aggregators' participation, differentiated tariffs for flexibility, and data/interoperability frameworks are not yet comprehensively regulated. Building and urban-planning provisions (pre-cabling/EV-ready parking), consumer protection (transparent pricing/roaming) and streamlined permitting for charging sites are identified as priority gaps to enable scale-up.

Institutions and market roles: D1.2.1 maps the general allocation of responsibilities (policy ministries, national regulator, transmission/distribution system operators, municipalities for local infrastructure), noting that secondary legislation and technical codes are needed to operationalise roles for new actors (e.g., charging-point operators, e-mobility service providers, aggregators) and to clarify metering, settlement and taxation for flexibility/V2X services.

Implementation status (cross-cutting): The analysis highlights typical barriers for first-wave projects: permitting complexity, grid-capacity and connection timelines, lack of standardised data protocols/roaming, and uncertain cost-recovery for flexibility services. These are common across partners and framed—per the PP3 method—as inputs for the influencing-factors synthesis in the next subsection.

2.11.3. Legal & political – factors

2.11.3.1. Recent developments for Hydrogen integration

- Market design enabler: New energy-market provisions open the door for aggregation, storage and flexibility, creating a policy hook for sector-coupled H_2 uses once by-laws are in force.
- RES cost base: Introduction of competitive RES auctions improves price discovery and long-term contracting—precondition for bankable green H_2 (electrolyser utilisation, PPA availability).
- Strategic clarity gap: NECP not yet final → uncertainty on H_2 targets, demand anchors and infrastructure sequencing.
- Policy signal, not framework: Hydrogen strategy at concept stage; definitions/GoO/RFNBO and rules for production-storage-transport still to be legislated.
- Implementation dependency: Secondary legislation needed for permitting pathways, metering/settlement and taxation applicable to H_2 projects.

2.11.3.2. Recent developments for E-Mobility integration

- EU alignment driver: Work toward AFIR-consistent national framework (via regional coordination) clarifies corridor coverage and minimum service levels for public recharging.
- Demand-side continuity: Eco-Fund-type incentives sustain EV uptake and charging rollout, but predictability and multi-annual design remain improvement areas.

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- Grid & market roles: By-laws needed to operationalise aggregators, dynamic tariffs and non-discriminatory access for CPO/EMSP actors.
- Built-environment levers: Pre-cabling/EV-ready requirements and streamlined municipal permitting would accelerate site deployment, especially in multi-apartment buildings.
- Data & roaming: Transparent pricing, interoperability and open protocols should be mandated to support national roaming and user trust.

2.11.3.3. Legal Analysis for Hydrogen and E-Mobility integration

- H_2 law baseline: No dedicated hydrogen act; key elements (terminology, RFNBO certification/GoO, network and blending rules) to be specified—priority for investor certainty.
- Operationalisation gap: Secondary legislation required for metering, settlement, taxation and the participation of new market actors (CPO/EMSP/aggregators).
- V2X readiness: Bidirectional charging lacks explicit legal recognition; clarify roles, responsibilities and market access for EVs as flexibility/storage assets.
- Grid interface: Connection procedures and capacity planning for charging/H_2 loads need clear timelines and technical codes to reduce project risk.
- Standards & data: Mandate interoperability (protocols/ID/auth/pricing transparency) to ensure nationwide roaming and system integration.
- Institutional coordination: Define single-window permitting and interfaces among ministries, regulator and DSOs/TSO to shorten lead times for both H_2 and e-mobility projects.

3. Acceptance

The analysis of acceptance provides important insights for advancing the expansion of renewable energy in the transport sector and in hydrogen use. It enables the identification of relevant influencing factors that can promote the successful deployment of integrated energy and transport systems.

To this end, key stakeholders from the fields of energy and mobility were interviewed about relevant socio-technical, political, ecological and economic factors (A3.1). The political and legal assessments from these interviews are summarised nationally by the participated countries and incorporated into D2.2.1.
The complete evaluation of the interviews can be found in the analysis of acceptance level and action plan to increase general support (A3.2 – period 5). According to the analysis of A3.2, the content of this report has to be incorporated into D2.2.1 (period 4). However, as it will be finalised after finalisation of D2.2.1, D2.2.1 will only refer directly to those political and legal findings from the interviews (A3.1) that are already available in advance. This is possible because the same participated countries are involved in both work steps and can therefore directly access and use their own interview results.

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3.1. Survey process (Guidelines A3.1)

Identifying political and legal acceptance factors and their potential for use is crucial for political decision-making processes. In this context, the political and legal results of the key stakeholder interviews (A3.1) are an integral part of D2.2.1 The aim of the interviews was to identify and evaluate the factors influencing the use of hydrogen and electric vehicles, i.e. the challenges, obstacles and opportunities.

3.1.1. Political and legal questions

At this point, the contents of the guidelines (A3.1) are summarised below:

3.1.1.1. Hydrogen-Integration

The interviews identified the obstacles that have been encountered so far in the introduction of hydrogen technologies and the further challenges that can be expected in the future.
The legal framework that needs to be adapted to promote the use of hydrogen in various sectors was also discussed, as well as the legal barriers that have been identified so far.
In addition, the study examined which international regulations could facilitate cross-border cooperation on hydrogen projects and which existing barriers currently stand in the way of such cooperation.

3.1.1.2. E-Mobility- Integration

The interviews addressed the challenges that have arisen to date in regulating charging tariffs for electric vehicles, particularly with regard to ensuring fair access for all social groups.
In addition, the interviews sought to identify the legal framework required to promote the introduction and use of technologies such as **V2G** and **Vehicle-to-Home** (hereinafter **V2H**), as well as the legal hurdles currently standing in the way of implementation.

3.1.2. Key Stakeholders

The first target group was key stakeholders from the energy sector. The questions, which aimed to identify limitations and advantages, related to hydrogen production, distribution and storage. In the field of e-mobility, the focus was on the grid, market structures and issues of public acceptance.
The questions posed to environmental organisations as the second target group focused on the ecological benefits, public acceptance, the potential role of the technologies in achieving climate targets, and specific recommendations for action.
The third target group, political administrators, was asked questions about regulations and strategic approaches to promoting public acceptance with the aim of enabling better integration of the technologies.

Outcome of the Interviews (A3.1)

At this point, the contents of the interviews (A3.1) are summarised below:

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3.2. Germany

3.2.1. Hydrogen integration

- **Current and future political hurdles**

Germany's hydrogen policy is widely seen as ambitious in strategy but hesitant in implementation. Across all interviews, experts highlight a persistent regulatory overcomplexity and unclear responsibilities between federal, state, and municipal levels. While national strategies such as the National Hydrogen Strategy (NWS) and the Energy Industry Act (EnWG) set clear targets, the translation into practical, legally reliable frameworks lags behind.

A major barrier identified is the lack of coherence between existing energy market rules and hydrogen system requirements. The current electricity market design, based on a price per kilowatt-hour, is seen as structurally incompatible with renewable and hydrogen-based systems that require flexibility and storage. Hydrogen projects often remain economically non-viable under this framework because they cannot capture the long-term value of flexibility or grid relief.

Experts call for a paradigm shift in market design, moving away from volumetric pricing toward availability- and service-based remuneration models – similar to flat-rate or insurance concepts. Under such schemes, customers would pay for energy availability and system stability rather than for each consumed kilowatt-hour. This shift would align market incentives with the physical logic of renewable systems and could enable hydrogen projects to operate sustainably.

At the same time, grid integration and cross-border transport remain major challenges. Although Germany actively participates in European hydrogen corridor initiatives, differences in national technical standards (e.g. permissible hydrogen blending levels) and slow permitting procedures continue to delay infrastructure deployment. Interviewees stress that cross-border cooperation is open but fragmented, and the lack of uniform regulation hampers joint investment.

- **Economic viability and political coherence**

The interviews further underline that hydrogen investments currently depend almost entirely on public funding and subsidy-driven pilot projects. Without a clear and predictable regulatory path, private actors face uncertainty. There is a broad consensus that the "learning phase" must be politically secured for at least another decade – comparable to the telecommunications liberalisation process.

In the short term, experts recommend political restraint: the energy sector is under extreme administrative strain due to parallel transformations (renewables expansion, smart meter rollout, and mobility electrification). Rather than new laws, stakeholders request policy stability and targeted support for system integration and data exchange.

3.2.2. E-mobility integration

- **Legal and practical challenges with V2G/V2H**

E-mobility is widely accepted as an integral part of Germany's decarbonisation path, but its integration into the energy system remains incomplete. The main obstacle is the absence of a coherent legal and technical framework for bidirectional charging technologies (V2G, V2H, V2X).

Experts describe the current situation as technically advanced but institutionally outdated. The regulatory framework still assumes a one-way electricity flow from producer to consumer. As a

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result, bidirectional charging – although technically feasible – lacks standardisation, certification procedures, and clear remuneration mechanisms.
Stakeholders identify several interrelated gaps:

- No consistent tariff models exist for electricity fed back into the grid via V2G or used domestically via V2H.
- Tax and labour law implications (e.g. charging at work, feeding back at home) remain unresolved.
- Grid operators cannot yet rely on voluntary consumer-based storage models due to the lack of reliability and standardised control mechanisms.

The interviews reveal a preference for V2H over V2G in the near term. V2H is already technically viable within closed manufacturer systems (vehicle, inverter, PV, control unit). It enables households to use surplus PV power effectively and relieves local grids during high generation periods. However, experts stress that these proprietary systems are not grid-compatible on a large scale, and no uniform standard exists for safe grid feed-in.
Multiple R&D initiatives across Germany are currently piloting interoperability and communication protocols for V2X, but results are fragmented. Interviewees highlight the need for national coordination to align industry standards, similar to the early rollout of smart metering infrastructure. The forthcoming amendment to the *Energy Industry Act (EnWG)* and *Charging Infrastructure Masterplan II* are seen as crucial to include V2X explicitly in future regulatory updates.

- **Charging tariffs and equitable access**

Transparent and fair tariff structures are considered essential to promote social acceptance and investment. The shift from time-based to kilowatt-hour-based billing at public charging stations has improved transparency, but stakeholders call for further standardisation and harmonisation across providers. Particularly for bidirectional charging, it remains unclear who benefits from flexibility services – the consumer, the grid operator, or the energy supplier.
Overall, experts view the current e-mobility framework as transitional: technologically advanced, but institutionally unaligned. A stronger focus on interoperability, taxation clarity, and user incentives is necessary to move from experimentation to market integration.

3.2.3. Acceptance Factors

As reflected in the interviews, acceptance in Germany is less about ideology and more about practical experience. Once individuals or municipalities experience tangible benefits from renewable technologies – cost savings, autonomy, or reliability – skepticism tends to decline.
At the same time, information asymmetry and regulatory complexity generate frustration and confusion. Experts agree that communication from policymakers should focus on stability, transparency, and education, rather than on reactive messaging. The public debate around the energy transition, they argue, often oscillates between overpromising and overregulating. A more measured, consultative approach involving research institutions and municipal stakeholders is needed.
From the interviews, the following influencing factors can be identified:

- **Hydrogen integration**
  - Market design remains incompatible with the physical logic of renewable and hydrogen systems.
  - Economic viability depends on targeted public support and long-term policy stability.

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  - Cross-border cooperation is hindered by differing national standards and slow permitting.
  - A shift toward service-based pricing models (availability instead of energy volume) is needed.

- **E-Mobility integration**
  - No comprehensive legal framework or technical standards for V2X exist yet.
  - V2H is more mature than V2G but remains confined to proprietary systems.
  - Tariff models and taxation rules for bidirectional charging are unclear.
  - Stronger coordination in standardisation and data exchange is required.
  - Public acceptance depends on transparent communication and perceived reliability.

3.3. Austria

3.3.1. Hydrogen integration

- **Current and future political hurdles**

Significant hurdles to the introduction of hydrogen technology are based on overly strict RFNBO criteria. While it is advantageous that it can be clearly proven that the hydrogen is green, it is not necessary, for example, that a brand-new power plant is used exclusively for hydrogen production. The CVD Directive, on the other hand, will only come into force in stages from 2030, which would require a stricter course to achieve the targets.
Under the current conditions, it is difficult to cover costs. In order to build something sustainable, it must be possible to generate profits to ensure long-term viability.

- **Cross-border cooperation**

Cross-border cooperation in the field of hydrogen technologies has not yet reached the planned level, but exchanges are very open. A wide range of companies – even competitors – are joining forces because the market simply does not exist yet and in order to better manage and reduce risks. A key obstacle at present is the lack of uniform regulations for cross-border hydrogen transport. Technical and regulatory inconsistencies resulting from different national regulations are hampering the integration and use of shared infrastructure. For example, some national gas networks allow a hydrogen content of 10%, while others only allow 5%.

3.3.2. E-mobility integration

- **Legal and practical challenges with V2G/V2H**

There is still a considerable need for action, both in terms of the legal framework and the technical standards for supporting V2X technologies.
Cross-border integration of V2H technology is not currently feasible. Even if it were introduced throughout Austria – and assuming that all vehicles were equipped with bidirectional charging – complete integration would not be possible at present due to several factors.

Practical regulations are needed for the use of electric vehicles at public charging stations or at certain energy suppliers. One possible approach would be to regulate charging to a certain level – for example, through a flexible charging limit. Vehicles could be charged to 100%, but a preferred

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charging range between 80% and 100% would be defined and specifically controlled through financial incentives.
Another key problem with the voluntary and free use of V2G as buffer storage is its lack of reliability: the connection is controlled by consumers and can be disconnected at any time. Grid operators and energy suppliers cannot therefore rely on this model. Backup solutions such as stationary battery storage are always needed. Nevertheless, V2G can serve as a supplementary grid support.
V2H is currently considered the preferred option – it is already technically feasible, but only to a limited extent. Although control also lies with the consumer in the case of V2H, the consumer has their own PV system or similar. This has advantages for the grid. Especially in summer, when PV systems often produce more electricity than the grid can absorb, feed-in reaches its limits. Instead of having to feed electricity from the PV system into the grid at a cost, consumers can use their electric cars as additional buffer storage. This not only makes economic sense for individuals, but also relieves the burden on the overloaded power grid – a win-win situation for both sides.
The system can work if the vehicle, home storage unit, control unit and PV system come from a single source and are optimally coordinated. However, the power grid is not yet designed to handle such individual solutions. There is currently no uniform standard that enables coordinated and safe grid feed-in from such systems.
The industry is optimistic: numerous research and development projects in Austria are testing various pilot models to close the existing gaps in technical standards. At the same time, the energy industry is exerting continuous pressure on politicians to ensure that important regulations to support this technology are incorporated into the amendment of the ElWG. The industry is also pushing for an update to the central strategic documents – the Austrian mobility strategy – to take V2G and V2H technologies into account.

- **Charging tariffs and socially equitable access**

There are currently no clear standards for a tariff structure, particularly in relation to V2G. This raises numerous questions: Which tariff applies when electricity is fed back into the grid from a vehicle? Are there separate tariff models for companies with large fleets of company vehicles? Legal uncertainties are also an issue. For example, what happens if a vehicle is charged at work and then fed back into the grid at home? Is it possible to make a profit from the energy used at work? How does this affect the employment relationship and are there any tax consequences?
For a long time, the lack of a legal basis for transparent billing by kilowatt hours instead of minutes was also a key challenge. Billing by the minute was considered non-transparent because vehicles charge at different speeds depending on their charging capacity. This was due to the lack of uniform federal measurement regulations for recording and billing kilowatt hours at charging stations. About two and a half years ago, this problem was solved through coordinated cooperation between the relevant parties. Now, over 95% of fast charging stations in Austria bill by kilowatt hours. This consumption-based billing creates transparency, enables fair cost comparisons and represents an important step towards socially equitable access to the charging infrastructure.

3.3.3. Acceptance factors

As explained in detail above, the successful integration of bidirectional charging technologies such as V2G and V2H currently faces several fundamental challenges. Significant barriers include the lack of a legal framework, the absence of clearly defined technical and legal standards, and unclear tariff and remuneration structures. In addition, there is legal uncertainty regarding the

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responsibilities and roles of individual players. These aspects are hindering both the market readiness of the technologies and their contribution to grid integration.

At this point, influencing factors are formulated from the political and legal issues summarised above from the interviews on acceptance (A3.1):

- **Hydrogen integration**
  - RFNBO criteria are too strict: A precise definition of green hydrogen is beneficial, but the electricity production by entirely new power plants is not necessary.
  - Ambitious implementation of the decarbonisation package by national legislators would promote the integration of hydrogen.
  - The current framework conditions make hydrogen projects economically unviable.
  - Exchange within the hydrogen industry is open due to a lack of competition, but cross-border cooperation is still in its infancy.
  - Different national regulations (e.g. permissible hydrogen content in the grid – 5% vs. 10%) make cross-border hydrogen transport difficult.

- **E-Mobility integration**
  - There is no comprehensive legal framework or technical standards for implementing V2X technologies.
  - The ElWG needs to be amended to better integrate e-mobility.
  - The mobility strategy should be updated to take account of the new technological possibilities offered by e-mobility.
  - The Clean Vehicle Directive should be implemented ambitiously.
  - Practical regulations are needed for the use of public charging stations, such as a charging range between 80% and 100%.
  - Models are needed to compensate for the lack of reliability of V2G technology.
  - V2H currently only works in closed, manufacturer-specific systems (vehicle, PV system, control unit from a single source). These proprietary solutions are not compatible with the grid on a broad scale – there is no standard for grid integration.
  - There are no clear tariffs for feeding electricity back into the grid (V2G) or for use in households (V2H).
  - Legal issues relating to V2G and V2H are still unresolved in terms of labour law, tax law and commercial advantages.
  - There is no mandatory introduction of billing based on kilowatt hours.

3.4. Slovakia

3.4.1. Hydrogen integration

The acceptance of hydrogen technologies in Slovakia is gradually improving as pilot projects and public communication on clean energy gain visibility. The establishment of the JESS Green Hydrogen for Transport project in Trnava serves as a major demonstrator for the practical integration of green hydrogen into public and freight transport. The initiative benefits from collaboration between the Ministry of Economy, Slovenská elektrizačná prenosová sústava (SEPS), and regional industrial actors, which has contributed to enhanced public awareness of hydrogen's role in reducing emissions.

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Stakeholder interviews indicate a growing recognition of hydrogen's potential in Slovakia's energy transition, though general public understanding remains limited. Industrial actors, municipalities, and universities are increasingly involved in pilot initiatives, and the national Hydrogen Strategy has been broadly welcomed by stakeholders as a step toward achieving the EU's decarbonisation targets. However, administrative complexity and uncertainty regarding the classification of hydrogen as an energy commodity continue to influence perceptions among investors.
The presence of international partnerships (for instance, Green Hydrogen Systems and Nilsson Energy cooperation) also contributes to technology acceptance by demonstrating successful use cases of green hydrogen within EU projects. Continued dissemination activities, such as educational workshops and regional stakeholder events, are improving acceptance levels across the public sector and energy community.

3.4.2. E-mobility integration

Public acceptance of e-mobility in Slovakia is significantly higher than that of hydrogen technologies, primarily due to visible progress in charging infrastructure and vehicle adoption. The eGUTS project in Senec is a notable example of regional implementation, which achieved sustained public use beyond its pilot phase. Cities such as Bratislava, Trnava, and Košice have introduced local strategies to increase EV use in municipal fleets, supported by the Ministry of Economy and the Slovak Electric Vehicle Association (SAE).
Surveys and stakeholder inputs highlight that Slovak citizens increasingly associate electromobility with innovation and environmental responsibility, especially in urban areas. Nevertheless, barriers persist in rural regions, where limited charging infrastructure and higher upfront costs for EVs remain deterrents.
The private sector is playing a growing role in infrastructure development, with companies like GreenWay and ZSE Drive operating large networks of fast chargers. As national and regional incentives continue under the Recovery and Resilience Plan, acceptance is expected to strengthen further. Integration of e-mobility with renewable electricity generation—especially from solar—has become a key narrative in public policy communication.

3.4.3. Acceptance factors

- **Positive drivers:**
    - Existence of national Hydrogen and E-Mobility strategies.
    - Demonstration projects (JESS Trnava, Senec charging network) that provide tangible results.
    - Active involvement of universities and municipal authorities in pilot activities.
    - Increasing EU and national funding for infrastructure and R&D.
    - High public trust in renewable energy technologies.

- **Barriers:**
    - Low public awareness of hydrogen technologies and their safety aspects.
    - Absence of a unified legal framework defining hydrogen production, distribution, and storage.
    - Limited coordination between national and regional actors in developing charging and hydrogen networks.
    - Uneven infrastructure deployment between urban and rural areas.

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- **Future needs:**
  - More extensive information campaigns on hydrogen safety and benefits.
  - Simplification of administrative procedures for pilot and investment projects.
  - Integration of hydrogen and e-mobility into education and regional innovation programmes.
  - Continuous alignment with EU frameworks to ensure public confidence in the long-term transition.

Overall, Slovakia demonstrates a positive acceptance trajectory supported by successful pilot activities and emerging policy coherence. The country is expected to strengthen its public and institutional support as demonstration projects transition into large-scale national implementations.

3.5. Romania

3.5.1. Hydrogen integration

- **Current and future political hurdles**

The development of green hydrogen in Romania faces significant political and legislative challenges. At present, the country lacks a comprehensive national strategy or regulatory framework specifically aimed at promoting green hydrogen production, distribution, and usage. As highlighted by energy sector experts, this is the most pressing barrier to scaling up hydrogen technologies in Romania. While Romania nominally follows European directives, such as the inclusion of energy communities and the EU Green Hydrogen Strategy, these rules are not yet fully adapted to local market conditions, which limits their practical application.
High production costs for green hydrogen represent another major obstacle. Municipal and environmental stakeholders stressed that incentives, subsidies, or tax reductions for producers and consumers are necessary to make hydrogen economically viable. For example, price reductions for green hydrogen fuel and hydrogen-based heating systems, as well as tax incentives for hydrogen vehicles, could encourage adoption. Political commitment is also needed to establish a nationwide hydrogen infrastructure, including refueling stations for cars, buses, and trucks, as well as pipelines for industrial and municipal use.
Public acceptance is closely intertwined with political support. Concerns about hydrogen safety, limited awareness, and misconceptions among citizens currently reduce acceptance. Policies should therefore include public education campaigns, demonstration projects, and participatory workshops, such as living labs, where citizens can experience hydrogen technologies firsthand. Environmental organizations can play a mediating role between policymakers, industry, and communities, advocating for safe integration and promoting the benefits of hydrogen in the context of circular economy practices.

- **Cross-border cooperation**

Although Romania aligns with EU strategies on hydrogen, cross-border collaboration is still limited. Experts highlighted obstacles including differences in technical standards, certification requirements, and safety regulations, which complicate international hydrogen transport and joint projects. Romania could benefit from harmonization efforts with neighboring countries and active participation in EU-funded pilot projects to share experiences and technical solutions. Such

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initiatives could facilitate regional cooperation, enhance infrastructure compatibility, and reduce risks associated with hydrogen transport and storage.

3.5.2. E-mobility integration

- **Legal and practical challenges with V2G/V2H**

Bidirectional charging technologies, such as vehicle-to-grid (V2G) and vehicle-to-home (V2H), are not yet legally recognized in Romania. The absence of regulatory frameworks prevents EV owners from feeding electricity back into the grid, and there is currently no standardization of charging infrastructure. Moreover, technical compatibility across EV models is inconsistent, further limiting the potential for V2G/V2H integration.

Battery degradation, high costs of bidirectional chargers, and the lack of financial incentives for consumers to participate in grid support are additional barriers. Energy experts emphasized that without legal recognition of EVs as decentralized energy storage assets, grid operators cannot reliably rely on V2G or V2H as supplementary energy sources. Similarly, municipalities cannot yet implement pilot schemes for V2G integration at a local scale, and national smart grid development is not yet sufficiently advanced to support widespread adoption.

Existing government initiatives, such as the Rabla Plus program and investments in charging infrastructure, primarily focus on EV acquisition rather than bidirectional functionality. Experts highlighted that long-term integration of V2G/V2H requires coordinated action between private and public actors, including standardized technical requirements, updated legislation, and financial mechanisms to compensate users for providing energy back to the grid.

- **Charging tariffs and socially equitable access**

Public charging tariffs are currently fragmented and inconsistent, varying by location, operator, and time of use. Legal uncertainties exist regarding electricity fed back into the grid, including tax implications, labor law, and commercial regulations. Furthermore, rural and low-income communities face limited access to EVs and charging infrastructure, which could exacerbate social inequalities.

Experts suggested several policy measures to address these challenges: subsidized EV leasing programs, vouchers for low-income households, installation of charging stations in underserved areas, and integration of home solar panels with V2H systems. These measures would improve technical feasibility and social acceptance while reducing energy costs for households.

3.5.3. Acceptance factors

- **Hydrogen integration**

Acceptance of hydrogen technologies in Romania is influenced by a combination of legal, economic, social, and political factors:

  - Legislation and political support: Lack of a dedicated national hydrogen framework, unclear alignment with EU directives, and absence of incentives limit deployment.
  - Economic feasibility: High production and infrastructure costs make hydrogen projects commercially risky. Subsidies, tax reductions, and financial support for pilot projects are needed to make adoption viable.
  - Public perception: Concerns about safety, price, and unfamiliarity with hydrogen technology hinder acceptance. Participatory initiatives, pilot demonstrations, and education campaigns can increase trust and understanding.

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  - Industry and civil society involvement: Environmental organizations and research institutions can act as mediators and knowledge brokers, facilitating cooperation between local authorities, businesses, and communities. They can promote circular economy integration, using industrial waste for hydrogen production, and demonstrate energy recovery applications.
  - Cross-border issues: Lack of harmonized technical and safety standards hinders international collaboration, but EU projects provide a pathway for learning and alignment.

- **E-mobility integration**

Public acceptance of electric vehicles, especially in relation to V2G and V2H applications, is currently constrained by technical, economic, and regulatory barriers:

  - Legal and regulatory: EVs are not yet recognized as decentralized energy storage; V2G/V2H technologies are not embedded in national legislation; and billing standards for energy fed back into the grid are absent.
  - Technical: Limited charging infrastructure, incompatible EV models, and concerns about battery degradation restrict adoption. Smart grid readiness is still evolving, preventing reliable integration.
  - Economic and social: High EV prices, limited access to financing, and uneven distribution of charging stations reduce adoption among low-income and rural communities.
  - Awareness and education: Citizens are not fully informed about the potential benefits of EVs, V2G, and V2H technologies. Awareness campaigns, demonstration projects, and integration with renewable energy systems (such as solar panels) are needed to build trust and engagement.

- **Governmental and societal factors**

Long-term acceptance requires coordinated policies addressing affordability, accessibility, technical standards, and education. Municipal and national authorities must integrate hydrogen and e-mobility strategies into urban planning, energy planning, and circular economy initiatives. Awareness campaigns, pilot projects, and clear legal frameworks are essential to ensure that hydrogen and V2G/V2H technologies are both technically feasible and socially accepted.

3.6. Serbia

The stakeholder interviews provide a comprehensive overview of the status, challenges, and opportunities surrounding the integration of green hydrogen and electric vehicles (EVs) within Serbia's energy landscape. The reports stress the crucial role of supportive governmental policies, active public acceptance, and the necessity of overcoming technical and regulatory challenges to ensure the successful deployment and widespread adoption of these technologies. The importance of the media in shaping public perception and promoting informed decision-making is also a recurring theme.

3.6.1. Hydrogen integration

- **Q: What are the major challenges for increasing green hydrogen production to meet future demands?**

A: A significant challenge lies in the limited renewable resources available in Serbia, as the country still relies heavily on coal. The transition to green hydrogen production necessitates substantial investments in renewable sources like solar and wind power. High investment costs involved in establishing green hydrogen production facilities also deter both local and foreign investors, and technological barriers related to achieving cost-effective hydrogen production through electrolysis at scale remain.

- **Q: How can hydrogen distribution costs be reduced to make it more economically viable?**

A: Sharing infrastructure is critical to reduce distribution costs, building a hydrogen grid that can be shared among multiple sectors, including industrial and residential users. Utilizing existing pipelines for hydrogen transport by repurposing or upgrading them helps to minimize the need for new infrastructure investments.

- **Q: When is green hydrogen expected to become competitive in the energy market?**

A: Green hydrogen could potentially become competitive by 2030, with supportive policies and significant investments in renewable energy and electrolysis technologies, particularly for sectors like heavy industry and transportation.

- **Q: What factors might limit the widespread adoption and storage of hydrogen as an energy carrier?**

A: The need for costly high-pressure tanks or cryogenic storage facilities and the challenges related to material compatibility and safety concerns during storage are significant limitations.

- **Q: What are the primary safety concerns surrounding the adoption of green hydrogen technologies?**

A: The primary safety concerns revolve around hydrogen's flammability and the potential for leaks, requiring stringent safety measures and monitoring protocols.

- **Q: What societal barriers can impede the successful implementation of hydrogen technologies?**

A: Cultural resistance to adopting new technologies and a preference for established energy sources can slow down hydrogen implementation efforts; tweaking societal perceptions through informative campaigns is key.

- **Q: How can governmental policies encourage the integration of green hydrogen as a viable energy carrier?**

A: Government can encourage integration through incentives and subsidies for companies investing in hydrogen production, R&D grants to promote innovation, regulatory framework development to establish supportive regulations, and public procurement policies that prioritize hydrogen use in public sector operations.

- **Q: What political hurdles have been encountered in the introduction of hydrogen technologies?**

A: An unclear regulatory framework creates hesitancy among investors, insufficient political will slows down progress, and competing priorities like expanding renewable energy or addressing natural gas reliance can divert attention and resources.

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- **Q: What methods can be employed to improve public awareness and acceptance of green hydrogen technologies?**

A: Implementing awareness campaigns to explain the benefits, safety, and uses of green hydrogen can positively influence public perception. Engaging in community engagement programs and providing transparent communication regarding hydrogen initiatives and their impacts are also crucial.

3.6.2. E-mobility integration

- **Q: What are the major challenges hindering the wide-scale adoption of electric vehicles?**

A: A primary hurdle is infrastructure development, particularly the lack of widespread and accessible charging stations. The initial cost of EVs remains a significant barrier, and consumer perception, including skepticism regarding reliability, range, and performance, hinders adoption. Finally, there are insufficient policy incentives and government support to encourage consumers to switch to EVs.

- **Q: What are the main challenges associated with the deployment of V2G and V2H technologies?**

A: These technologies face challenges in technological maturity, as V2G and V2H are still relatively new. There is also a lack of clear regulatory frameworks surrounding energy trading between EVs and the grid. Furthermore, there needs to be increased consumer awareness and education to facilitate widespread adoption.

- **Q: What impact does the adoption of electric vehicles have on electricity prices for consumers?**

A: The increased demand for electricity due to EV adoption could lead to higher prices if the energy supply is insufficient. However, EVs can also facilitate load management opportunities by charging during off-peak hours and providing energy back to the grid during peak periods, potentially stabilizing prices.

- **Q: What incentives can be implemented to encourage EV adoption and V2G/V2H participation?**

A: Implementing financial compensation for those participating in V2G programs, providing tax incentives for purchasing necessary equipment, and offering subsidized technology or reduced electricity rates can motivate users.

- **Q: What are the key factors that impede people from using electric vehicles more widely?**

A: The primary factors are range anxiety, caused by limited charging infrastructure, lengthy charging times, a lack of information regarding EV benefits, high upfront costs, and higher insurance rates compared to traditional vehicles.

- **Q: What strategies can the government pursue to support EV and V2G/V2H adoption?**

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A: The government can support adoption through educational programs to increase awareness and understanding, infrastructure investments to expand the charging network, and supportive policies to streamline the adoption process.

- **Q: What legal hurdles currently exist that inhibit the further development of V2G/V2H technologies?**

A: The development of V2G and V2H technologies is hindered by inadequate energy market regulation, the absence of comprehensive safety standards, and insufficient consumer protection laws tailored to these innovative energy systems.

3.6.3. Acceptance factors

Public acceptance is essential for both hydrogen and e-mobility to succeed, with the media playing a crucial role in shaping opinions. Key concerns for hydrogen include safety, environmental impact (particularly differentiating between grey and green hydrogen), and technological complexity, while for e-mobility, anxieties around range, safety, and performance are paramount. To increase acceptance, efforts should focus on targeted educational campaigns and transparent communication to address misunderstandings regarding safety and environmental impacts for hydrogen, and highlighting affordability, environmental benefits, supportive government policies, and convenient infrastructure access for e-mobility. Engaging community leaders, correcting misinformation, and focusing on accessible information are crucial for building public confidence and driving wider adoption of both hydrogen and electric vehicles.

Acceptance Factors (Hydrogen):

- Public acceptance is critical for the successful deployment of green hydrogen solutions; skepticism or opposition from the public can lead to regulatory hurdles and slow down progress.
- The media exerts substantial influence on public opinion, significantly shaping how individuals perceive and accept green hydrogen technologies and initiatives.
- The public expresses concerns about safety and the environmental impact.
- Common misunderstandings include perceived risks, confusion with other hydrogen types, and the complexity of the technology.
- Public perception can be improved through educational campaigns, social media engagement, and media collaboration.

Acceptance Factors (E-Mobility):

- Public acceptance is critical for the successful deployment of E-mobility solutions.
- The public generally concerns with range anxiety, safety, performance, and battery lifespan regarding E-mobility.
- Public awareness about EV can be improved by addressing misinformation, improve public information, educate journalists.
- Awareness, affordability, environmental benefits, government support, infrastructure access are the main key affects on acceptance.
- Involve community leaders, local stakeholders, and offer tailored approaches to address concerns that is how community may affect awareness of green technologies.
- Collaboration is really important and it is done by partnerships between government, industry, environmental organizations, and local communities.

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- The media needs to verify data and encourage a balanced coverage is a key strategy for media.
- Encourage well-known people in the public opinion, as celebrities, politicians, and community leaders for support.

3.7. Czech Republic

3.7.1. Hydrogen integration

- **Current and future political hurdles**

Stakeholders in Czechia recognise that the legal recognition of hydrogen as an energy gas is an important milestone, yet the framework for its large-scale integration remains incomplete. The absence of national technical standards, certification schemes, and a clear taxation model for renewable and low-carbon hydrogen generates legal uncertainty and discourages investment. Permitting procedures are still complex, and responsibilities between relevant authorities are not clearly defined, which delays project approval. Concerns were also expressed that the national transposition of RED III could result in overly strict requirements, limiting opportunities for smaller producers and slowing market growth. Financial barriers remain significant, as current support mechanisms are insufficient to offset high production and infrastructure costs, challenging the long-term economic viability of projects.

- **Cross-border cooperation**

International cooperation on hydrogen infrastructure is progressing mainly through participation in European initiatives and cross-border corridor planning, but practical implementation is hindered by regulatory and technical discrepancies. Differences in allowable hydrogen blending levels in national gas networks and diverging safety requirements complicate the integration of shared infrastructure. Stakeholders emphasised that harmonised regulation, coordinated investment strategies, and unified technical standards are essential for enabling efficient cross-border hydrogen flows and accelerating market development.

3.7.2. E-mobility integration

- **Legal and practical challenges with V2G/V2H**

Stakeholders in Czechia note that while the deployment of charging infrastructure is progressing, the legal and regulatory environment for advanced technologies such as Vehicle-to-Grid (V2G) and Vehicle-to-Home (V2H) remains underdeveloped. There are no comprehensive technical standards or unified rules governing bidirectional charging, creating uncertainty for investors and slowing adoption. Current legislation does not clearly define responsibilities for grid connection, billing, and taxation when electricity is fed back into the grid from private or commercial vehicles. As a result, integration of V2G into the national energy system is still limited to small-scale pilots, often tied to research projects rather than market-ready solutions. For V2H, stakeholders see greater near-term potential, especially in combination with household photovoltaic systems, as it can reduce grid strain during peak generation periods. However, there is no standardised approach for ensuring safe and coordinated grid interaction, and current distribution network design does not fully support decentralised bidirectional flows.

- **Charging tariffs and socially equitable access**

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Tariff structures remain a key unresolved issue. There is no consistent framework for pricing electricity fed back into the grid, nor clarity on how workplace charging interacts with home feed-in from the same vehicle. These gaps create legal and financial uncertainty for consumers and fleet operators. Stakeholders emphasise that harmonised technical standards, transparent billing rules, and integration of V2X into national mobility and energy strategies are essential for enabling wider adoption and market viability.

3.7.3. Acceptance factors

From the political and legal perspectives gathered in the interviews, several factors influence the integration of hydrogen and e-mobility in Czechia:

- **Hydrogen integration**
  - National technical standards, certification schemes, and taxation rules for renewable and low-carbon hydrogen are missing, creating uncertainty for investors.
  - The permitting process is unclear, with no unified methodology for regional authorities, leading to delays in project approvals.
  - The transposition of RED III into Czech law may set requirements that are too strict for smaller producers, potentially slowing market entry.
  - Current economic conditions make it challenging to ensure profitability for hydrogen projects without stronger financial support.
  - Cross-border cooperation is hindered by differing national regulations, such as permissible hydrogen blending levels in gas networks.

- **E-mobility integration**
  - No comprehensive legal framework or technical standards for V2G/V2H exist, limiting their deployment beyond pilot projects.
  - Grid connection rules, billing procedures, and taxation for bidirectional charging remain undefined.
  - Tariff structures for electricity fed back into the grid are inconsistent, and workplace-to-home feed-in raises unresolved legal issues.
  - The absence of a standard for grid integration of V2H systems limits their scalability.

Strategic documents, such as the national mobility plan, do not yet fully address the opportunities of V2X technologies.

3.8. Bosnia and Herzegovina

3.8.1. Hydrogen integration

- **Political, institutional and legal barriers**

Complicated structure of governance in BiH limits coherent and faster actions in this field. Besides, this, institutional capacities are still very low, especially in terms of staff expertise and technical readiness. Legal adaptations are needed because current energy laws and also construction laws (and by-laws) lack specific provisions related to green hydrogen. Permitting processes must be simplified to accelerate investments and reduce investor uncertainty. Harmonization with EU directives is urgently needed in order to stimulate projects and processes in this field.

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Besides this, having in mind high initial costs, the stimulative incentives are of significant importance - subsidies for hydrogen production and infrastructure, tax benefits, and better funding opportunities for this kind of projects are essential to promote and accelerate the green hydrogen economy.
On the other side, according to results of interviews, fossil fuel lobbies and conflicting national policies slow down the processes of green transition.

- **Public awareness**

Public awareness in this field is still very low, even within environmental NGOs, indicating even greater knowledge gaps among the general public. It is necessary to launch several public awareness campaigns (via media, schools, universities, and civil society) in order to increase understanding of importance of green hydrogen. Better knowledge of key benefits is essential for public understanding, especially regarding risks, safety, costs, and environmental impact.
Lack of pilot projects, demonstration projects etc. is still one of the key characteristics in Bosnia and Herzegovina. Community involvement and local participation campaigns and strategies such as participatory planning, local pilot and demonstration projects, are very important for building trust and long-term public support.

3.8.2. E-mobility integration

- **Public barriers**

Key obstacles for better and faster adoption of electric vehicles are insufficient charging infrastructure, especially in rural and suburban areas, and high initial costs of EVs.
Also, willingness to switch to EVs is still at low level. Questions like battery lifespan, range, spare parts etc, are limitation factors for adoption of EVs, despite long-term savings expected. On the other side, environmental benefits are not considered as factor of importance stronger than mentioned issues.

- **Long-term strategies and role of local communities/governments**

Urban mobility strategies and planning activities, especially in local communities and municipalities, should include measures for faster development of EV infrastructure. That means measures such as local incentives, pilot projects, municipality projects (such as city public transport fleets, public campaigns, etc.), could help faster adoption and usage of electric vehicles.

3.8.3. Acceptance factors

At this point, influencing factors are formulated from the political and legal issues summarised above from the interviews on acceptance (A3.1):

- **Hydrogen integration**
  - The current framework conditions make hydrogen projects economically unviable and unattractive.
  - Regulatory gaps and complicated structure of governance in BiH limits coherent and faster actions in this field
  - Institutional capacities in Bosnia and Herzegovina are still very low
  - Very low public awareness,

- **E-Mobility integration**

- There are several key obstacles for better and faster adoption of electric vehicles, but especially insufficient charging infrastructure and high initial costs of EVs.
- Questions like battery lifespan, range, spare parts etc, are limitation factors for adoption of EVs.
- Environmental benefits are not considered as significant factor of importance,
- Local incentives, pilot projects, municipality projects (such as city public transport fleets, public campaigns, etc.), could help faster adoption and usage of electric vehicles

3.9. Croatia

3.9.1. Hydrogen integration

The interviews revealed that Croatia's green hydrogen sector is still in a nascent stage, facing a number of critical hurdles. A primary technical and economic barrier is the current lack of surplus electricity from renewable sources, which makes large-scale green hydrogen production difficult and unprofitable. As the energy expert, Matija Vajdić, noted, such production only makes sense during rare surplus hours, which for now, are not sufficient to justify the investment without significant subsidies. The experts unanimously agreed that the high costs of production and the absence of a robust distribution network mean that these projects are heavily reliant on grants and taxpayer money, with the private sector's investment remaining limited to pilot projects. The public authority representative, Vesna Kučan Polak, highlighted the slow pace of implementing detailed, operational-level policies and legal acts, which, despite a clear national strategy, creates uncertainty for project developers.

Beyond the economic and technical aspects, a critical issue is the public's perception. All three experts—the public authority representative, the environmental expert Željka Fištrek, and the energy expert Matija Vajdić—agreed that public awareness of hydrogen is close to zero. The public's lack of knowledge, coupled with fears related to safety, necessitates a more robust and transparent communication strategy. The experts emphasized the need to move beyond professional conferences and engage the public through early-stage consultations and demonstration projects, similar to the one involving a hydrogen bus in Zagreb. This would help address concerns and provide valid, targeted information to combat misinformation and "greenwashing."

3.9.2. E-mobility integration

The transition to electric mobility faces its own set of challenges, most notably those of an economic and infrastructural nature. The experts pointed to the high purchase price of electric vehicles as the single most significant barrier for the average Croatian consumer. This issue is compounded by a national vehicle fleet with an average age of approximately 12 years, demonstrating a significant gap in purchasing power. Subsidies, while available, are often seen as benefiting a segment of the population that can already afford these vehicles, rather than helping to replace older, more polluting cars.

From an infrastructure perspective, the interviews revealed a poorly developed charging network. For a large portion of the urban population living in apartments, the lack of home charging options presents a major practical limitation. The concept of Vehicle-to-Grid (V2G) technology, while a

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promising buzzword, was universally deemed a distant reality in Croatia. The energy expert noted that the necessary hardware is not yet commercially available, and the public authority representative highlighted the additional legal and regulatory complexities of integrating a new actor (the vehicle) into the power grid. As one expert put it, these problems will likely be solved by other, wealthier countries, and Croatia will simply "copy-paste" their solutions.

3.9.3. Acceptance factors

Despite the significant challenges, the interviews collectively present a clear picture of a nation in the early stages of a critical energy transition. Progress is being made through a clear national strategy and a number of pilot projects, often with significant European funding. The experts provided several recommendations for accelerating this process.

- **Integrated Communication**: Implement a more systematic and transparent communication strategy to educate the public on the benefits and risks of new technologies. This should involve public consultations and demonstration projects to build trust and increase acceptance.
- **Targeted Incentives**: Develop more stable, long-term co-financing models that are accessible to all social strata, encouraging the replacement of older, high-polluting vehicles.
- **Focus on Public and Industrial Transport**: Prioritize the development of hydrogen and electric solutions for public transport and industrial applications, as these sectors offer a greater opportunity for decarbonization and are better suited for the current stage of technology and infrastructure development.
- **Proactive Regulation**: Create clear and stable legal frameworks and regulations that provide security for investors, avoiding delays and administrative obstacles that currently hinder project implementation.

In summary, the interviews affirm that Croatia is on the right path, but the journey requires a more integrated and coordinated approach. Overcoming the financial, regulatory, and public perception barriers will be crucial for Croatia to accelerate its energy transition and ensure the benefits of green technologies are accessible to all citizens.

3.10. Hungary

3.10.1. Hydrogen integration

The green hydrogen ecosystem is only in its early stages in Hungary only developed due to regulatory pressure that is underpinned by the fact that apart from the 10 MW electrolyzer (≈1,600 t/year) operated by the MOL Group at its Danube Refinery in Hungary whereas similar projects are planned in Slovnaft (Slovakia) and INA (Croatia) (both subsidiaries by the same company), driven by EU RED III compliance obligations for refinery decarbonization. Green hydrogen costs remain high at €5–13/kg, depending on location (cheapest in Southern Europe, most expensive in Central Europe). By contrast, gray hydrogen costs around €2–2.5/kg. To become competitive, green hydrogen should reach ~€1/kg, which is currently unrealistic without major subsidies or innovation. Hungary's hydrogen production is currently dominated by gray hydrogen (150–200 kt/year). The transition toward low-carbon (blue, turquoise) and green hydrogen is expected to be gradual, not abrupt. Hydrogen was heavily "hyped" between 2020–2022, but expectations have

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since cooled, as actual deployment lags far behind EU ambitions (e.g. only 0.4 GW electrolyzer capacity by 2024 vs. the EU target of 4 GW). Experts stress the need for coherent, realistic strategies backed by legal, educational, and financial instruments — otherwise, targets remain “political wish lists”. Hydrogen valleys are seen as effective integration models: local ecosystems combining production, refueling infrastructure, transport (buses, trains), and industrial off-takers. Example: Győr–Veszprém corridor, where hydrogen rail applications could emerge. The key to hydrogen’s viability lies in sector integration: coupling renewable generation (solar, wind, nuclear) with electrolyzers to stabilize the power grid and supply hydrogen for transport and industry. Optimal capacity utilization is crucial — electrolyzers with too low operating factors (e.g. solar-only systems) produce prohibitively expensive hydrogen. Large-scale units (>5 MW) are considered the minimum economically viable size. Potential innovations include: room-temperature hydrogen storage (Iridium complex) and bacterial hydrogen generation in depleted oil fields, but these are experimental technologies far from being market-ready.

3.10.2. E-mobility integration

Hungary’s e-mobility sector benefits from strong industrial activity (battery manufacturing, vehicle assembly), but infrastructure rollout and grid readiness remain limited. Charging infrastructure expansion is constrained by high grid connection costs, uncoordinated regulation, and variable tariffs across operators. EV adoption is slowed by price sensitivity, range anxiety, and limited access in rural areas. V2G and V2H technologies (using EVs as mobile storage) are still in the pilot phase. Barriers include:

- Lack of standardization and legal frameworks
- Inadequate incentives for vehicle owners
- Limited awareness and perceived battery degradation risk

Successful integration could balance grid loads, lower consumer electricity bills, and increase renewable utilization. However looking at energy communities as an ideal framework for implementing these technologies they are lagging behind in implementation due to regulatory hurdles, lack of clear pathways for development and difficult technological steps.

3.10.3. Acceptance factors

At this point, influencing factors are formulated from the political and legal issues summarised above from the interviews on acceptance (A3.1):
EVs are seen positively in environmental terms, but upfront costs remain a major deterrent. Both technologies contribute to sector coupling: EVs for short-distance and light-duty transport; hydrogen for heavy-duty, long-range, and fleet applications. Combined development of hydrogen refueling and EV charging infrastructure in regional “hydrogen valleys” or energy hubs can yield shared economic and environmental benefits. Experts stress complementarity, not competition between hydrogen and batteries: each serves distinct niches in the energy transition. Hydrogen and e-mobility integration in Hungary is progressing but uneven and subsidy-dependent. Batteries currently offer a faster, cheaper decarbonization path, while hydrogen remains a strategic long-term solution for industrial and heavy transport use.

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3.11. Montenegro

3.11.1. Hydrogen integration

Stakeholders generally view hydrogen as strategically interesting but not yet investable for Montenegro's current demand profile. Public authorities and utilities express cautious support for pilot-scale, depot-based use-cases (e.g., municipal or bus fleets, waste/utility vehicles) located in industrial zones with clear safety oversight. Key acceptance themes include: the need for credible offtake (fleet contracts or public service obligations), additional renewable electricity to produce low-carbon H_2, and streamlined permitting with a single contact point. Concerns persist around safety/readiness of responders, environmental permitting, water availability for electrolysis, and long-term price visibility (CAPEX/OPEX, guarantees of origin). Overall, stakeholders favour stepwise deployment (demo → pre-commercial) paired with training and standards before city-wide roll-out.

3.11.2. E-mobility integration

Acceptance for EVs is broadly positive, especially among municipalities, tourism operators and corporate fleets that view charging as a service/amenity. Citizens highlight the total cost of ownership and charging reliability/coverage as decisive. Developers and building managers cite apartment-block constraints (pre-cabling, metering, cost allocation) and connection lead times as practical barriers. Fleet operators ask for predictable incentives, transparent charging prices, roaming/interoperability, and dynamic tariffs to manage operating costs. Municipal actors are supportive but request simple permitting templates, public-space guidelines, and grid-capacity planning that reflects strong summer seasonality on the coast. Overall, the perceived trajectory is positive if infrastructure quality, process simplicity, and price transparency improve in parallel.

3.11.3. Acceptance factors

- Clear use-cases first: Pilot depot-based H_2 (public fleets/utility services) and destination/municipal EV charging build trust with visible public benefits.
- Reliability and transparency: Users prioritise charger uptime, price transparency at the point of use, and national roaming/interoperability.
- Simple processes: One-stop permitting, standard municipal templates, and predictable grid-connection timelines reduce friction for both H_2 and EV projects.
- Building readiness: Pre-cabling/EV-ready provisions, clear metering/billing for multi-apartment buildings, and fair cost allocation enable uptake in cities.
- Seasonal grid planning: Acceptance improves when DSO capacity planning and flexibility options (smart charging, TOU tariffs) reflect tourism peaks.
- Skills & safety: Targeted training for first responders, inspectors and installers increases confidence in H_2 handling and bidirectional/smart EV systems.
- Economic visibility: Stable, multi-annual incentives, TCO calculators, and access to low-cost finance (public or blended) de-risk early adoption.
- Data & standards: Mandating open protocols, transparent data sharing (usage, uptime), and consumer-friendly information supports trust and choice.
- Local co-benefits: Projects framed around air-quality, noise reduction and tourism services (e.g., hotel/municipal charging) gain stronger community support.

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- Coordination across levels: Clear roles for ministries, regulator, DSO/TSO and municipalities—plus a single contact point—are decisive for stakeholder buy-in.

4. Best-practices A2.3

The results from the presentation of the best practice models (A2.3) are also be used for the development of D2.2.1. This part, which was prepared by every participating country, has been fully incorporated into the political recommendations of each participating country. The results summarise successful existing business models from the various countries participating and provide a catalogue of possible existing business approaches. These results offer valuable impetus to potential investors and energy planners, serve as guidance for political decision-makers in setting strategic courses, and enable them to identify relevant influencing factors.

At this point, the contents of the best practice models (A2.3) are summarised below:

4.1. Hydrogen integration

Enclosed are the respective best practice models (A2.3) sorted by participated countries, which deal with the integration of hydrogen:

- Electrolyser for generating green hydrogen from offshore wind energy. (LP)
- PV system for producing green hydrogen, tank filling systems and methanisation unit. (PP3)
- Voestalpine initiative for producing green hydrogen. (PP3)
- Since 2019, cars have been powered by hydrogen produced on site from the energy of solar cells on the petrol station premises. This is a modular, containerised plug-and-play electrolysis solution. (PP4)
- Water electrolysis plants. (PP5)
- Hydrogen buses as demonstration projects in Cluj-Napoca and Galati (Romania) with roadshow and test events. (PP5)
- Public relations, workshops and information campaigns to promote hydrogen technology. (PP7)
- First filling station for 100% green hydrogen. (PP8)
- Small hydrogen valley as a regional pilot project. (PP9)
- Use of the transport sector as a starting point for hydrogen pilot projects in Croatia. (PP10)
- Installation and operation of a 10 MW PEM electrolyser to partially cover the hydrogen demand of the Shell refinery in Wesseling, Germany. (PP10)
- Hydrogen production by electrolysis, which is mixed with natural gas. (PP11). (PP11)

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4.1.1. Best practices factors

The best practice models (A2.3) focus on the production, use and distribution of green hydrogen. They provide an overview of currently successful business models and thus also highlight the limits of what is currently feasible.

At this point, influencing factors are formulated from the best practice models summarised above (A2.3):

- **Generation from renewable energies**
  - Electrolysis plants are primarily powered by water, wind and solar energy. (LP, PP3, PP4, PP5, PP10, PP11)
  - Innovative, modular and mobile electrolysis systems in the form of a 'containerised plug-and-play electrolysis solution' enable flexible use, for example at filling stations. (PP4)
  - Small, decentralised hydrogen systems – known as 'hydrogen valleys' – promote the regional hydrogen economy and strengthen local value creation. (PP9). (PP9)

- **Use of hydrogen**
  - Green hydrogen is increasingly being used in the transport sector, particularly in vehicles such as buses and in the construction of hydrogen filling stations. (PP3, PP4, PP5, PP8, PP10)
  - o The addition of hydrogen to the natural gas grid is being tested in several projects. (PP 3, PP11)
  - o Green hydrogen is used in industry, for example in refineries. (PP10)

- **Accompanying measures**
  - Public relations work, workshops and roadshows promote understanding and acceptance of hydrogen technologies. (PP5, PP7)
  - Pilot projects in the transport sector test the practical application of hydrogen solutions and provide valuable insights for widespread rollout. (PP5, PP8, PP10)

4.2. E-mobility integration

Enclosed are best practice models (A2.3) sorted by participated countries that deal with the integration of e-mobility:

- Electric, battery-powered articulated buses with fuel cells are used to extend the range. (LP)
- A high-speed charging network for electric vehicles is available. (PP2)
- Battery-powered e-buses are used in cooperation with transport companies and infrastructure partners. (PP3)
- Innovative logistics concepts and optimised electric vehicles are used for inner-city goods delivery. (PP3)
- Electric car parking spaces with integrated charging facilities are available. (PP4)
- Ultra-fast charging stations form part of the infrastructure. (PP5)

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- A platform promotes e-mobility solutions such as public charging stations, e-car sharing and incentives for companies to introduce electric fleets. (PP5)
- Solaris Urbino electric buses and the appropriate charging infrastructure are in use. (PP7)
- A patent enables the reduction of platinum requirements in hydrogen electric vehicles to a tenth and has already initiated a cooperation for the prototype development of an industrial device. (PP8)
- Intelligent mobility solutions and e-mobility services, including charging infrastructure, support the transport transition. (PP9)
- Subsidies facilitate the purchase of energy-efficient vehicles. (PP10)
- Electric buses are procured, put into operation and supported by accompanying services. (PP11)
- The expansion of photovoltaic technologies and systems for households and small businesses – with a tenfold increase in rooftop solar installations – enables free home charging of electric vehicles. (PP12)

4.2.1. Best practices factors

The best practice models (A2.3) focus on the generation, use and distribution of e-mobility. They illustrate the business models that are currently successful and thus also the limits of what is currently feasible.

At this point, influencing factors are formulated from the best practice models summarised above (A2.3):

- **Use in the transport sector**
  - E-buses with additional hydrogen fuel cells increase the range in regular service. (LP)
  - E-buses are used, partly supplemented by accompanying services. (PP3, PP7, PP11,PP8)
  - Patent (platinum requirement) reduces raw material usage, tested in a prototype of an industrial device. (PP8)
  - E-car sharing is offered as part of the mobility concept. (PP5)
  - Electric delivery vehicles are used for urban logistics. (PP3)

- **Use in charging infrastructure**
  - A high-speed charging network and ultra-fast charging stations enable short charging times. (PP2, PP5)
  - Charging points in public spaces and car parks improve access to electric mobility. (PP4, PP5)
  - The expansion of the charging infrastructure for electric cars is a key component. (PP9, PP12)
  - A powerful charging infrastructure for electric buses requires continuous operation. (PP7)

- **Accompanying measures**
  - Transport companies and infrastructure partners are working together to implement electric mobility projects. (PP3)

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- Logistics concepts enable efficient and emission-free goods delivery. (PP3)
- A central platform brings together measures to promote e-mobility solutions. (PP5)
- Companies receive targeted incentives to switch to electric vehicle fleets. (PP5)
- Networked mobility services and intelligent control systems optimise the use of electric vehicles. (PP9)
- Subsidies for the purchase of energy-efficient vehicles. (PP10)
- Procurement programmes simplify the purchase of electric buses, including related services. (PP11)

5. Recommendations

The recommendations at national and EU level for improved framework conditions for integrating V2X and hydrogen into a more sustainable energy system include a variety of legal and political influencing factors (D1.2.1), acceptance factors of key stakeholders (A3.1) and best practice models (A2.3).
A look at the three areas enables a comprehensive analysis, the identification of key issues and, beyond that, a structured solution-finding process.
Based on this, practical and solution-oriented measures and strategies can be developed.
A table with keywords in the following chapter provides an overview of the recommendations developed.

5.1. Germany

5.1.1. Hydrogen integration

5.1.1.1. Legal framework

Stakeholders highlighted the need for clear national legislation to support hydrogen technologies. Ambiguities in permitting and responsibilities slow down project implementation. A targeted legal framework should define hydrogen production, storage, and distribution, including responsibilities for authorities and private actors. Clear definitions would reduce uncertainty and enable faster deployment of hydrogen projects.

5.1.1.2. Economic viability and incentives

Interviewees emphasized the importance of practical financial support. Complex funding procedures and short-term project financing make investments risky. The current electricity market design, based on volumetric pricing, is structurally incompatible with the value of flexibility and storage that hydrogen provides. A paradigm shift towards service-based or availability-based remuneration models is needed. National incentives, such as streamlined subsidies and predictable funding, along with EU-level support like the European Hydrogen Bank, are crucial to improve economic feasibility. The "learning phase" for hydrogen requires at least a decade of politically secured support.

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5.1.1.3. Cross-border cooperation

Inconsistent national regulations, such as differing permissible hydrogen blending levels in gas grids and technical standards, hinder cross-border hydrogen transport and collaboration. Harmonized EU standards, coupled with platforms for knowledge exchange, are essential to facilitate joint projects and improve infrastructure integration. Germany should actively push for and participate in the creation of a uniform EU rulebook for interconnection and trade to accelerate the development of a coordinated European hydrogen market.

5.1.2. E-mobility integration

5.1.2.1. Legal framework

Legal uncertainties remain a key challenge for Vehicle-to-Everything (V2X) applications and bidirectional charging. The regulatory framework is institutionally outdated, still assuming one-way electricity flow. There is an urgent need for a coherent legal and technical framework that explicitly recognizes electric vehicles as energy storage assets and defines the conditions for their participation in balancing and flexibility markets. National updates to the Energy Industry Act (EnWG) and the Charging Infrastructure Masterplan II must explicitly incorporate V2X to provide legal certainty for investors and operators.

5.1.2.2. Economic viability and incentives

Economic barriers, including unclear cost recovery for grid services, fragmented funding, and a lack of transparent tariff models for bidirectional charging, limit the adoption of V2X. Targeted financial incentives and coherent funding mechanisms are required. Furthermore, unresolved tax and labour law implications, for instance when charging at work and feeding back at home, need clarification to unlock private investment and user participation.

5.1.2.3. Standardisation and infrastructure

A major obstacle is the lack of comprehensive technical standards and interoperability for V2X technologies. While Vehicle-to-Home (V2H) is technically viable in proprietary systems, there is no uniform standard for safe and coordinated grid feed-in. Binding standardisation for communication protocols, control systems, and charging hardware is essential. This must be accompanied by the mandatory introduction of kilowatt-hour-based billing at all public charging stations to ensure transparency and fair cost comparison for users. Stronger national coordination is needed to align industry standards, similar to the rollout of smart metering infrastructure.

5.2. Austria

5.2.1. Hydrogen integration

5.2.1.1. Legal framework for legal certainty

The current regulatory framework creates considerable legal uncertainty for electrolysers. This is particularly due to the pending adoption of key national legislative amendments. The extensive

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regulatory adjustments provided for in these amendments could create the urgently needed legal certainty through clear definitions of terms, unambiguous allocation of responsibilities and the explicit integration of new technologies, particularly in the field of energy storage.
Such legal clarification is a key prerequisite for the reliable further development and integration of electrolysers as part of modern energy storage solutions. It is the responsibility of the Austrian legislature to establish this legal certainty through appropriate national legislation and strategies.
A key component here is the amendment to the ElWOG, the draft of which (ElWG) has been under review since the beginning of July 2025.
ElWG provides, in particular, for a revision and implementation of the definitions of electricity companies and energy storage facilities, explicitly including electrolysis as a technology for the first time. Clearly defined responsibilities in the approval process are intended to enable faster project implementation and improve the economic viability of business models.

5.2.1.2. Economic viability and financial incentives

The economic viability of new technologies requires not only a clear legal framework but also practical and targeted incentives. Economic considerations are one of the biggest challenges for the introduction of innovative systems. According to stakeholders, complex financing structures and the need to repeatedly apply for funding due to individual funding caps make it considerably more difficult to secure reliable and comprehensive financing for large-scale industrial projects.
At national level, these challenges require, in particular, the amendment of relevant laws (see above). In connection with new technologies, questions arise in particular regarding the distribution of network usage fees for energy storage. At European level, the EU is pursuing a clear strategy to promote hydrogen. In future, the state aid framework and award procedures are to be specifically adapted to the requirements of hydrogen-based technologies.

5.2.1.3. Practical assessment and corresponding amendments

The novelty of the technology poses considerable challenges for the practical application of relevant regulations. These require ongoing, systematic and practical assessments, followed by targeted measures to continuously optimise the overall system. By raising its climate target to a 90% reduction in net greenhouse gas emissions, the EU is demonstrating its determination to comprehensively shape the transition to a climate-neutral economy. Although initial regulations on the production of renewable hydrogen have been established at EU level, stakeholders say that their high level of complexity often leads to significant production costs in practice. Accordingly, while the precise definition of hydrogen is generally welcomed, they consider the current criteria for RFNBOs to be too restrictive. In particular, the obligation to link hydrogen production to new power plants is not considered necessary from an economic and infrastructural feasibility perspective, according to stakeholders. In addition, they argue that obtaining the necessary permits and approvals remains a key hurdle, particularly due to the novelty of the technology and the lack of established administrative procedures.

5.2.1.4. Coordination of national framework conditions and cross-border cooperation

According to stakeholders, differing national regulations are a major obstacle to cross-border cooperation in the field of hydrogen, particularly when it comes to transport via existing gas networks. For example, the permissible hydrogen content in the networks varies from Member State to Member State.

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The EU is committed to harmonising the legal and methodological framework in order to create a reliable basis for cooperation and investment security. In addition, the EU also expressly supports the networking of relevant market players to promote the cross-sectoral use of hydrogen technologies and has obliged Member States to designate a central regulatory authority for hydrogen. Consideration could also be given to establishing national bodies as general points of contact for the cross-border exchange of knowledge and experience. The current range of cross-border knowledge extends from large-scale electrolysis plants based on water, wind or solar power to decentralised hydrogen systems and modular, mobile applications or pilot projects on an industrial scale. Countries that are currently still in the testing phase are also part of the overall picture and should be systematically involved. A broad-based and structured exchange of knowledge between Member States is therefore the most effective lever for a comprehensive, technology-neutral and cross-border coordinated expansion of the hydrogen economy.

5.2.2. E-mobility integration

5.2.2.1. Application-oriented legal framework

E-mobility and V2X as an application also face considerable legal uncertainties. These result in particular from pending amendments to existing legislation. According to stakeholders, there is particular legal uncertainty with regard to the planned legal implementation of energy storage facilities and the associated grid usage fees. Furthermore, V2X technologies have not yet been taken into account in the mobility strategy. According to them, the lack of a legal basis poses considerable challenges for the optimal use of this technology. Further open questions exist in the area of tax law and labour law, in particular in connection with the commercial use of bidirectional charging systems, according to stakeholders.

At national level, the Austrian legislator is pushing for the urgently needed creation of legal certainty in the field of e-mobility by amending the ElWG. The draft, which is not yet legally binding, provides, among other things, for the explicit consideration of bidirectional and intelligent charging, the recognition of electric vehicles as energy storage devices and the introduction of a flexible metering system.

However, a holistic and practical approach is needed to ensure legal certainty in the long term. This should enable continuous regulatory development based on practical experience. According to stakeholders, updating the national mobility strategy and fully implementing the Clean Vehicle Directive would be particularly effective.

5.2.2.2. Synergies between e-mobility & hydrogen

A holistic view of e-mobility does not exclude possible synergies with the hydrogen sector. The cross-sector coupling of both technologies offers considerable potential, but is associated with a number of unresolved legal and practical challenges. In particular, there is uncertainty among stakeholders about the extent to which hydrogen will be used strategically and politically in mobility in the future.

Stakeholders believe that it is the responsibility of the Austrian legislature to leverage this potential through practical legal frameworks and strategic measures. They would like to see cross-sector integration firmly anchored in the national mobility strategy. Functioning international models could provide guidance here, such as the use of electric buses with supplementary hydrogen fuel cells to increase their range.

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5.2.2.3. Financing and incentives

The introduction and expansion of e-mobility depend largely on economic considerations – particularly with regard to financial structuring, the associated administrative burden and commercial support instruments. For example, according to stakeholders, the complete financing of large industrial projects regularly requires multiple applications due to individual funding limits. According to them, another economic hurdle is the lack of a tariff structure for feed-in within the framework of V2X applications and possible double taxation as a result of an unclear division of responsibilities when using bidirectional charging infrastructure. These uncertainties make it difficult to make reliable business calculations.

At national level, the aforementioned amendment of relevant legislation – in particular the ElWG – is therefore urgently needed to create a legal basis for economic planning. Austria can also benefit from models tried and tested in other countries and the knowledge gained from them. These include platforms for promoting e-mobility solutions and publicly supported procurement programmes for electric buses, including accompanying services.

At European level, EU studies predict annual cost savings of EUR 9.7 billion through accelerated electrification with the help of bidirectional charging of electric vehicles alone. In order to realise this potential, the planned amendment to the InvestEU Regulation aims to mobilise investments of up to EUR 50 billion for clean mobility. The necessary investments in renewable energy will be supported by a clean energy investment strategy worth billions, planned for 2025. In addition, a new action plan for electrification, planned for the first quarter of 2026, is expected to make a significant contribution to promoting a diversified energy supply in line with the REPowerEU targets.

5.2.2.4. Standardisation and infrastructure

The introduction of new technologies such as V2X is hampered not only by a lack of definitions and unclear distribution of responsibilities but also by the absence of a technical standard for practical use by all stakeholders. According to them, V2X applications currently often only work in closed, manufacturer-specific systems. A lack of uniform control technology also hinders network integration and compatibility with photovoltaic systems.

These circumstances highlight the urgent need for binding standardization that takes technological developments into account. According to stakeholders, the mandatory introduction of billing based on kilowatt hours would also be a step in the right direction. Measurement systems – such as flexible metering points – are essential for practical application. The latter enables precise billing even if there are multiple feed-in and consumption points within a customer's system. In order to meet the demands of stakeholders, concrete regulations for the use of public charging stations are also required, such as allowing a charging range between 80% and 100%. According to stakeholders, models to compensate for the currently limited reliability of V2X technology should also be implemented. In doing so, consideration should also be given to proven application models from other countries, such as electric buses with supplementary services and e-car sharing models. In doing so, attention should also be paid to proven application models from other countries, such as electric buses with additional services, e-car sharing models, and high-speed and ultra-fast charging stations. In order to leverage this experience, institutionalized cross-border knowledge exchange is essential – for example, via a platform for promoting e-mobility solutions. In addition, proven concepts for stronger networking of relevant actors could also be adopted, including intelligent mobility solutions and digital e-mobility services, logistics concepts for emission-free goods delivery and cooperation models with transport companies and infrastructure partners.

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5.3. Slovakia

5.3.1. 5.3.1. Hydrogen Integration

5.3.1.1. 5.3.1.1. Legal Framework and Regulatory Clarity

Slovakia has established a solid strategic orientation through its National Hydrogen Strategy (2021), yet the regulatory and legislative framework remains incomplete. Hydrogen is not yet explicitly defined as an energy commodity within national law, and no dedicated act governs its production, transport, or storage. The **Energy Act (No. 251/2012 Coll.**) and Act on Regulation in Network Industries (**No. 250/2012 Coll.**) only partially cover related activities, resulting in uncertainty for investors, operators, and public authorities.
It is therefore recommended that Slovakia:

- Introduce a legal **definition for hydrogen and energy storage systems** within national legislation, in line with Directive (EU) 2019/944 and Directive (EU) 2024/1788.
- Define specific **permitting and certification rules** for hydrogen facilities and distribution infrastructure.
- Establish a **central hydrogen market operator** under the Ministry of Economy to coordinate planning, grid connection, and certification processes.
- Integrate hydrogen into the **national energy and climate strategy** as an explicit component of the low-carbon transition and industrial decarbonisation.

The alignment of Slovakia's legal system with EU regulations will enhance investor confidence and create legal certainty for both domestic and foreign hydrogen initiatives.

5.3.1.2. 5.3.1.2. Economic Viability and Financial Incentives

The economic success of hydrogen projects depends on targeted funding and stable support mechanisms. Slovakia has taken positive steps through the **Operational Programme Quality of Environment (OP KŽP)** and the R**ecovery and Resilience Plan (Component 3 – Green Slovakia)**, both of which include pilot actions for hydrogen and renewable energy. However, long-term incentives remain fragmented.
Recommended actions include:

- Establishing a **Hydrogen Development Fund**, pooling EU and national resources for infrastructure, R&D, and demonstration plants.
- Introducing tax incentives and preferential loans for hydrogen production and transport projects.
- Supporting **public procurement** of hydrogen buses and vehicles through national co-financing schemes.
- Encouraging **public–private partnerships (PPP)** in industrial zones and logistics parks for hydrogen refuelling stations.

Projects like the **JESS Green Hydrogen for Transport** pilot in Trnava provide a valuable foundation for determining cost benchmarks and refining support mechanisms for scaling.

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5.3.1.3. 5.3.1.3. Practical Challenges and Operational Considerations

Slovakia faces several operational and administrative barriers that slow hydrogen deployment, including lengthy approval procedures, limited technical expertise, and the absence of dedicated standards. These gaps can be addressed by:

- Establishing a **Hydrogen Competence Centre** under the Ministry of Economy, in partnership with SEPS and leading universities.
- Developing technical norms and **certification standards for electrolysers**, refuelling stations, and hydrogen transport.
- Institutionalising the **regulatory sandbox** approach used in the JESS Trnava project to accelerate innovation.
- Providing **training and workforce development programmes** in cooperation with technical universities and industry associations.

Such measures will enable Slovakia to operationalise hydrogen safely and efficiently while ensuring compliance with EU safety and quality standards.

5.3.1.4. 5.3.1.4. Coordination and Cross-Border Cooperation

Regional coordination is critical for Slovakia's hydrogen transition. Given its location between Austria, Czechia, and Hungary, Slovakia is strategically positioned to join **Central European Hydrogen Corridor** initiatives.
Key actions include:

- Strengthening cooperation with **neighbouring TSOs** for hydrogen blending and infrastructure planning.
- Supporting the creation of a joint **regional certification system** for renewable hydrogen, consistent with Delegated Regulation (EU) 2023/1184.
- Engaging in **bilateral and Danube Region partnerships** to share knowledge, harmonise infrastructure standards, and develop regional hydrogen logistics.

Such cooperation would enable the efficient exchange of hydrogen across borders and promote investment synergies in Central Europe.

5.3.2. 5.3.2 E-Mobility Integration

5.3.2.1. 5.3.2.1 Application-Oriented Legal Framework

Slovakia's e-mobility development is guided by the **Alternative Fuels Infrastructure Development Plan** and the **National Recovery and Resilience Plan**, yet a unified legal act defining all regulatory and operational aspects of e-mobility is still missing.
To strengthen the legal framework:

- Adopt a **comprehensive e-mobility act** covering charging standards, network interoperability, and smart-charging regulations.
- Implement EU **AFIR (Regulation 2023/1804)** provisions directly into national law to ensure harmonisation with European standards.
- Legally define **Vehicle-to-Grid (V2G)** and **smart-charging systems** within the electricity market law.

These steps would ensure that Slovakia's legal environment supports innovation, consumer protection, and grid stability as EV adoption grows.

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5.3.2.2. 5.3.2.2 Synergies Between E-Mobility and Hydrogen

Hydrogen and e-mobility should not be developed separately but as complementary technologies. Slovakia's strategic location allows for **hybrid renewable energy hubs** combining hydrogen refuelling and EV charging in industrial corridors and transport nodes.
Recommended policy directions:

- Foster **sector coupling** between electricity, hydrogen, and mobility systems.
- Integrate hydrogen **electrolysis facilities with solar or wind farms** to serve both charging and refuelling purposes.
- Encourage **joint investment schemes** for e-mobility and hydrogen infrastructure using shared grid access and energy management systems.

Such synergies will optimise the use of renewable electricity and improve the overall efficiency of the Slovak transport decarbonisation strategy.

5.3.2.3. 5.3.2.3 Financing and Incentives

Public funding remains crucial to sustaining e-mobility growth in Slovakia. Existing support programmes should evolve into predictable, long-term mechanisms:

- Extend the **EV purchase subsidy scheme** for both individuals and businesses.
- Introduce **corporate tax deductions** for fleet electrification and installation of workplace chargers.
- Provide **preferential tariffs** for electricity used in EV charging, particularly during off-peak hours.
- Create a **municipal infrastructure grant** ensuring equitable access to chargers in smaller cities and rural areas.

Stable financing frameworks and long-term incentives are key to encouraging investment and consumer confidence in e-mobility.

5.3.2.4. 5.3.2.4 Standardization, Infrastructure, and Social Acceptance

To accelerate adoption, Slovakia should prioritise the development of uniform technical standards, interconnection between networks, and social awareness campaigns.
Key recommendations:

- Harmonise **technical standards** for charging connectors, payment systems, and communication protocols.
- Expand **fast-charging corridors** along major highways (D1, R1) and in remote regions to close infrastructure gaps.
- Implement **awareness campaigns** showcasing e-mobility's environmental and economic benefits, emphasising lower maintenance costs and reduced emissions.
- Encourage **municipalities** to electrify their public fleets and incorporate e-mobility promotion into local climate plans.

The **Senec eGUTS project** provides a replicable example of successful community-level implementation that enhances both visibility and public trust.
Slovakia has entered a decisive phase of its clean-energy transformation. While policy alignment with EU frameworks is strong, implementation at the national level remains fragmented.
To ensure success, Slovakia should:

- Clarify **legal frameworks** for hydrogen and e-mobility.

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- Consolidate **financial support** and align incentives with EU mechanisms.
- Promote **knowledge transfer** through competence centres and pilot-based learning.
- Strengthen **cross-border coordination** under the Danube Region cooperation structures.

Combining these elements will enable Slovakia to transform pilot experiences into systemic reforms, positioning the country as a Central European leader in renewable hydrogen and e-mobility integration.

5.4. Romania

5.4.1. 5.2.1. Hydrogen Integration

5.4.1.1. 5.2.1.1. Legal Framework and Regulatory Clarity

In Romania, the regulatory and legislative framework for hydrogen technologies is still in its infancy, creating significant uncertainty for project developers and stakeholders. According to expert interviews, there is currently no comprehensive national strategy or legislation specifically addressing hydrogen production, storage, and distribution. This lack of a clear legal framework affects both the economic viability of projects and public acceptance.

The adaptation of European legislation—such as the EU Renewable Energy Directive and hydrogen-specific RFNBO criteria—has been partial, often applied "by name" without thorough alignment to the Romanian context. This results in unclear responsibilities, inconsistent safety requirements, and gaps in permitting procedures. Stakeholders emphasize that practical legal clarity is a prerequisite for reliable project implementation and long-term investment security.

A key component of advancing the sector would be the adoption of national regulations that explicitly integrate hydrogen as an energy carrier, define responsibilities for production and distribution, and align technical standards with EU frameworks. Pilot projects, such as the Cluj-Napoca Technical University municipal hydrogen initiative, illustrate both the potential and the current regulatory gaps, highlighting the need for a structured legal framework to enable scaling up.

5.4.1.2. Economic Viability and Financial Incentives

Economic considerations remain a major challenge for hydrogen development in Romania. Experts underline that the high production cost of green hydrogen and the lack of targeted financial support hinder large-scale implementation. Stakeholders report that financing structures are complex, fragmented, and often require multiple applications, which slows down project development.

Governmental incentives—such as tax reductions for hydrogen vehicles and subsidies for electrolysis plants—would be critical for increasing adoption. Moreover, integrating hydrogen projects into European funding mechanisms, such as Horizon Europe or the EU Emissions Trading System, could provide substantial financial support. Strategic measures to reduce production costs, including improved energy efficiency, optimized infrastructure, and streamlined permitting procedures, are essential to increase market competitiveness.

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5.4.1.3. Practical Challenges and Operational Considerations

Hydrogen technologies pose practical challenges related to production, storage, and distribution. Safety concerns, particularly regarding storage of highly explosive hydrogen, require the development of technical standards and clear operational protocols. Interviews highlight that both industry stakeholders and the public perceive hydrogen as a potentially risky technology unless strict safety regulations are established.

Experts also stress the importance of public awareness campaigns and demonstration projects to increase societal acceptance. Pilot projects in Cluj-Napoca demonstrate the practical feasibility of municipal-level hydrogen applications, while also highlighting infrastructural limitations, such as storage capacity, transport logistics, and integration into the existing energy system. Continuous monitoring and practical assessments are necessary to optimize deployment strategies and ensure safety compliance.

5.4.1.4. Coordination and Cross-Border Cooperation

Cross-border cooperation in hydrogen deployment is in early stages but is recognized as strategically important. Romania's current regulatory heterogeneity compared to other EU Member States complicates potential cross-border hydrogen projects, particularly in transport via gas networks and shared infrastructure. For example, varying safety standards, permissible hydrogen concentrations, and storage protocols create technical and regulatory obstacles.

Stakeholders emphasize the need for harmonized national and regional frameworks aligned with EU standards, as well as the creation of central authorities or coordination bodies to facilitate knowledge exchange and investment security. Best practices could include the systematic integration of pilot projects, decentralized hydrogen systems, and collaboration with more advanced regions in Europe. Broad-based knowledge sharing, including lessons from other countries' municipal projects and industrial-scale deployments, is considered essential for the sustainable and technology-neutral expansion of the hydrogen sector.

5.4.2. E-Mobility Integration

5.4.2.1. Application-Oriented Legal Framework

E-mobility, particularly V2G and V2H technologies, faces similar legal uncertainties in Romania. Current legislation does not explicitly account for bidirectional charging, the recognition of electric vehicles as energy storage devices, or grid integration mechanisms. Interviews indicate that unclear responsibilities regarding electricity tariffs, taxation, and liability in commercial use of V2G/V2H systems are key obstacles to deployment.

National experts suggest that legal amendments are necessary to integrate V2X technologies into the Romanian energy and mobility strategy. Practical measures should include defining roles for grid operators, public authorities, and private users, alongside technical and safety standards for vehicle-to-grid and vehicle-to-home applications. A coordinated approach with EU frameworks and pilot demonstration projects is needed to gradually build legal certainty and operational feasibility.

5.4.2.2. Synergies Between E-Mobility and Hydrogen

Stakeholders recognize potential synergies between e-mobility and hydrogen technologies, particularly in supporting flexible and clean energy solutions. For example, electric buses equipped with supplementary hydrogen fuel cells could extend operational range and reduce dependency

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on fossil fuels. However, experts note that policy and strategic guidance are required to coordinate cross-sector adoption.

The integration of both technologies in urban mobility planning, municipal fleets, and public transport systems could enhance sustainability and resilience. Pilot projects and international examples provide guidance for Romania, but a clear legal framework and strategic roadmap are necessary to exploit these synergies effectively.

5.4.2.3. Financing and Incentives

The expansion of e-mobility depends heavily on economic and financial factors. Interviews indicate that high EV costs, lack of infrastructure, and the absence of clear incentives for V2G/V2H adoption are major barriers. Public authorities in Romania have implemented programs such as Rabla Plus and subsidies for home charging infrastructure, but more targeted incentives are needed.

Stakeholders recommend introducing feed-in tariffs for energy exported via V2G, tax reductions for V2G-enabled vehicles, and financial compensation for energy supplied back to the grid. Lessons from other EU countries suggest that a combination of public grants, energy pricing incentives, and business support programs can significantly accelerate EV adoption while enabling bidirectional technologies to contribute to grid stability.

5.4.2.4. Standardization, Infrastructure, and Social Acceptance

Technical standardization, infrastructure development, and social acceptance are critical for Romania's e-mobility strategy. Experts highlight that V2G and V2H currently function only in limited proprietary systems, and there is no uniform standard for grid integration. This complicates large-scale deployment and integration with residential photovoltaic systems.

Measures to address these challenges include mandatory kilowatt-hour billing at public charging stations, models to compensate for the variable reliability of V2G, and public awareness campaigns to improve acceptance. Infrastructure investments, such as high-speed chargers and PV-integrated energy storage, combined with training programs and communication campaigns, are essential to maximize both technical feasibility and societal acceptance of e-mobility.

5.5. Serbia

5.5.1. Hydrogen integration

5.5.1.1. Legal framework for legal certainty

To foster legal certainty for hydrogen integration in Serbia, a comprehensive legal framework should be developed, acting as a foundational bedrock for investments, innovation, and sustainable growth in the sector. This framework must begin with a clear definition of hydrogen, encompassing its various forms (green, blue, grey) and establishing standards for production, transportation, storage, and usage, aligning with EU directives and best practices.

A crucial element is the establishment of permitting and licensing procedures for hydrogen projects. These procedures should be streamlined and transparent, reducing bureaucratic obstacles while ensuring adherence to safety and environmental regulations. Interoperability of hydrogen infrastructure must be addressed, ensuring seamless connections across different systems and regions, alongside a detailed framework that clearly delineates the rights and responsibilities of hydrogen producers, distributors, and consumers.

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Another essential aspect is the integration of hydrogen into existing energy laws and regulations, acknowledging its role as an energy carrier and feedstock. This necessitates amendments to laws governing renewable energy, electricity, and gas, ensuring hydrogen's equal treatment with other energy sources. Environmental regulations should be updated to address the specific impacts of hydrogen production and usage, including emissions and waste management, incentivizing environmentally friendly production methods.

Finally, the legal framework must prioritize safety, establishing stringent standards and protocols for handling hydrogen, protecting workers, the public, and the environment. These standards should be regularly updated to reflect the latest technological advancements and safety knowledge, creating a solid foundation for a safe and thriving hydrogen economy in Serbia.

5.5.1.2. Economic viability and financial incentives

To ensure the economic viability and attract investment in hydrogen integration in Serbia, a multi-faceted approach combining targeted financial incentives and strategic market development is essential. Recognizing the current cost challenges associated with hydrogen production, especially green hydrogen, the government should implement a robust system of subsidies and tax credits for producers. These incentives should be designed to bridge the cost gap with conventional energy sources, making hydrogen competitive in key sectors such as transportation, industry, and power generation.

Beyond production incentives, financial support should be extended to the development of hydrogen infrastructure, including pipelines, storage facilities, and refueling stations. Public-private partnerships can be instrumental in sharing the financial burden and expertise, accelerating infrastructure deployment. Demand-side incentives are equally crucial, such as rebates for hydrogen-powered vehicles and equipment, or preferential tariffs for industries using hydrogen as a feedstock or energy source.

Creating a clear and stable regulatory framework is paramount to reduce investor risk and encourage long-term commitments. This framework should provide certainty regarding permitting processes, grid access, and hydrogen certification, assuring investors of a predictable market environment. Serbia should also actively pursue access to EU funding mechanisms and international financing options specifically targeting hydrogen projects.

Finally, promoting research and development in hydrogen technologies is essential to drive down costs and improve efficiency. This can be achieved through grants, tax incentives, and support for pilot projects, fostering innovation and building a skilled workforce in the hydrogen sector. By implementing these measures, Serbia can create a compelling economic case for hydrogen integration, attracting investment, stimulating innovation, and paving the way for a sustainable and competitive hydrogen economy.

5.5.1.3. Practical assessment and corresponding amendments

To ensure effective hydrogen integration in Serbia, a practical, phased assessment approach, coupled with responsive legislative amendments, is essential. The initial step involves conducting a comprehensive assessment of Serbia's existing energy infrastructure, identifying potential synergies and modifications required to accommodate hydrogen production, storage, transport, and utilization. This includes evaluating the capacity of natural gas pipelines for hydrogen blending, assessing the suitability of existing storage facilities, and determining the feasibility of repurposing industrial sites for hydrogen production.

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Following this assessment, pilot projects should be launched to test hydrogen technologies in real-world scenarios. These projects should focus on various applications, such as hydrogen-powered transportation, industrial processes, and residential heating, to gather data on performance, cost-effectiveness, and environmental impact. Data collected from these pilot projects should then inform the development of tailored regulations and standards.
Based on the assessment findings and pilot project results, amendments to existing legislation are crucial. This may involve revising energy laws to incorporate hydrogen as a recognized energy carrier, updating building codes to accommodate hydrogen-based heating systems, and establishing safety regulations for hydrogen handling and storage. These amendments should be designed to be flexible and adaptable, allowing for adjustments as hydrogen technologies evolve and mature.
A crucial aspect is the establishment of a clear and transparent process for stakeholder engagement throughout the assessment and amendment process. This includes consulting with industry experts, government agencies, research institutions, and the public to ensure that all perspectives are considered and that the final legal framework is practical, effective, and widely supported. By taking this iterative approach, Serbia can ensure that its legal framework for hydrogen integration is grounded in real-world experience and facilitates the development of a sustainable and thriving hydrogen economy.

5.5.1.4. Coordination of national framework conditions and cross-border cooperation

For Serbia to successfully integrate hydrogen into its energy system, a cohesive national strategy alongside robust cross-border collaboration is paramount. Establishing a central coordinating body, likely within the Ministry of Energy, is crucial to harmonize national framework conditions. This body should be responsible for developing a comprehensive hydrogen strategy that aligns with Serbia's broader energy and climate goals, and for ensuring consistency across various government agencies and sectors.
Within Serbia, this coordinating body should facilitate the development of standardized regulations, permitting processes, and safety standards for hydrogen projects. This will create a level playing field for investors and streamline the deployment of hydrogen technologies. Simultaneously, proactive engagement with neighboring countries is essential to foster cross-border cooperation on hydrogen infrastructure, supply chains, and knowledge sharing.
Serbia should actively participate in regional hydrogen initiatives, such as the development of cross-border hydrogen pipelines and the establishment of common hydrogen certification schemes. This collaboration can help unlock economies of scale, reduce costs, and ensure a reliable supply of hydrogen to meet domestic demand. Furthermore, aligning national regulations with those of neighboring countries can facilitate cross-border trade and investment in the hydrogen sector.
Finally, fostering strong relationships with EU institutions and participating in EU-wide hydrogen initiatives will be crucial for Serbia to access funding opportunities and benefit from the expertise and best practices of other European countries. This coordinated approach, combining strong national leadership with proactive cross-border cooperation, will be essential for Serbia to realize the full potential of hydrogen as a clean and sustainable energy source.

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5.5.2. E-mobility integration

5.5.2.1. Application-oriented legal framework

To accelerate the adoption of e-mobility in Serbia, a targeted and application-oriented legal framework is essential. This framework should prioritize specific areas where e-mobility can have the most immediate impact, such as public transportation, urban logistics, and shared mobility services. For example, regulations could mandate the gradual electrification of public bus fleets in major cities, accompanied by financial incentives and technical support for municipalities.

In urban logistics, the legal framework could incentivize the use of electric vans and cargo bikes for last-mile deliveries through preferential access to city centers and designated loading zones. This would not only reduce emissions and congestion but also create new business opportunities for local companies. Furthermore, the regulations should promote the development of shared e-mobility services, such as electric scooter and bike sharing, by establishing clear rules for licensing, insurance, and safety standards.

Beyond these specific applications, the legal framework should also address broader issues, such as charging infrastructure deployment. This includes streamlining the permitting process for installing charging stations in public and private locations, incentivizing the construction of fast-charging corridors along major highways, and ensuring interoperability between different charging networks. A crucial aspect is the implementation of smart charging regulations that allow for grid-friendly charging during off-peak hours, minimizing the impact on the electricity grid.

Finally, the legal framework should include provisions for promoting the circular economy for EV batteries, such as establishing collection and recycling schemes, and incentivizing the reuse of batteries in stationary energy storage systems. By focusing on specific applications and addressing key challenges, Serbia can create a targeted and effective legal framework that accelerates the adoption of e-mobility and contributes to a cleaner and more sustainable transportation system.

5.5.2.2. Synergies between e-mobility & hydrogen

To maximize the benefits of clean transportation in Serbia, a strategic approach that leverages the synergies between e-mobility and hydrogen is essential. Instead of viewing them as competing technologies, policymakers should focus on creating a supportive ecosystem where both can thrive and complement each other. One key area of synergy lies in public transportation. While battery-electric buses are well-suited for shorter, predictable routes within urban areas, hydrogen fuel cell buses offer a compelling solution for longer routes and intercity travel, where range and refuelling time are critical considerations. Municipalities could implement a mixed fleet strategy, utilizing both technologies based on specific route requirements.

Another area of synergy is in heavy-duty transportation. While battery-electric trucks are gaining traction for shorter-haul deliveries, hydrogen fuel cell trucks are emerging as a promising option for long-haul freight transport, where high payload capacity and fast refuelling are essential. The government could incentivize the adoption of both technologies through targeted subsidies and infrastructure investments, focusing on creating dedicated charging and refuelling corridors along major highways.

Furthermore, hydrogen can play a crucial role in supporting the electricity grid as the penetration of electric vehicles increases. Electrolyzers, which use electricity to produce hydrogen, can be used to store excess renewable energy during periods of high production and low demand. This hydrogen can then be used to power fuel cell vehicles or reconverted back into electricity during periods of peak demand, providing valuable grid balancing services.

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Finally, the development of a green hydrogen economy can create new economic opportunities for Serbia. By investing in renewable energy sources and electrolyzer technologies, Serbia can become a producer and exporter of green hydrogen, powering its own transportation sector and supplying clean energy to neighbouring countries. This integrated approach, recognizing the unique strengths of both e-mobility and hydrogen, will be crucial for creating a sustainable and resilient transportation system in Serbia.

5.5.2.3. Financing and incentives

To accelerate e-mobility adoption in Serbia, a comprehensive financing and incentives strategy is crucial, addressing both the high upfront costs and the need for widespread charging infrastructure. Direct purchase subsidies for electric vehicles (EVs) should be offered to individual consumers and businesses, making EVs more competitive with conventional vehicles. These subsidies should be tiered based on vehicle type and battery capacity, incentivizing the adoption of more efficient and longer-range EVs.

In addition to direct subsidies, tax incentives can further reduce the cost of EV ownership. This could include exemptions from vehicle registration taxes, annual road taxes, and value-added tax (VAT) on EV purchases. Companies that invest in electric vehicle fleets should be offered tax deductions or accelerated depreciation allowances, encouraging businesses to transition to cleaner transportation.

Beyond vehicle incentives, a robust financial support system is needed for charging infrastructure deployment. Grants and low-interest loans should be made available to businesses, municipalities, and individuals for the installation of public and private charging stations. The government should also explore public-private partnerships to accelerate the development of fast-charging corridors along major highways.

To incentivize smart charging and grid stability, time-of-use electricity tariffs should be implemented, offering lower rates for EV charging during off-peak hours. Furthermore, feed-in tariffs could be offered to EV owners who allow their vehicles to provide vehicle-to-grid (V2G) services, helping to balance the electricity grid and increase the utilization of renewable energy sources.

Finally, dedicated funding mechanisms should be established to support research and development in e-mobility technologies, fostering innovation and creating new economic opportunities. This could include grants for local companies developing EV components, battery recycling solutions, and smart charging systems. By combining these various financing and incentive mechanisms, Serbia can create a supportive ecosystem for e-mobility, attracting investment, stimulating innovation, and accelerating the transition to a cleaner and more sustainable transportation system.

5.5.2.4. Standardisation and infrastructure

For seamless e-mobility integration in Serbia, a concerted effort towards standardization and infrastructure improvement is vital. A national standardization body should be tasked with adopting and implementing international standards for charging connectors, communication protocols, and safety requirements for electric vehicles (EVs) and charging equipment. This will ensure interoperability across different charging networks and prevent technological lock-in, promoting consumer choice and market competition.

To address "range anxiety" and encourage EV adoption, a nationwide charging infrastructure network must be rapidly expanded. This requires a strategic deployment plan that prioritizes high-

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traffic areas, such as city centers, shopping malls, highway rest stops, and tourist destinations. The government should streamline the permitting process for installing charging stations, reducing bureaucratic hurdles and accelerating deployment timelines.
To ensure grid stability and maximize the use of renewable energy, smart charging technologies should be widely implemented. This includes deploying load balancing systems at charging stations, incentivizing off-peak charging through time-of-use tariffs, and exploring the potential of vehicle-to-grid (V2G) technologies to provide grid services. Furthermore, the electricity grid itself needs to be upgraded to accommodate the increasing demand from EVs. This requires investments in grid modernization, including smart grids, energy storage solutions, and distribution automation systems.
Finally, public awareness campaigns are essential to educate consumers about e-mobility and promote the use of charging infrastructure. These campaigns should provide information on charging station locations, charging protocols, and smart charging options. By combining these efforts towards standardization and infrastructure improvement, Serbia can create a user-friendly and reliable e-mobility ecosystem, encouraging widespread EV adoption and paving the way for a cleaner and more sustainable transportation future.

5.6. Czech Republic

5.6.1. Hydrogen integration

5.6.1.1. Legal framework for legal certainty

Act No. 87/2025 Coll. places hydrogen in the energy system, but legal certainty will come only with clear follow-up rules and consistent practice. The responsible ministries, the energy regulator and the market operator should set a straightforward licensing model for production, storage and transmission/distribution, and publish market rules for balancing, nominations, metering and settlement of hydrogen’s energy content. Grid companies together with the regulator should issue a Hydrogen Network Code that defines gas-quality ranges for blends and pure hydrogen, rules for odorization, metering, pressure classes and interconnection tests.
A national registry of guarantees of origin should be launched, compatible with EU systems, with clear verification and audit procedures. Technical requirements should be translated quickly into Czech standards, supported by guidance for blending and for end-use appliances.
Permitting needs one national methodology that states when environmental assessment is required, which studies and safety documents are needed, and assigns a single coordinating authority so opinions run in parallel and deadlines are predictable. The finance authorities should clarify VAT/excise and depreciation for renewable versus low-carbon hydrogen. The regulator should define how “hydrogen-readiness” investments are treated in network tariffs and request readiness plans from transmission and distribution operators.

5.6.1.2. Economic viability and financial incentives

Hydrogen projects in Czechia face high capital costs in production and distribution, and revenues are uncertain. Without public support they are not yet competitive. Viable early uses exist near end-users in industry and public transport, but missing infrastructure adds risk. Acceptance is price-sensitive - transparency and value-for-money safeguards are essential.

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To unlock investment, experts recommend pairing upfront aid with predictable revenues. Run competitive auctions for long-term price support (contracts for difference per kg/MWh) with 8–12-year terms, simple carbon rules and modest volume flexibility; combine with declining capital grants for first plants. Prioritise projects co-located with renewables or near industrial offtakers, and favour brownfield sites to cut grid and permitting costs.

Improve financing via low-interest loans or partial guarantees from a public development bank, and allow revenue-stacking from flexibility services (e.g., absorbing surplus renewables) with simple metering and fast settlement. Aggregate stable demand via public buyers: municipal fleets, buses, utilities, using standard offtake contracts and payment guarantees. Tie all incentives to clear disclosure of origin and costs, with plain-language public reporting to build trust.

At EU level, align national auctions and support with the EU state-aid framework and make projects eligible for European Hydrogen Bank/Innovation Fund windows (for price support or CAPEX top-ups). Ensure guarantees of origin are interoperable with EU systems and that contract rules reflect EU carbon-intensity and additionality requirements to avoid later compliance risks.

5.6.1.3. Practical assessment and corresponding amendments

Because hydrogen technologies are new, many rules still lack workable detail. Czech regulation should adopt a "learn-and-adjust" approach: time-limited pilot regimes for electrolysers, storage and refuelling sites with simple published guidance; systematic collection of operational evidence (safety, metering, grid impacts, costs); and scheduled updates of secondary legislation and administrative practice. A small national review group: industry, grid operators, safety services, municipalities and the regulator should turn findings into rapid amendments.

Compliance pathways must be practical as well as lawful. Instead of de-facto "new-plant only" requirements, allow multiple routes (e.g., power purchase agreements, on-site renewables, time-matched grid electricity) with proportionate monitoring for smaller producers. Permitting should use national templates and checklists, clear thresholds for environmental assessment, parallel opinions from authorities, and a digital one-stop interface; pre-application scoping and fixed timelines reduce uncertainty. For grid connection, publish transparent cost-sharing rules and standard agreements, and pre-approve brownfield and behind-the-meter configurations where risks are lower.

All changes should remain fully compatible with the EU framework (RED III and related rules, state-aid guidance and Hydrogen Bank windows), with the explicit aim of cutting administrative burden while preserving compliance and market access.

5.6.1.4. Coordination of national framework conditions and cross-border cooperation

Across the EU, cross-border hydrogen use is slowed by uneven national rules—different blending limits in gas grids, varying gas-quality bands and odorisation practices, incompatible metering and data formats, and diverging safety procedures. This makes transport via existing pipelines costly and uncertain. The EU should therefore steer a common, practical rulebook for interconnection and trade: harmonised limits and quality parameters (for blends and pure hydrogen), standard templates for interconnection and capacity booking, a shared methodology for carbon accounting and disclosure, and parallel permitting with comparable documentation and single contact points on both sides of a border. In parallel, the EU should fund structured networking among market players and authorities (from large electrolysers to modular, mobile pilots), so countries at different stages can exchange lessons quickly. Support windows (Innovation Fund / European

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Hydrogen Bank / CEF) should prioritise cross-border pilots and the adaptation of existing networks. Each Member State should name a single national coordinator for hydrogen to interface with neighbors and EU bodies.

Czechia: Appoint a single contact point for cross-border hydrogen projects, publish bilingual guidance, and run pilot interconnections at border nodes. Agree with Germany, Austria, Poland and Slovakia on workable blending thresholds, safety procedures and data exchange, and submit coordinated EU funding applications so timelines and reporting align on both sides.

5.6.2. E-mobility integration

5.6.2.1. Application-oriented legal framework

To move V2X from pilots to practice, Czech law needs clear, usable rules that match how charging and homes actually work. Stakeholders stress that legislation lags behind technology; V2G/V2H exist but lack legal backing and operational clarity. The framework should explicitly allow bidirectional flows and peer-to-grid transactions, define the roles and liabilities of drivers, site owners and aggregators, and set simple rules for metering, data exchange and settlement so that exported kilowatt-hours can be credited and paid.

Connection and permitting should use national templates with predictable timelines and one point of contact for distribution-network issues. Tariffs need an application-ready structure: kWh-based billing as default, transparent display of total price, and time-of-use/export remuneration that rewards smart charging while avoiding “double charging” for the same energy. Public communication and plain-language contracts are essential for acceptance, as media highlight sensitivity to price and technical opacity. Privacy and data-use rules should be explicit, given concerns around household metering and profiling.

Finally, the national Clean Mobility Action Plan should be updated to include V2X: grid-integration rules for apartment buildings, access for fleets and municipalities, and simple participation of small users in flexibility services. This aligns legal intent with deployment and supports fair access across social groups.

5.6.2.2. Synergies between e-mobility & hydrogen

Policy should treat battery-electric mobility and hydrogen as complementary parts of one system and plan them together on a use-case basis. A national, cross-sector roadmap should link charging rollout, hydrogen refuelling and grid development, and clearly state the intended role of hydrogen in mobility so investors and cities can plan with certainty. Cross-sector integration ought to be anchored in mobility and energy strategies rather than left to ad-hoc pilots.

Targets, funding and procurement should be technology-neutral and reward system value (reliability, flexibility, reduction of curtailment), not individual technologies. Rules for grid access and remuneration should be coherent across both sectors, and basic interoperability (data, safety, responsibilities) should enable projects to operate seamlessly without bespoke arrangements. Public tenders can bundle battery-electric and hydrogen use cases under one contract where this best serves service quality and whole-system efficiency.

At the European level, alignment with common frameworks and cross-border corridors is essential. Czech projects should be designed to plug into EU knowledge-sharing and funding streams (e.g., integrated depot or logistics hubs), so lessons travel quickly and financing is scalable. A light national coordination forum can review evidence from deployments and periodically adjust guidance, keeping the strategic approach stable.

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5.6.2.3. Financing and incentives

E-mobility deployment in Czechia is constrained mainly by economics. High upfront costs (vehicles, charging hardware, grid upgrades) combine with uncertain operating revenues from smart and bidirectional charging. Stakeholders point to fragmented support with funding caps that force multiple applications, heavy administrative burden, and long, unpredictable timelines—all of which raise the cost of capital. Missing or inconsistent tariff structures for V2X feed-in, unclear allocation of responsibilities (site owner vs. supplier vs. aggregator) and the risk of double taxation make business cases hard to price. Additional hurdles include grid-connection fees, slow settlement cycles, non-portable billing arrangements, and split incentives in apartment housing. Smaller operators are disproportionately affected by compliance and metering costs, and by credit risk on counterparties in emerging flexibility markets.

At the European level, alignment with the state-aid framework and evolving market-design guidance is essential for bankability. Stakeholders highlight uncertainty around how EU-level rules for V2X remuneration, data and measurement will translate nationally, which affects long-term revenue assumptions. Access to EU instruments (e.g., Innovation Fund, InvestEU, Modernisation Fund) can lower financing costs, but differing eligibility and reporting requirements add transaction costs when combined with national schemes. Until these issues are clarified and streamlined, reliable economic planning for large-scale e-mobility remains difficult.

5.6.2.4. Standardisation and infrastructure

A credible scale-up of e-mobility needs clear, usable standards and an infrastructure plan that cities, operators and investors can follow. National rules should ensure full interoperability with a single set of definitions for roles and responsibilities, kilowatt-hour billing as the standard, clear, all-in price display, and interoperable data formats so any vehicle can charge at any public point and users can switch providers without losing history. Bidirectional operation ought to be covered by simple, uniform requirements for metering, settlement and responsibility, with privacy and cybersecurity rules consistently applied at home, at work and at public sites, and aligned with common EU practice on roaming, cross-border pricing transparency and recognition of compliance checks so rules work the same across borders.

On infrastructure, planning should prioritise places where charging solves real operational needs—depots and logistics hubs, plus shared solutions for apartment buildings—followed by well-spaced public sites along main corridors and in dense urban areas. Grid integration needs early attention through joint assessments and standardised connection terms that enable shared connections and managed charging, so a single upgrade can serve multiple chargers (and, where relevant, co-located storage or electrolysis). Clear reliability and maintenance expectations, accessible design and consistent safety procedures are essential for user trust.

Taken together, these measures lower transaction costs and help Czech networks work seamlessly with neighbouring markets while keeping consumer protection consistent.

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5.7. Bosnia and Herzegovina

5.7.1. Hydrogen integration

5.7.1.1. Legal framework

In order to attract both domestic and foreign investment, BiH, including both entities, Republika Srpska and Federation of Bosnia and Herzegovina, must establish a clear and supportive legal and regulatory framework. This framework could include introducing a proper legal definition and certification scheme for “green hydrogen” in line with prevailing EU standards.

5.7.1.2. Simplification of procedures and financial incentives

Also, very important measure for faster development in this filed could be simplification of permitting and licensing procedures for renewable-hydrogen projects, together with implementation of some kind of feed-in tariffs or other financial incentives to improve the bankability of green hydrogen investments.
One of the good activitie could be also facilitating access to EU and international climate finance (e.g., the Western Balkans Investment Framework, EBRD, EIB).

5.7.1.3. Strategic framework and specific goals

It is necessary to develop clear, measurable goals for hydrogen development and to move beyond general policy statements. It is necessary to define specific, time-bound measures for hydrogen integration in transport and industry, including responsibilities, investment plans, and regulatory pathways.

5.7.1.4. Strengthening institutional capacities and infrastructure

Institutional capacities and also infrastructure readiness are two key factors for scaling hydrogen use. Bosnia and Herzegovina should promote research and development through universities, institutes, and public-private partnerships, in order to strengthen institutional capacities of the country. On the other side, it is important to strengthen the infrastructure and explore the development of hydrogen refuelling stations for heavy-duty transport. Also, it is important to support pilot projects involving hydrogen storage and distribution technologies.
In order to enhance the faster development of infrastructure and institutional capacities, green hydrogen development in BiH should be closely coordinated with neighbouring countries and aligned with regional plans under the Energy Community and the Green Agenda for the Western Balkans. Recommendations for this filed could include engaging in cross-border projects and hydrogen valleys with EU surrounding member states, participating in regional funding instruments and technical assistance platforms, promoting harmonization of standards and regulatory frameworks with neighbouring countries etc.

5.7.1.5. Public awareness and new skills

It is very important to launch educational and training programs for engineers, technicians, and policymakers. On the country level, it is necessary to create and promote new public awareness campaigns in order to increase acceptance and understanding of hydrogen’s role in the overall energy transition. The future green hydrogen transition will require new skills, new know-how, but also good public awareness and support, and a trained workforce. Both entities should develop curricula in universities focused on hydrogen technologies.

5.7.2. E-mobility integration

5.7.2.1. Infrastructure

One of the key barriers to EV adoption is the lack of public charging infrastructure. Both Republika Srpska and Federation of Bosnia and Herzegovina should map and analyse current EV charging points and prioritize expansion in urban areas, highways, and tourist zones. It is important to support both slow (AC) and fast (DC) charging stations, ensuring interoperability.
One of the most important measures could be related to including EV charging in urban planning processes and require installation-ready infrastructure in new buildings and parking areas. Of course, together with standardisation of regulations for grid connection, permitting, and safety of EV chargers.

5.7.2.2. Financing and incentives

In order to improve and encourage private sector investment in charging stations it is necessary to create and offer incentives in form of grants, co-financing, public-private partnerships etc. The expansion of e-mobility is closely connected to economic power of the population and companies, especially in countries like Bosnia and Herzegovina, which are still underdeveloped.
To boost sales of electric vehicles and increase adoption rates, the governments of both entities, and also at state level, should introduce various incentive mechanisms, such as:

- Incentives for electric buses, delivery vehicles, and company fleets.
- Reduced import taxes and VAT exemptions for electric vehicles.
- Subsidies or rebate programs for purchasing EVs.
- Non-fiscal incentives: free parking, use of bus lanes, exemptions from tolls, etc.

These incentives should be transparently managed and harmonized across both entities.
Incentive mechanisms are extremely important in area of public transport where public procurement policies can be a strong driver of e-mobility. The governments should prioritize the electrification of municipal buses and taxis, especially in very polluted urban centres like Banja Luka, Sarajevo, Tuzla, Zenica, Prijedor, etc. Besides this, it is important in public transport industry to introduce and set certain minimum targets for electric vehicles in public institutions' fleets.
As good opportunity for these measures, the access available EU funds for green urban mobility projects (e.g., through the Western Balkans Green Agenda) could be identified.
Pilot projects involving electric buses, minibuses, and electric bikes can improve public awareness and demonstrate feasibility.

5.7.2.3. Workforce and the public

In order to improve and encourage e-mobility sector it is necessary to educate the public, on one side, and train the workforce on the other. Successful transition to e-mobility depends on informed consumers and skilled professionals.
It would be good to launch awareness campaigns on the environmental and financial benefits of EVs. It is already said that benefits from EVs, especially environmental benefits, are not recognized as of crucial importance. It is also very important to provide transparent information on charging locations, costs, and vehicle types.

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Trainings and educations of mechanics, electricians, and engineers to service electric vehicles and charging infrastructure are one of the key elements of this measure, but also support to academic and vocational institutions in developing e-mobility-focused curricula.
This will also contribute to green job creation and general workforce modernization.

5.8. Croatia

5.8.1. Hydrogen integration

5.8.1.1. Legal framework for legal certainty

Fast-track secondary by-laws under NN 78/2025 (Renewables & High-Efficiency Cogeneration Act) and launch a coordinated transposition program for the EU Hydrogen & Decarbonised Gas Package by Q3 2026. Amend the Gas Market Law to define hydrogen network operation (unbundling/TPA), recognise electrolysers as storage with clear grid-fee treatment, and designate a single regulatory authority for hydrogen (via HERA) with one-stop permitting guidance for electrolysers and H_2 stations. These steps remove definitional gaps, shorten permitting, and align Croatia with EU market rules.

5.8.1.2. Economic viability and financial incentives

Stand up a national hydrogen auction (CfD) aligned with the European Hydrogen Bank, complemented by NPOO-backed grants for H_2 refuelling (six public stations) and anchor-demand projects (e.g., INA's green H_2). Create a single application window that bundles grants/loans/guarantees to avoid today's fragmented, multi-application burden for industrial-scale projects.

5.8.1.3. Practical assessment and targeted amendments

Adopt "connect-and-manage" connection rules and publish transparent hosting-capacity maps to accelerate electrolyser and station grid access; finalise the long-pending connection fee methodology and codify curtailment/redispatch compensation. Establish an RFNBO certification workflow (GoO alignment) and standard metering for behind-the-meter electrolysers to reduce compliance friction and OPEX.

5.8.1.4. Coordination of national conditions & cross-border cooperation

Embed Croatia in regional H_2 corridors with Slovenia and Hungary and plan for Krk's role as a hydrogen import/export node; harmonise blending/purity thresholds and interconnection codes with neighbours to de-risk pipelines and backbone links. Use the updated NECP to lock in cross-border milestones and financing streams.

5.8.2. E-mobility integration

5.8.2.1. Application-oriented legal framework

Explicitly codify bidirectional charging (V2G/V2X) in national law, define aggregator roles and balancing responsibilities, and mandate multi-point metering to separate load/feed-in at premises.

Ensure full AFIR compliance (payment transparency, roaming, data disclosure) and publish tax/VAT guidance to avoid double charging of V2G transactions.

5.8.2.2. Synergies between e-mobility & hydrogen

Adopt a technology-neutral fleet strategy: prioritise BEV for urban/light duty and pilot H_2 for hard-to-electrify/heavy-duty corridors; pair bus depots with V2G-capable chargers and plan H_2 supply where duty cycles warrant. Integrate both into DSO/TSO investment plans so charging and prospective H_2 loads reinforce grid flexibility rather than strain it.

5.8.2.3. Financing and incentives

Make FZOEU support multi-year and predictable, expanding from capex to performance-based opex (e.g., incentives for flexibility services from depot fleets). Tie EV-bus charging and logistics hubs to NPOO instruments and InvestEU-compatible facilities; require project bundling (vehicles + infrastructure + software) to cut admin load and speed delivery.

5.8.2.4. Standardisation and infrastructure

Mandate ISO 15118-20 and OCPP 2.0.1 in public procurements, kWh-based billing, and open data interfaces per AFIR to ensure interoperability and future-proofing for V2G. Publish an AFIR-conform national build-out plan (TEN-T coverage, power levels, HDV milestones) and align building codes for EV-ready/V2G-ready pre-cabling in new and major-renovation sites.

5.9. Hungary

5.9.1. Hydrogen integration

5.9.1.1. Legal framework

There are planning efforts, but there are no legally binding standard that hydrogen blending percentage defined for injection. The surveys by FGSZ are not yet finalized. However hydrogen blending could push renewable and hydrogen integration to a higher level building on the already existing market demand for biomethane and hydrogen injection. Clarification of RFNBO/H_2 certification rules and domestic guarantee systems, introduce dynamic electricity tariffs and flexibility payments that reward electrolyzers providing grid services would also improve economies of hydrogen in the meantime.

5.9.1.2. Financial incentives

As green hydrogen is not commercially viable due to high prices of production and high investment costs, the main drivers are regulatory, such as AFIR and RFNBO and NZIA trigger MOL Hungarian Oil to introduce their green hydrogen project, logically, coordinated EU and national investments and subsidies can bolster new projects especially if contributing to a reliable return on investment.

5.9.1.3. Alternative technologies, capacities

Several sources suggest that R&D efforts for developing alternative pathways and technologies regarding production, storage and utilization can further improve the green hydrogen ecosystem.

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In a similar manner, domestic production of green technologies, increased capacities of contractors (in all green technologies, not only hydrogen) are crucial for a national take-off. Human resources should be developed accordingly by managing coordinated efforts towards training experts and offer specific knowledge regarding hydrogen, such as safety measures, biogas purification, etc.

5.9.1.4. Sector coupling and targeted subsidies

Altough the technology can be considered somewhat mature, the investments into production due to limited production capacities remain high. As explained above, domestic capacities would further boost economies, but also electricity storage is required to provide reliable zero-carbon energy for green hydrogen production. Therefore subsidies and incentives should focus on providing both production capacities and energy storage as well to minimize carbon footprint.

5.9.1.5. Education and communication

Social acceptance of hydrogen is key. Press exaggerates events related to hydrogen due to its perceived danger. Effective communication regarding the advantages of green hydrogen (and sector coupling as well as smart grids) will increase its social acceptance. The Hydrogen Bus Roadshow organized by the HUMDA Hungarian Mobility Development Agency is a good example that should be replicated with hydrogen production technologies.

5.9.2. E-mobility integration

5.9.2.1. Bridging the gap between urban and rural areas

One of the key elements of e-mobility is charging infrastructure. Social acceptance can be and is increased by providing funds for charging infrastructure outside urban areas.

5.9.2.2. Targeted training for e-mobility transition

Considering that e-mobility is a cross-cutting field requiring knowledge both in transport management and a deep understanding of the issues that come with alternative fuels, a critical skills gap related to the lack of mutual understanding and cross-domain competences of the professionals in the transport & logistics and energy & electrical engineering sectors that hinder e-mobility transition and the introduction of alternative fuels. Tis gap could be addressed by complex training programmes aiming at experts in both fields. Not only experts, but Municipalities and other project developers should be aware of the peculiar set of legal, organization, human resource and technical challenges that could arise with fleet transitions to plan appropriate projects and consider the resources needed; moreso when also building an integrated project coupling mobility and energy.

5.9.2.3. Bundling projects

Bundle projects (vehicle procurement, charging/refueling infrastructure, renewables, energy storage) rather than single isolated elements. Bundling reduces stranded-asset risk and increases the efficiency of renewables, return of investment while decreasing local carbon emissions.

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5.10. Montenegro

5.10.1. Hydrogen integration

5.10.1.1. Legal framework for legal certainty

Define the scope of hydrogen in law. Introduce legal definitions (incl. RFNBO), guarantees of origin, and rules for production, storage, transport and (where applicable) blending; align with Energy Community acquis.
Operationalise new market roles. Specify permitting, metering, settlement and taxation for H_2 operators; publish one-stop guidance and standard forms.
Regarding safety, adopt national safety standards for H_2 facilities (industrial zones/depots), incident response procedures, and certification for installers/inspectors.

5.10.1.2. Economic viability and financial incentives

Pilot procurement for public service fleets. Launch competitive calls for depot-based H_2 pilots (e.g., municipal buses/utility fleets) with multi-year offtake contracts.
Targeted CAPEX support. Provide CAPEX grants or CfD-style support for electrolysers tied to additional RES and verifiable offtake.
Lower financing costs. Aggregate small projects into bankable bundles; enable blended finance with IFIs and green credit lines.

5.10.1.3. Practical assessment and targeted amendments

Streamlined permitting. Introduce a single contact point and statutory timelines; publish checklists for H_2 projects (land-use, environment, water).
Resource safeguards. Issue guidance on water use for electrolysis and wastewater handling; require RES additionality and grid-impact studies.
Skills & readiness. Fund training for first responders, inspectors, and operators; certify training providers.

5.10.1.4. Coordination of national conditions & cross-border cooperation

Cross-border corridors. Coordinate with neighbouring WB/EU partners on refuelling nodes and safety harmonisation along priority routes.
Data sharing & monitoring. Establish a national H_2 registry (projects, capacity, incidents) and share data with regional platforms.

5.10.2. E-mobility integration

5.10.2.1. Application-oriented legal framework

AFIR-aligned national framework. Set service-level requirements for public charging (uptime, info at point of use), pricing transparency per kWh, and roaming rights.
Building readiness. Mandate pre-cabling/EV-ready provisions in new/renovated buildings; define metering, sub-metering and cost allocation in multi-apartment dwellings.

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Aggregator & V2X access. Recognise bidirectional charging and aggregator participation; define settlement, taxation and consumer protections.

5.10.2.2. Synergies between e-mobility & hydrogen

Integrated depots. Enable shared depots where EV and H_2 fleets co-locate with on-site RES and storage; publish grid-connection templates for mixed loads.
Coordinated flexibility. Prioritise smart charging and time-of-use/dynamic tariffs; pilot V2G for municipal fleets and pair with local RES/H_2 production where feasible.
Joint training & safety. One curriculum for EV high-voltage and H_2 safety for responders, installers, and inspectors.

5.10.2.3. Financing and incentives

Multi-annual EV support. Convert EV/charging support into predictable, multi-year schemes with declining rates and clear eligibility; prioritise fleets and multi-apartment retrofits.
Municipal charging programmes. Co-finance destination and neighborhood charging (tourism nodes, public buildings, mobility hubs) with quality KPIs (uptime, accessibility).
Low-cost capital. Offer interest-rate buy-downs or guarantees for CPOs/HOAs to deploy shared building chargers.

5.10.2.4. Standardisation and infrastructure

Interoperability by default. Require open protocols (e.g., OCPP/OCPI-type), open tariffs, and national roaming; obligate real-time data on availability and pricing.
Quality & transparency. Set uptime SLAs, repair-time targets, and consumer information standards (pricing units, session summaries, complaint handling).
Grid readiness & seasonal planning. Publish connection timelines/costs, prioritize reinforcements at tourism hotspots, and enable queue management/flex options.

5.11. European Union

Due to the close ties between EU Member States and the EU itself, the factors influencing the EU have already been taken into account and utilised at national level. The following recommendations were extracted from the legal analysis (D1.2.1; chapter 2) and the interviews with stakeholders (chapter 3) and are summarised below:

5.11.1. Hydrogen integration

The EU recognises the need to regulate the hydrogen sector in order to promote it’s development and provides Member States with a legislative basis for hydrogen production, storage and use. While the precise definition of hydrogen is generally welcomed in practice, stakeholders consider the current criteria for RFNBOs to be too restrictive. In addition, they argue that the high complexity of the regulatory framework results in significant production costs. For example, linking hydrogen production to new power plants is not absolutely necessary from an economic or infrastructural point of view. Furthermore, stakeholders point out that both the pending adoption of relevant national legislative amendments and outdated national strategies are leading to considerable legal uncertainty, particularly with regard to the inadequate implementation of the decarbonisation package. In addition, technological innovation is hampered by a lack of standardisation.

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Inconsistent terminology and a lack of technical specifications complicate approval procedures and cross-border cooperation.. In particular, there is no uniformly regulated blending ratio for hydrogen in the existing natural gas network.
Economic considerations are one of the biggest practical challenges in introducing new, innovative systems. Complex financing structures and individually limited maximum funding amounts are additional obstacles, according to stakeholders.
According to them, the cross-border exchange of experience on the economically viable use of new technologies (like renewable hydrogen production) is still at an early stage of development.
It is therefore essential to consistently revise existing regulations at EU level with a view to practical feasibility and to establish binding standards in order to promote such an innovative sector as the hydrogen sector. This includes, in particular, revising the criteria for RFNBOs, introducing an EU-wide certification system for hydrogen and setting a uniform blending quota in the natural gas network. The focus should be on enabling rapid and practical implementation by the Member States. Only in this way can the EU's commitment, which is also reflected in the new target of reducing net greenhouse gas emissions by 90% by 2040, be translated into concrete strategies and national legal frameworks in a timely manner. In addition, the timely integration of new technologies into European strategies is of central importance, as this makes it easier for national strategies to align themselves with them.
The EU's clear funding strategy also includes financial support measures. For example, the European Hydrogen Bank is funded by the EU Emissions Trading System to support specific projects. In the future, additional funds should be made available more easily and in a more targeted manner through a revision of the state aid framework and an adjustment of the award procedures. Incentives for private investors should also be included in the funding mechanisms.
Although the EU actively supports the networking of market players and plans to establish central national regulatory authorities for the hydrogen market, there is a need – beyond the introduction of uniform standards and definitions – for a non-competitive and structured exchange of knowledge to ensure smooth cross-border dialogue and technology transfer.

5.11.2. E-mobility integration

According to stakeholders, a lack of legal provisions and unclear definitions – particularly in the area of bidirectional charging – are leading to considerable legal uncertainty. This is also hindering the full exploitation of the potential of cross-sector coupling of relevant technologies, hydrogen and V2X. This is associated with a number of unresolved legal and practical issues, such as the permissible scope of hydrogen use in the mobility sector.
According to stakeholders, further uncertainties arise from the current financial arrangements, which make reliable business calculations difficult. In particular, individual funding ceilings hinder the full financing of large-scale industrial projects.
The lack of technical standards is also problematic, according to stakeholders. V2X applications currently operate predominantly in closed, manufacturer-specific systems. This complicates both grid integration and compatibility with photovoltaic systems and stands in the way of uniform control technology.
A holistic approach to promoting V2X therefore requires not only a viable legal framework, but also accompanying measures that go beyond this.
In order to reduce the existing uncertainty among stakeholders, a practical and coherent regulatory system is needed, particularly in the field of V2X, which is based on continuous regulatory development taking into account practical experience. A framework for guidance can

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be provided by strategic measures at European level, practical legal frameworks in the Member States and successful international models that can be used as a basis for national regulations and continuously updated with the aim of accelerating implementation.

The EU also recognises the economic potential of annual cost savings in the course of electrification. According to forecasts, up to EUR 9.7 billion could be saved annually in the area of bidirectional charging of electric vehicles alone. As part of the planned amendment to the InvestEU Regulation in 2025, up to EUR 50 billion is to be mobilised for clean mobility. An investment strategy is to channel additional funds into renewable energies from 2025 onwards, while an action plan for electrification planned for 2026 is to contribute to the diversification of energy supply in line with the RePowerEU objectives. In addition, a revision of state aid law and procurement procedures is to create more targeted incentives.

The urgent need for binding standardisation is also a fundamental prerequisite for technological development. According to stakeholders, this applies in particular to a uniform measurement methodology and the legal recognition of electric vehicles as energy storage devices.

The successful implementation and promotion of new technologies therefore require a broad structural basis. This includes platforms for e-mobility solutions, publicly supported procurement programmes, models to compensate for the currently limited reliability of V2X technologies, and concepts for stronger networking between relevant actors.

6. Overview

The measures and strategies from Chapter 5 are summarised in charts for each participating country and for the EU. The overview is divided into two columns with the respective recommendations on hydrogen and e-mobility.

6.1. Germany

Hydrogen	E-Mobility
Integrative legal framework: A clear national hydrogen law is needed to establish defined authority responsibilities, streamline permitting processes, and eliminate ambiguities in the definitions governing hydrogen production, storage, and distribution.	**Application-oriented legal framework**: Germany's electricity laws still assume a one-directional flow of power, so they require updates to explicitly recognise electric vehicles as mobile storage units and enable bidirectional use. Amendments to the EnWG and the Charging Infrastructure Masterplan II are therefore needed to formally integrate V2G into the legal framework and clarify roles, responsibilities, and regulatory conditions.
Economic viability & Incentives: Funding procedures should be simplified and long-term financial certainty ensured, supported by stable political commitment throughout the sector's learning phase.	**Technological synergies**: Supporting the sector coupling by enabling flexible interaction between vehicles, buildings, PV systems, and the grid. Integrating V2G capabilities into national energy planning allows (for example EVs) to complement hydrogen, stationary storage, and renewable generation as part of a coordinated flexibility system.

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Amendment: Germany has already strengthened its hydrogen framework in the past through amendments to the Energy Industry Act (EnWG), which now formally defines and regulates hydrogen networks, and through the Hydrogen Acceleration Act, which streamlines planning and permitting across multiple laws. Looking ahead, further reforms are recommended—particularly modernising market design toward service-based remuneration and harmonising permitting, standardisation, and cross-border rules to enable a coherent and scalable hydrogen system.	**Financing and incentives**: A clear legal basis is essential to unlock new sources of income—such as remuneration for grid services—and to encourage investment by consumers and businesses. Bidirectional charging needs to become economically viable and attractive for early adopters.
Cross-border cooperation: Aligning the different rules and technical standards across the EU. Further a unified EU rulebook for trade and interconnection would be useful.	**Standardisation and infrastructure**: Harmonised technical standards, interoperable communication protocols, and reliable metering and billing systems are required. Including V2G explicitly in strategic instruments like the Charging Infrastructure Masterplan II (2030) will support the development of uniform infrastructure, reduce fragmentation, and enable secure and grid-compatible integration.

6.2. Austria

Hydrogen	E-Mobility
Integrative legal framework: The systemic integration of definitions, a clear allocation of responsibilities and the inclusion of electrolysers as part of modern energy storage solutions in strategies and legislation – particularly in approval procedures – strengthen the coherence and efficiency of the legal framework.	**Application-oriented legal framework**: Explicit consideration of new technological applications, such as bidirectional charging, and definitions of terms, for example for energy storage, are required.
Economic viability: The targeted use of public funds – for example in procurement and aid procedures, the provision of funds for the European Hydrogen Bank and the networking of relevant market players – promotes financial solidity.	**Technological synergies**: The cross-sector coupling of V2X should be anchored in strategies and aligned with best practice models.
Up-date of legal framework: Harmonisation and rapid revision of existing regulations are prerequisites for realistic economic and infrastructural implementation, including its challenges.	**Financing and incentives**: Economic predictability should be created through an appropriate legal framework, promotion platforms and publicly supported procurement models. In addition, investments should be made to accelerate electrification in order to exploit the financial potential and push ahead with the targets through action plans.
Cross-border cooperation: The exchange of knowledge – both general and on economically proven models – promotes the economically viable use of transport via existing gas networks, large-scale electrolysis plants based on water, wind or solar energy, decentralised hydrogen systems and modular, mobile applications, as well as the development of uniform standards.	**Standardisation and infrastructure**: Technical standards should be harmonised to enable practical use; in addition, cross-border knowledge exchange on proven application models and their challenges should be promoted and their implementation advanced.

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6.3. Slovakia

Hydrogen	E-Mobility
Integrative legal framework: Hydrogen is not yet formally recognised in the Slovak energy legislation. A clear definition, classification, and permitting system are missing. Slovakia should establish a unified Hydrogen Act defining hydrogen as an energy commodity, introducing certification and grid-connection procedures. Responsibilities between the Ministry of Economy, ÚRSO, and SEPS should be streamlined under one coordination authority to simplify permitting.	**Application-oriented legal framework**: Slovakia should move from pilot projects to practical implementation of Vehicle-to-Grid (V2G) and smart charging. A comprehensive E-Mobility Act should define metering, data exchange, and roles of aggregators and operators. Tariff and billing systems should allow kWh-based transparent pricing and prevent double charging.
Economic viability: Early hydrogen projects (e.g., JESS Trnava) face high CAPEX and uncertain long-term returns. Predictable support schemes, connection to industrial end-users, and transparent cost-benefit monitoring are key to improving bankability. A Hydrogen Development Fund and targeted tax incentives can ensure financial sustainability.	**Technological synergies:** Battery-electric and hydrogen mobility should be treated as complementary. Slovakia should co-plan charging and refuelling infrastructures with grid upgrades and renewable integration. Coordinated planning under the National Recovery and Resilience Plan will enhance flexibility and sector coupling.
Amendment and governance: To build investor confidence, Slovakia should apply a "learn-and-adjust" approach—launching time-limited regulatory sandboxes, collecting safety and metering evidence, and revising secondary legislation every two years. A one-stop permitting system would reduce administrative delays and strengthen market entry.	**Financing and incentives:** EV deployment is constrained by high upfront costs and fragmented support. National and EU funding should align under long-term, predictable schemes. Slovakia should continue EV purchase subsidies, corporate tax deductions, and reduced network tariffs for charging during off-peak hours.
Cross-border cooperation: Slovakia's integration into regional hydrogen networks (e.g., Central European Hydrogen Corridor) is vital. Common standards for blending, gas quality, and certification should be developed with Austria, Czechia, and Hungary. A single Slovak coordination point should facilitate participation in cross-border pilots and EU-level hydrogen market alignment.	**Standardisation and infrastructure**: Slovakia should ensure uniform standards for charging connectors, data privacy, and bidirectional operation. National infrastructure planning should prioritise highway corridors (D1, R1) and rural accessibility, ensuring early grid integration via shared connections and managed charging systems.

6.4. Romania

Hydrogen	E-Mobility
Legal Framework and Regulatory Clarity: In Romania there is currently no comprehensive national strategy or legislation specifically addressing hydrogen production, storage, and distribution.	**Application-Oriented Legal Framework:** Current legislation does not explicitly account for bidirectional charging, the recognition of electric vehicles as energy storage devices, or grid integration mechanisms.
Economic Viability and Financial Incentives: Strategic measures to reduce production costs, including improved energy efficiency, optimized infrastructure, and streamlined permitting procedures, are essential to increase market competitiveness.	**Synergies Between E-Mobility and Hydrogen**: The integration of both technologies in urban mobility planning, municipal fleets, and public transport systems could enhance sustainability and resilience.

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Practical Challenges and Operational Considerations: Pilot projects in Cluj-Napoca demonstrate the practical feasibility of municipal-level hydrogen applications, while also highlighting infrastructural limitations, such as storage capacity, transport logistics, and integration into the existing energy system.	**Financing and Incentives**: The expansion of e-mobility depends heavily on economic and financial factors. Public authorities in Romania have implemented programs such as Rabla Plus and subsidies for home charging infrastructure, but more targeted incentives are needed.
Coordination and Cross-Border Cooperation: Align policies, research, and investments across regions and sectors. Broad-based knowledge sharing, including lessons from other countries' municipal projects and industrial-scale deployments, is considered essential for the sustainable and technology-neutral expansion of the hydrogen sector.	**Standardization, Infrastructure, and Social Acceptance**: Technical standardization, infrastructure development, and social acceptance are critical for Romania's e-mobility strategy. Infrastructure investments, such as high-speed chargers and PV-integrated energy storage, combined with training programs and communication campaigns, are essential to maximize both technical feasibility and societal acceptance of e-mobility.

6.5. Serbia

Hydrogen	E-Mobility
Develop a Legal Framework: Create clear regulations for production, transportation, and use to provide investor certainty.	**Implement Purchase Incentives**: Offer subsidies and tax breaks to lower the upfront cost of electric vehicles.
Invest in Infrastructure: Build production facilities, pipelines, and refueling stations to support hydrogen deployment.	**Expand Charging Infrastructure**: Deploy charging stations strategically, focusing on high-traffic areas and highways.
Promote Pilot Projects: Launch pilot projects to test hydrogen technologies in various sectors and gather real-world data.	**Support Local Applications**: Incentivize electric buses, urban deliveries, and shared mobility to maximize impact.
Coordinate Nationally: Establish a central body to harmonize regulations and promote cross-sector collaboration.	**Standardize Charging Systems**: Adopt international standards to ensure interoperability across charging networks.
Foster Cross-Border Cooperation: Participate in regional hydrogen initiatives to access funding and share knowledge.	**Modernize the Grid:** Upgrade the electricity grid to support increasing EV charging and enable smart charging.
Green Hydrogen is Essential: Prioritize renewable energy sources for hydrogen production to maximize environmental benefits.	**Promote Battery Recycling:** Establish a system for collecting and recycling EV batteries to promote circularity.

6.6. Czech Republic

Hydrogen	E-Mobility
Integrative legal framework: Hydrogen is recognised in the national energy system and can be distributed in blends or as pure gas. To give investors certainty, the state needs clear follow-up rules: simple licensing and market rules, a practical hydrogen network code, and a single, predictable permitting approach with responsibilities clearly assigned.	**Application-oriented legal framework**: Move V2X from pilots to practice by explicitly allowing bidirectional flows, clarifying roles and liabilities, and applying simple metering; ensure kWh-based billing, transparent pricing and no double charging.
Economic viability: Early projects face high CAPEX and uncertain revenues. Bankability improves where	**Technological synergies**: Treat BEV and hydrogen as complementary; define hydrogen's role, co-plan

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support is predictable, projects are near end-users (industry, public transport), and cost/benefit transparency strengthens acceptance and investor confidence.	charging/refuelling with network upgrades, keep support technology-neutral and value-based, ensure coherent grid access, and align with EU frameworks.
Amendment: Adopt a "learn-and-adjust" approach: time-limited pilots, systematic evidence on safety, metering and grid impacts, and scheduled updates to secondary legislation and administrative practice. clear thresholds and a one-stop coordination to cut delays.	**Financing and incentives**: Deployment is constrained by high upfront costs, fragmented support with caps, unclear V2X tariffs and possible double taxation; alignment with EU state-aid and market-design guidance is essential for reliable revenue assumptions and lower capital costs.
Cross-border cooperation: Different national rules on blending, gas quality, metering and safety slow cross-border hydrogen flows. The EU should set a simple common rulebook and fund its rollout. Czechia should mirror this with one national contact point and a few coordinated border pilots.	**Standardisation and infrastructure**: Ensure full synergy (definitions, data, privacy/cyber), uniform requirements for bidirectional operation and flexible metering, and infrastructure planning, with early grid-integration via shared connections and managed charging.

6.7. Bosnia and Herzegovina

Hydrogen	E-Mobility
Legal and regulative framework: In order to attract both domestic and foreign investment, both state and entity governments must establish a clear and supportive legal and regulatory framework.	**Infrastructure:** Both entities should map and analyse current EV charging points and prioritize expansion of infrastructure in urban areas, highways, and tourist zones, together with standardisation of regulations for grid connection, permitting, and safety of EV chargers.
Simplification of procedures and financial incentives: Very important measure for faster development in this filed could be simplification of permitting and licensing procedures for renewable-hydrogen projects, together with implementation of some kind of feed-in tariffs or other financial incentives to improve the bankability of green hydrogen investments.	**Financing and incentives**: In order to improve and encourage private sector investment in charging stations it is necessary to create and offer incentives in form of grants, co-financing, public-private partnerships etc. The expansion of e-mobility is closely connected to economic power of the population and companies, especially in countries like Bosnia and Herzegovina, which are still underdeveloped.
Amendment: Harmonisation and rapid revision of existing regulations are prerequisites for realistic economic and infrastructural implementation, including its challenges.	**Workforce and the public:** Successful transition to e-mobility depends on informed consumers and skilled professionals. Launching awareness campaigns on the environmental and financial benefits of EVs could be of great importance. Trainings and educations but also support to academic and vocational institutions in developing e-mobility-focused curricula could improve the workforce and create new skills.
Cross-border cooperation: The exchange of knowledge – both in general and on economically proven models – promotes the economically viable use of new technologies and supports the development of uniform standards.	
Public awareness and new skills: Launching educational and training programs for engineers, technicians, and policymakers, together with new public awareness campaigns will enhance new skills, new know-how, public awareness and support.	

6.8. Croatia

Hydrogen	E-Mobility

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Integrative legal framework: Croatia recognises energy storage in law but lacks explicit provisions for electrolysers and hydrogen transport. The forthcoming by-laws under NN 78/2025 and an update to the Gas Market Law should anchor hydrogen as a regulated activity with clear definitions and responsibilities.	**Application-oriented legal framework:** Bidirectional charging (V2G/V2X) is not yet recognised in Croatian law, leaving roles, taxation, and settlement unclear. AFIR implementation requires explicit codification of smart charging, aggregator responsibilities, and flexible metering.
Economic viability: Current funding is fragmented; NPOO grants (e.g., €15m for six H_2 stations) are positive but limited. A consolidated financing platform and alignment with the European Hydrogen Bank would improve bankability.	**Financing and incentives:** The FZOEU continues to provide subsidies for EVs, with the 2025 programme set at €21.2m. Predictability of funding and expanded support to fleets, depots, and infrastructure integration would strengthen adoption.
Practical assessment: Implementation barriers persist in grid connection rules, permitting delays, and restrictive RFNBO certification. Transparent hosting-capacity maps, a harmonised connection fee, and streamlined approval procedures are essential.	**Synergies:** A technology-neutral mobility strategy should explicitly define roles for hydrogen (heavy duty, long-distance) and electric mobility (urban, passenger), ensuring DSOs/TSOs plan for both in grid development.
Cross-border cooperation: Croatia's role in Adriatic/Balkan corridors (Slovenia, Hungary, Krk terminal) requires harmonised blending standards and coordinated infrastructure planning to attract private investment and enable cross-border hydrogen trade.	**Standardisation and infrastructure:** Technical standards (ISO 15118-20, OCPP 2.0.1) should be mandated for chargers; kWh-based billing and open data interfaces should be enforced. National infrastructure rollout must meet AFIR density targets and be supported by building-code requirements for EV-ready and V2G-ready installations.

6.9. Hungary

Hydrogen	**E-Mobility**
Integrative legal framework: Hydrogen is addressed in the National Hydrogen Strategy (2021), but not yet fully embedded in sectoral laws. The Electricity and Gas Acts include no explicit provisions for hydrogen. The 2025 energy regulatory sandbox decree allows hydrogen-related pilots under controlled conditions, including hydrogen blending and grid-injection experiments. However, there is no unified Hydrogen Act, and certification, guarantees of origin, and blending limits remain undefined.	**Application-oriented legal framework:** E-mobility is guided by the Jedlik Ányos Plan 2.0 and Hungarian Electromobility Strategy, but lacks a dedicated E-Mobility Act or provisions for bidirectional charging (V2G/V2H). There are fragmented tariff and metering rules and no standardised framework for aggregators or data management. The government introduced a regulatory sandbox that may serve as a testbed for innovative charging and flexibility solutions.
Economic viability: Hydrogen is not yet commercially viable: green H_2 costs €5–13/kg vs. gray H_2 at €2–2.5/kg. The MOL 10 MW electrolyser (1,600 t/yr) is the only operational large-scale unit, driven mainly by EU decarbonisation obligations under RED III / AFIR. Financial viability depends on EU and national subsidies; no domestic CfD, feed-in, or tax credit scheme exists. Experts emphasise coordinated EU–national funding and support for hydrogen valleys as critical to bankability.	**Financing and incentives:** National programmes in 2024–2025 provided up to €10,500 per EV for company purchases and €72M (28bn HUF) for charging infrastructure in rural areas. Municipal measures (free parking, fleet grants) complement national aid. However, predictability of incentives is limited, with yearly schemes and short application windows. There is no differentiated tariff system for charging or V2G, and grid connection costs remain high. Long-term economic planning and stable financing mechanisms are needed.
Practical assessment: Pilot projects (e.g., Bükkábrány Energy Park, Akvamarin grid injection) are advancing, but no commercial hydrogen market yet. The Hydrogen Bus Roadshow improved public awareness, while FGSZ's hydrogen transmission studies explore blending and infrastructure reuse. Integration with renewables (solar >8,000 MW in 2025) offers synergies for storage and balancing, yet electrolyser utilisation rates are too low to reach cost parity. Experts highlight hydrogen's role in industry and heavy transport, complementary to e-mobility.	**Synergies:** Hungary has strong EV and battery manufacturing, but deployment is slower than industrial capacity. Infrastructure is expanding, yet regulatory and standardisation gaps hinder interoperability. V2G/V2H pilots are still rare; one operational bus charger in Bábolna exists. Integration with energy communities is limited due to unclear legislation. Synergies between e-mobility and renewable energy are recognised but not yet institutionalised. Coordinated planning for hydrogen valleys and smart grids could unlock systemic benefits.

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Cross-border cooperation: FGSZ is engaged in cross-border hydrogen corridor planning (with Slovakia, Austria, Czechia, Croatia). Surveys for potential interconnection and injection points have been launched but no concrete project is operational. Alignment with EU rules on RFNBO certification and guarantees of origin is pending. Hungary's participation in regional corridors (e.g., Central European Hydrogen Corridor) is at the preparatory stage.	**Standardisation and infrastructure:** Charging infrastructure expansion is supported by national programmes and EU AFIR implementation, but standardisation gaps persist (connector types, data protocols). National grid upgrades lag behind the pace of EV adoption. The government supports EU-level harmonisation of standards and open protocols (ISO 15118-20, OCPP 2.0.1) but domestic transposition is incomplete. Rural coverage remains a key infrastructure challenge.

6.10. Montenegro

Hydrogen	E-Mobility
Integrative legal framework: Define hydrogen in primary law (incl. RFNBO), set guarantees of origin, and regulate production, storage, transport and—if applicable—blending. Adopt by-laws to operationalise roles, metering, settlement and taxation; issue a national safety/siting code with certification for installers and first responders.	**Application-oriented legal framework:** Align with AFIR for service levels (uptime, info at point of use), pricing transparency per kWh, and roaming. Recognise bidirectional charging (V2G/V2H) and aggregator participation; amend building and urban codes for pre-cabling/EV-ready parking and clear metering/cost allocation in multi-apartment buildings.
Economic viability: Launch depot-based public fleet pilots (buses/utility vehicles) with multi-year offtake; provide CAPEX grants/CfD-style support for electrolyser projects tied to additional RES and contracted offtake. Use blended finance (Eco-Fund + IFIs) and bundle smaller projects to reduce WACC and improve bankability.	**Financing and incentives:** Convert EV/charging support into predictable, multi-annual schemes with a fleet and multi-apartment focus. Co-finance destination/neighbourhood charging (tourism nodes, public buildings) with uptime KPIs; provide low-cost capital (guarantees/interest buy-downs) for CPOs/HOAs deploying shared chargers.
Practical assessment: Establish a one-stop permitting portal with statutory timelines and checklists (land-use, environment, water). Issue guidance on water use and effluents for electrolysis; require RES additionality and grid-impact studies. Fund training for inspectors, responders and operators to lift capacity rapidly.	**Synergies:** Promote integrated depots where EV and H_2 fleets co-locate with on-site RES/storage. Enable smart charging and TOU/dynamic tariffs; pilot V2G for municipal/corporate fleets and link to local RES/H_2 production where feasible.
Cross-border cooperation: Coordinate with neighbours on refuelling nodes along priority corridors, compatible safety codes and emergency procedures; participate in regional data-sharing (project registry, capacity, incidents) to support planning and trade readiness.	**Standardisation and infrastructure:** Mandate open protocols (OCPP/OCPI-type), national roaming and real-time data on availability/prices. Set uptime SLAs and repair targets; publish connection timelines/costs and prioritise reinforcements at tourism hotspots, enabling queue management and flexibility options.

6.11. European Union

Due to the close ties between EU Member States and the EU itself, the factors influencing the EU have already been taken into account and utilised at national level. The following recommendations (chapter 5) were extracted from the legal analysis (D1.2.1; chapter 2) and the interviews with stakeholders (chapter 3) and are summarised below:

Hydrogen	E-Mobility

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Practice-oriented legal framework, strategies and standards: For a transitional period, in line with stakeholder feedback, consideration should be given to relaxing the RFNBO criteria and introducing an EU-wide, sector-coupling certification system. In addition, the continuous integration of new technologies into European strategies is of great value as a guide for Member States.	**Practice-oriented legal framework:** Strategies should be developed to guide the cross-sector coupling of hydrogen and mobility in terms of the use of hydrogen in the mobility sector. **Financial arrangements:** The potential for cost savings in the course of electrification – in particular through bidirectional charging – should be exploited in a practical manner and supplemented by adjustments to the InvestEU Regulation, state aid law and public procurement law.
Economic viability: A clear support strategy at EU level should be implemented, in particular through financial flows into the hydrogen bank and the targeted steering of other support options, such as state aid law and procurement procedures.	**Technological standardisation:** Binding technical standards should be introduced. These must ensure that systems from different manufacturers work together and that measurements are carried out using uniform methods. The experiences and feedback of interest groups should be taken into account.
Further support measures: Competition-free and structured knowledge exchange should be ensured through the targeted networking of market actors.	**Further support measures:** According to stakeholder feedback, models for compensating V2X technologies should be developed, concepts for increased networking of relevant actors should be elaborated, publicly supported procurement programmes should be launched and a platform for e-mobility solutions should be created.

7. Cross-border policy recommendations

7.1. Workshop in Alba Iulia

At the **workshop in Alba Iulia (19 November 2025)**, the participating countries formed three groups, which were distributed across three tables with different themes and rotated to the next table after 20 minutes. One after the other, all participating countries discussed factors suitable for cross-border recommendations, in line with the theme of their table. The tables were thematically assigned to the **three key areas: law and politics, acceptance, and best practice**.

The factors discussed were selected by the partners from their **own content** as part of a **preparation task**. These are based on the factors already formulated in the policy recommendations (D2.2.1). A maximum of three factors were selected for each key area, i.e. three from law and politics (Chapter 2), acceptance (Chapter 3) and best practice (Chapter 4).

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During the workshop discussion, it was discussed and agreed on **cross-border policy recommendations**, i.e. which ones can be **implemented in all participating countries**. The recommendations on hydrogen and e-mobility are as follows:

7.2. Hydrogen

7.2.1. Legal & political

For the legal and political framework of hydrogen technologies, the partners recommend the introduction of a **uniform, clearly defined term for 'green' hydrogen** – agreed upon across Europe and beyond. This term should be clear, understandable and legally binding. In addition, important environmental aspects such as energy source, life cycle emissions and sustainability should be taken into account. A common terminology makes it easier to design policy decisions, support programmes and communication measures consistently and to prevent misunderstandings. The aim is to create a compatible legal framework. It also supports the orientation of market players across borders and simplifies investment decisions.

When developing strategies for **investment** in hydrogen technologies, it is recommended to focus on their **long-term nature and to communicate this more strongly**. These strategies should set clear investment targets, for the corresponding technologies. Support programmes should be targeted at both private investors and public authorities. This will strengthen the confidence of investors and public authorities that funds will be allocated in the long term, that certain technological innovations will be supported, and that progress and new areas of activity can be expected in the field of hydrogen.

7.2.2. Acceptance

In order to strengthen social acceptance of hydrogen technologies and thus enable cross-border action, the partners first recommend **communicating the use of hydrogen transparently**, especially in the areas of infrastructure and industry. Public and private **hydrogen applications** – for example in the transport sector, energy infrastructures or industrial processes – should be made **visible**. They should serve as concrete examples and demonstrate the safety of the technology. This will make hydrogen experienceable and comprehensible in everyday life, which will promote trust and acceptance among the population and local decision-makers.

In addition, it is recommended that sy**stematic education and information programmes on hydrogen safety** be established in all Member States. These should be aimed at both professionals in industry and infrastructure and the general public, and should provide practical information on safe handling, technical protective measures, emergency procedures and existing safety standards. Transparent, easily accessible and scientifically sound information can reduce uncertainty, strengthen confidence in safety precautions and thus increase acceptance of hydrogen applications across borders.

7.2.3. Best-practices

The partners recommend promoting the gradual development of a **national hydrogen infrastructure**. The aim is to develop cross-border transferable best practice recommendations. The supply of hydrogen should also be made possible beyond the public sector.

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In order to make widespread use of hydrogen as a new energy source, **communal and regional storage solutions** should be established. The expansion of hydrogen **storage facilities** at local and regional level is considered a key recommendation.

Targeted **knowledge transfer** programmes should be set up for the development of small-scale decentralised energy storage and connection to higher-level grids. These should in particular support the planning, operation and safety of hydrogen storage facilities.

7.3. E-mobility

7.3.1. Legal & political

To strengthen cross-border cooperation in the field of e-mobility and to take into account different levels of development in the Member States, the partners recommend **establishing common technical standards**. **Broad financial accessibility and practicability** should be more important than the most technically sophisticated solution. **Subsidies**, especially for technical solutions that are suitable for cross-border implementation, should be **long-term and communicated transparently**. Harmonised technical regulations facilitate the development of interoperable infrastructures and promote the scaling of cross-border e-mobility services.

In addition, it is recommended that uniform legal concepts and frameworks be sought across borders for areas that have not yet been regulated or have been insufficiently regulated. However, **regulatory sandboxes** should be implemented prior to regulation. These should be open to all legislators and market participants according to transparent and non-discriminatory criteria.

7.3.2. Acceptance

In order to increase acceptance of e-mobility in different countries, the partners propose promoting the expansion of **charging infrastructure along major transport routes**. Charging points on motorways and in their vicinity offer **visible and reliable opportunities for use**. Once this has been tested, proven reliable and widely adopted, it will increase the **sense of community** among users.

Another step is the **transparent presentation of all costs associated with charging**. Clear information on electricity prices, fees, tariffs and billing models reduces barriers. It is also recommended that the charging process (e.g. equipment, billing) be **standardised to a greater extent**. Uniform and border-independent user standards help to ensure that e-mobility functions smoothly across national borders and is perceived as reliable.

In addition, **government processes** for setting up charging infrastructure should be **simplified**. Streamlined approval procedures make it easier for local authorities, businesses and private actors to set up charging points quickly and efficiently. This should be accompanied by **monetary and non-monetary incentives**, such as financial subsidies, tax breaks or support services, such as preferential parking and special information and advisory services.

7.3.3. Best-practices

In order to promote cross-border transferable best practice approaches in the field of e-mobility, the partners initially recommend gradually **shifting the focus** from direct subsidies **to long-term attractive framework conditions**. These include, for example, models in which photovoltaics on the roof of a house are linked to reduced tariffs for charging electric vehicles at home. Finally, the

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nations' promotion and communication strategies should focus more on **non-monetary incentives and awareness raising**. Companies and local authorities can also make e-mobility more attractive through measures such as preferential parking, access to certain zones, reserved parking spaces with charging infrastructure or internal mobility programmes.
At the same time, local authorities should be given targeted support through appropriate programmes and, where appropriate, also be **obliged to electrify their own vehicle fleets**. Cities and municipalities thus act as visible role models and anchor points for the spread of e-mobility.
Another key element is the **targeted use of e-mobility in sensitive areas** such as cultural monuments, historic city centres and traffic-calmed or traffic-restricted zones. Electric vehicles can help to significantly reduce noise and emissions while ensuring accessibility.
The consistent expansion and integration of charging infrastructure in residential and working environments is also essential. Framework conditions should be created in all Member States to enable the **easy installation and use of charging points in residential complexes and at workplaces**. Affordable charging options in residential areas and on company premises help to make e-mobility suitable for everyday use and accessible to broad sections of the population. Employers can play an important role by providing charging options and integrating e-mobility into their mobility and human resources strategies.
The cross-border exchange of **proven guidelines and examples of good practice** based on the concepts presented makes it easier for other cities, regions and companies to adopt similar approaches and highlight the added value of e-mobility.

In addition, it is recommended that innovative concepts such as **vehicle-to-grid (V2G) be tested in a targeted manner – on a limited scale – using pilot fleets**. This will allow electric vehicles with V2G functionality to be tested in real-world usage scenarios. The experience gained in this process should be systematically evaluated and **disseminated across borders**.

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