

Gas Decarbonisation Pathways for Estonia

(3 Baltic states + Finland)

Deliverable 7: Action Plans for achieving a carbon neutral gas market in Estonia

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**Rotterdam, 11 September 2023**

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**In association with:**





**CONTENTS**

[1 Introduction 6](#_Toc145401436)

[2 Objectives, scope and methodology 7](#_Toc145401437)

[2.1 Objective and scope of the report 7](#_Toc145401438)

[2.2 Methodology 7](#_Toc145401439)

[3 Description of action plan measures 9](#_Toc145401440)

[3.1 Action set 1: Governance of the gas system decarbonisation 10](#_Toc145401441)

[3.2 Action set 2: Gas market design and integration 24](#_Toc145401442)

[3.3 Action set 3: Support and requirements for renewable and low-carbon gas production and/or consumption 39](#_Toc145401443)

[3.4 Action set 4: Infrastructure planning 55](#_Toc145401444)

[3.5 Action set 5: Energy and carbon taxation 65](#_Toc145401445)

[4 Action plan summary and recommendations 78](#_Toc145401446)

[4.1 Relevance to the gas decarbonisation scenarios 80](#_Toc145401447)

[4.2 Analysis of other implementation aspects 81](#_Toc145401448)

# Introduction

This report is the main final deliverable in the “Gas Decarbonisation Pathways for Estonia”, building on previous deliverables:

* **Deliverable 3** characterised a business-as-usual and three gas decarbonisation scenarios (REN-Methane, REN-Hydrogen, Cost Minimal) for the Baltic Regional Gas Market countries;
* **Deliverable 4** assessed the impacts of the decarbonisation scenarioson the economy and energy system of the concerned countries;
* **Deliverable 5** identified and analysedspecific risks related to the three decarbonisation scenarios compared to the business-as-usual scenario;
* **Deliverable 6** conducted a sensitivity analysis of the impacts for each of the decarbonisation scenarios.

This **Deliverable 7 report** **presents an action plan detailing various policies for achieving a carbon neutral gas system in the Baltic states and Finland**. As such, the actions proposed should facilitate the achievement of the three decarbonisation scenarios employed throughout the study.

The remainder of the report is structured as follows:

* Chapter 2 presents the objective, scope and methodology of this report;
* Chapter 3 presents the selected action plans and measures;
* Chapter 4 summarises the action plan and provides recommendations to policymakers.

# Objectives, scope and methodology

## Objective and scope of the report

The objective of this report is to **elaborate a comprehensive action plan detailing various policies for achieving a carbon neutral gas system by 2050 in the Baltic states and Finland.**

As indicated in the EU Energy System Integration Strategy[[1]](#footnote-2), energy policies should follow a hierarchy for cost effective decarbonisation:

1. **A ‘circular’ energy system with energy efficiency as the core principle** should be prioritised, with reduction of energy demand and use of unavoidable waste materials and energy when these cannot be reduced further;
2. **Greater direct electrification of end-uses** leveraging the rapidly decreasing costs of renewable electricity sources and the high source-to-sink efficiencies from electricity generation to consumption;
3. **The use of renewable and low-carbon fuels for hard-to-decarbonise applications** where direct electrification is not feasible due to low efficiency and/or high costs.

The actions of this plan focus on the third step for effective decarbonisation of the Baltic states and Finland’s gas system. **Energy efficiency and direct electrification measures reducing overall gas demand are not included, but should nonetheless be prioritised ahead of policies substituting natural gas by renewable and low-carbon gases.**

This report as well as the overall project address the **Baltic states and Finland, thus covering the Baltic Regional Gas Market (BRGM) area.** Many of the actions proposed therefore aim to promote cooperation between the BRGM Member States in order to reduce the costs of decarbonising the regional gas system as well as to avoid competition distortion in the current and future gas markets. Where relevant, regional initiatives involving other Member States of the Baltic Energy Market Interconnection Plan (BEMIP) are mentioned, but the proposed actions focus on the four Member States of the BRGM.

The 3 decarbonisation scenarios are in Deliverable 3 detailed for the **2030, 2040 and 2050 time horizons**. Therefore, the actions proposed aim to achieve the decarbonisation pathways across those time horizons, including both short-term and long-term actions.

## Methodology

The actions proposed in this report apply to relevant gas decarbonisation scenarios developed in Deliverable 3 of the project[[2]](#footnote-3):

* **Renewable methane (REN-Methane) scenario**, leveraging biogas and biomethane for on- and off-grid applications, reserving hydrogen for off-grid hard-to-decarbonise applications;
* **Renewable hydrogen (REN-Hydrogen) scenario**, with on- and off-grid use of hydrogen and development of a regional cross-border hydrogen network by 2050;
* **Cost Minimal scenario (CM)**, exploring competition between renewable gases and natural gas, to find the least cost-based decarbonisation solution for the modelled period, given set constraints and modelling boundaries.

Each action proposed in this report is structured according to the following sub-sections:

1. **Why is the action required?** This section presents the main reasons for regulatory intervention, including by recapping existing or planned EU legal provisions which require action at the national level;
2. **Current status,[[3]](#footnote-4)** describing the relevant developments at the EU and national level which affect the proposed action, including any policies and measures at the national level. As such, the proposed action often seeks to adjust or complement existing policy measures;
3. **Description of the proposed action,** detailing any individual measures which may compose the action at hand, as well as explaining how it could be implemented in practice by the national governments;
4. **Assessment of implementation aspects,** detailing the expected action costs, complexity, need for involvement of stakeholders (ranked as low/medium/high), implementation horizon (ranked as short/medium/long-term), and applicability to the three decarbonization scenarios.

The assessment of implementation aspects is summarised at the start of each action by employing the following Figure 2‑1. The context for each proposed action is presented with the action itself; the report does hence not include an overall context introduction. This allows to directly link the relevant context to the reasons why the proposed action is needed to decarbonise the region’s gas system.

Figure 2‑1 Example summary table for an action for decarbonising the gas market in the Baltic states and Finland

|  |  |
| --- | --- |
| **Criteria** |   |
| **Responsibility for implementation** | National Ministries |
| **Costs**  | Low |
| **Complexity** | Medium |
| **Stakeholder involvement** | High |
| **Implementation**  | Medium-term |
| Impacted gases |
| Biogas/biomethane | Hydrogen  | Synthetic natural gas |
| xxx | xxx | xxx |
| Relevance for decarbonisation scenarios |
| *REN-Methane* | *REN-Hydrogen* | *REN-Cost Minimal* |
| xxx | xxx | xxx |

The proposed actions are based on:

* The decarbonisation scenarios detailed in Deliverable 3 and their energy system and macro-economic impact assessment provided in Deliverable 4;
* The risk analysis conducted in Deliverable 5, including the main risk mitigation options identified;
* Further desk research concerning technological, market and policy developments in the region, including a review of actions proposed in other studies;
* A written consultation of stakeholders across the region conducted in July-August 2023.

# Description of action plan measures

This chapter describes the 12 proposed actions to decarbonise the gas system of the Baltic states and Finland, categorised according to 5 action sets as illustrated in Figure 3‑1:

* **Action set 1:** Governance of the gas system decarbonisation;
* **Action set 2:** Gas market design and integration;
* **Action set 3:** Support and requirements for renewable and low-carbon gas production and/or consumption;
* **Action set 4:** Infrastructure planning;
* **Action set 5:** Energy and carbon taxation.

**The proposed measures take as starting point the policy measures adopted or proposed by the four national governments**, by conducting a review of the current policy landscape at the EU and national level. Hence, the proposed measures are meant to complement (or revise) the current regulatory frameworks, and may coincide with measures being considered by the concerned national governments but not yet publicly announced.

Figure 3‑1 Actions for the decarbonisation of the gas system of the Baltic states and Finland



## Action set 1: Governance of the gas system decarbonisation

### Action 1) Improve the governance structure and strategic policies for renewable gases

|  |  |
| --- | --- |
| **Criteria** |   |
| **Responsibility for implementation** | National Ministries |
| **Costs**  | Low |
| **Complexity** | Medium |
| **Stakeholder involvement** | High |
| **Implementation**  | Short to medium-term |
| Impacted gases |
| Biogas/biomethane | Hydrogen  | Synthetic natural gas |
| xxx | xxx | xxx |
| Relevance for decarbonisation scenarios |
| *REN-Methane* | *REN-Hydrogen* | *REN-Cost Minimal* |
| xxx | xxx | xxx |

#### Why is the action required?

##### Regarding methane gases

In the realm of the gas system decarbonisation, the establishment of dedicated regional coordination platforms is needed, serving as instrumental catalysts for the seamless incorporation of renewable gases, notably biogas and biomethane, into the gas system. These platforms serve as pivotal enablers of efficient cross-border collaboration, harmonisation of market and grid access rules (including gas specifications), and the optimal utilisation of infrastructure.

It is important for local and national governments to have clear plans and strategies for the development and use of biogas/biomethane. These plans serve two main goals: they provide a clear path for how renewable gases can fit into the existing energy systems, and they outline the specific goals, policies, and actions needed to increase the production and use of renewable gases.

The contribution to reducing carbon emissions from gas systems mainly comes from using biogas/biomethane effectively, along with some help from renewable hydrogen, especially during the transitional period. Increasing biogas/biomethane production is crucial for meeting the carbon emissions reduction goals, according to research findings. It is also important to regularly monitor the actual production as well as the updated potential for biogas and biomethane. This helps to make sure the decarbonisation plans of the Baltic and Finland common gas market are on the right track to meet the energy and climate goals and respond to market needs. By doing this, the region can make smarter investments and plan the right infrastructure, making the efforts to cut carbon emissions more effective.

Facilitating regional cooperation in the gas market has been addressed by the Gas Regulation and Directive among other legislations. Article 12 of the EU Gas Regulation 715/2009 explicitly addresses regional cooperation of gas TSOs. According to this article, TSOs shall establish regional cooperation within ENTSO-G for drafting the network codes. Moreover, they shall publish a regional investment plan every two years and make investment decisions based on that regional investment plan. Member States are allowed to promote cooperation in more than one geographical area. Additionally, Article 6(1) of the Gas Directive states that “In order to safeguard a secure supply on the internal market in natural gas, Member States shall cooperate in order to promote regional and bilateral solidarity.” The following article 7 specifically refers to the promotion of regional cooperation “for the purpose of integrating their national markets at one and more regional levels”. Also, it delineates that “the geographical areas covered by such regional cooperation shall include cooperation in geographical areas defined in accordance with Article 12(3) of Regulation (EC) No 715/2009. Such cooperation may cover other geographical areas.”

Finally, article 15(3) of the Renewable Energy Directive (RED II) mandates Member States to "ensure that their competent authorities at the national, regional and local level include provisions for the integration and deployment of renewable energy, including for [...] natural gas and alternative fuel networks." Additionally, it is noteworthy that while the TEN-E Regulation’s recital (5) underscores the significance of regional cooperation concerning the development of natural gas infrastructure, ANNEX III reaffirms the centrality of the above mentioned Article 12 of the EU Gas Regulation 715/2009 and Article 7 of the Gas Directive 2009/73/EC. These articles serve as guiding directives for fostering collaborative efforts within gas markets at the regional level.

##### Regarding hydrogen

In the distinctive energy landscape of the Baltic states and Finland, characterised by their fully integrated gas market, an acute need arises for a coherent governance structure and strategic policies to facilitate and stimulate the decarbonisation approach through hydrogen innovation. A tailored approach to this unique region – whose peculiarities stem from its historical isolation from the EU energy networks in the past - is essential for several compelling reasons, underscoring the regional intricacies that shape its energy transition. While the cross-border gas interconnections have improved in the region in recent years[[4]](#footnote-5), a similar cross-border approach needs to be adopted for the hydrogen infrastructure development planning. Such a requirement of close cooperation at regional level has been intensified in the wake of the impact of the current geopolitical tensions on the energy system.[[5]](#footnote-6) Studies have shown that territorial collaboration plays a pivotal role in advancing the energy transition within the Baltic Sea Region, primarily due to the substantial financial backing provided by the EU Cohesion Fund for joint initiatives[[6]](#footnote-7).

Given the interconnectedness of the Baltic states and Finland within their common gas market, harnessing existing platforms or forging new collaborative mechanisms will amplify synergies, harmonise market and grid regulations, and expedite cross-border administrative processes as an influential measure in developing the hydrogen market. This approach not only minimises fragmentation but also capitalises on collective efforts for a more streamlined hydrogen-driven transition. To benefit of economies of scale, adopting a collective approach is necessary in the context of hydrogen blending in methane gas pipelines, as discussed as an option in DLV3, or for developing a dedicated hydrogen transport network. Regional cooperation can be considered as a steppingstone to set the stage for the harmonisation of gas specifications on a larger scale in the future. In the absence of an EU-wide gas specification standard, Article 15(1) of the Commission Regulation 2015/703 considers TSOs responsible for reaching - in cooperation with NRAs - a joint proposal for solving issues that may arise due to gas quality differences in cross-border flows. A regional cooperation platform is hence an adequate instrument for developing regional hydrogen infrastructure development plans and for agreeing on common specifications and rules.

Additionally, contextualising the evaluation of the potential of renewable and low-carbon hydrogen within the Baltic states and Finland's unique energy system is paramount. The intertwined relationship between renewable hydrogen and renewable electricity deployment necessitates strategic synchronisation. The assessment process should delve into how hydrogen deployment can provide synergies with the region's renewable electricity sources, in view of optimising its integration to deliver maximum carbon emissions reductions and energy system economic and energy efficiency, particularly as studies showed the importance of coherence in wind energy development in the Nordic-Baltic region[[7]](#footnote-8), [[8]](#footnote-9).

To implement such a strategy, tailoring collaborative hydrogen roadmaps and strategies to the distinctive attributes of each nation within this regional cohort is pivotal. These blueprints must reflect local energy mix nuances, existing infrastructure, and socio-economic dynamics. Concurrently, a regional roadmap should be meticulously crafted to integrate the aspirations of stakeholders, ensuring alignment and a unified direction that amplifies the collective impact of hydrogen deployment.

In sum, the distinct energy landscape of the Baltic states and Finland necessitates a bespoke approach to hydrogen governance. By fostering regional collaboration, crafting locally nuanced roadmaps, strategically evaluating hydrogen integration, and emphasising the role of regional platforms in enhancing economic scalability and harmonising gas standards, these nations can harness the full potential of hydrogen as a linchpin for decarbonisation. This tailored strategy not only positions them as pivotal contributors to the European Union's sustainability agenda but also fosters resilient energy systems for a greener future.

#### Current status

##### Regional coordination platforms

Early initiatives for the integration of the electricity and natural gas systems and markets in the Baltic states can be traced back in 2009 when the Baltic energy market interconnection plan (BEMIP)[[9]](#footnote-10) was established to end the isolation of the Baltic electricity and natural gas sectors from the rest of Europe. Later on, the Baltic Energy Ministers signed a declaration in January 2015 to establish a transparent, competitive and fully functioning regional natural gas and electricity markets through the implementation of the Third Energy Package, called the Regional Gas Market Coordination Group (RGMCG), and shortly after, Finland was invited to join this coordination group[[10]](#footnote-11). An action plan of RGMCG was launched in 2017, marked by the introduction of implicit capacity allocation at interconnection points between Latvia-Lithuania and Estonia-Latvia. This approach established a structured marketplace for cross-border gas trade while simplifying administrative issues related to third-party access (TPA) and TSO balancing agreements.

In 2018, the tariff model and inter-TSO compensation (ITC) mechanism for the common Baltic-Finnish market were established, following a phased integration strategy. Finland, Estonia, and Latvia's NRAs (National regulatory authorities), collectively known as FinEstLat, bolstered their cooperation to create the FinEstLat market. Consequently, methodologies for calculating transmission tariffs were adjusted, and the tariff scheme was approved. Since January 2020, the single-entry tariff zone of FinEstLat has been operational. This merger connected the Finnish, Estonian, and Latvian markets, eliminating internal tariffs and setting uniform entry tariffs through the ITC mechanism. However, two balancing areas were created within the FinEstLat system to accommodate differing market maturity levels: the common Estonian-Latvian balancing zone and the Finnish balancing zone[[11]](#footnote-12).

In March 2020, ACER released analyses of reference price methodologies for Estonia, Latvia, Lithuania, and Finland, leading to revisions in Common Regulations governing Natural Gas Transmission System Use within FinEstLat. These changes aimed to resolve inconsistencies that arose during the initial stages of the Estonia-Latvia common balancing zone[[12]](#footnote-13).

In 2020, Artelys conducted an analysis supporting the establishment of a four-country entry tariff area and the development of a compliant ITC model. Simultaneously, the TSOs assessed potential integration options and decided to focus on comprehensive market integration only after achieving enhanced operational efficiency. This involves addressing internal congestion, expected to be resolved upon the completion of the "Enhancement of Latvia-Lithuania interconnection" PCI in 2024. Furthermore, a Solidarity Agreement, in line with the security of gas supply Regulation, was initiated in August 2020[[13]](#footnote-14).

By the end of 2020, the four NRAs formalized a Memorandum of Understanding to strengthen cooperation and the Baltic-Finnish market's establishment. A Working Group comprising the NRAs was formed to facilitate collaboration. The TSOs also explored unified systems for issuing and trading guarantees of origin for renewable gases. The RGMCG continues to develop a four-country market model, incorporating Lithuania into the regional market. Expanding the single-entry system will enhance integration across four relatively small national markets, fostering increased competition. To this end, in early 2020, national energy ministries, NRAs, and gas TSOs from Estonia, Finland, Latvia, and Lithuania established a Roadmap for regional gas market integration, with the FinBalt single entry tariff set to take effect on 1 October 2023. Further integration, merging FinEstLat with the Lithuanian gas market, presents opportunities for the Baltic states and Finland to maximize infrastructure benefits, including gas storage facilities, LNG terminals, Balticconnector, and the Gas Interconnection Poland–Lithuania (GIPL).

However, Russia’s invasion of Ukraine in 2022, as well as other related geopolitical shifts have reshaped the region's gas market dynamics. The FinBalt market faces unprecedented challenges, and the turbulence persists. Consequently, the existing ITC mechanism, designed on different market assumptions, no longer aligns with the current reality and may not benefit all parties involved. Thus, on 12 October 2022, the FinBalt NRA chairs jointly decided to postpone the merger, stipulating that it could occur no earlier than October 2024[[14]](#footnote-15).

##### Regional and national roadmap/strategies for biogas/biomethane and (re)evaluation of biogas/biomethane production potentials

The four countries have developed and implemented several policies and plans for their biogas/biomethane sector, including:

###### Estonia

The Ministry of Economic Affairs and Communications of Estonia (MKM) has been responsible for energy policy, including renewable energy initiatives. However, as of 2023, energy policy falls under the Ministry for Climate. In 2018, MKM formulated and the Estonian Government ratified the Estonian Long-Term Energy Strategy extending to 2030[[15]](#footnote-16). This strategy prioritises the integration of biogas/biomethane as a key component in achieving national energy targets. Estonia has committed to attaining a 25% share of renewable energy in its gross final energy consumption by 2020, with 10% dedicated to the transport sector. Remarkably, Estonia had already exceeded this overall target in 2011, achieving a share of 25.5%[[16]](#footnote-17). While the Estonian NECP mentioned a renewable electricity target of 40% of total electricity consumption in 2030[[17]](#footnote-18), in 2022, the government raised this target for renewable electricity to 100%, which raised the target for the overall share of renewable energy to 65%[[18]](#footnote-19).

Additionally, in 2015, MKM introduced a Regulation offering investment support for public buses running on methane. This support can reach up to 30% of the total investment cost, with a minimum threshold of 400,000 euros and a maximum limit of 4 million euros. The first successful case was executed by the Pärnumaa Public Transport Centre. The Regulation also introduced support for Compressed Natural Gas (CNG) filling stations. To incentivise biomethane production, Estonia employs a Feed-in Premium system, which offers a fluctuating bonus to biomethane producers, contingent on the prevailing natural gas prices in the Baltic Natural Gas Spot market. This approach, referred to as a sliding price mechanism, allows for variations in the premium based on the current natural gas price[[19]](#footnote-20).

As part of Estonia’s Recovery and Resilience Plan (RRP)[[20]](#footnote-21), a support measure to increase the use of resource efficient green technologies was created. Under this scheme sustainable bioresource use was supported with 28.8 million euros. This included support for biogas production as well. The updated RRP that considers the goals of REPowerEU added a 20-million-euro reform to increase the production and use of biogas and biomethane. This reform seeks to create an additional support measure for the production and use of biogas/biomethane. In addition, a biogas roadmap for Estonia will be created and an analysis to identify necessary regulatory, organizational and financial measures to support biogas production and use will be conducted.

The draft update of Estonia’s NECP for 2030 (adopted 10 August 2023) states that since 1 January 2023, there are no deliveries of Russian natural gas to Estonia via the gas network. Estonia’s gas system is connected to Latvia, Russia and Finland. In the direction of Latvia, the connection is through Karks (7 million m3/day), while the connection to Russia is through Narva (1.2 million m3/day) and Värska (3.4 million m3/day) and Finland through Balticconnector (5.4 million m3/day). The total interconnection capacity is thus 14 million m3/day. There are no gas storage facilities, liquefied gas terminals or compressor stations in the Estonian gas system. The highest consumption of natural gas in the last 20 years was 6.7 million m3/day (on 19 January 2006). Thus, the N-1 criterion is 104.5 %, which means that one of the security of supply criteria is met. In total, the gas system consists of 885 km of pipelines, three gas metering stations and 36 gas distribution stations.

The Estonian gas transmission network development plan for the period 2021-2030, prepared by the gas TSO Elering AS, points out that, over the next 10 years, the priority project is the reconstruction of the Vireši-Tallinn gas pipeline network, which helps to increase the pressure of the gas pipeline and thus the capacity allowed to Balticconnector. The project is expected to be completed by 2025.

###### Finland

In October 2019, the Ministry of Economic Affairs and Employment established a working group to formulate a medium-term national biogas programme. This group was assigned to assess the existing state of biogas production, identify major obstacles hindering its widespread adoption, and propose solutions to implement Government Programme commitments related to biogas. The resulting report, along with policy recommendations, was issued in January 2020, outlining objectives through 2024. Finland has set a goal to have 50,000 passenger road vehicles on gas by 2030. This has been reiterated in its recent NECP draft, which refers to 0.9 TWh of biogas/biomethane gross final consumption in the transportation sector, with the target of at least 6,100 gas-powered lorries and busses by 2030.

In the post-2021 period, Finland has developed plans to extend its gas distribution infrastructure by suing support through the European Union Recovery and Resilience Facility (RRF) funding. Initiatives are underway to develop a new support scheme. Furthermore, investment aid has been initiated for biogas facilities and manure processing, with intentions to expand this support to encompass nutrient recycling and carbon sequestration.

Additional measures include the introduction of support for gas-powered heavy-duty vehicles through an aid program, a commitment to continuing conversion aid, an evaluation of funding opportunities and biogas sustainability, updates to safety guidelines, enhanced advisory services, advocacy for governmental support regulation, an ongoing experimental program exploring new nutrient recycling technologies, advancements in the preparation of the EU's Common Agricultural Policy (CAP), and the continuation of investment aid for biogas facilities within existing support frameworks. Notably, investment aid for biogas-related agriculture and rural enterprises has seen an increase for the period spanning 2021-2022, a modification also reflected in the national CAP plan proposal for the forthcoming CAP period commencing in 2023[[21]](#footnote-22).

Finland’s volume of planned clean energy investments up to 2030 for biogas production is 370 million Euro[[22]](#footnote-23). Moreover, a state grant, named "energy aid" (2018 to 2022), supports investment projects that advance the production and use of renewable energies, enhance energy efficiency, and mitigate environmental impacts stemming from energy production and consumption. Between 2018 and 2021, investment aid was also available for filling stations developments and conversion of passenger cars to gas, with a subsidy of 1,000 euros per car. Notably, biogas and biomethane applications are exempt from excise duties in Finland. Furthermore, imported biomethane enjoys exemption from excise duties and custom fees. Finally, it's important to mention that natural gas is duty-free when originating from outside the EU, but VAT and excise duties apply[[23]](#footnote-24).

###### Latvia

Among the EU Member States, Latvia has one of the lowest renewable energy shares in the transport sector, accounting for less than 4% of energy from renewables. The Latvian NECP mentions that the share of advanced biofuels & biogas in gross final energy consumption in transport would only reach 3.5% in 2030.

Latvia embarked on supporting electricity generation from biogas in 2009, which subsequently spurred biogas production in 2012. This growth continued steadily, reaching 87.8 ktoe in 2015, a substantial achievement for a relatively small nation. A significant portion of this biogas production, approximately 70.6 ktoe in 2015, could be attributed to the introduction of the Feed-in Tariff (FiT) in 2009, representing an increase of 510%[[24]](#footnote-25). According to the Latvian NECP[[25]](#footnote-26), production of electricity from biogas received 43,444,604 Euro public aid over the market price within the scope of the mandatory procurement mechanism in 2018[[26]](#footnote-27).

However, developments in Latvia have posed challenges for the biogas sector, such as the introduction of a subsidised electricity tax in 2014, which reduced the revenues for renewable electricity producers. Moreover, support for new plant construction, which was extended but not renewed, has hampered sectoral expansion. Contracts between the government and biogas operators for receiving FiT typically span ten years, implying that support has already ceased for some plants and will conclude for all biogas operators within the next few years. At present, four biogas plants operate without support, while seven have ceased production. Consequently, it is likely that the biogas sector will experience a substantial reduction in production capacity over the next 3-5 years.

###### Lithuania

Lithuania presently utilises biogas primarily for electricity and heat generation. To harness its full potential, there is a proposal to shift the focus from electricity and heat production towards upgrading biogas to biomethane and its integration into natural gas networks. This transition will involve the need to evaluate the necessary modifications to align the natural gas quality standards with the requirements for biomethane producers connecting to the network. The NECP projected the production and supply of biomethane gas to the transport sector at 81.5 ktoe by 2030. The Ministries of Energy, Agriculture, Transport and Communications, and Environment are considered responsible for implementing the policy. To ensure a balanced supply and demand for biomethane gas alongside the anticipated growth in natural gas consumption in the transport sector, natural gas suppliers for direct transport use would be mandated to provide a specified quantity of gas sourced from renewable energy. A one off subsidy for production facilities is provided, and purchasing of gas-fuelled public transport vehicles is also encouraged. Public funding will be provided through the 2021–2027 EU Structural Funds, State and municipal budgets, and the Climate Change Programme[[27]](#footnote-28).

##### Regional and national roadmap/strategies and (re)evaluation of hydrogen production potentials

###### Estonia

Estonia has embraced the potential of hydrogen as key component in its transition towards a low-carbon energy system, with an array of initiatives and strategic considerations[[28]](#footnote-29). The (former) Ministry of Environment initiated a Hydrogen Working Group, with a special focus on the transport sector, to evaluate the prospects of hydrogen deployment. Additionally, Estonia is exploring the expansion of renewable hydrogen production through electrolysis. Moreover, Estonia has endorsed in January 2022 its participation in Important Projects of Common Interest (IPCEIs), 2022, committing EUR 111 million investment in hydrogen[[29]](#footnote-30).

Estonia started in 2021 with an action plan to develop a hydrogen strategy. A budget of EUR 50 million from the national Recovery and Resilience Fund was allocated towards the deployment of hydrogen technologies[[30]](#footnote-31). The Estonian authorities also developed a Hydrogen Roadmap together with relevant stakeholders. The roadmap[[31]](#footnote-32) was completed in February 2023 and signed by three ministers in March 2023.

The absence of a regulatory framework for hydrogen has been identified as a significant hurdle to the deployment of renewable hydrogen. However, progress is expected with the forthcoming approval of the revised EU Gas Directive and Regulation, designed to facilitate hydrogen deployment. Estonia will have to align its Natural Gas Act with these new EU provisions.

Estonia has further unveiled the Hydrogen Valley Estonia initiative, a collaborative effort encompassing public and private entities as well as research institutions. This initiative places a strong emphasis on transforming Estonia's predominantly fossil-fuel-dependent energy system into a sustainable one, in alignment with its ambitious target of achieving 100% renewable energy usage by 2030. In 2022, the Hydrogen Valley Estonia initiative outlined a comprehensive plan for establishing an ambitious national hydrogen ecosystem within six years, including the development of production units, transport/distribution networks, and various applications. The consortium's initiatives have already catalysed promising projects, advancing Estonia's hydrogen sector significantly[[32]](#footnote-33).

###### Finland

Finland has strategically integrated large-scale hydrogen technology deployment into its national decarbonisation plans as outlined in its National Hydrogen Strategies Report for 2022[[33]](#footnote-34). Total dedicated hydrogen production in Finland is estimated at 140,000–150,000 t/a (4.7–5.0 TWh), of which 99% is produced via either steam reforming or partial oxidation of fossil fuels and about 1% via water electrolysis[[34]](#footnote-35). In comparison to some other EU Member States, Finland's hydrogen-powered transport system is not yet developed. While the government has set an ambitious target of achieving 250,000 electric vehicles by 2030 within its Medium-term Climate Change Policy Plan for 2030, there is this plan no specific target for hydrogen-powered vehicles[[35]](#footnote-36). In August 2021, P2X Solutions, a Finnish pioneer in power-to-X technology, announced its intention to construct the nation's first renewable hydrogen production plant by 2024[[36]](#footnote-37).

While Finland has not yet defined specific targets for hydrogen deployment in its NECP[[37]](#footnote-38), the European Commission's assessment has highlighted the absence of technology-specific policies to promote fuel cell vehicles and hydrogen refuelling station infrastructure. However, Finland utilises several policy instruments, such as car taxes and carbon pricing, to incentivise hydrogen adoption. Additionally, revised legislation on guarantees of origin encompasses hydrogen and streamlines the process of assessing hydrogen's sustainability[[38]](#footnote-39).

Furthermore, to foster hydrogen development, the Finnish government established a working group on energy system integration, the promotion of the hydrogen economy, and Power-to-X technologies[[39]](#footnote-40). This working group recommends government funding for demonstration projects, the promotion of e-fuels' production and distribution, and the development of a framework for governing and promoting hydrogen transport, among other initiatives. This report was intended to inform the government's upcoming climate and energy strategy, scheduled for presentation to Parliament in February 2022. Additionally, a National Hydrogen Roadmap for Finland was commissioned by Business Finland and delivered in 2020[[40]](#footnote-41). The roadmap offers suggestions across the hydrogen value chain, with a primary focus on research, development, and innovation.

On 9 February 2023, the Government of Finland adopted a resolution on hydrogen, outlining the nation's objectives and measures to achieve them. Finland aspires to become European leader in the hydrogen economy across the entire value chain, aiming to produce at least 10% of the EU's carbon-free hydrogen by 2030. Recognised strengths include clean, reliable, and affordable electricity, with the predictability of the operating environment, seamless permit procedures, and land use planning considered competitive advantages[[41]](#footnote-42).

The decision of the Finnish government lays the foundation for the development of a national hydrogen strategy as part of the climate and energy strategy. The goal is to cultivate a new industry in Finland centred on hydrogen and hydrogen-derived products, supporting the renewal of manufacturing and technology companies in the field[[42]](#footnote-43).

Finally, Finland has released its "Clean hydrogen economy strategy for Finland," outlining three key areas for capitalisation on this up to €34 billion opportunity. The strategy aims to position Finland as leading high-value hydrogen economy in Europe by 2035. The three focus areas include expanding domestic clean hydrogen production, accelerating the growth of domestic clean industries, and fostering the export of hydrogen-related technologies and services. The strategy anticipates unlocking €16 to 34 billion in annual revenues[[43]](#footnote-44).

###### Latvia

The Latvian NECP pointed to hydrogen in a few cases, including the necessity of evaluating the possibility of refurbishing the natural gas infrastructure to hydrogen and other gaseous fuels, as well as drafting an action plan for the development of hydrogen infrastructure and market conditions[[44]](#footnote-45). Latvia's primary focus lies in the transport sector, with the first hydrogen refuelling station in operation in Riga since 2016. Latvia’s vision for hydrogen use in transport is long-term and includes plans for the development of dedicated hydrogen infrastructure.

Innovation is prioritized and is to be achieved via the implementation of the national RD&I Smart Specialization Strategy in the period 2021 - 2027. Furthermore, Latvia continues coordination efforts with the neighbouring Baltic countries. However, no specific hydrogen related objectives were included in the 2019 NECP. An hydrogen strategy has not been developed in Latvia so far. Efforts to stimulate the development of a hydrogen economy are being carried out by researchers and businesses within the framework of associations, such as the Latvian Hydrogen Association[[45]](#footnote-46).

Latvia has participated in a couple of hydrogen initiatives. In Riga, as part of the H2Nodes project, the public transport operator “Rīgas satiksme” has introduced hydrogen fuel cell range extenders in its electric trolleybus system. With this pilot project of the innovative concept of “HyTrolley”, trolleybuses provide greater flexibility, less noise, zero tailpipe emissions and higher energy efficiency. While this project kicked off the practical use of hydrogen as a fuel in Latvia and the trolleybuses move daily commuters throughout Riga, the hydrogen station produces grey hydrogen from natural gas[[46]](#footnote-47).

Latvia is also a member of BalticSeaH2 initiative[[47]](#footnote-48). The Freeport of Riga has assumed responsibility to provide the necessary research of hydrogen technology use in the maritime sector - for the purposes of vessel refuelling, shipping, hydrogen storage, redistribution, transfer and distribution within these stages. Within the framework of the project, a hydrogen hybrid vessel’s conversion and piloting are also planned at the port of Riga. The Freeport of Riga is an active member of the Latvian Hydrogen Association and a promoter of the technology.[[48]](#footnote-49)

On December 14, 2022, the national TSOs Gasgrid Finland (Finland), Elering (Estonia), Conexus Baltic Grid (Latvia), Amber Grid (Lithuania), GAZ-SYSTEM (Poland) and ONTRAS (Germany) have signed a cooperation agreement to develop hydrogen transport infrastructure from Finland through Estonia, Latvia, Lithuania and Poland to Germany to meet the REPowerEU 2030 targets. The TSOs have initiated this project called Nordic-Baltic Hydrogen Corridor to strengthen the region’s energy supply security, reduce the dependency of imported fossil energy and play a prominent role in decarbonising the fossil gas system and energy-intensive industries along the corridor[[49]](#footnote-50).

###### Lithuania

Lithuania's current approach to hydrogen primarily centres on research, development and innovation. According to the Lithuanian NECP, the Lithuanian Energy Institute stands out as a leading research institution in the energy sector, with an impressive portfolio of 15 patents, with a predominant focus on hydrogen applications[[50]](#footnote-51). Furthermore, Lithuania has formulated a national Hydrogen Sector Development Roadmap and its Implementation Action Plan in collaboration with Baringa Partners, Amber Grid, and EPSO-G[[51]](#footnote-52). However, that is publicly available information about concrete implementation steps.

In March 2021, Lithuania enacted the Alternative Fuels Law, which serves as the foundation for support measures encompassing biofuels, alternative fuels, including renewable electricity, hydrogen, and biomethane gases[[52]](#footnote-53). This law outlines an ambitious objective for the development of biomethane and hydrogen gas in the coming years, aiming for biomethane and renewable hydrogen to constitute at least 5% of the final energy consumption in the transport sector by 2030[[53]](#footnote-54).

Lithuania has also made significant strides in adapting natural gas quality requirements to encompass injected hydrogen gas as of December 2020. Additionally, there is a keen interest in utilising hydrogen as a means to store offshore wind energy, with a perspective spanning until 2030[[54]](#footnote-55). In 2021, the Ministry of Energy initiated a national study to formulate the National Hydrogen Development Guidelines, entrusting this endeavour to the Lithuanian energy transmission group, EPSO-G, given the potential role of the national gas grid in transporting renewable hydrogen[[55]](#footnote-56). Furthermore, Lithuania established the Lithuanian Hydrogen Platform in November 2020, facilitating collaboration among national research institutions, businesses, and the public sector to advance hydrogen technologies within the country[[56]](#footnote-57). As of January 2022, 45 organisations actively participated in this platform[[57]](#footnote-58). Remarkably, Lithuania has allocated EUR 20 million from its National Recovery and Resilience Fund and EUR 50 million from the EU Modernization Fund to support hydrogen production and pilot and experimental projects. This substantial commitment underscores Lithuania's dedication to hydrogen development, with a total investment of EUR 300 million allocated for this purpose by 2030[[58]](#footnote-59).

#### Description of the proposed action

Considering the current situation and challenges in the energy sector, and taking into account the gas governance structure and goals as depicted in the previous sections, this study recommends the following governance actions for the gas system decarbonisation.

1. **A Comprehensive Regional Strategy for Decarbonised Gas Development:** This study highlights the pivotal role of biogas/biomethane in the decarbonisation of the regional gas market by 2050, particularly as reflected in the Cost Minimal scenario. Presently, the Estonian renewable gas sector predominantly relies on bioenergy, in which sustainability challenges surrounding biomass exist[[59]](#footnote-60). The same is expected in the other Baltic states, as they have also significant biomass potential. This presents a unique challenge at the intersection of energy and material use, necessitating meticulous regional management of biomass sources especially as the Cost Minimal scenario requires utilising biomass resources across the region. To address the intricacies of decarbonised gas production, specifically hydrogen and biogas/biomethane, a well-defined and systemic regional strategy is imperative to clarify further the role of biogas/biomethane as well as the development of renewable hydrogen in the Baltic regional gas market.

This strategy should encompass the technological, financial, and infrastructure developments required for achieving a carbon neutral gas system by 2050 in the region. It is highly recommended to adopt a systemic approach in energy network planning particularly for the transition era and phasing out of natural gas. At the same time, it is important that this strategy is developed at the regional level, taking into account but not limited to economy of scale considerations.

The intricate nature of energy-related matters underscores the necessity for a comprehensive approach. Energy issues should not be examined in isolation, solely from a technical standpoint; rather, they should be assessed within the broader context of their interconnections with various factors. This holistic viewpoint acknowledges the intricate interplay of these elements, often resulting in unforeseen consequences[[60]](#footnote-61). Within the context of this research, this perspective underscores the importance of adopting a systemic approach that considers the intricate relationships between renewable electricity and gases, electrification of energy demand, sustainability, energy system costs (affordability for households and competitive energy supply for businesses), and security of energy supply. Crafting policies that address these aspects collectively is imperative. Therefore, we advocate for the formulation of a Comprehensive Regional Strategy for Decarbonised Gas Development, as opposed to treating these elements separately. Such an approach ensures a more effective and coordinated response to the challenges at hand. More precisely, a detailed plan should:

* 1. Determine targets for biogas/biomethane production by 2050, and intermediate production milestones for 2030 and 2040, based on the annual biomass feedstock volumes available for energy purposes, taking into account the expected biomass use in other sectors (as feedstock for food,…). This strategy should seamlessly integrate into a larger national bioeconomy and energy policy framework, existing or being developed, emphasising a systemic approach to sustainability and streamlining practices. It must ensure the sustainable production and utilisation of biomass, provide clear guidance and public support for sustainable development where justified and necessary.
	2. Similarly, renewable hydrogen production mandates an appropriate planning of production assets and related transport infrastructure, particularly to address the need for dedicated renewable electricity generation capacity, primarily from wind energy farms, as outlined in this report. Consequently, a coherent regional strategy is imperative to establish the necessary deployment plans for the required wind energy plants, particularly in the Baltic Sea region.
	3. Additionally, a roadmap is required to designate preferred locations for biogas/biomethane and hydrogen production units, taking into account the availability of feedstock or electricity. This approach should allow to optimise the cost-efficiency of feedstock transportation (for biomethane) and electricity (for hydrogen), the socio-economic impacts of biomethane generation and electrolysers in rural and urban areas, and also, the transport of decarbonised gases to final consumers. Such a planning should align with other initiatives focusing on the existing gas network aiming to prevent it from becoming a stranded asset.
	4. Simultaneously, operators in the regional gas market should be enabled and incentivised where appropriate, to establish new biogas/biomethane and hydrogen production units or expand existing ones. This is especially important as sharp growth is aimed at biogas/biomethane production capacity within this study which entails significant investment in a short time span, reflected in the cost minimal scenario.
	5. Other actions proposed in this plan should be included, for example regarding harmonisation of energy and carbon taxation policies (covered in the action set 5 under section 3.5)

Such a regional integrated approach requires corresponding interstate collaboration platforms that facilitate cooperation between the countries. In order not to add to the complexity of structures, the Nordic/Baltic cooperation group within the ENTSO-G can be invoked to converge the national planning and facilitate communications to draft and help implement this regional development strategy.

1. **Adoption of an enabling legal framework to facilitate the transition to a decarbonised gas system:** Changes in the existing national gas regulatory frameworks of the Baltic countries must be considered to enable emerging hydrogen initiatives and facilitate further investments in biogas/biomethane facilities and their injection into the gas grid. As the recast Gas Directive and Regulation are expected to be formally approved in the coming months, EU Member States will need to align their national legislation with these new EU provisions[[61]](#footnote-62). While the Baltic regional gas market countries should capitalise on this opportunity to adapt their national gas systems' legal and regulatory frameworks, it seems a priori unrealistic to immediately impose for hydrogen infrastructure the same legal framework as currently applied for natural gas networks (in particular strict horizontal unbundling obligations)[[62]](#footnote-63). A viable solution could involve allowing natural gas TSOs (and DSOs where relevant) to contribute to a dedicated hydrogen network construction, and allowing them to own and operate both the methane and hydrogen networks. While vertical unbundling and TPA rules are necessary to ensure a proper market functioning, a complete horizontal unbundling between methane and hydrogen transport assets and activities should not be imposed, also taking into account the small scale of the concerned assets and activities in these countries. The implementation of the new EU gas package at the national level should hence be wisely planned in the Baltic region, and importantly, the concerned countries should ensure synchronised and consistent legal developments.
2. **Extending the mandate of the NRAs**: Expanding the scope of the NRAs to explicitly encompass the regulation of decarbonised and renewable gases is a critical and necessary step. Collaborative efforts among NRAs in the Baltic-Finland region are also vital to harmonise regulatory practices, facilitating cross-border trade in (decarbonised) gases and ancillary services’ procurement. This paves the way for mutually beneficial joint ventures in decarbonised gas technologies, particularly when considering the future use of the Underground Gas Storage (UGS) facilities in Latvia. Close cooperation between the concerned NRAs and with the TSOs (and gas storage operator) is indispensable in this context.

#### Assessment of implementation aspects

While the forthcoming investments associated with expanding biomethane and hydrogen production capacities in the upcoming years may prove notable, our focus in this report is primarily centred on establishing a governance framework, financial arrangements, and infrastructural requirements. As such, we anticipate that the associated costs will mainly pertain to administrative expenditures incurred by Energy ministries, NRAs and TSOs. These costs mainly encompass allocating dedicated personnel responsible for reviewing and adapting the relevant structures and processes, hence **costs are not expected to be high**.

The proposed measures are considered to be of **moderate complexity**. This is predominantly attributable to the uncertainties surrounding the overall gas market evolution and the detailed planning required to accomplish the objectives outlined in this section, encompassing local, national, and regional planning. Although regional collaboration and routine interactions between ministries, NRAs, and TSOs are already established, further enhancements are necessary to facilitate an optimised cost-benefit analysis and coordinated planning of network infrastructure projects. The **timeline for implementation of the action is** **medium-term.**

**Active engagement of stakeholders is considered of paramount importance** in the execution of these initiatives. Sectoral stakeholders, including infrastructure operators like DSOs, TSOs, and authorities like NRAs, are anticipated to provide crucial insights for regional planning exercises. Furthermore, seeking consultation with market participants regarding draft infrastructure development plans is also of utmost importance.

In line with the Cost Minimal scenario, the proposed actions should be set up in the short term, as large investments are expected to be realised by 2030. Nevertheless, continuous biomethane and hydrogen production capacity expansion remains imperative until 2050. This necessity arises because these actions predominantly centre on process enhancements, bolstering collaborative efforts, and entail relatively moderate complexities. Their relevance spans various decarbonisation scenarios, as regional planning for methane and hydrogen infrastructure holds pivotal significance for the development of required investment projects while concurrently contributing to the overall reduction in methane gas demand.

## Action set 2: Gas market design and integration

### Action 2a) Further integrate the Baltic Regional Gas Market and facilitate access for new actors

|  |  |
| --- | --- |
| **Criteria** |   |
| **Responsibility for implementation** | National Ministries and NRAs in concertation with TSOs |
| **Costs**  | Low |
| **Complexity** | Medium |
| **Stakeholder involvement** | High |
| **Implementation**  | Short to medium-term |
| Impacted gases |
| Biogas/biomethane | Hydrogen  | Synthetic natural gas |
| xxx |  | xxx |
| Relevance for decarbonisation scenarios |
| *REN-Methane* | *REN-Hydrogen* | *REN-Cost Minimal* |
| xxx | x | xxx |

#### Why is the action required?

Increased integration of energy markets, through common rules and cross-border infrastructure, is considered by the EU as the most cost-effective way to ensure secure, sustainable and affordable energy supplies to its citizens.[[63]](#footnote-64) Energy market integration provides substantial macro-economic benefits such as enhanced competition at supra-national level, improved competitiveness, higher security of supply and facilitated market integration of renewable energy production.[[64]](#footnote-65) The Agency for the Cooperation of Energy Regulators (ACER) presents market integration as a tool to also improve market liquidity, reduce market concentration and increase the number of supply sources.[[65]](#footnote-66)

Regional cooperation and market integration has become one of the genuine pillars of the European energy policy. The regional approach on energy issues has emerged as a bridge between the national level which holds key competences in this area, and the European level.

Article 6 of the proposed **Hydrogen and Decarbonised Gas Market Package (HDGMP)** aims to promote regional cooperation and integration. It states that EU Member States should cooperate in order to integrate their national hydrogen and methane gas markets at one or more regional levels and to create regional markets across the EU.[[66]](#footnote-67) In addition, Article 74 requires regulatory authorities to ensure regional cooperation on cross-border issues such as cross-border capacity allocation, network codes and rules governing the management of congestion.

The revised **TEN-E Regulation** (EU) 2022/869 that was approved by the co-legislators on 30 May 2022 and published in the Official Journal of the EU on 3 June 2022, aims to better support the modernization of the EU’s cross-border energy infrastructure. The TEN-E considers that regional cooperation is an effective tool to facilitate the implementation of Projects of Common Interest (PCI). As such, it includes the following provisions on regional cooperation and the development of cross-border energy infrastructure:

Article 3 of the TEN-E indicates that regional groups shall be established. These regional groups are defined in Annex I of the TEN-E. For hydrogen and electrolysers, Estonia, Latvia, Lithuania and Finland are part of the Baltic Energy Market Interconnection Plan (BEMIP) together with Denmark, Germany, Poland and Sweden.

Article 16 of the TEN-E defines the process for project promoters submitting an investment request to concerned NRAs, and for NRAs issuing a cross-border cost allocation decision.

#### Current status

##### Regional market integration in the Baltic-Finnish region

Historically, the Baltic states and Finland were completely isolated from the EU gas grids and were fully dependent on Russia and Belarus for their gas supplies.[[67]](#footnote-68) To reduce their gas supply risks and improve markets’ functioning, the four countries have been working actively towards the achievement of their gas markets’ integration in the past years. In 2016, the prime Ministers of Baltic countries and Finland signed a declaration to create a single regional natural gas market.[[68]](#footnote-69) This declaration aimed to establish common market rules in the region. The first milestone for the integration process of the Regional Gas Market Coordination Group (RGMCG) was the implementation of the implicit capacity allocation of the interconnection capacity between Latvia-Lithuania and Estonia-Latvia in 2017. This allowed cross-border gas trade, while minimising the administrative burden of third party access (TPA) and balancing agreements between TSOs.[[69]](#footnote-70) In 2018, a tariff model and an inter-TSO compensation (ITC) mechanism was designed for the common Baltic-Finnish market, which aimed to further integrate the market.

The NRAs of Finland, Estonia and Latvia[[70]](#footnote-71) then decided to strengthen their cooperation by creating the FinEstLat system, a single entry tariff zone. Lithuania decided to discontinue its participation in the entry-exit zone as it did not agree with the proposed market design.[[71]](#footnote-72) The FinEstLat system became operational in 2020. The merger of these three markets meant the removal of internal transmission tariffs and the setting of entry tariffs in the region at the same level, by applying the ITC mechanism.[[72]](#footnote-73) At the same time as the elaboration of the regional tariff zone, Estonia and Latvia formed a unified balancing area.[[73]](#footnote-74) Finland remained a separated balancing area.

Further gas market integration by merging the FinEstLat system with the Lithuanian gas market was planned for October 2023, with the elaboration of a single entry tariff. However, the Russian invasion of Ukraine in 2022 had an important impact on the regional gas market. As the ITC mechanism was originally developed based on assumptions about the market functioning, the NRAs considered that it would no longer correspond to the current situation and potentially not benefit the four countries involved.[[74]](#footnote-75) The gas market merger was therefore postponed to October 2024. The merger is coordinated by RCMCG which is composed of the four parties’ NRAs, Ministries and TSOs/infrastructure operators. The coordination group has created a roadmap for market development, which has been approved by all parties.

Following the gas market integration of Finland and the Baltic states, the European Energy Exchange (EEX) has in May 2023 acquired 66% of the shares in the regional gas exchange GET Baltic (operating in the four countries) from the Lithuanian gas TSO (Amber Grid).[[75]](#footnote-76) As a result, GET Baltic has become part of the EEX Group and Amber grid holds the remaining share (34%). The main objective of this acquisition is to strengthen the markets of GET Baltic and foster integration into the pan-European gas trading markets. GET Baltic is a significant market player in the region. In 2022, it had a market share of 17% of total gas consumed in the Baltic and Finnish markets traded on its systems (compared to 12% in 2021). In the same year, a volume of 7 TWh of natural gas was traded on the GET Baltic exchange.[[76]](#footnote-77)

The Baltic states and Finland also cooperate with their neighbouring countries within the BEMIP High-Level Group. The objective of BEMIP is to achieve an open and integrated regional electricity and gas market between Member States located in the region of the Baltic Sea.[[77]](#footnote-78) As part of the BEMIP, several (ongoing) gas infrastructure projects have contributed (or will contribute) to improving the resilience of the gas grid in this region by ensuring market integration and decreasing dependence on Russian gas:

The **Balticconnector** (connecting Estonia and Finland), which was the first gas link ending the isolation of Finland in 2020. It has highly contributed to the regional market integration with the Baltic states;[[78]](#footnote-79)

The enhancement of the existing **Latvia-Lithuania gas interconnector** (‘ELLI’ project) which is expected to be commissioned in 2024/2025. It is a key element to complete the Baltic-Finnish regional gas market;[[79]](#footnote-80)

The **gas interconnection between Poland and Lithuania** (GIPL) which became operational in 2022;[[80]](#footnote-81)

Other gas infrastructure such as the **Klaipeda LNG Terminal**, the **Świnoujście LNG Terminal (Poland)** and the upgrade of the **Inčulkalns UGS in Latvia**.

##### Competition and market liquidity in the Baltic-Finnish gas markets

As mentioned above, the integration of gas markets should allow to increase competition and market liquidity as well as facilitate the access for new actors thanks to lower barriers to entry/exit. As the Baltic-Finnish gas markets have become more integrated, competition in the gas markets has improved. However, further efforts are necessary to have a more competitive market by having a higher number of market parties.[[81]](#footnote-82)

In Estonia, there are only six companies active in the wholesale market. In 2021, the incumbent (Eesti Gaas) had still a market share of 56% versus 74% in 2017, which shows an improvement in the competition situation. The two smallest suppliers had a combined market share below 2% in 2021.[[82]](#footnote-83)

In Lithuania, there were 14 active wholesale market participants in 2021, compared to 8 in 2017.[[83]](#footnote-84) The market share of the three largest wholesalers has however increased from 22% in 2017 to 32% in 2021.

The Finnish gas market was isolated until 2019 with a pipeline connection only to its supplying country (Russia). There was only one gas wholesale supplier until the market opened up in 2020 when 34 suppliers became active. In 2021, there were 39 active wholesale companies. Despite the entry of new market actors, the market is however still concentrated as the three largest shippers had a market share of 76% in 2021.[[84]](#footnote-85)

The ACER/CEER annual report on the results of monitoring the internal electricity and natural gas markets in 2021[[85]](#footnote-86) indicates that stakeholders active in the Baltic-Finnish gas market perceive the GET Baltic hub liquidity as very limited beyond the short-term horizon. They recognise that the exchange is increasingly used as price reference to link the prices of selected supply contracts in the region, but it is still mainly a spot physical trading venue. In addition, the opportunities to hedge forward prices and do financial trade are still considered to be very narrow.

#### Description of the proposed action

Although the Baltic states and Finland have already made significant efforts in the integration of their gas market, three initiatives are key for further integration:

The inclusion of Lithuania in the single tariff area, already in place for Estonia, Latvia and Finland;

* The expansion of the Estonia-Latvia balancing area to Lithuania and Finland;
* The finalisation of the ELLI project, which should facilitate the two above initiatives.

It is recommended that the four countries **encourage the finalisation of these projects and in particular, make further efforts to create a genuine single entry-exit model to completely merge the Baltic-Finnish gas markets**. This would bring tangible security and commercial benefits.[[86]](#footnote-87) To do so, Lithuania and the FinEstLat system must agree on the adequate market design which ensures fair and balanced economic gains to all concerned countries.

In addition, the gas markets need to become more competitive and allow for a larger number of suppliers to be active. Therefore, the governments of the four countries should **facilitate access for new/small market participants and continue progress towards opening and diversifying their gas markets**. In this context, the four countries should implement measures which allow to further increase wholesale gas market liquidity and improve its functioning. The liquidity of the market can be enhanced by:

Ensuring the availability of longer-term products. This supports the hedging[[87]](#footnote-88) of risk of exposure to large changes in prices.

* Supporting robust reference prices (i.e. prices reflecting the product’s real market value based on underlying economic conditions) that are widely available to market participants.
* Promoting effective short-term markets which enable all suppliers (and large industrial end-users) to buy the gas they need to cover their short-term requirements.

To meet these objectives, the countries could oblige major natural gas importers/traders to trade a proportion of their imports via the forward and day-ahead market.

The proposed measures should contribute significantly to the mitigation of Risk 6 ‘Infrastructure cannot be adequately or timely developed, including repurposing or adaptation of natural gas infrastructure’, Risk 7 ‘Security of gas supply can be threatened due to adequacy/flexibility issues of the regional energy system’ and Risk 8 ‘Security of gas supply can be threatened due to external energy dependence’ identified in Deliverable 5 of this study.

#### Assessment of implementation aspects

The market integration process could be costly, especially when it requires to develop additional infrastructure. In the Baltic-Finnish regional gas market, most of the infrastructure has already been developed (apart from the ongoing ELLI project) which means the cost of further integration will be limited to regulatory and organisational aspects. The implementation of measures to increase competition and market liquidity should be not be very costly either. We hence consider the **cost level** of this measure as relatively **low**.

The complexity of further market integration lies in the development of market rules that fit the four countries. Measures aimed to improve the liquidity of the gas markets will also need to be harmonised across the four countries. This can require “difficult” negotiations, and hence we consider the **complexity** to be **medium**. Stakeholders, in particular TSOs and market parties, are expected to be highly involved in this process.

As many initiatives to finalise market integration are already ongoing, the timing of implementation is expected to be **short- to medium-term**. Finally, these measures would **impact mainly the scenarios most reliant on biogas/biomethane, that is the REN-Methane and the Cost Minimal scenarios.**

### Action 2b) Review energy certification system (including biogas and off-grid gas and extension to low-carbon fuels)

|  |  |
| --- | --- |
| **Criteria** |   |
| **Responsibility for implementation** | National Ministries in concertation with NRAs and TSOs |
| **Costs**  | Low |
| **Complexity** | Low |
| **Stakeholder involvement** | Medium |
| **Implementation**  | Short-term |
| Impacted gases |
| Biogas/biomethane | Hydrogen  | Synthetic natural gas |
| xxx | xxx | xxx |
| Relevance for decarbonisation scenarios |
| *REN-Methane* | *REN-Hydrogen* | *REN-Cost Minimal* |
| xxx | xxx | xxx |

#### Why is the action required?

Renewable and low-carbon gases (such as biogas, biomethane and hydrogen) play a key role in the energy transition and the achievement of the EU climate and energy objectives. In particular, the injection of renewable and low-carbon gases into natural gas networks is a key driver of the decarbonisation of the gas sector. In order to establish a market for these gases, a commercial recognition of renewable and low-carbon gases through the establishment of a legal definition and a certification framework is important.[[88]](#footnote-89) In addition, the establishment of pan European certification schemes or Guarantees of Origin (GOs) is crucial to ensure cross-border scale up and tradability of these gases.[[89]](#footnote-90)

###### Certification of renewable and low-carbon hydrogen

Embedded GHG emissions between different hydrogen types (renewable, low-carbon, grey) differ significantly. Due to the specific chemical properties of hydrogen, there are generally no GHG emissions at the point of end-use. However, embedded upstream GHG emissions can differ significantly depending on the production process (e.g. electrolysis, Steam Methane Reforming with or without Carbon Capture & Storage/Utilisation).

Especially for hydrogen produced via electrolysis, the specific mix of the electricity used affects significantly its GHG emissions over the entire supply chain. If electricity with a high carbon footprint is used, the induced GHG emissions by electrolysis can even be higher than with the current dominant technology of steam-methane reforming of natural gas without carbon capture. Knowing the embedded, or induced GHG emissions of hydrogen is hence key towards the ultimate goal of reducing GHG emissions.

However, due to information asymmetry within the supply chain, end-users of hydrogen can currently not reliably assess the embedded GHG emissions of supplied hydrogen. Incentives to stimulate hydrogen demand might hence be counter-productive towards the goal of GHG emission reduction, in particular if the origin and thus embedded emissions of hydrogen are unknown to the end-users.

Also, authorities do not have a standard yet to underpin support for production and/or use of hydrogen with a low-carbon footprint. A harmonised certification scheme implemented at global or EU level (or at least in the Member States that are part of the same supra-national (regional) market) could also facilitate cross-border trading, and be used as a basis to evaluate and compare different potential import sources.

In conclusion, a certification system could provide transparency regarding the embedded GHG emissions of hydrogen, and be used as a basis to incentivise the production and/or use of hydrogen with a low GHG footprint. Though, at time of writing, the issue of hydrogen certification is still under design and discussion at EU level.

###### Certification of biogas and biomethane

In the EU, biogas is included in the GOs framework. There are different schemes for certification: GOs that can be transferred across borders as well as national registries for consumption.[[90]](#footnote-91)

When injecting biomethane in the natural gas network, renewable gas and natural gas are mixed together in a common gas network and become indistinguishable. Therefore, biomethane certificates or GOs are useful to assign renewable attributes to biomethane, allowing suppliers/customers to ensure their gas supply/consumption is sustainably produced. In addition, certification provides biomethane producers a way of obtaining an extra income to support their operations. Indicative prices of biomethane certificates based on Greenfact’s database and market sources (late-2021) range in general from 2 to 60 €/MWh.[[91]](#footnote-92)

#### Current status

##### Developments at EU level

The EU has taken steps towards reducing information asymmetry by introducing principles for the certification and standardization of renewable and low-carbon gases.

Renewable Energy Directive

Since 2018, Article 19 of the **Renewable Energy Directive (RED II)** has extended the scope of GOs[[92]](#footnote-93) to also cover renewable gas (including hydrogen).[[93]](#footnote-94) The article aims to provide a reliable proof of the origin of renewable gas to final energy consumers, as well as to facilitate cross-border trade for renewable gases. Further, RED II requires EU Member States to establish appropriate trustworthy systems to handle GOs and facilitate transactions and to designate national bodies to operate and impose regulations on the GO system. Articles 29 and 30 of RED II provide a framework for assessing sustainability and GHG emissions savings criteria for biofuels, bioliquids and biomass fuels (which include biogas and biomethane).

Proposal for a Hydrogen and Decarbonised Methane Gas Package

The proposed Directive of the HDGMP introduces definitions of renewable gas and low-carbon hydrogen, gas and fuels. Renewable gas refers to biogas as defined by Article 2 of RED II, including biomethane and renewable gaseous fuel parts of fuels of non-biological origin. Low-carbon hydrogen, gas and fuels are all defined by the same GHG emissions reduction threshold, i.e.:

* ‘Low-carbon hydrogen’ means hydrogen the energy content of which is derived from non-renewable sources, **which meets a GHG emission reduction threshold of 70%**;
* ‘Low-carbon gas’ means the part of gaseous fuels in recycled carbon fuels as defined in Article 2 of RED II, low-carbon hydrogen and synthetic gaseous fuels the energy content of which is derived from low-carbon hydrogen, **which meets the GHG emission reduction threshold of 70%**;
* Low-carbon fuels means recycled carbon fuels as defined in Article 2 of RED II, low-carbon hydrogen and synthetic gaseous and liquid fuels the energy content of which is derived from low-carbon hydrogen, **which meet the GHG emission reduction threshold of 70%.**

The methodology for assessing the GHG emissions reduction threshold is not provided in the current directive proposal. However, Article 8 states that the EC shall adopt delegated acts by December 2024, which specify the methodology for assessing GHG emissions savings from low carbon fuels. Article 8 of the proposed HDGMP directive also refers to Articles 29 and 30 of RED II for certifying and verifying renewable gases (i.e. biogas, biomethane and renewable gaseous fuel parts of fuels of non-biological origins). The GHG emissions reduction threshold for biogas are set by these two Articles to:

* At least 50% for biogas consumed in the transport sector for installations starting operations until 2015;
* At least 60% for biogas consumed in the transport sector for installations starting operations between 2015 and 2020;
* At least 65% for biogas consumed in the transport sector for installations starting operations from 2021 onwards;
* At least 70% for electricity, heating and cooling production from biogas for installations starting operations between 2021 and 2025 and at least 80% for installations starting operations from 2026 onwards.

Taxonomy for Sustainable Investments

Further, on the European level, the taxonomy for sustainable investments defines whether investments in energy assets can be considered to be sustainable. No explicit distinction between renewable and low- carbon energy has been made in the context of the sustainable investment eligibility criteria. To be considered as sustainable investments, the GHG emissions from hydrogen production cannot exceed 3 tons of CO2-eq per ton of hydrogen on a life-cycle basis. For hydrogen-based fuels, a similar approach to biofuels under RED II applies. Investments in power generation plants using non-fossil hydrogen are deemed sustainable if the electricity output does not exceed the threshold of 100 g of CO2-eq per kWh over their lifetime.

Self-regulatory certification systems

Besides existing and proposed EU legislation related to the definitions of renewable and low-carbon hydrogen, gas and fuels, market-based initiatives for certification have also emerged. Renewable gas certificates are in several EU Member States traded domestically and internationally. There is a growing interest in cross-border trade, particularly in the voluntary market. However, the pan-European cross border trade is still limited.

One main certification scheme gaining track for hydrogen is CertifHy, which focuses on both renewable and low-carbon hydrogen. To be eligible as renewable hydrogen, the produced hydrogen should originate from renewable energy sources as defined in Article 2 of REDII, and should have a GHG balance below a defined threshold, which is at least 60% lower than hydrogen produced through steam-methane reforming of natural gas, that currently has a benchmark GHG footprint of 91 g CO2eq/MJ. Low-carbon hydrogen comprises renewable hydrogen as well as hydrogen originating from non-renewable sources, such as nuclear power or fossil energy using carbon capture and storage, and potentially carbon capture and utilization. Its greenhouse gas balance needs to be below the same threshold as the one defined for renewable hydrogen[[94]](#footnote-95).

##### Developments in the Baltic RGMCG

National renewable and low-carbon gas registries have been set up in several countries across the EU, including all four Baltic-Finnish Member States:

The Estonian biomethane registry is administered by the TSOs (Elering). It is currently a national system; imports or exports of gas GOs are not yet possible.[[95]](#footnote-96) Moreover, the process for biogas and biomethane producers is alleged to be complex and time consuming.[[96]](#footnote-97)

* In Lithuania, the TSO (Amber Grid) is administering the national register of GOs of gas produced from renewable energy sources since 2019.[[97]](#footnote-98) In other words, Amber Grid is responsible for issuing, transferring and cancelling GOs, and supervising and controlling the use of GOs as well as provides the recognition of imported GOs. The Lithuanian system allows for a certain degree of cross-border trading as GOs issued by other Member States can also be recognised in Lithuania.[[98]](#footnote-99)
* The Finnish GOs registry for gas and hydrogen is administered by the TSO (GasGrid) since 2022. GOs are only required if the energy is sold or marketed as renewable. The transfer of GOs between EU countries is possible.[[99]](#footnote-100)
* Since 2023, the Latvian TSO (Conexus) has become the administrator of gas GOs.[[100]](#footnote-101)

The Baltic-Finnish Green Gas Coordination Group is working on developing rules and solutions for achieving regional cross-border transfer of gas guarantees of origin GOs in the short term.[[101]](#footnote-102) In addition, the Estonian and Lithuania TSOs are participating in the REGATRACE (Renewable Gas Trade Centre in Europe) project which is aimed at harmonising solutions for gas GOs at EU level.[[102]](#footnote-103)

#### Description of the proposed action

The certification of renewable and low-carbon hydrogen allows for the commercial recognition and the creation of a market for these gases, and to facilitate cross-border trade. For this reason, we recommend that the four countries **work towards the harmonisation of their energy certification schemes**. This framework should include biogas and off-grid gases and also be extended to include low-carbon fuels. The countries should also **anticipate the adoption of the HDGMP Directive and the publication by the EC of delegated acts** on the methodology for assessing the GHG emissions reduction threshold, and **start developing an appropriate methodology for assessing GHG emissions savings from low carbon fuels** (incl. low-carbon hydrogen).

#### Assessment of implementation aspects

As renewable and low-carbon gas registries are already in place in the four countries, the cost and complexity of reviewing and harmonising the certification framework should be relatively **low**. It should be done in consultation with stakeholders (market operators, TSOs, DSOs and NRAs). Therefore, we rate the involvement of stakeholders to be at least **medium**.

This action could be implemented in the **short-term** in order to stimulate the creation of the regional gas market and foster cross-border trade (including with other EU Member States). All scenarios and all gases should be impacted in the same way by the review of energy certification schemes.

### Action 2c) Consider measures to develop a liquid hydrogen/derivatives market in the long-term

|  |  |
| --- | --- |
| **Criteria** |   |
| **Responsibility for implementation** | National Ministries in concertation with NRAs |
| **Costs**  | Low |
| **Complexity** | Medium |
| **Stakeholder involvement** | Medium |
| **Implementation**  | Medium- to long-term |
| Impacted gases |
| Biogas/biomethane | Hydrogen  | Synthetic natural gas |
|  | xxx |  |
| Relevance for decarbonisation scenarios |
| *REN-Methane* | *REN-Hydrogen* | *REN-Cost Minimal* |
| x | xxx | x |

#### Why is the action required?

As indicated in the Action 2a) description, the development and integration of energy markets brings significant competition, security of supply and decarbonisation objectives, and is been a key pillar of EU energy policy. This should also apply to the future hydrogen/derivatives market. Action 2a) also summarises the revised **TEN-E Regulation** (EU) 2022/869 and proposed **Hydrogen and Decarbonised Gas Market Package (HDGMP)** provisions to promoting regional cooperation and integration on infrastructures and markets.

But contrary to the case for methane gases, global and regional renewable and low-carbon hydrogen and derivative markets will have to be built from scratch. Some interlinkages will exist between methane gases and hydrogen markets. For meeting energy policies such as renewable targets, such (renewable and low-carbon) gases may be interchangeable, as well as for some industrial processes. However, for many applications methane and hydrogen gases will not be interchangeable. Hence the existence of liquid methane markets will not help hydrogen producers and consumers much, and does not dispense with the need for a liquid hydrogen market in the long-term.

Hydrogen and derivative production and infrastructure projects as well as investments for adaptation of industrial processes or development of refuelling infrastructure will require some certainty regarding the demand and prices for the services provided. Hydrogen sale agreements (HSA) with a duration of several years will be the main channel to de-risk investments in hydrogen supply and demand, potentially even when liquid short-term markets are established. To a large extent, authorities of the BRGM can play a role in providing this certainty and helping the bankability of projects through among other support schemes for supply and demand, which are discussed in the action 3b). However, a liquid hydrogen/derivatives market should also contribute to providing this certainty, both through long- and short-term markets. Long-term markets with a duration of one or a few years such as over-the-counter trades of a few years should complement HSAs, while shorter-term markets will allow players to adjust their positions, including to meet balancing responsibilities and meet system needs.

Hence, hydrogen markets 1) reduce risks for investors across the hydrogen supply chain; 2) allow market participants to adjust their positions according to electricity and other price forecasts, renewable energy availability and other uncertainties; 3) reduce the cost of procurement for hydrogen system services; 4) provide signals to participants to provide flexibility to the broader energy system.

#### Current status

Markets for grey hydrogen exist in some regions such as North-western Europe, but liquid markets for any kind of hydrogen or most derivatives do not exist in the Baltic states, renewable or otherwise. Global grey ammonia trade is established currently, with ammonia export ports in place in Estonia and Latvia, as well as an import port in Finland.[[103]](#footnote-104) While these terminals could readily be used for renewable ammonia trade, this does not seem to be the case yet. Fossil-based methanol trade also takes place in the region.[[104]](#footnote-105)

In the 2020 Hydrogen Strategy, the Commission committed itself to developing a benchmark for hydrogen transaction prices. Private parties have developed hydrogen price benchmarks since, for example EEX (which owns the GET Baltic exchange) with it’s Hydrix benchmark,[[105]](#footnote-106) currently available for Germany

Moreover, some projects are on-going which could lead to the integration of the future hydrogen markets and increase the hydrogen and broader energy system flexibility:

* The Clean Hydrogen Partnership has in January 2023 selected 9 Hydrogen Valley projects following its first call for proposals in 2022. The total funding requested for these 9 Hydrogen Valleys amounts to €105.4 million. The Partnership has started the grant preparations for 2 flagship Hydrogen Valleys (projects of a scale significantly larger to what has been supported to date – i.e., producing at least 5,000 tonnes hydrogen / year, with interlinkages to other places of hydrogen production and/or consumptions outside project boundaries). The hydrogen corridor across the Baltic Sea countries, including Estonia and South Finland, is one of the 2 selected flagship projects.[[106]](#footnote-107)
* In December 2022, the TSOs from six EU countries (including the Baltic states and Finland) have signed a cooperation agreement on a cross border-backbone pipeline, **Nordic-Baltic Hydrogen Corridor**, to transport hydrogen from Finland through Estonia, Latvia, Lithuania and Poland to Germany. This project should strengthen the region’s energy supply security, reduce its dependency of imported fossil energy and play a prominent role in decarbonising energy-intensive industries along the corridor by replacing fossil-based production and consumption by renewable hydrogen.[[107]](#footnote-108) The companies seek to develop a network of 1,000 km of dedicated hydrogen pipelines that would transport hydrogen from producers to end-users to ensure they have access to an open, reliable, and safe hydrogen market. The pipelines would serve 65 TWh of identified potential hydrogen demand in the Bothnian Bay region by 2050. The core route will be along the coastline, with a branch to Kiruna, Sweden. The Nordic Hydrogen Route investment is estimated at EUR 3.5 billion, offering a hydrogen transportation cost of EUR 0.1-0.2 per kg. It would enable ten-fold investments of around EUR 37 billion in wind power and electrolysis.[[108]](#footnote-109)
* An ambitious project **BalticSeaH2** has been launched in June 2023 with the Finnish CLIC Innovation and Gasgrid Finland as project coordinators, and will last for 5 years. The consortium includes 40 partners from 9 Baltic Sea region countries (including Finland, Estonia, Latvia, and Lithuania) and aims to build a major integrated cross-border hydrogen valley between southern Finland and Estonia. Gasgrid Finland is preparing hydrogen transport infrastructure (Nordic-Baltic Hydrogen Corridor, [Baltic Sea Hydrogen Collector](https://www.offshore-energy.biz/nordic-gas-tsos-offshore-wind-developers-plan-giant-green-hydrogen-infrastructure-project-in-baltic-sea/) and [Nordic Hydrogen Route](https://gasgrid.fi/en/projects/nordic-hydrogen-route-en/)) to enable the development of the hydrogen economy and hydrogen markets in the Baltic Sea region. The [BalticSeaH2 project](https://www.offshore-energy.biz/balticseah2-project-moves-forward/) enables 25 demonstration and investment cases to showcase the different sectors of the hydrogen economy, adding up to over €4 billion in total investments. The production potential will reach 100,000 tonnes of hydrogen annually by the end of the project. The hydrogen and its derivatives can be utilised by different industries brought together by the project. The total volume of the project is €33 million euro, with €25 million funding from the EU.[[109]](#footnote-110)
* The Latvian TSO is studying the possibility of hydrogen seasonal storage in the Inčukalns underground gas storage. Both a mix of hydrogen and methane gases as well as dedicated hydrogen storage are being considered, with a storage capacity of 10 000 GWh and a potential commissioning date of 2040.[[110]](#footnote-111)

Measures such as on the certification of renewable and low-carbon gases, development of support mechanisms or other provisions to foster supply and demand (such as consumption obligations) and research & development are being considered by the RBGM Member States as discussed in other sections. However, the Baltic states and Finland have so far not considered in detail other measures for the development of a liquid national or regional hydrogen market.

#### Description of the proposed action

The measures proposed in the present action complement the ones covered in the other action sets. As covered in other sections, the authorities of the BRGM should take up actions in order to:

* Develop the appropriate governance system and strategies for decarbonisation of the gas system, including through development of the hydrogen sector (action set 1)
* Review the energy certification system for renewable and low-carbon gases (action 2b)
* Provide appropriate economic support and requirements for renewable (and possibly low-carbon) hydrogen, including through achieving a level playing field regarding energy and carbon taxation (action sets 3 and 5)
* Improve planning of hydrogen infrastructures as well as their operation through appropriate quality standards (action set 4)

The development of liquid hydrogen markets is a challenging task, given that it depends on achieving a sufficient level of supply and demand making up a number of transactions between multiple participants, thus depending on market players being interested to participate in the market in the first place. The actions the BRGM authorities could take could be categorised as follows:

* Developing local hydrogen markets
* Integrating national and regional markets
* Enabling hydrogen and derivative imports

##### Developing local hydrogen markets

Hydrogen valleys are excellently placed to start the development of hydrogen markets in the BRGM. As all decarbonisation scenarios of the present study consider that hydrogen valleys would develop to some extent, the measures taken up by the regional governments in this sub-section could be beneficial no matter the degree of actual development of the hydrogen sector.

**The BRGM authorities can work with the Commission, market operators and market parties to further develop public and privately-developed hydrogen price benchmarks.** The authorities can ensure the publication of a BRGM hydrogen price benchmark, by developing one themselves, contracting one, or working with the Commission for the future EU hydrogen price benchmark to provide dedicated information for the BRGM.

The Commission or the BRGM authorities could more easily gather data from market participants given confidentiality considerations. But in any case the publication of such benchmark would only be possible once a sufficient volume of transactions would ensure the confidentiality of individual trades. In this regard, publication of the benchmark at the regional level could be a facilitator.

Authorities could also work in parallel with publishers of existing hydrogen price benchmarks to incentivise the extension of these to the BRGM. However, current benchmarks are more focused on countries such as the Netherlands and Germany, and one could expect the publishers to extend the benchmarks to the BRGM once there is sufficient market demand for it. Thus, a government-led (Commission of BRGM Member States) benchmark seems more likely.

**The Member States could facilitate the balancing of supply and demand in the future hydrogen systems, in isolated hydrogen valleys but also subsequently at the national and regional levels in case an interconnected hydrogen backbone is developed.**

Individual hydrogen producers and consumers in hydrogen clusters (i.e. geographically confined networks) will find it challenging to balance their positions. Domestic renewable hydrogen supply will be variable, particularly that which will have to fulfil the geographical and temporal requirements of the recently adopted EU delegated acts following the transition period. While hydrogen demand in the industrial sector may be more stable, both supply and demand will still be subject to variability. Isolated hydrogen clusters will also likely not have access to underground hydrogen storage capabilities, having to rely on surface storage and other flexibility means for balancing purposes.

Hence, given the low initial market liquidity in hydrogen clusters, market participants will have limited options for contracting flexibility from the market initially. Authorities could implement measures to address this issue. This can include the requirement that hydrogen network operators bear a greater balancing role for isolated and interconnected hydrogen systems, defining tolerance limits for deviations of suppliers and producers from their schedules. Hydrogel network operators could also be required to procure the balancing services in a market-based manner and gradually through a centralised short-term platform, further contributing to the development of a liquid hydrogen market.

##### Integrating national and regional markets

In case a hydrogen backbone is developed in the region interconnecting the different hydrogen clusters and projects (also with the rest of the European hydrogen system), the BRGM Member States should work towards developing the associated hydrogen markets. **BRGM authorities could develop a hydrogen target model** **to ensure no undue barriers to market integration are found later on. For this authorities could conduct or procure an analysis on the minimum rules for harmonisation through the hydrogen target model.**

A hydrogen target model will enable the specification of aspects such as:

* + **Role of network and market operators** beyond the principles to be set in the upcoming EU regulatory framework for hydrogen and decarbonised gases, such as for example a legal mandate to a single network and a single market operator (nationally or regionally) if warranted;
	+ **Product definitions for organised wholesale and balancing markets** to facilitate the national and regional integration of the different organised platforms, including for example duration and product size;
	+ **Use of a single entry-exit and balancing zone model,** facilitating trade particularly for Estonia and Latvia who will depend on Finland and Lithuania for access to the European gaseous hydrogen market;
	+ **Balancing responsibilities for hydrogen network operators and market participants**, building on the principles indicated above.

##### Enabling hydrogen and derivative imports

The scenarios considered in Deliverable 3[[111]](#footnote-112) assume that hydrogen and derivatives demand in the BRGM will be met through domestic wind-based hydrogen production. However, as noted in Deliverable 5[[112]](#footnote-113), the availability of renewable electricity for the production of renewable gases is a risk that should be considered. Enabling hydrogen and derivative imports could thus not only increase the supply and competition in the region’s hydrogen markets, but also increase security of supply, providing an alternative to domestic production.

Imports could take place through pipelines as gaseous hydrogen or as derivatives through terminals. In the case of pipeline imports, these could serve end-users connected to the hydrogen backbone but also potentially serve other end-users if distribution is made through other means such as trucks. Derivative imports would most likely serve industries located in port areas, due to the more reduced demand for these derivatives in specialist industries or due to safety restrictions limiting transport (as in the case of ammonia), except if the derivatives are re-converted to gaseous hydrogen.

**BRGM authorities could enable hydrogen and derivative imports by further assessing the potential for hydrogen imports and domestic production, and providing guidance within the NECPs, Long-Term Strategies and other policy documents**. This would clarify the role of imports to complement domestic production, updating existing policy documents which often do not cover the topic. The guidance would also address the role of the different hydrogen forms (gaseous, liquid/compressed, derivatives) in decarbonising the regional systems.

BRGM authorities should also participate at the EU Energy Platform for future joint purchasing of hydrogen and derivatives at the European level. While currently focusing on joint natural gas purchases, the Commission has announced the intention to expand the initiative for the joint procurement of hydrogen. While hydrogen suppliers and consumers are ultimately responsible for closing the deals facilitated through the platform, Member States still have an important role in helping national players in participating in the mechanism. BRGM Member States could actively participate in the EU Energy Platform, including by using the analysis of potential hydrogen imports recommended above.

#### Assessment of implementation aspects

As for methane gases, the cost of some of the pre-requisite measures for development of an integrated hydrogen market will be high, such as for developing the hydrogen backbone or providing the economic support to improve the business case of supply- and demand-side projects. Nonetheless, most of the measures proposed are regulatory in nature, requiring that the BRGM Member States finance the necessary studies. The costs for the measures such as for setting up organized markets or balancing the hydrogen system will be higher, but should be recovered from the market participants. Hence, **the cost of this measure is assessed as low.**

The definition of a Hydrogen Target Model will be feasible, as many aspects should be set at the European level, and others can build on the extensive experience of gas and electricity markets. However, actual implementation of the model will be very complex, and require the participation of various stakeholders. As such, **the complexity of this action is assessed as medium.**

Some hydrogen projects in the region are already in development as indicated. However, the measures indicated here are not seen as critical to those projects in the short-term (in contrast to other actions in this plan such as the review of the energy certification system described in action 2b). Moreover, many measures can only be adopted once a fledgling renewable hydrogen sector appears, while others are relevant only if a regional hydrogen backbone develops. Hence, **the timing of implementation is expected to be medium- to long-term.**

**This action should impact particularly the REN-Hydrogen scenario**, which is the only one where a hydrogen backbone is expected. Nonetheless, as indicated the measures for developing a liquid hydrogen market are relevant for all decarbonisation scenarios.

## Action set 3: Support and requirements for renewable and low-carbon gas production and/or consumption

### Action 3a) Review/introduce coordinated production and/or consumption support measures to foster methane-based gases

|  |  |
| --- | --- |
| **Criteria** |   |
| **Responsibility for implementation** | National Ministries |
| **Costs**  | High |
| **Complexity** | High |
| **Stakeholder involvement** | High |
| **Implementation**  | Short- to medium-term |
| Impacted gases |
| Biogas/biomethane | Hydrogen  | Synthetic natural gas |
| xxx | x | x |
| Relevance for decarbonisation scenarios |
| *REN-Methane* | *REN-Hydrogen* | *REN-Cost Minimal* |
| xxx | x | xxx |

#### Why is the action required?

Notwithstanding the increased prices for natural gas and for GHG emission allowances (under the EU ETS), biogas/biomethane investments may still require further targeted (temporary) incentives with clearly defined ‘sunset clauses’ to accelerate their market uptake. While natural gas prices are high in historical terms, they have come down since the peaks observed in 2022 and uncertainty still remains regarding long-term price developments. As investors need to recover their investments in a number of years, the uncertainty around long-term prices may still represent a barrier to development of biogas/biomethane

Furthermore, certain routes for the production of methane gases have higher levelized cost of energy, and may be unprofitable under current gas prices even if they are identified as necessary to decarbonise the BRGM gas system in the long-run. Thus, considerations of dynamic efficiency may warrant incentives for the production of methane gases if cost reductions are expected for those routes. The modelling conducted under Deliverable 3 of this project deployed for specific scenarios and countries synthetic natural gas (SNG) capacity due to constraints on the production and consumption other gases such as biogas/biomethane and hydrogen. While due to its high costs SNG may not actually be deployed in the BRGM region in a significant scale, this highlights that constraints regarding e.g. the potential for some renewable energy inputs (a relevant risk identified in Deliverable 5) may require more expensive routes to be employed also.

Sustainable biomass potentials are also not the same for all countries of the BRGM, as highlighted in Deliverable 2. Therefore, from an economic efficiency standpoint, there is an argument for the BRGM cooperating in exploiting the lowest cost potential biogas/biomethane sources, particularly given the on-going integration of the Baltic Regional Gas Market – even if the total combined sustainable biomass potential is not sufficient to fully decarbonised the regional gas system (depending on actual gas consumption reduction from current levels).

Moreover, all decarbonisation scenarios of Deliverable 3 of the present project foresee a more significant exploitation of the biogas/biomethane potential in the region, and the REN-Biomethane scenario foresee the gases to bear most of the responsibility for decarbonising the regional gas system. In this regard, public support for renewable methane gases could lead to distortions in the regional gas market in the absence of coordination between Member States on the matter.

The framework for renewable methane gases at the EU level is undergoing important changes. The EU has adopted as part of the REPowerEU Plan a new target of 35 bcm annual biomethane production by 2030, as well as associated actions to reach them[[113]](#footnote-114), including a measure to “promote sustainable biogas and biomethane co-operation with neighbouring and enlargement countries”. The action details indicate that existing national promotion schemes electricity production from biogas should be reviewed in order to potentially incentivise the conversion of such plants to biomethane production as well as new biomethane investments..

#### Current status

The BRGM Member States have in the past mainly focused on the development of biomethane use in the transport sector (as was the case of Finland and Estonia) or biogas for electricity production, or did not have a strategy for developing the production and consumption of biogas/biomethane. Since then a number of support measures have been phased out, while for some of the region’s countries new measures are planned, as detailed in Table 3‑1.

Estonia focuses on the use of biogas/biomethane in the transport sector; the investment support granted to filling stations and public buses (MKM Regulation adopted in 2015) is not specifically promoting bioenergy but applies to the use of methane in general. A sliding feed-in premium, based on the prevailing natural gas spot price in the Baltic market, is paid to biomethane producers.

The Finnish biogas action plan 2020-2024 was published in January 2020. Finland focuses at present mainly on the use of biogas/biomethane for road transport, via a legally binding target for biofuels to account for 34% of all fuels consumed in road transport in 2030. There are no government targets in place for biogas or biomethane, but there is a target of 50 000 gas-powered passenger vehicles by 2030. A number of support measures have been phased out in the country. The sliding feed-in tariff system for the production of electricity from biogas has been phased out from 1 January 2019. However, existing plants under the scheme will receive the public aid up to 12 years from the start of production.[[114]](#footnote-115) In 2018-2022 State aid was granted to investment projects that use renewable energies, advance energy efficiency and reduce the environmental effects caused by energy production and use. Additionally, in 2018-2021 there was investment aid for filling stations and converting passenger cars to gas.

Latvia does not have specific targets for the use of biogas/biomethane. Latvia started to support electricity generation from biogas in 2009, which had a clear impact on the biogas production. However, with the end of the support it is likely that the biogas production capacity will significantly decrease during the next 3-5 years.

In Lithuania, there were few support scheme for the production of biomethane, except a for a grid connection discount and a recent support for the installation of biomethane and biogas plants. However, a number of new measures have been planned.

Table 3‑1 Identified measures supporting the production and consumption of methane and hydrogen gases

| Measure name | Country | Biogas/Biomethane | Hydrogen/Derivatives | Short description | Expected implementation |
| --- | --- | --- | --- | --- | --- |
| Support scheme for the use of biomethane (I) | Estonia | **✓** |  | Investment support for filling stations. Investment support for buses, waste trucks, fire brigade trucks and other protecting vehicles (police, etc), with a 12 M€ budget. | 2023  |
| Support for the production of biomethane (II) | Estonia | **✓** |  | In development. 20 M€ for increasing biomethane use. | 2023 |
| Production support for biomethane (III) | Estonia | **✓** |  | Support scheme price difference. When the gas market price is less than 100 €/MWh, for example 60 €/MWh, the biomethane producers get a financial support of 40 €/MWh. 6 M€ budget for 2023. | In force |
| Biogas/biomethane audit | Estonia | **✓** |  | Audit to find out the actual potential for biogas/biomethane what is financially reasonable. Different aspects: potential, regional aspects, business model analyse, long term view on where biomethane could be used | In development, 2023 tender |
| Hydrogen transport pilot project | Estonia |  | **✓** | At the end of 2021, a pilot project for the deployment of green hydrogen in public transport was launched, amounting to 5 million euros. The support was received by Utilitas, which is introducing hydrogen in the taxi industry. The project must be ready by the end of November 2024.[[115]](#footnote-116) | In force |
| Support round for zero-emission vehicles | Estonia |  | **✓** | In February 2023, a support round for zero-emission vehicles opened, providing EUR 9 million tosupport the purchase of both electric cars (including hydrogen fuel cells) and electric boxes. The objective of the support measure is to increase the share of vehicles used in Estonia using electricity produced fromrenewable energy sources and to contribute to wider environmental-conscious choices in the businesssector and by private individuals | In force |
| Creating opportunities for the uptake of renewables-based green hydrogen technologies | Estonia |  | **✓** | Grants are allocated to investments in renewables basedgreen hydrogen technologies in line with the investment policy,representing at least EUR 49.49 million[[116]](#footnote-117) | In force |
| Use of green hydrogen in the transport sector and as a feedstock in the chemical industry | Estonia |  | **✓** | 49 million budget | 2023[[117]](#footnote-118) |
| Tallinn green hydrogen complete chain | Estonia |  | **✓** | In the course of the project, a complete chain will be built in Tallinn for the use of hydrogen fuel in the taxi industry. For this purpose, a renewable hydrogen production unit with supply solutions will be established. | On going |
| Biogas and electrofuels inclusion in the transport distribution obligation | Finland | **✓** | **✓** | Biogas and electrofuels have been included in the transport distribution obligation (earlier only liquid biofuels). The obligation is to increase to 34% by 2030 according to the current legislation but will likely be reduced to 22.5% by 2027 | In force / update (reduction) not yet adopted but planned |
| Support for the conversion of tractors and other agricultural machinery to use biogas | Finland | **✓** |  | The conversion of tractors and other agricultural machinery to use biogas is supported as an environmental investment through agricultural subsidies. Subsidies covering 35% of eligible costs, are granted for modifications to enable biogas use and for the equipment involved, but not for purchasing the tractor or machinery itself. The subsidy covers 35% of eligible costs, including costs of the purchase and installation of new equipment. | In force |
| National investment aid to support new processing techniques for manure and reject material from biogas plants | Finland | **✓** |  | The investment aid is targeted at Investment aid is targeted at companies and biogas plants processing manure or digestate. Agricultural schools are assisted in the preparation of study content on nutrient recycling, and in cooperation with the National Biogas Programme, emphasis is placed on the treatment of digestate from biogas plants and the recycling of nutrients.[[118]](#footnote-119) | In force |
| Non-binding target of electrolysis capacity of 200 MW in 2025 and 1,000 MW in 2030.  | Finland |  | **✓** | Only a non-binding target without any binding legislation but investment support available (see the first row of this table) | Non-binding target in force |
| Hydrogen and biomethane distribution stations investment support | Finland | **✓** | **✓** | Hydrogen distribution stations have been included in the new Decree on infrastructure support for electric transport, biogas and renewable hydrogen in 2022–2025 | In force |
| Investment subsidies for renewable projects including biogas and hydrogen | Finland | **✓** | **✓** | Investment subsidies for renewable projects including biogas and hydrogen. Typical monetary amount of the subsidy is 30 % of the investment. In the Sustainable Growth Programme for Finland, 150 M€ has been allocated to low-carbon hydrogen and carbon capture and utilisation. The programme also promotes research and development activities, and investments in energy infrastructure and new energy technology.[[119]](#footnote-120) | In force |
| IPCEI Hy2Use | Finland |  | **✓** | Two Finnish projects were included in the 2nd hydrogen IPCEI round. P2X Solutions Oy’s project promotes carbon neutrality and environmental objectives in both industry and transport by producing renewable hydrogen and renewable synthetic fuels. Solar Foods produces protein by utilising carbon dioxide and renewable electricity.[[120]](#footnote-121) | In force |
| Carbon Contracts for Difference(CCfD) for promoting low-carbon industry | Finland |  | **✓** | The Finnish government is considering the use of carbon contracts for difference to promote among others decarbonisation of the industry.[[121]](#footnote-122) | Under consideration |
| Support to electricity generation from biogas | Latvia | **✓** |  | Latvia started to support electricity generation from biogas in 2009, which had a clear impact on the biogas production. The production grew steadily to reach 87.8 ktoe in 2015. Different tax regulation mechanisms are in place for biogas installations. The FiT support to biogas operators is granted for 10 years; for the first plants the support has ended, and within the next years it will end for all biogas operators. There are 4 biogas plants operating without support, and 7 have stopped their production. It is likely that biogas production capacity will significantly decrease.[[122]](#footnote-123) | In force |
| Financial incentives for municipalities for the deployment of infrastructure and transport | Lithuania | **✓** |  | The Lithuanian draft NECP of 2023 indicates financial incentives for municipalities for the deployment of infrastructure for public transport vehicles powered by alternative fuels and/or renewable energy sources (electricity, hydrogen, biomethane) | 2023 |
| Promotion of new zero-emission buses | Lithuania | **✓** |  | The Lithuanian draft NECP of 2023 indicates a measure for replacing polluting buses in municipalities with new zero-emission buses (electricity, hydrogen, biomethane) with financial incentives and setting up the recharging/refuelling infrastructure needed for them | 2024 |
| Promotion of recharging/refuelling infrastructure for alternative fuels | Lithuania | **✓** | **✓** | The Lithuanian draft NECP of 2023 indicates a measure for establishment/development of recharging/refuelling infrastructure for alternative fuels (electricity, biogas and hydrogen), including 1. Development of publicly accessible refuelling points for compressed biogas (implemented by the start of biogas production); 2. Establishment of publicly accessible hydrogen refuelling points | 2024 |
| Promotion of zero-and zero-emission vehicles powered by electric, hydrogen or biogas | Lithuania | **✓** | **✓** | The Lithuanian draft NECP of 2023 indicates a measure for promoting of zero-and zero-emission vehicles powered by electric, hydrogen or biogas produced from RED II compliant feedstocks (for minibuses and buses (M2 and M3) and heavy goods (N2 and N3) vehicles | 2024 |
| Investment support for the installation of biomethane production and biogas treatment plants (I) | Lithuania | **✓** |  | Financing of biomethane production facilities, including biogas treatment plants. The aim is to reach production capacity capable of producing 1.4 TWh of biomethane by 2030. The construction of the gas pipeline up to the overall gas network and the connection of the production facilities to the gas networks is not financed. | In force |
| Investment support for the installation of biomethane production and treatment plants (II) | Lithuania | **✓** |  | The aim of this measure is to provide an additional production capacity of at least 600 GWh of biomethane produced in 2030 resulting from the combined implementation with the existing measure above. | 2026 |
| Obligation for operators of natural gas refuelling points for the use of RES for natural gas supply to the transport sector | Lithuania | **✓** |  | Entities supplying natural gas for direct consumption in the transport sector shall be obliged to supply a specified and gradually increasing amount of gas from renewable energy sources | 2025 |
| Regulatory changes for the establishment of a system of public biomethane gas access points | Lithuania | **✓** |  | The aim of this measure is to enable producers distant from gas networks to feed biomethane into the gas networks without a direct connection of the production facility. Public entry points would enable part of the biomethane producers to feed gas into the gas network without direct connection to the gas network and transport the produced biomethane to the entry point by transporters. This measure would create a regulatory environment enabling gas injections and determining the authorities responsible for control and surveillance. | 2024 |
| Development of bio-waste treatment infrastructure | Lithuania | **✓** |  | Support for bio-waste treatment infrastructure in projects for the production of biomethane gas and/or for the installation of biogas treatment plants | In force |
| Discount on the grid connection fee[[123]](#footnote-124) | Lithuania | **✓** |  | Lithuania has implemented a 40% discount on the grid connection fee | In force |
| Incentive for non-hazardous waste for biogas production | Lithuania | **✓** |  | Fees to landfill non-hazardous waste should increase up to 50 - 70 €/ton in the 2022-2025 roadmap and rise further as part of the 2026-2030 roadmap, with the aim to reduce the share of waste disposed in landfills to 5%.[[124]](#footnote-125) | In force |
| Development of sustainable airport infrastructure | Lithuania |  | **✓** | The measure includes: (1) deployment of sustainable aviation fuel supply infrastructure; (2) the electrification of aircraft parking areas at Vilnius, Kaunas and Palanga airports; 3) upgrading of airport infrastructure by installing new or adapting existing parking areas in accordance with the criteria required to service hydrogen and/or electric aircraft | 2024 |
| Green hydrogen production | Lithuania |  | **✓** | In 2023 a call for applications for investments for the development of renewable hydrogen production capacity has been published. It is planned to allocate up to 50 M€ from the Modernization Fund. It is expected that these investments will create 65 MW of renewable hydrogen production capacity in Lithuania, and the annual volume of hydrogen production will reach more than 8 thousand tons.[[125]](#footnote-126) | in force |
| H2Value | Estonia, Latvia |  | **✓** | The “Supporting the Regional Development of the Green Hydrogen Fuel Value Chain for Transportation in Estonia and Latvia” (H2Value) project aims to establish an interregional green hydrogen value chain in South Estonia, Tartu region, and Northern Latvia, Vidzeme region, with the hydrogen being used in the road transport sector. The project is funded by the EU’s Interregional Innovation Investments Instrument. | In force |
| H2Nodes | Estonia, Latvia |  | **✓** | The H2Nodes project, co-financed by the EU Connecting Europe Facility, aims to establish the first two hydrogen refuelling stations in the Baltic states.[[126]](#footnote-127) | In force |
| IPCEI Hy2Tech | Finland, Estonia |  | **✓** | Finland and Estonia got one project each approved in the 1st hydrogen IPCEI round. The Elcogen project for Estonia and the Neste project for Finland were included among the 41 projects selected.[[127]](#footnote-128) | In force |
| Nordic-Baltic Hydrogen Corridor | 6 TSOs (Finland to Poland/ Germany) |  | **✓** | Hydrogen separate transport chain from Finland to Germany/Poland across the Baltic states. | Project phase |

*Main sources: Draft 2023 National Energy and Climate Plans; direct communication with national representatives.*

#### Description of the proposed action

As shown, the biogas/biomethane sectors at the national, regional and EU levels are undergoing significant changes, and the BRGM Member States could adopt measures for reviewing/introducing coordinated production and/or consumption support measures to foster methane-based gases, both to reap benefits as well as to mitigate risks of uncoordinated action.

The most efficient uses of biogas vary greatly depending on the availability of sustainable feedstocks, location, local energy needs, security of supply considerations and other aspects. These factors are specific for each country of the BRGM, and could even change between regions within each country. Hence, the choice of support instruments for biogas/biomethane and other renewable methane gases lies with each BRGM Member State and should be aligned with its overall strategy for the energy system and biogas/biomethane. Nonetheless, for the reasons indicated above there are a number of benefits from reviewing/introducing coordinated production and/or consumption (transitional) support measures to foster methane-based gases.

Therefore, the national governments could adopt a number of actions in this regard. First, **the Baltic states and Finland should conduct a coordinated review on the focus on certain biogas/biomethane uses**, e.g. the current focus for transport purposes. This review could be part of the Regional Comprehensive Strategy for Decarbonised Gas Development proposed under the action set 1. The most efficient uses of biogas should be promoted depending on the availability of sustainable feedstocks, location, local energy needs, and security of supply (particularly natural gas substitution) considerations. More specifically:

* Electrification might represent a better option than biomethane to decarbonise passenger road transport
* In the context of the current gas crisis, biomethane could also rather be used to substitute natural gas use in buildings and industry, depending on the cost differentials between methane gases and gasoline/diesel and security of supply consideration
* But biogas could also substitute natural gas consumption for some heating/co- and tri-generation applications

**The concerned Member States should consider the introduction of joint projects and joint support mechanisms.** This could build on the coordinated review of support for biomethane/biogas as well as any regional assessment of renewable energy potential conducted as part of the Regional Comprehensive Strategy for Decarbonised Gas Development. Member States could identify common gases they would like to promote and make use of existing provisions at the EU level, such as the new cross-border renewable energy project status and funding available under the revised Connecting Europe Facility Regulation.

**The revision of existing or introduction of new economic support mechanisms should consider a number of further principles:**

* **Do not restrict support to certain renewable and potentially low-carbon methane gas production routes** – alternative renewable gas production routes and feedstocks should be eligible for receiving economic support as long as they comply with feedstock sustainability and other requirements. This should also not preclude more targeted R&I support for technologies with a lower readiness level. Member States could consider also making low-carbon methane gas eligible for support.
* **Consider making both methane gases and hydrogen eligible for support measures –** governments should consider the benefits and disadvantages of restricting support measures to certain gas carriers or opening up to all renewable methane as well as hydrogen gases. A certain portion of the budget could be reserved for each type of gas, while the remainder could be open for all types.
* **Gradually transition to competitive** **mechanisms incentivising the participation of producers in the gas market**, where this is not yet the case, and **phase out support when not necessary anymore**. Support mechanisms for methane gas production should focus on de-risking investments by employing e.g. a contracts-for-difference scheme using soft upper and/or lower reference prices, incentivising gas producers to sign gas sale agreements with offtakers as well as to participate in short-term markets. Any market distortions vis-à-vis fossil gas should be addressed through other actions, such as those proposed under action set 5 on energy and carbon taxation.

#### Assessment of implementation aspects

For the reasons indicated economic support to biogas/biomethane production may still be warranted, in combination with other measures. While there is a potential upside to the region’s governments in case for example contracts-for-differences are employed to provide support and high energy prices materialise, the support could also lead to significant budget expenditures. **Therefore the cost of this measure is assessed as high**. This does not mean however that the measure should not be implemented, as it may be essential to address any profitability gaps or excessive risks in biomethane/biogas projects. Furthermore, uncoordinated approaches for supporting renewable gas production could entail comparatively higher costs to the public budget.

Incentivising the most efficient uses for the region’s sustainable biomass potential according to the cascading principle is a challenging task given the multiple possible uses, carriers, and interactions between energy markets. Moreover, economic support should be provided only when necessary, but it can be challenging to assess profitability gaps in a changing and uncertain context. Therefore, **the complexity of this action is rated as high.** Moreover, stakeholders, particularly producers, should be continuously involved in the consideration and design of any support mechanisms. Hence, **the stakeholder involvement for this action should be high.**

The region’s Member States should consider the measure’s proposals already prior to the introduction of new or revision of existing support schemes. However, the measure also depends on other actions, particularly those proposed under the action set 1 on governance, given the importance of cooperation to the topic. Therefore, **the implementation of this action is defined as short- to medium-term.**

This measure should impact particularly the production and consumption of biogas/biomethane in the region, and to a smaller extent that of synthetic methane, to the extent the latter will be produced at all. Therefore, **the main scenarios impacts are the REN-Biomethane and Cost Minimal scenarios,** albeit the REN-Hydrogen scenario should also be impacted as it also sees biogas/biomethane production (at lower levels than the other decarbonisation scenarios).

### Action 3b) Assess the need for and implement specific support measures for renewable hydrogen production and/or consumption

|  |  |
| --- | --- |
| **Criteria** |   |
| **Responsibility for implementation** | National Ministries  |
| **Costs**  | High |
| **Complexity** | High |
| **Stakeholder involvement** | High |
| **Implementation**  | Short-term |
| Impacted gases |
| Biogas/biomethane | Hydrogen  | Synthetic natural gas |
|  | xxx |  |
| Relevance for decarbonisation scenarios |
| *REN-Methane* | *REN-Hydrogen* | *REN-Cost Minimal* |
| x | xxx | x |

#### Why is the action required?

**Hydrogen produced via electrolysers using renewable electricity** is a promising option to decarbonize industrial processes and heavy-duty transport applications, for which it is one of the few suitable CO2 reduction strategies. The production cost of renewable hydrogen is however still too high to be competitive with grey hydrogen. To stimulate its production and use, and to enable further cost reduction by technology development and economies of scale, public support is justified and necessary during the initial development phase. Public support can take different forms: investment support (CAPEX-based) to producers and/or users, operational support (OPEX-based) to producers and/or users e.g. through CfDs, targets imposed on industrial users of grey hydrogen to switch to renewable hydrogen (consumption obligation), or a combination of several instruments. Several EU Member States are currently investigating the most appropriate approach.

While the European Commission is mainly focusing its efforts to accelerate the ramp-up of renewable hydrogen, RePowerEU also acknowledged that other forms of **fossil-free hydrogen** can play a role in substituting fossil energy. Some EU Member States are for instance considering the opportunity of stimulating **low-carbon hydrogen** produced by using nuclear based electricity or through steam methane reforming of natural gas combined with CCU/S, which offers the potential of solving upstream and downstream hydrogen challenges regarding production, transport and end-use in the short term, enabling the transition towards renewable hydrogen in the medium to long term. Low-carbon hydrogen could be supported as a transitional measure to enable large CO2 emission reductions in industrial areas, such as harbours with energy-intensive industries.[[128]](#footnote-129)

The most immediate route to accelerate the use of renewable and low-carbon hydrogen in the EU is to substitute current grey hydrogen use in energy-intensive industries, such as the ammonia/fertiliser industry, other chemical industries and refineries. However, these industries may still need to do some investments in order to switch to renewable and low-carbon hydrogen use. Moreover, the recently increased EU hydrogen production and consumption ambitions as stated in the **REPowerEU plan** will require not only the substitution of unabated fossil hydrogen but also the significant development of new end-uses for hydrogen and derivatives already in the 2030 timeframe.

These ambitions have been confirmed in the final agreed text for the revision of the Renewable Energy Directive II. The provisional agreement approved in March 2023 requires that 42 % of hydrogen used in industry be renewable by 2030, and 60 % by 2035. For the transport sector, it sets a target for a 1 % share of RFNBOs by 2030, as part of a combined target of 5.5 % for advanced biofuels and RFNBOs.[[129]](#footnote-130)

While it is uncertain whether the targets will (or should) be achieved,[[130]](#footnote-131) a significant increase in renewable hydrogen production and consumption in the EU can be expected. But industries and other end-users such as heavy-duty transport will need to conduct significant investments to adapt their processes and develop the refuelling infrastructure. And also the necessary dedicated hydrogen transport infrastructure will have to be built. Compliance with the Water Framework Directive is of key importance to address the additional fresh water needs at those locations where the roll-out of renewable or low-carbon hydrogen production capacities takes place.

The European Commission has recently set up the **European Hydrogen Bank**,[[131]](#footnote-132) which should close the investment gap and connect potential supply of renewable hydrogen with the demand objective of 20 million tonnes by 2030. The European Hydrogen Bank will facilitate both renewable hydrogen production within the EU and imports. The scaling up of electrolyser manufacturing for renewable hydrogen production will contribute to the competitiveness and resilience of the European industry, including the steel and fertiliser producers and the shipping industry. Scaling up the European hydrogen market will also allow European companies to play a leading role in the emerging global hydrogen market, which offers new economic growth opportunities. The European Hydrogen Bank aims to bring down hydrogen cost by subsidizing production in a similar vein to the Contracts for Difference (CfD) scheme introduced for renewable electricity (although the Bank chose a fixed support in €/kg for its pilot auction[[132]](#footnote-133)).

In the short term, public support will be necessary not only for the supply but also for the consumption of renewable (and potentially low-carbon) hydrogen. Measures have been adopted at the EU level, with the establishment of the European Hydrogen Bank. However, the budget of the Bank is limited and likely not enough to meet the renewable hydrogen targets in the EU. Also, there are no guarantees that producers located in the Baltic states and Finland will be awarded support in the pilot or subsequent auctions, and any production awarded support will certainly not be sufficient to decarbonise the region’s gas system. Therefore, there is space (and even need) for measures at the regional or national level to stimulate the production and consumption of renewable hydrogen (and potentially low-carbon hydrogen depending on national or regional strategies).

However, Member States will need to prioritise support in line with their strategy to upscaling renewable hydrogen, given the cost of such measures. Moreover, according to the study on hydrogen resources and policies for Estonia[[133]](#footnote-134) public funding only covers part of the investments and requires that private actors fund a comparatively high share of the supported projects, thus limiting the interest of investors. This highlights that the actual design of any support measures is relevant in order to attract sufficient interest from market participants.

#### Current status

Table 3‑1 above (on page 42 under action 3a) details the existing or planned measures for supporting the production and consumption of renewable hydrogen (and biogas/biomethane) in the Baltic states and Finland. As can be seen, various measures are in place or planned, particularly for incentivising the production of renewable hydrogen and the deployment of fuel cell electric vehicles and the associated hydrogen refuelling infrastructure. Finland also indicated the aim to use renewable hydrogen in the energy system, and potentially export it or other RFNBOs.[[134]](#footnote-135)

The distribution of measures is somewhat uneven, with particularly Latvia having fewer measures as far as could be determined. Nonetheless, the Baltic states and Finland seem to have a mostly adequate approach regarding the prioritisation of end-uses for renewable hydrogen, mostly focusing demand-side support for industry and transport. However, as is the case for biomethane, some of the transport-oriented measures support urban passenger transport, where battery electric vehicles could be a more appropriate decarbonisation solution.

It can also be noted that there are limited joint initiatives between the region’s countries in supporting hydrogen. The only joint projects identified are the Nordic-Baltic Hydrogen Corridor (which does not yet seem to benefit of public subsidies) and the Estonian and Finnish projects selected under the IPCEI Hy2Tech round (where the individual projects are rather of a national and even local scope).

#### Description of the proposed action

In contrast to biogas/biomethane, the incipient status of the renewable hydrogen sector in the Baltic states and Finland (as in the rest of Europe) requires a different approach from the Member States. The development of a regional hydrogen market is still distant (and uncertain) and the ability of the governments to subsidise the value chain is modest, meaning that concerns of distortion of competition in the short-term are limited (although such concerns should be considered in the medium- to long-run as it is expected that a competitive regional hydrogen market will emerge in the long-run, as discussed in action 2c).

Therefore, Member States could implement national measures to incentivise renewable hydrogen production and consumption, with limited impacts on their neighbours. However, there is also a case for cross-border cooperation between the Baltic states and Finland in supporting renewable hydrogen production, as there is one for biogas/biomethane. The significant amounts of renewable electricity required to meet the hydrogen production levels forecasted in the REN-Hydrogen scenario of deliverable 3 is a challenge, as highlighted in the risk analysis of Deliverable 5. The Member States will need to develop additional solar PV and wind energy capacity, including offshore wind energy parks. This could provide an opportunity for regional cooperation, in order to jointly exploit the best renewable energy areas.

Therefore, the following actions should be considered by the Member States:

* **Conduct a review on the current policy focus on certain hydrogen uses and adapt the support measures accordingly.** The current support for hydrogen fuelled passenger vehicles and for refuelling infrastructure in cities could be evaluated and possibly phased out, as electrification is considered a more appropriate option for passenger cars. Hydrogen use (possibly in the form of derivatives) could still be supported for heavy-duty transport, other transport sectors such as maritime transport and aviation, and for the decarbonisation of the industry (in combination with other measures such as potentially a consumption obligation);
* **Agree on a common approach to meeting the national sectoral sub-targets of the revised REII**: To avoid the risk of competition distortion while meeting the new sub-targets for transport and particularly industry, the Baltic states and Finland could agree on a common approach, for example on whether to create consumption obligations for industry, how and to which level support renewable hydrogen production, and other aspects.
* **Analyse the possibility for regional cooperation in renewable electricity projects for hydrogen production,** especially offshore wind energy projects. The Member States could use the existing and proposed cooperation platforms discussed in the action set 1 for this purpose.
* **Apply the principles presented in action 3a) of not restricting support to certain renewable hydrogen production routes.** To avoid competition distortion between technologies and to decarbonise the energy system at least cost,any support mechanism should include also other renewable and possibly low-carbon technologies, such as biogas/biomethane and low-carbon hydrogen projects, while ringfencing a part of the budget for renewable hydrogen.

#### Costs, complexity, stakeholder involvement and relevance to the scenarios

It will take time for renewable hydrogen to reach competitiveness with unabated fossil hydrogen, and investments will also be necessary at the consumer side, especially for developing new hydrogen uses. Therefore, **the cost of this measure is assessed as high,** even if renewable (and potentially low-carbon) hydrogen may be the best solution to decarbonise some end-uses.

**The complexity of this measure is rated as high,** as developing appropriate supply- and demand-side measures will be challenging, particularly if joint projects or support mechanisms are to be developed using national funding. Increasing participation of producers and consumers (including with own funds) in the initiatives will require appropriate design of the support, which means that **stakeholder involvement in this measure should be high.**

As indicated, most Member States of the region have already adopted a number of measures – but various adjustments are possible in the portfolio of measures deployed. Moreover they have or will soon publish their updated draft National Energy and Climate Plans, but these should still be adjusted in 2024 following the comments from the European Commission. Hence, there is the opportunity to adjust the foreseen support mechanisms, and **this action is categorised as short-term.**

**The** **REN-Scenario is the most affected by the present action**, but it is also relevant for the other decarbonisation scenarios as they make use of hydrogen for off-grid applications. However, this will reduce the potential for cooperation in joint projects or support measures, and hence the overall importance to the REN-Methane and Cost Minimal scenarios.

### Action 3c) Consider legal ban on connecting new buildings to the natural gas grid and on installing fossil fuel boilers in new buildings

|  |  |
| --- | --- |
| **Criteria** |   |
| **Responsibility for implementation** | National ministries |
| **Costs**  | Low |
| **Complexity** | Medium |
| **Stakeholder involvement** | Medium |
| **Implementation**  | Short to medium-term |
| Impacted gases |
| Biogas/biomethane | Hydrogen  | Synthetic natural gas |
| xxx | x | xxx |
| Relevance for decarbonisation scenarios |
| *REN-Methane* | *REN-Hydrogen* | *REN-Cost Minimal* |
| xxx | x | xxx |

#### What is the current status and why is the action required?

At present, space and water heating accounts for 80% of average household energy consumption in Europe – with more than half of this generated by fossil fuels. Phasing out sales of new ‘stand-alone’ fossil fuel boilers would result in high GHG emissions savings, as well as a reduced reliance on fossil fuel imports.

Raising the energy efficiency requirements for new heating appliances could gradually reduce the use of fossil fuel operated boilers, since they are significantly less energy efficient than most other solutions, such as electric heat pumps. More strict rules at EU level could hence de facto lead to a ban on the installation of new ‘stand-alone’ fossil fuel boilers in Europe. These measures could include:

- adopting more ambitious Minimum Energy Performance Standards in the Energy Performance of Buildings Directive (EPBD);

- tightening the Ecodesign standards for space and water heating appliances from 2027 to restrict the placement of stand-alone fossil fuel boilers in the EU single market;

- rescaling the energy labels for space and water heating appliances from 2024/2025 in such a way that stand-alone fossil fuel boilers are placed at the bottom of the A-G rating;

- prohibiting direct or indirect subsidies for fossil fuel heating appliances from 2024/2025 in the EPBD.[[135]](#footnote-136)

At national level, several European countries (including UK, Germany, Belgium, the Netherlands, Denmark, Norway and France) have already taken initiatives to impose a legal ban on using fossil fuels in new buildings. Some countries have also introduced or are considering a legal ban on the installation of a new fossil fuel based boiler in existing premises.[[136]](#footnote-137) [[137]](#footnote-138)

The Scandinavian and Baltic EU countries, where average heating needs are higher because of climatic factors, had already reached high shares, of more than 50%, of renewable sources in final energy consumed for heating and cooling in 2020, by utilising biomass extensively. The widespread use of modern district heating systems in these countries can facilitate the integration of low-temperature heat from geothermal and solar thermal sources and from recovered waste heat.[[138]](#footnote-139)

#### Description of the proposed action

To accelerate the shift from fossil fuels to renewable or low-carbon energy vectors for building heating, the Baltic-Finnish countries can learn lessons from the experience in other EU countries, and implement a legal ban on connecting new residential and tertiary buildings to the natural gas grid and on installing fossil fuel boilers in new buildings.

This measure will lead to a high penetration of electric heat pumps in new buildings (partly powered with locally produced PV electricity) and will hence contribute to the energy efficiency, RES and decarbonisation objectives.

In principle this measure does not require a specific public budget; the legal measure can be imposed on gas DSOs and investors in new buildings without public subsidies. If the additional investment cost (insulation, heat pumps) would be too high for some vulnerable households, the authorities can provide interest-free loans, either directly via public institutions, or indirectly via commercial banks. If appropriate, phasing out fossil fuel use in existing buildings can be stimulated by subsidising the installation of electric heat pumps, As the economic multiplier of local investments in buildings related equipment is high, this measure would a low net cost to the public budget.

The proposed measures should contribute significantly to the mitigation of Risk 10 ‘Investments in methane infrastructure (in this case connection of buildings to the natural gas grid and installation of methane fuelled end-use equipment) can lead to lock-in on natural gas or asset stranding’ and of Risk 11 ‘Policies and regulations can present barriers to implementation of gas decarbonization actions’. The lack of adequate policies can indeed hinder the implementation of gas decarbonization actions.

#### Assessment of implementation aspects

The cost of this measure is very low for the authorities (energy ministries and NRAs) and grid operators, while the cost impact for end-users can be high in the short term (higher capex) but they should be able to recover the additional investment cost in the medium to long term by lower opex. We hence estimate the **cost level** of this measure as **low**.

The complexity of the measure lies in the development and implementation of adequate legislation. As existing practices and experiences in other Member States can be used as a basis, the policy analysis process to develop the measure would not be difficult. However, given the resistance to such measure that other Member States have faced, we consider the **complexity** to be **medium**. Stakeholders, including energy and heating equipment suppliers, and DSOs, should be involved in this process.

The implementation of this measure is proposed to take place in the **short- to medium-term**. Finally, this measure **would affect all decarbonization scenarios**, but would have a higher impact on the methane based scenarios than on the hydrogen based pathway.

## Action set 4: Infrastructure planning

### Action 4a) Increase regional methane/hydrogen/electricity infrastructure planning coordination

|  |  |
| --- | --- |
| **Criteria** |   |
| **Responsibility for implementation** | National ministries / NRAs / TSOs /DSOs |
| **Costs**  | Low |
| **Complexity** | Low |
| **Stakeholder involvement** | High |
| **Implementation**  | Short-term |
| Impacted gases |
| Biogas/biomethane | Hydrogen  | Synthetic natural gas |
| xxx | xxx | x |
| Relevance for decarbonisation scenarios |
| *REN-Methane* | *REN-Hydrogen* | *REN-Cost Minimal* |
| xxx | xxx | xxx |

#### Why is the action required?

Electricity and natural gas network infrastructure planning is subject to EU regulation and already pursued in an increasingly integrated manner, between TSOs at the regional and EU levels (through the Ten Year Network Development Plans), and also between TSOs and DSOs at the national level.[[139]](#footnote-140)

According to Recital 26 of the revised TEN-E regulation (EU) 2022/869, “trans-European energy networks framework should rely on a smarter, more integrated, long-term and optimised ‘one energy system’ view through deployment of a framework that enables greater coordination of infrastructure planning across various sectors and creates an opportunity to optimally integrate various coupling solutions involving various network elements between various infrastructures.”

In view of facilitating the production of hydrogen and renewable gases and their transport via the grid, there will be a need to increase requirements for **integrated energy system planning**. This implies a better coordination, through integrated planning processes, of grids development to match the expected hydrogen and other renewable gases (particularly biomethane) production.

Supra-national (regional) planning of energy infrastructure with cross-border impact (TSO networks, large storage projects) is necessary to avoid a sub-optimal infrastructure configuration from a technical and economic (market) perspective. The draft recast Gas Directive requires Member States to promote regional cooperation between natural gas TSOs and hydrogen network operators with the view of creating a ‘competitive internal market for gases’ and facilitate the integration of isolated systems forming gas islands.[[140]](#footnote-141) Cross-border cooperation between national regulatory authorities is imposed in the proposed EU governance architecture (recast Gas Directive), notably on network codes and (other) cross-border issues.[[141]](#footnote-142)

The revised TEN-E Regulation also requires the electricity and gas ENTSOs to develop infrastructure gaps reports every two years, “on those infrastructure gaps potentially affecting the fulfilment of the Union’s 2030 climate and energy targets and its 2050 climate neutrality objective”.[[142]](#footnote-143) Furthermore, the revised TEN-E Regulation created a priority corridor for hydrogen and electrolysers in the region, the Baltic Energy Market Integration Plan Hydrogen. The cooperation on Projects of Common Interest in the TEN-E Regulation is organised in regional groups, with the four BRGM countries cooperating with a number of other Member States (Denmark, Germany, Poland, Sweden) in the BEMIP Hydrogen regional group.

The draft recast Gas Directive also introduces a requirement for hydrogen network operators to develop cross-border dedicated hydrogen interconnectors “accommodating all economically reasonable and technically feasible demands for capacity and taking into account security of hydrogen supply”.[[143]](#footnote-144) Moreover, “infrastructure operators, including LNG terminal operators, storage operators, distribution system operators as well as hydrogen, district heating infrastructure and electricity operators” are required to cooperate with the gas TSO towards the development of the network development plan. The NDP itself should contain information on infrastructure to be decommissioned, and be aligned to the NECPs, their updates as well as progress reports. [[144]](#footnote-145) Finally, the proposed recast Gas Directive requires hydrogen network operators to submit to the NRA an overview of planned hydrogen network infrastructure as well as a report on the development of the hydrogen system. Member States may moreover apply the same gas integrated planning requirements to hydrogen. [[145]](#footnote-146)

Moreover, as highlighted in Deliverable 5 of this project,[[146]](#footnote-147) the planning of methane gas and potentially dedicated hydrogen networks in the Baltic region should consider various risks, including that of higher gas demand reductions than anticipated and the resulting stranding of assets, as well as the contrasting risk of lock-in into unsustainable pathways due to investments in unabated fossil gas infrastructure.

A recent report by Agora Energiewende, Artelys et al. (2023)[[147]](#footnote-148) highlights that governments and regulators must anticipate a rapid decrease in gas demand and carefully assess its impact on gas supply and distribution infrastructure. The scenario EU Gas Exit Pathway developed in the study indicates a potential sharp decline in the demand for fossil gas in the EU in the near term could be possible, and would not be accompanied by a wide-scale adoption of biomethane and hydrogen to the extent expected by some actors, which would result in a much lower utilisation and even stranding of some methane gas infrastructure, in particular distribution grids and LNG terminals. Based on this analysis, Agora recommends that policymakers must promptly establish a regulatory and planning framework to manage the accelerated decommissioning of existing gas assets, and that oversight by EU and national regulators is crucial to ensure development plans at all levels are aligned to the decarbonisation, renewable energy deployment and security of supply objectives.

#### Current status

##### Gas and hydrogen national development plans

In its opinion 08/2022 and annexes[[148]](#footnote-149) ACER reviews gas and hydrogen NDPs regarding their consistency with the EU gas TYNDP. The documents provide relevant information on the NDPs for the Baltic states.[[149]](#footnote-150)

According to ACER’s opinion 08/2022 and annexes, the frequency of publication of the NDPs is not harmonised in the Baltic states (annual in Estonia, biannual in Latvia and Lithuania). In Estonia the NRA provides a non-binding opinion on the gas NDP, while in Latvia and Lithuania the NRA approves or rejects it (in Lithuania without the legal power to amend the plan). The Estonian and Lithuanian NDPs are based on one scenario/vision, with a time horizon of 10 years, and the Estonian gas NDP is aligned to the Fit-for-55 scenarios, while the Lithuanian NDP is furthermore aligned to the NECP and the REPowerEU plan. Also, the gas NDPs of the three Baltic states do not use a cost-benefit analysis to evaluate investment projects.

The gas NDPs for the Baltic states only cover the gas networks, and do not include LNG terminals or underground gas storages. The Lithuanian NDP contains most project information, while the Estonian one does not provide project information such as commissioning date and implementation status, and project benefits. The Estonian and Lithuanian gas NDPs break down gas demand by sector/activity, while the Latvian does not.

Concerning the different gas types and the decarbonisation of the gas system, the Estonian and Lithuanian NDPs address hydrogen and biomethane, while the Latvian does not. The Estonian NRA considers the NDP lacks a primary focus on the energy transition, and include renewable gas projects only if duly justified.

Hydrogen blending in the gas networks is not yet allowed by the Baltic TSOs. The Lithuanian NRA indicates it seems legally possibly to inject hydrogen with a admixture of 2%vol­, and the gas TSO has plans to allow a higher H2 admixture level in its gas networks, with projects included in the latest NDP in that regard (with an acceptance of up to 10% in 2030 being studied). The Lithuanian gas TSO furthermore refers in its NDP to plans to develop dedicated hydrogen networks.

The Latvian and Lithuanian gas TSOs foresee investments to enable the injection of biomethane in the gas transmission system. The gas TSOs in the Baltic states are legally obliged to provide a connection point for biomethane upon request (if capacity is available), while only in Lithuania the gas TSO is obliged to publish actual and future capacity for biomethane injection.

##### Other developments

In 2021 the BRGM TSOs have established the Hydrogen Baltic Coordination Group (H2BCG) and are developing a study on hydrogen blending, with a study contract awarded end 2021.[[150]](#footnote-151),[[151]](#footnote-152)

Currently the Finnish gas and electricity TSOs are elaborating a study on “Energy transmission infrastructures as enablers of hydrogen economy and clean energy system”.[[152]](#footnote-153) Moreover, under the Natural Gas Market Act (maakaasumarkkinalaki 587/2017), the Finnish gas TSO should establish and enhance the gas network. It must also construct adequate cross-border transmission capacity to integrate the European transmission system, provided that such construction is financially justifiable, and there exists a reasonable and technically feasible demand for natural gas to ensure a secure supply. Note that the Finnish government indicates in its draft 2023 NECP that “following the commissioning of the Inkoo floating LNG terminal and the expansion of the capacity of the transmission network in Inkoo, Finland no longer has any need to expand the transmission infrastructure for natural gas.”[[153]](#footnote-154)

A number of hydrogen-related projects at the national or regional level are in development, as described in the section on action 2c) ‘Consider measures to develop a liquid hydrogen/derivatives market in the long-term’.

The interactions between the methane gas and hydrogen systems and the heat sector should also be considered in the infrastructure planning. Tilia et al. (2021)[[154]](#footnote-155) highlight that all four countries of the RBGM have national urban planning policies in place which indirectly guide the development of district heating, although these various policies are not integrated into a national urban plan.

#### Description of the proposed action

After the formal approval of the proposed recast Gas Directive[[155]](#footnote-156), the EU Member States will have to make their national legislation compliant with these new EU provisions. The BRGM countries should take this opportunity to include in their new legislation harmonised rules for enhanced regional cooperation between the concerned authorities (ministries and NRAs) on the one hand, and the TSOs on the other hand in view of more coordinated and integrated cross-border planning of methane gas, hydrogen, and electricity networks and large storage projects. Ministries, NRAs and TSOs should employ existing and new regional platforms (presented in Action set 1) to discuss infrastructure planning issues and to develop consistent national development plans, based on agreed harmonised scenarios and assumptions.

Based on the analysis above, enhancing regional cooperation on methane gas and hydrogen infrastructure planning will need to address also several issues at the national level. While the issues mentioned below may have been addressed in some of the BRGM countries, further work is necessary for promoting regional cooperation:

* **The Finnish gas TSO should be required to publish its NDP and enhance its network planning activities**. While the Finnish government foresees in its latest NECP that no further expansion of the methane gas infrastructure will be needed, both the government and the gas TSO consider the development of dedicated hydrogen networks in the future. An objective and transparent planning process would enable the identification and cost-benefit analysis of domestic and cross-border methane gas and hydrogen infrastructure investment plans (new, adapted/repurposed or to be decommissioned). This is in line with the recommendations of the Finnish study “Hydrogen economy – Opportunities and limitations”.[[156]](#footnote-157) Moreover, the Finnish and Baltic states governments will need to consider whether to certify a single or multiple hydrogen network operators in each country, among which potentially the current national gas TSOs;
* **The four BRGM countries should further adapt and harmonise their national regulatory frameworks,** in order to use the same scenarios and assumptions for their NDPs and to enhance the regional cooperation on the identification and analysis of projects that are of common interest or have a cross-border impact, as well as existing pipelines to be decommissioned. Moreover, NRAs should be empowered to approve and if necessary amend national development plans (including decommissioning), while TSOs should be required to assess the costs and benefits of their investment projects (including climate benefits), using multiple scenarios representing future uncertainty (including the possibility of significant decrease in methane gas demand) and aligned with the updated climate and energy targets. Enabling the decarbonisation of the gas system should be a primary aim of the NDPs, which would have to consider projects to integrate renewable and low-carbon gases, in particular biomethane and hydrogen, while accounting for the fact that hydrogen blending in methane grids will be a temporary or transitional solution as stated by ACER,[[157]](#footnote-158) and including new fossil gas-based investment projects only when duly justified;
* **Gas, electricity and in the future hydrogen network operators** should be required to cooperate in the development of network investment plans and of the hydrogen infrastructure overview at the national and regional level, including through the use of common scenarios and the identification of infrastructure gaps for the integration of biomethane and electrolysers for the production of renewable hydrogen.

These measures should to a significant extent help addressing some of the main risks identified in Deliverable 5,[[158]](#footnote-159) especially risk 6 “Infrastructure cannot be adequately or timely developed, including repurposing or adaptation of natural gas infrastructure”.

The actions proposed here related to the adaptation of the national regulatory frameworks and to cooperation at the regional level can and should be implemented simultaneously: next to ensuring that the national networks are adapted and developed taking duly account of the interactions between the different energy vectors, the concerned ministries, NRAs and TSOs should also enhance regional cooperation.

#### Assessment of implementation aspects

Concerning the **costs of the proposed actions, they are ranked as low** as they would involve mainly administrative costs for NRAs and TSOs**.** Guidehouse and Frontier Economics (2021)[[159]](#footnote-160) have assessed the administrative costs of the hydrogen policy options considered in the Hydrogen and Decarbonised Gas Market Package. The costs are driven by the number of dedicated employees that would have to work on the related processes, and are estimated not to exceed 60 million EUR/year for the whole EU, and cover the processes not already undertaken by NRAs and TSOs, such as related to third-party access, unbundling compliance, revenue regulation and tariff setting. Considering that the actions proposed here would involve processes for planning methane networks (in addition to eventual hydrogen networks), 2 FTEs for each of the 4 NRAs and TSOs at an annual cost of 100 000 EUR/y per FTE would lead to overall costs for the 4 countries of 1.6 million EUR (or somewhat higher if one considers additional dedicated staff at the ministries).

The **complexity of the proposed measures is ranked as low.** Enhancing cooperation at the regional level will require regular interactions between the ministries, NRAs and TSOs, and furthermore NRAs need to ensure sufficient human resources for adequately overseeing the TSO activities. However, these activities are to some extent already taking place, and the proposed actions do not require complex technical solutions except for improving the cost-benefit analysis of planned infrastructure projects. However, the methane gas TSOs already have expertise in the CBA methodology of such projects.

There is a **high need for stakeholder involvement** **–** both sectoral actors such as other infrastructure operators (including methane gas DSOs and electricity TSOs and DSOs) which should provide information for the regional planning activities, as well as market players which should be consulted on the draft plans.

The proposed actions could be implemented in the **short-term** (i.e.in the next few years) given they are focused on the improvement of existing processes, strengthening of cooperation and have low complexity.

Finally the actions are **relevant in all decarbonisation scenarios**, as regional methane and hydrogen infrastructure planning will be important to develop the necessary infrastructure while accounting for the overall reduction in methane gas demand.

### Action 4b) Review and harmonise connection requirements for renewable and low-carbon gas production and coordinated planning for transmission and distribution

|  |  |
| --- | --- |
| **Criteria** |   |
| **Responsibility for implementation** | National ministries and NRAs in concertation with TSOs and DSOs |
| **Costs**  | Low  |
| **Complexity** | Medium  |
| **Stakeholder involvement** | Low |
| **Implementation**  | Short- to medium term |
| Impacted gases |
| Biogas/biomethane | Hydrogen  | Synthetic natural gas |
| xxx | xx | x |
| Relevance for decarbonisation scenarios |
| *REN-Methane* | *REN-Hydrogen* | *REN-Cost Minimal* |
| xxx | xxx | xxx |

#### What is the current status and why is the action required?

The draft recast Gas Directive introduces obligations on gas TSOs and DSOs for the connection of new production facilities for renewable and low-carbon gases.[[160]](#footnote-161) According to these new provisions, TSOs and DSOs shall establish and publish transparent and efficient procedures for non-discriminatory connection of new production installations of renewable and low carbon gases. These procedures shall be subject to approval by the NRAs. The TSOs and DSOs shall not be entitled to refuse economically reasonable and technically feasible connection requests of a new production facility installation for renewable and low carbon gases.

According to a BIOSURF study, major barriers to the deployment of the biomethane market are “insufficient gas grid capacity at low and medium pressure in some areas; the high cost of grid connections, which have to be paid by the developer, as well as long delays in completing the connections; and the difficulty of matching the exact energy content (CV) of biomethane to the gas grid needing the injection of propane.”[[161]](#footnote-162)

Due to the expected increasing number of local injections of biomethane (and in the future possibly also hydrogen) into the methane gas grids, more coordination between the TSOs and DSOs is required regarding investment planning and operational issues. This coordination can also be useful to determine the most adequate injection point for specific biomethane plants (DSO or TSO grid) and to identify potential needs for investments that allow reverse flows (if local injection during summer months is expected to exceed local off-take).

#### Description of the proposed action

After the final approval at EU level of the new gas package, the Baltic-Finnish countries will have to transpose the relevant provisions regarding connection rules and costs for renewable and low-carbon gas production facilities into their national legislation. This action should be initiated by the national energy ministries and be undertaken in close cooperation with the NRAs, on the basis of a draft to be submitted by the grid operators.

More coordinated planning for transmission and distribution networks can also be included in the revised national legislation; the frequency of the investment plans can e.g. be harmonised and mutual consultancy processes (between TSO and related DSOs and between TSOs of neighbouring countries) can be imposed via legislation.

The proposed measures should contribute significantly to the mitigation of Risk 6 ‘Infrastructure cannot be adequately or timely developed, including repurposing or adaptation of natural gas infrastructure’, and Risk 11 ‘Policies and regulations can present barriers to implementation of gas decarbonization actions’ identified in Deliverable 5 of this study.

#### Assessment of implementation aspects

The proposed measure “Review and harmonise connection requirements for renewable and low-carbon gas production and coordinated planning for transmission and distribution” will not require high costs, as it does in principle not include the need to develop additional infrastructure or to adapt existing infrastructure. The cost will hence mainly relate to the preparation of legal and regulatory provisions and the implementation of organisational changes by the grid operators and NRAs. We can hence expect the level of costs to be relatively **low**.

The complexity of reviewing and harmonising grid connection specifications and network planning is **medium** as it requires interactions between the grid operators and NRAs at national and regional level. Other stakeholders should in principle not be strongly involved in this process.

As the expected new EU legislation should anyhow be transposed into national laws, the timing for the implementation of the proposed measure could be determined on this basis in order to have a coordinated overall review process of the existing legislation and regulatory obligations on TSOs/DSOs. The timing of implementation is hence expected to be rather **short-term**.

Finally, these measures would **impact all scenarios and gases in a similar way**.

### Action 4c) Review and harmonise gas quality standards where appropriate

|  |  |
| --- | --- |
| **Criteria** |   |
| **Responsibility for implementation** | TSOs in concertation with NRAs and DSOs |
| **Costs**  | Low  |
| **Complexity** | Medium  |
| **Stakeholder involvement** | Medium |
| **Implementation**  | Short-term |
| Impacted gases |
| Biogas/biomethane | Hydrogen  | Synthetic natural gas |
| xxx | xx | x |
| Relevance for decarbonisation scenarios |
| *REN-Methane* | *REN-Hydrogen* | *REN-Cost Minimal* |
| xxx | xxx | xxx |

#### What is the current status and why is the action required?

As stated in the draft recast Gas Directive “**Differences in gas quality parameters and in the volume of hydrogen blended in the natural gas system can affect the design of gas infrastructure, end-user applications and cross-border system interoperability,** thus risk fragmenting the internal market. However, the current gas quality rules are not fit to deal with future developments.”[[162]](#footnote-163)

In the Commission’s proposal for the recast Gas Directive, the allowed **cap for hydrogen blends** is set at 5% by volume for all cross-border points in the natural gas system (Art. 20). The rule will apply from 1 October 2025, and will be implemented through a procedure for cross-border coordination of gas quality between first TSOs and then the NRAs, in case of occurred cross-border trade restriction due to gas quality differences. The proposed recast Gas Regulation contains rules on the cross-border coordination on gas quality (Art. 19).

According to biogas experts, the **current gas quality specifications regarding the oxygen content in the transmission grid are considered (in particular in Estonia) as a barrier to biomethane injection**. Higher allowed O2 levels for biomethane injection (similar to the values applied in countries with high biomethane production such as Italy, France, the Netherlands and Germany) would facilitate biomethane injection.

#### Description of the proposed action

After the formal approval of the **recast Gas Directive, the Baltic-Finnish countries will have to make their national legislation compliant with the new EU provisions**, including those on gas quality. The BRGM countries should take this opportunity to include in their new legislation rules for enhanced regional cooperation between the concerned TSOs in view of adapting where necessary and further harmonizing their quality specifications, in view of eliminating specific technical specifications that would hinder injection of biomethane and limited volumes of hydrogen.

**Harmonised gas quality specifications for hydrogen blends** will have to be determined by the BRGM TSOs in line with the new Gas Directive. Where and when the expected hydrogen blend would exceed 5%, dedicated transport infrastructure will have to be made available by the newly appointed hydrogen network operators.

Also for the **hydrogen backbone and dedicated pipelines, harmonized gas quality requirements will have to be determined** by the transmission network operators, in view of facilitating trade between the different clusters independently of the national borders.

The **responsibility for ensuring and monitoring the quality of injected gas** should be clearly defined. According to Marcogaz and EBA, the general practices are that the producer/shipper of biomethane is responsible for the quality of biomethane injected into the grid, but the quality control of the biomethane before and after injection should be ensured by the concerned grid operator (DSO or TSO).[[163]](#footnote-164)

We also **recommend reviewing and adapt where appropriate the O2 content specifications for gas transported via TSO or DSO grids,** based on European standards and good practices in order to facilitate biomethane injection into the grid and its use as fuel. Minimum requirements for the quality of biomethane for fuel use are defined in EN 16723- 2: 2017-10 “Natural gas and biomethane for use in transportation and biomethane for feeding into the natural gas network - Part 2: Specifications for fuels for motor vehicles”. A limited proportion of accompanying substances is permitted, which must usually be reduced to a minimum before the biogas upgrading process. Some critical accompanying substances mentioned are, e.g. hydrogen (2 mol%) and oxygen (1 mol%).[[164]](#footnote-165)

The proposed measures should contribute significantly to the mitigation of Risk 6 ‘Infrastructure cannot be adequately or timely developed, including repurposing or adaptation of natural gas infrastructure’, and Risk 11 ‘Policies and regulations can present barriers to implementation of gas decarbonization actions’ identified in Deliverable 5 of this study.

#### Assessment of implementation aspects

The proposed measure ‘Review and harmonise gas quality specifications where appropriate’ will not require high costs, as it does in principle not include the need to develop additional or new infrastructure. The cost will hence mainly relate to the review and adaptation of the quality specifications by the grid operators (in concertation with the NRAs) and some technical changes of equipment (e.g. metering devices) where required. We hence assume that the cost level of this measure will be relatively **low**.

The complexity of reviewing and harmonising the gas quality specifications is **medium** as it requires interactions between the grid operators and NRAs at national and regional level. Other stakeholders should in principle not be strongly involved in this process.

The timing of implementation of this measure is proposed to be rather **short-term,** as the current quality specifications seem to hinder the injection of renewables gases, and may hinder cross-border gas trade.

Finally, these measures would **impact all scenarios and gases in a similar way,** as biomethane and hydrogen will to some extent be injected into the grid in all scenarios, at least in some of the 2030, 2040 and/or 2050 timeframes.

## Action set 5: Energy and carbon taxation

### Action 5a) Review energy excise tax across energy products

|  |  |
| --- | --- |
| **Criteria** |   |
| **Responsibility for implementation** | National ministries |
| **Costs**  | Low |
| **Complexity** | Medium |
| **Stakeholder involvement** | Medium |
| **Implementation**  | Short-term |
| Impacted gases |
| Biogas/biomethane | Hydrogen  | Synthetic natural gas |
| xx | xx | xx |
| Relevance for decarbonisation scenarios |
| *REN-Methane* | *REN-Hydrogen* | *REN-Cost Minimal* |
| xxx | xxx | xx |

#### Why is the action required?

The taxation of energy and fuels is a tool based on the ‘polluter pays’ principle that can contribute to fostering energy transition and decarbonisation of the economy.[[165]](#footnote-166) As taxes on energy use increase the overall cost of energy and thus create a price signal, they can discourage irrational energy consumption behaviours and encourage households and businesses to reduce their energy use or to switch to low-carbon energy sources. In addition, taxes on energy use can also have an effect on investment patterns and enhance energy efficiency improvements (e.g. building renovation to reduce energy needs for heating, investments in R&D to accelerate the deployment of renewable energy sources and more energy-efficient technologies). Finally, taxes on energy use are a major source of government revenues, which can be dedicated to energy transition projects, including renewable energy and energy efficiency (in particular for low-income and vulnerable households).

Although energy taxation is a useful instrument to accelerate the energy transition, many energy-intensive and other fossil fuel using companies across the EU (including in the Baltic states – as shown in the next subsection ‘current status’) benefit from energy excise tax exemptions, which indirectly supports the further use of fossil fuels. In response to increasing fossil energy prices in recent years, some Member States have cut their excise taxes on energy products to mitigate the impacts on energy bills.[[166]](#footnote-167) Some of these tax reductions could also be classified as fossil fuel subsidies.[[167]](#footnote-168) Energy excise taxation structures should be revised in order to avoid further support to fossil fuels which would prevent the achievement of the climate and energy objectives.

#### Current status

Taxes and levies on energy represent an important share of the overall energy price paid by consumers in the EU.[[168]](#footnote-169) The fourth study on energy prices and costs (2020)[[169]](#footnote-170) indicates that EU average taxes and levies account for around 40% and 32% of households’ electricity and gas bills, respectively. In the industry, taxes and levies represent 30 to 34% of electricity and 13 to 16% of gas costs. Taxes and levies on energy differ among Member States and can take various forms, e.g. excises, VAT, renewable energy levies, capacity levies, environmental taxes.[[170]](#footnote-171) Excise taxes are indirect taxes on the sale or use of specific products, such as energy.[[171]](#footnote-172)

##### Energy excise taxes in the EU

In the EU, energy excise taxes cover all energy products used for heating and transport, as well as electricity. Member States have agreed on common rules to ensure that excise taxes are applied in a similar way and to the same products across the EU.

Energy Taxation Directive

Directive 2003/96/EC restructuring the Community framework for the taxation of energy products and electricity (also called the Energy Taxation Directive or ETD) lays down the EU rules for taxing energy products including electricity and most heating fuels.[[172]](#footnote-173) The ETD sets structural rules to avoid potential competition distortion in the EU and defines excise duty minimum rates to encourage decarbonisation and energy efficiency.[[173]](#footnote-174) As part of the Fit-For-55 package the EC has proposed in July 2021 a revision of the ETD that aimed at ensuring that energy taxes also account for the carbon content of fuels.[[174]](#footnote-175) This revision should contribute to a better alignment of the energy taxation rules and levels with the climate and energy efficiency objectives. The draft recast ETD aims to remove disadvantages for clean technologies and introduce higher levels of taxation for inefficient and polluting fuels, complementing carbon pricing through the ETS. Ensuring that environmental impacts (external costs) are properly reflected in the taxation structure is also crucial to avoid misleading price signals for businesses and households, thereby reducing the risk to push them towards investment choices that may face increased risks of becoming stranded or increasingly expensive due to climate policy. Taxes on electricity and fuels would be aligned based on their energy content (rather than on volume or weight as currently applied) and environmental performance.

The current minimum excise duty rates that Member States must apply to natural gas as per the ETD are presented in Table . In Finland and Lithuania, the currently applied excise duty rates on natural gas are significantly higher than the minimum excise duty rates imposed by the ETD.

Table ‑ Minimum excise duty rates to be applied by Member States to natural gas for fuel and transport, and electricity as per Energy Taxation Directive and excise duty rates in the Baltic-Finnish region

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Sector | Minimum excise duty rates in ETD (in EUR/GJ) | Excise duty rates in Finland (in EUR/GJ) | Excise duty rates in Estonia (in EUR/GJ) | Excise duty rates in Latvia (in EUR/GJ) | Excise duty rates in Lithuania (in EUR/GJ) |
| **Motor fuels** | 2.6 | 5.85 | 1.07 | 0.53 | 6.56 |
| **Motor fuels used for commercial and industrial use** | 0.3 | 5.85 | 1.07 | 0.53 | 6.56 |
| **Heating and electricity** | For business: 0.15For non-business: 0.3 | 5.85 | 1.07 | For business: 0.15For non-business: 0.46 | For business: 0.15For non-business: 0.3 |

*Source: Directive 2003/96/EC[[175]](#footnote-176) and EC Taxes in Europe Database[[176]](#footnote-177)*

The draft recast ETD proposed in 2021 by the European Commission, comprises reviewed minimum rates for natural gas and renewable and low-carbon gases (see Table ).

Table ‑ Proposed minimum excise duty rates to be applied by Member States to gas products as per the draft recast Energy Taxation Directive

| Sector | Fuel | Proposed revised minimum excise duty rates in ETD recast (in EUR/GJ) |
| --- | --- | --- |
| *Between 2023-2032* | *From 2033* |
| **Motor fuels** | Natural gas | 7.17 | 10.75 |
| Non-sustainable biogas | 7.17 | 10.75 |
| Non-renewable fuels of non-biological origin | 7.17 | 10.75 |
| Sustainable food and feed crop biofuels and biogas | 5.38 | 10.75 |
| Sustainable biofuels and biogas | 5.38 | 5.38 |
| Low-carbon biofuels | 0.15 | 5.38 |
| Renewable fuels of non-biological origin | 0.15 | 0.15 |
| Advanced sustainable biofuels and biogas | 0.15 | 0.15 |
| **Motor fuels used for commercial and industrial use** | Natural gas | 0.6 | 0.9 |
| Non-sustainable biogas | 0.6 | 0.9 |
| Non-renewable fuels of non-biological origin | 0.6 | 0.9 |
| Sustainable food and feed crop biofuels and biogas | 0.45 | 0.9 |
| Sustainable biofuels and biogas | 0.45 | 0.45 |
| Low-carbon biofuels | 0.15 | 0.45 |
| Renewable fuels of non-biological origin | 0.15 | 0.15 |
| Advanced sustainable biofuels and biogas | 0.15 | 0.15 |
| **Heating fuels** | Natural gas | 0.6 | 0.9 |
| Non-sustainable biogas | 0.6 | 0.9 |
| Non-renewable fuels of non-biological origin | 0.6 | 0.9 |
| Sustainable food and feed crop biofuels and biogas | 0.45 | 0.9 |
| Sustainable biofuels and biogas | 0.45 | 0.45 |
| Low-carbon biofuels | 0.15 | 0.45 |
| Renewable fuels of non-biological origin | 0.15 | 0.15 |
| Advanced sustainable biofuels and biogas | 0.15 | 0.15 |

*Source: EC COM(2021) 563 final*

The approval of the proposed revision of the ETD follows the special legislative procedure.[[177]](#footnote-178) In other words, unanimity from the Council is required to adopt the revised ETD, following consultation of the European Parliament (EP) and the European Economic and Social Committee (EESC). In January 2022, the EESC adopted an opinion. The EP is currently revising the proposal. After a year of negotiations, the Czech Presidency indicated in November 2022 that all Member States had not yet tabled on a final proposal, but the majority of Member States expressed a positive opinion about the suggested ETD changes and the next steps. In June 2023, the Swedish Presidency announced that further progress had been made in the negotiations. However, work was still needed to reach a common agreement on outstanding issues.[[178]](#footnote-179)

##### Energy taxation in Finland

In Finland, there is only one rate for natural gas for all purposes (heating, propellant and mobile applications). Until 2021, biogas and biomethane in all end-use applications were exempt from excise duties.[[179]](#footnote-180) Imported biomethane is also exempt from both excise duty and custom fees. Natural gas is duty free when coming from outside the EU, however in compliance with the ETD, VAT and excise duties apply. Since 2022, a tax on the use of biogas in transport (not for heating) is implemented in the context of several tax changes made by the Government.[[180]](#footnote-181)

Energy-intensive companies may apply for a refund of the excise tax they have paid on energy, if the excise duty amount is high compared to the company’s value added (i.e. more than 0.5% of the VA).[[181]](#footnote-182) In 2020, the refund was up to 85% of the share of excise duty that exceeded the 0.5% VA. The government announced in its NECP that this tax refund will be gradually phased out by 2025.

The Ministry of Finance commissioned the VTT Technical Research Centre of Finland to elaborate a study on the development of energy taxation in Finland.[[182]](#footnote-183) The study analyses the energy taxation of heating, industrial and machinery fuel use and of electricity use. It concludes that the current model works relatively well. However, the revision of the ETD would require significant changes to the current taxation system.[[183]](#footnote-184)

##### Energy taxation in Estonia

Excise duty rates are lower in Estonia that in Finland and Lithuania. Intensive gas users (i.e. economic operators with high gas consumption) may benefit from a rebate of the excise duty.[[184]](#footnote-185) The gas consumption intensity calculated as the share of the total cost of natural gas in the value added generated by the company, must be above 13% to be eligible for a rebate. In addition, the company must comply with conditions for receiving State aid.

Energy excise duty exemptions also apply to specific actors.[[185]](#footnote-186) The exemption only applies to the part of energy use directly necessary to carry out the exempted process (e.g. use in production equipment) and not to the energy consumption for indirect purposes (e.g. product packaging, lighting of offices and warehouses, etc.).

In response to the Covid-19 crisis, the Estonian government temporarily decreased the excise duty on natural gas from May 2020 to April 2022.[[186]](#footnote-187)

##### Energy taxation in Latvia

Latvia has the lowest excise duty rates of the Baltic-Finnish region. Reduced excise tax rates for natural gas do not exist in Latvia.[[187]](#footnote-188)

##### Energy taxation in Lithuania

In Lithuania, the following energy uses are exempt from excise duty:[[188]](#footnote-189)

Natural gas used for CHP generation;

* Natural gas and electricity used by households and/or by charitable organisations;
* Electricity generated using renewable energy sources.

In 2023, the Lithuanian Parliament has adopted amendments to the Law on Excise Duty.[[189]](#footnote-190) These amendments include a gradual phasing out of fossil fuel benefits and subsidies to gasoil, coal, coke, lignite, diesel and LPG in cylinders. The excise tax rates will also be applied. However, reduced rates will still be applied to renewable diesel used in agricultural machinery and natural gas used for heating. As of 2025, energy excise taxes will include a CO2-component based on emissions of the type of fuel.

##### Fossil fuels subsidies

Next to energy taxation exemptions or reductions, fossil fuels also benefit from various subsidies which stimulate their further development. A report of the European Environment Agency (EEA) on fossil fuel subsidies (2023)[[190]](#footnote-191) states that the latter have remained stable over the period from 2015 to 2021, at around 52 billion euros in 2021. In the EU, Finland is at the 10th position of Member States providing the most fossil fuel subsidies between 2025 and 2020. The three Baltic states are located towards the end of the ranking. Together with Sweden, Estonia is the Member State which has cut fossil fuel subsidies the most since 2015 (by 50%).

#### Description of the proposed action

This proposed action is aimed at reviewing the energy excise tax rules and levels for energy products in the Baltic-Finnish region. As described in the above analysis, the revised ETD is expected to contribute to the alignment of the energy taxation principles with the more ambitious climate and energy efficiency objectives and ensure that the environmental impacts are properly reflected in taxation structures across the EU. As the proposal requires unanimity in the Council for its adoption, the approval process is difficult and takes much time. Although the political negotiations have started in 2021, it is still unclear whether and when the proposal will effectively be adopted. Therefore, it is recommended that the **governments of Finland, Estonia, Latvia and Lithuania anticipate and already adapt their legislation and energy taxation rates, based on the principles and rules of the proposed ETD**. This should also include the gradual phasing out of energy excise tax exemptions (including those to natural gas) that exist in the Baltic-Finnish Member States. To avoid competition distortion in the regional (energy) market, it is recommended that the four countries harmonise to some extent their energy taxation approaches.

In addition, as shown in the above analysis, fossil fuels still benefit from subsidies in the Finish-Baltic region. Hence, together with the revision of energy excise taxation structures, **further initiatives to accelerate the phasing out of existing subsidies for fossil fuels** is recommended. Estonia has already started phasing out its fossil fuel subsidies (which have been cut by half since 2015).

The proposed measures should contribute significantly to the mitigation of Risk 3 ‘Fossil gas decarbonisation can negatively affect competitiveness of industrial users’, Risk 4 ‘Developments of in global energy markets impact competitiveness of gas decarbonisation solutions and Risk 11 ‘Policies and regulations can present barriers to implementation of gas decarbonisation actions’ identified in Deliverable 5 of this study.

#### Assessment of implementation aspects

The authority responsible for revising the energy taxation system are the Ministries of Finance in all four countries. As increasing tax rates and phasing out exemptions may be associated with public opposition, the involvement of stakeholders in the process should be at least **medium**. This measure should also be accompanied with clear communication on the objectives of the policy revision.

Energy taxation already exists in the Baltic-Finnish region. Hence, the cost of reviewing the current energy excise tax schemes would be relatively **low**. Additional social policies needed to mitigate the impact of increased tax rates should however be considered in the implementation of new tax rates; the complexity of the proposed measures would hence be **medium**.

The recommended timing of implementation would be the **short-term** (as of 2023-2024), as it is considered appropriate to anticipate the adoption of the proposed recast ETD. The revision of the energy excise tax rates should already contribute to the achievement of 2030 objectives.

The proposed measure will contribute to the achievement of **all decarbonisation scenarios**, but the REN-Methane and the REN-Hydrogen scenarios will be the most impacted as the fossil energy consumption levels are highest in these scenarios. As the proposed recast ETD introduces minimum excise rates for renewable and low-carbon gases as well, all gases would be impacted. However, they would be less impacted than natural gas for which the rates are much higher.

### Action 5b) Review/introduce carbon taxation

|  |  |
| --- | --- |
| **Criteria** |   |
| **Responsibility for implementation** | National ministries |
| **Costs**  | Low in Finland, Estonia and Latvia Medium / Higher in Lithuania |
| **Complexity** | Low / Medium |
| **Stakeholder involvement** | High |
| **Implementation**  | Short- to medium-term |
| Impacted gases |
| Biogas/biomethane | Hydrogen  | Synthetic natural gas |
| x | x | x |
| Relevance for decarbonisation scenarios |
| *REN-Methane* | *REN-Hydrogen* | *REN-Cost Minimal* |
| xxx | xx | xx |

#### Why is the action required?

Carbon pricing is an approach to decrease carbon emissions based on the ‘polluter pays’ principle. A price is set on GHG emissions to hold emitters accountable for the damages they cause in adding emissions to the atmosphere. Carbon pricing can take different forms, but all aim at creating a price signal on GHG emissions. One of the two main forms of carbon pricing is carbon taxation.[[191]](#footnote-192) A **carbon tax** sets a price on carbon by defining a tax rate on GHG emissions, or on the carbon content of fossil fuels.[[192]](#footnote-193) This allows to create a financial incentive to lower emissions by switching to more efficient processes and cleaner fuels.[[193]](#footnote-194) Whereas the price on carbon is certain with a carbon tax, the level of emission reduction is not (as opposed to other carbon pricing mechanisms such as ETS).

In the context of the decarbonisation of the gas sector, setting a carbon tax allows to incentivise the shift away from methane gas and stimulates investments into and use of low-carbon or renewable gases (e.g. hydrogen, biogas/biomethane). Carbon taxation is also a mean to raise revenues to fund decarbonisation measures or to compensate for the negative socio-economic consequences of the rise in energy prices.

Carbon taxation (and carbon pricing in general) is however not a silver bullet. It should be part of a broad package of tools to achieve climate and energy targets. Policy instruments and investments are key to complement carbon taxation and enable consumers to respond to higher prices by shifting to low-carbon options. Another important challenge of the implementation of carbon taxation is public acceptance. First, carbon taxes can have a distributional impact on society as lower-income households usually bear the economic burden of a carbon tax in a disproportionate way. Therefore, it should be introduced gradually with targeted measures to support low-income households, vulnerable people and those facing energy poverty. Second, as a carbon tax increases the cost of polluting activities for industries (in particular for energy-intensive ones), it may lead to carbon leakage. In this context, it is crucial to clearly communicate on the rationale of the policy and the use of its revenues.[[194]](#footnote-195)

#### Current status

##### Carbon taxation in the EU

In 2023, 37 carbon tax programs have already been implemented worldwide in various countries and subnational jurisdictions (i.e. cities, states and provinces).[[195]](#footnote-196) These programs cover 5.62% of global GHG emissions.[[196]](#footnote-197) Several EU Member States have carbon taxation schemes, which often address emissions not covered by the EU ETS. Table 3‑4 provides an overview of the MS carbon tax schemes in the EU. In the Baltic-Finnish region, a carbon tax is in place in Finland, Estonia and Latvia.

Table ‑ EU Member State carbon taxes

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Country & year established | Explicit carbon tax rate as of 2021 (EUR/tCO2) | % of total GHG emissions covered | Sectors covered | Revenues in 2019 (in EUR) |
| Sweden (1991) | 108.8 | 40% | Transport & heating | 2.1 billion |
| Finland (1990)\* | 62.2 | 36% | 1.3 billion |
| France (2014) | 44.8 | 35% | 8.2 billion |
| Ireland (2010) | 25.6 | 49% | 440 million |
| Germany (2021) | 25.0 | N/A | Transport, heating & industry not in EU ETS | - |
| Denmark (1992) | 23.8 | 40% | Transport & heating | 475 million |
| Portugal (2015) | 23.8 | 29% | 257 million |
| Luxembourg (2021) | 20.0 | n/a | - |
| Slovenia (1996) | 17.4 | 24% | 74 million |
| Spain (2014) | 14.6 | 3% | Fluorinated gases | 110 million |
| Latvia (2004) | 9.1 | 15% | Industry not in EU ETS | 8 million |
| Estonia (2000) | 1.8 | 3% | Thermal energy except from biofuels | 2.7 million |
| Poland (1990) | 0.1 | 4% | Industry not in EU ETS | 915 000 |
| Netherlands (2021) | N/A | N/A | Industry and waste | - |

*Source: EC (2022)[[197]](#footnote-198), EEB (2021)[[198]](#footnote-199)*

The EEB published a report in 2021 which analyses carbon tax schemes in 11 Member States (all above except the German, Dutch and Luxembourg schemes as these have only recently been implemented).[[199]](#footnote-200) According to the EEB, although carbon taxes are relatively low in many EU countries, the adoption of a carbon tax leads to lower emissions growth rates in comparison to other similar countries’ trajectories. In countries where carbon taxes seem ineffective, there are often various exemptions granted and tax rates are low.

Some good practices include:

**Use of revenues** **and addressing public acceptance** - Most countries allocate the tax revenues to the general government budget but there exist some good practices in countries which earmark the revenues. In **Portugal**, the government has committed to use the revenues for tax policy measures, with earmarking for tax cuts to help relieve large households from paying personal income taxes. The revenues are also partially used for green spending (green mobility, nature conservation, climate mitigation). In **Ireland**, the revenues raised are allocated to green subsidies and redistributed to protect vulnerable energy consumers. **Sweden** allocates the tax revenue to the general budget but the government has implemented parallel tax reliefs for low income households. The country has increased social transfers and reduced the basic rate of income taxes to offset the harm on low- and middle-income households. The country has also increased the carbon tax gradually to provide households and businesses time to adapt and shift their consumption patterns. Finally, **Denmark** has accompanied carbon tax increases with reductions in employer social contributions and personal income taxes. However, carbon tax revenues do not directly fund labour tax reductions as the latter have generally exceeded increases in carbon tax revenues.

* **Effectiveness** – In **Sweden**, the carbon tax has allowed to decrease emissions of the sectors covered by half since its implementation. The administrative costs of the carbon and energy tax is estimated to be 0.1% of total revenues, which was one of the initial concerns in the design of the scheme. Since the implementation of the carbon tax in **Denmark**, GHG emissions have decreased and there has been a shift from coal as main energy source to renewable energy in the industry.

Carbon taxation in Finland

Finland was the world’s first country to introduce a carbon tax in 1990.[[200]](#footnote-201) The carbon tax was designed as a component of the energy tax on fossil fuel and based on the carbon content of the latter. At the time of introduction the tax was equal to 1.12 €/tCO2eq. It gradually increased over the years. In 2021, the Finnish carbon tax covered 36% of the country’s GHG emissions and was equal to 62.2 €/tCO2eq. As such, Finland’s carbon tax is at the top end of carbon pricing schemes in the EU, only Sweden has significantly higher prices (for non-EU ETS emissions). Table shows the effective carbon prices by major fuel type in Finland in 2018.[[201]](#footnote-202) The effective carbon tax for natural gas is 43 €/tCO2eq. In addition, there is a fuel tax on energy content equal to 31 €/tCO2eq for natural gas. In 2019, the methodology to calculate CO2 emissions for fuels covered by the carbon tax in Finland was adapted. It now applies to lifecycle emissions, instead of only combustion emissions.[[202]](#footnote-203)

Table ‑ Effective carbon prices by major fuel type in Finland in 2018 (in EUR/tCO2eq)

| Sector/fuel type | Domestic carbon tax | Fuel tax (on energy content)  | EU ETS charge | Total |
| --- | --- | --- | --- | --- |
| **Electricity / district heating** |
| Coal and other solid fuels | 0 | 0 | 30 | 30 |
| **Industry** |
| Coal and other solid fuels | 15 | 10 | 30 | 55 |
| Natural gas | 43 | 31 | 30 | 104 |
| **Road transport** |
| Gasoline | 77 | 234 | 0 | 311 |
| Diesel | 75 | 124 | 0 | 199 |
| **Buildings** |
| Diesel | 62 | 29 | 0 | 92 |

*Source: IMF (2021)*

The revenues resulting from the carbon tax represent around 2% of state revenues. These revenues are directly transferred to the general government budget and are not earmarked. The Finnish government is gradually strengthening the carbon tax component in the energy tax and shifting the tax burden to higher carbon fuels, thereby greening its tax system.[[203]](#footnote-204) Despite a comprehensive system of exemptions to the carbon tax,[[204]](#footnote-205) it has been partially successful in reducing Finland’s GHG emissions. Studies indicate that the tax allowed to decrease CO2 emission growth per capita. However, as the carbon and energy taxes are combined it is difficult to attribute the exact effect of the carbon tax on emissions.

Carbon taxation in Estonia

A carbon tax was implemented in Estonia in 2000. However, the average carbon tax is very low, i.e. 1.8 €/tCO2eq in 2021 and it covers only 3% of total GHG emissions in the country. The revenues generated from the tax are not earmarked and are directly assigned to the government budget. The effectiveness of the tax is low as the rate is considered too low to provide firms and households with compelling signals to adapt their consumption behaviour.[[205]](#footnote-206)

Carbon taxation in Latvia

Latvia has implemented a carbon tax in 2004, which covers 15% of total GHG emissions in the country. In 2021, the average carbon tax was equal to 9.1 €/tCO2eq.[[206]](#footnote-207) The revenues of the carbon tax were originally allocated to municipalities where they were generated (to a level of 40%). Now, 100% of the revenues are assigned to the general government budget.

##### Other EU developments related to carbon pricing

Revision of EU ETS

A cornerstone of the EU climate policy is the EU Emission Trading Scheme (EU ETS). It was introduced in 2005 and covers the following sectors: power and heat generation, energy-intensive industrial installations and aviation.[[207]](#footnote-208) As part of the Fit-For-55 package, the EU ETS has been revised to also encompass the transport and building sectors from 2027. In December 2022, a provisional trialogue agreement was reached.[[208]](#footnote-209) The agreed text increases the overall GHG emissions reduction target. In addition, it extends the ETS to the maritime sector as of 2024. A new separate EU ETS for buildings and road transport fuels will start in 2027 (EU ETS II).

CBAM

As mentioned in Deliverable 5, to mitigate the negative impact of the decarbonization policies, including the substitution of fossil gas by renewable energy, on the competitiveness of the EU industry, the EU has adopted the Carbon Border Adjustment Mechanism (CBAM) regulation.[[209]](#footnote-210) The CBAM aims to prevent carbon leakage by putting a fair price on carbon emitted during production of carbon intensive goods that are entering the EU, and to encourage cleaner industrial production in non-EU countries. In this way the CBAM should protect to some extent the competitiveness of the EU industries that are included in the scope[[210]](#footnote-211), at least for production destined for the internal market.

#### Description of the proposed action

Carbon taxation is one of the effective tools to achieve decarbonisation. It stimulates renewable and low-carbon solutions and pushes for adoption of non-fossil based technologies and reduction in energy demand.

The above overview shows that carbon taxes are already implemented in Finland, Estonia and Latvia. In Finland, the carbon tax system is well-established and carbon tax rates are among the highest rates in the EU. The scheme has contributed to the reduction of GHG emissions in the country. However many exemptions still exist and carbon tax revenues are not earmarked to specific investments related to the energy transition. In Estonia and Latvia, carbon tax rates are very low which prevent the schemes from having a significant impact. A carbon tax has not yet been implemented in Lithuania. In combination with other measures proposed in this report to decarbonise the gas sector, it is recommended to **review the current carbon tax systems in Finland, Estonia and Latvia by gradually increasing rates** and **introduce a carbon tax in Lithuania**.

A gradual and measured carbon tax would allow to internalise the external cost of carbon emissions from gas consumption. It would provide a long-term and predictable price signal to support the transition to low-carbon and renewable gas technologies. However, the measure should be implemented globally and not only for the gas sector. Table 3‑6 presents some recommendations for the main design components of a carbon tax.

Table ‑ Recommendations for the design of carbon taxation in the Finish-Baltic region

|  |  |
| --- | --- |
| Design components | Recommendations |
| **Tax base** | * The tax should cover all fuels.
* Exemptions should be minimised to ensure that most sectors are covered (except EU ETS installations).
 |
| **Tax rate** | * The price should gradually increase.
* The OECD has benchmarked national carbon prices against various carbon costs. It has concluded that a carbon tax of 120 €/tCO2eq by 2030 would be aligned with the overall social carbon costs and would be necessary to achieve decarbonisation by 2050.
 |
| **Assess potential undesirable effects** | **Carbon leakage** – Assess the risk of companies delocalising their production abroad. * **Policy overlaps or inconsistency** – Carbon pricing instruments can be significantly more effective if they are aligned with complementary policies (as those described in this action plan).

The potential conflicts with the current Finish, Estonian and Latvian legal frameworks would be limited, as it is similar to the already existing carbon pricing system. However, Lithuania should assess the compatibility. * **Ensure social acceptance** - Concerns about public perception, in terms of increasing the relative costs of energy, in light of already high energy prices, should be properly addressed. Social policies should be implemented to ensure that vulnerable households are not negatively impacted by carbon taxation. Energy producers/suppliers should bear some of the cost of carbon taxation to ensure that they are incentivised to shift away from methane gas.
 |
| **Revenue use** | * The revenues from carbon pricing can partly be used to subsidize energy transition investments (particularly for low-income households).
* Revenues can be recycled to reduce other conventional taxes, protect lower-income households, support cleaner technologies, address fairness and competitiveness concerns, or channel public funds toward other public policy objectives.
 |
| **Monitoring and compliance** | * Responsible authority: Ministries of Finance, Environment/Climate and Energy.
 |

The proposed measures should contribute significantly to the mitigation of Risk 3 ‘Fossil gas decarbonisation can negatively affect competitiveness of industrial users’, Risk 4 ‘Developments of in global energy markets impact competitiveness of gas decarbonisation solutions’ and Risk 11 ‘Policies and regulations can present barriers to implementation of gas decarbonisation actions’ identified in Deliverable 5 of this study.

##### Other considerations for the introduction and review of carbon taxes

The design of carbon pricing schemes must be adapted to the local context and depends on specific policy objectives, but effective schemes share common characteristics. A well-known design tool is the FASTER Principles for Successful Carbon Pricing developed by the World Bank and the OECD. According to this tool, a successful scheme must include the following characteristics:[[211]](#footnote-212)

**Fairness** - Reflect the “polluter pays” principle and ensure that both costs and benefits are fairly shared.

**Alignment of policies and objectives** – Carbon pricing should not be stand-alone mechanism. It is most effective when it is combined with and promotes broader policy goals, both climate and non-climate related.

**Stability and predictability** – A stable policy framework is key and clear, consistent and (over time) increasingly strong price signal to investors should be sent.

**Transparency** – Implementation and design should be transparent.

**Efficiency and cost-effectiveness** – Effective carbon pricing lowers the cost and increases the economic efficiency of reducing emissions.

**Reliability and environmental integrity –** Allow for measurable reduction in environmentally harmful practices.

#### Assessment of implementation aspects

To ensure social acceptance of the measure as well as the adaptability of the carbon tax to the local context and policy objectives, the involvement of stakeholders should be **high**. It is also key to establish clear communication on the rationale behind the review/introduction of the carbon pricing scheme.

As carbon taxation already exists in Finland, Estonia and Latvia, the administrative cost of reviewing the scheme would be **low**. The Swedish example could be taken as an example regarding the administrative management to learn lessons to minimise the costs. In Lithuania, the administrative costs would be **higher** as an entirely new carbon taxation scheme would have to be designed and implemented.

The cost of this measure on end-users would be high, in particular in the REN-Methane and the REN-Hydrogen because they continue to rely on methane gas up significantly until 2040. In addition, under these two scenarios the average cost for commercial and household consumers was already higher than in the Cost minimal scenario (except for Lithuania). A high carbon tax would initially lead to higher energy costs, but the impact would gradually decrease by switching to low-carbon and renewable sources.

The complexity of reviewing/introducing carbon taxation is **medium to high**. Even though establishing the carbon pricing would be simple, if based on fuel use (especially in Finland, Estonia and Latvia where a scheme is already in place), it could become complex when considering the additional social policies needed to mitigate the risk of energy poverty.

The timing of implementation would be in the **short to medium-term**, between 2023 and 2030. The implementation of a carbon tax will contribute to the achievement of all decarbonisation scenarios. However, the REN-Methane and the REN-Hydrogen will be the most impacted by a carbon price because they will continue to rely on methane gas up significantly until 2040.

# Action plan summary and recommendations

Figure 4‑1 presents the timeline for implementation of the actions comprised in the plan for decarbonisation of the gas system in the Baltic states and Finland. Table 4‑1 presents the summary of each of the proposed actions regarding responsibility for implementation, implementation horizon, costs, complexity, need for stakeholder involvement, and relevance to the gas decarbonisation scenarios.

Figure 4‑1 Action timeline for decarbonisation of the gas system of the Baltic states and Finland



As indicated in section 2.1, the actions of this plan focus on promoting the production and use of renewable and low-carbon gases for hard-to-decarbonise sectors and applications. Energy efficiency and direct electrification measures aiming at reducing overall gas demand are not included in the plan, but should nonetheless be prioritised ahead of policies substituting natural gas by renewable and low-carbon gases. **This means policymakers should pay particular attention at realistically forecasting future gas demand, implementing and taking into account ambitious energy efficiency and electrification measures.**

**As detailed in chapter 3, the proposed measures take as a starting point the policy measures adopted or proposed by the four national governments**, by conducting a review of the current policy landscape at the EU and national level. Hence, the proposed measures are meant to complement (or revise) the current regulatory frameworks, and may coincide with measures being considered by national governments but not yet publicly announced.

Figure 4‑2 Summary table of the proposed actions to decarbonise the gas system of the Baltic states and Finland

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Action** | **Implementation responsibility** | **Costs** | **Complexity** | **Stakeholder involvement** | **Implementation horizon** | **Relevance for decarbonisation scenarios** |
| **Short** | **Medium** | **Long** | **REN-Methane** | **REN-Hydrogen** | **Cost Minimal** |
| 1 Improve the governance structure and strategic policies for renewable gases | Ministries | Low | Medium | High |  |  |  | xxx | xxx | xxx |
| 2a) Further integrate the Baltic Regional Gas Market and facilitate access for new actors | Ministries and NRAs in concertation with TSOs | Low | Medium | High |  |  |  | xxx | x | xxx |
| 2b) Review energy certification system (including biogas and off-grid gas and extension to low-carbon fuels) | Ministries and NRAs in concertation with TSOs | Low | Low | Medium |  |  |  | xxx | xxx | xxx |
| 2c) Consider measures to develop a liquid hydrogen/derivatives market in the long-term | Ministries in concertation with NRAs | Low | Medium | Medium |  |  |  | x | xxx | x |
| 3a) Review/introduce coordinated production and/or consumption support measures to foster methane-based gases | Ministries | High | High | High |  |  |  | xxx | x | xxx |
| 3b) Assess the need for and implement specific support measures for renewable hydrogen production and/or consumption | Ministries | High | High | High |  |  |  | x | xxx | x |
| 3c) Consider legal ban on connecting new buildings to the natural gas grid and/or to new gas boilers | Ministries | Low | Medium | Medium |  |  |  | xxx | x | xxx |
| 4a) Increase regional methane/hydrogen/electricity infrastructure planning coordination | Ministries / NRAs / TSOs /DSOs | Low | Low | High |  |  |  | xxx | xxx | xxx |
| 4b) Review and harmonise connection requirements and coordinated planning for transmission and distribution | Ministries and NRAs in concertation with TSOs and DSOs | Low | Medium | Low |  |  |  | xxx | xxx | xxx |
| 4c) Review and harmonise gas quality standards where appropriate | TSOs in concertation with NRAs and DSOs | Low | Medium | Medium |  |  |  | xxx | xxx | xxx |
| 5a) Review energy excise tax across energy products | Ministries | Low | Medium | Medium |  |  |  | xxx | xxx | xx |
| 5b) Review/introduce carbon taxation | Ministries | Low/High[[212]](#footnote-213) | Low/Medium | High |  |  |  | xxx | xx | xx |

## Relevance to the gas decarbonisation scenarios

**It can be seen that most actions are highly relevant for all scenarios, which is related to the fact that all three decarbonisation scenarios rely to some extent on the main renewable gases** deployed in the scenarios: biogas, biomethane and hydrogen. Thus, while some actions only (or mainly) affect biogas/biomethane or hydrogen, they affect all decarbonisation scenarios (to different extents).

**The main differences are noted in the action sets 2 (Gas market design and integration) and 3 (Support and requirements for renewable and low-carbon gas production and/or consumption).** The reduced reliance of the REN-Hydrogen scenario on methane gases in the 2050 horizon (although they are still important in the 2040 horizon) means it is affected by for example policy 2a) “Further integrate the Baltic Regional Gas Market”, but to a lower extent. Likewise, the fact that in the REN-Methane and Cost Minimal scenarios hydrogen is deployed only locally means that those scenarios are affected by measures focusing on hydrogen, but to a lower extent.

**In contrast, action sets 1) “Governance of the gas system decarbonisation”, 4) “Infrastructure planning” and 5) “Energy and carbon taxation” have a significant impact on all scenarios.** This is logical, as those sets do not specifically focus on methane or hydrogen gases, but instead are transversal, aiming to provide the appropriate signals and regulatory conditions to all stakeholders to deploy the most efficient solutions to decarbonise the gas system.

**Hence, almost all actions proposed are required in order to fully and cost-efficiently decarbonise the Baltic Regional Gas Market**, regardless of the specific choices that policymakers and stakeholders will make regarding e.g. the extent of biomethane and hydrogen use in the different end-use sectors, and whether dedicated hydrogen networks at the national or regional levels will be deployed. **Therefore, these actions can be considered no-regret actions.** The exceptions are mainly actions 2c) “Measures to develop a liquid hydrogen market” and 3c) “Consider a legal ban on connecting new buildings / new gas boilers”. Depending on the extent of the role of hydrogen in the region’s energy system, creating a liquid hydrogen market may not be fully feasible as hydrogen production and use may remain localised, at least in the short- to medium-term. And while we recommend policymakers to consider a legal ban on building connections to the fossil gas grid and/or on installing new fossil gas boilers, it may be possible to decarbonise the gas system without this measure, as long as other measures are sufficiently effective and appropriate signals are provided to stakeholders.

**An important choice that national governments should make concerns the development of a dedicated hydrogen network at the national and regional level.** As discussed, the three decarbonisation scenarios all make use of the main renewable gas types (biogas, biomethane, hydrogen). However, the scenarios are strongly differentiated by whether a dedicated hydrogen network is deployed in the 2040-2050 timeframe, with only the REN-Hydrogen scenario considering such a network. This has an impact on the relative importance of hydrogen in the future energy system, as well as the relevance of many actions in the present plan, particularly 2c (Measures to develop a liquid hydrogen/derivatives market in the long-term) and 4c (Review and harmonisation of gas quality standards, in what concerns hydrogen gas quality).

**Quick implementation of the actions is paramount for maximising the societal net benefits of decarbonising the region’s gas system.** Deliverable 4 of this project has shown that the Cost Minimal scenario presents the lowest total costs in the considered time horizon, with the early substitution of LNG imports ahead of 2040 being a main driver. This implies that many of the decarbonisation policies for the region should substantially reduce the fossil gas use already by 2030, which would require that the policies are in place in the next years. As shown in the action plan timeline (Figure 4‑1) most of the proposed actions have indeed a short implementation horizon, and should be in place at most by 2030 (with the notable exception of actions to develop a liquid hydrogen market). The fastest these actions can be implemented, the higher would be the societal net benefits. The main exception are actions 2a) and 2b) which concern (transitional) support to methane gases and hydrogen/derivatives, respectively. Here, cost reductions in hydrogen production technologies will be driven in part by learning effects and economies of scale influenced by investments in the EU and globally. Hence, there could be a case for phasing/spreading out economic support. But in order to avoid competition distortion, this can be done in coordination with other EU Member States, and a balance should be found with decarbonising the region’s gas system sufficiently fast.

## Analysis of other implementation aspects

#### Implementation responsibility

**As can be seen from the summary Table 3‑1, national ministries bear the main responsibility for implementation of the proposed measures, often jointly with NRAs**. Network operators (TSOs and sometimes DSOs) should also be frequently involved, but the final decisions on those policies should remain with policymakers and regulators. The main exception concerns action 4c) “Review and harmonise gas quality standards where appropriate”, where TSOs are logically the best placed to agree on harmonised gas quality standards (with the involvement of and possibly a mandate from policymakers/regulators).

#### Implementation cost

**Most of the measures proposed are ranked as having a low cost to the national governments, as the actions defined in the action sets 1, 2 and 4 are mostly regulatory in nature**. Therefore, while they will require additional administrative resources from the governments and stakeholders, as well as e.g. IT systems to implement and monitor the measures, the costs would be low compared to measures requiring significant investments

**The action sets which do have a high cost impact are the action sets 3) Support and requirements for renewable and low-carbon gas and to a lesser extent 5) Energy and carbon taxation.** The measures in action set 3) will require national governments that subsidise biogas, biomethane or hydrogen projects, either to address the profitability gap (particularly for renewable hydrogen) or at least de-risk the investments (particularly for biogas and biomethane). The measures proposed in the energy and carbon taxation action set 4) will entail changes in environmental and other taxes in place in the region, thus altering the associated government revenues (and expenditures in case of tax reductions/exemptions). However, this measure will in principle lead to an overall increase in energy and carbon taxes to reflect the negative externalities of fossil energy consumption and related carbon emissions. Therefore, depending on how these revenues are recycled, this measures could have a positive or at least neutral impact on government accounts – without even considering the societal co-benefits of such an energy taxation reform. The main exception is the introduction of a carbon tax in Lithuania, as currently the country does not have such a scheme which would therefore entail new administrative costs (which could nonetheless be covered by part of the tax revenues).

#### Implementation complexity

**The implementation complexity of most actions proposed is rated as medium**, as typically they require the development of new measures or the review of a (complex) regulatory framework for the respective action area. As many of the proposed measures are transversal in nature, and hence need to consider important system integration aspects with interactions with several stakeholder groups (across all four Member States), energy carriers and end-use sectors, the complexity of these actions is not surprising.

**There are some exceptions, with the complexity of the following actions being rated as low**:

* **Action 2b) Review of energy certification system**, as such systems for renewable and low-carbon gases are already in place in the region to some extent;
* **Action 4a) Increase regional methane/hydrogen/electricity infrastructure planning coordination,** as the required planning activities are already taking place to some extent and stakeholders have significant experience both in coordinating planning and in other relevant areas such as cost-benefit analyses of new energy infrastructure.

**Policymakers should pay attention to the fact that despite the existence of some actions with low complexity, most are rather complex**. They will thus require important human resources from policymakers and regulators, and while these administrative costs should be limited compared to the societal benefits of the measures, the implementation of the measures may still face difficulties due to the lack of adequate human resources at the national level.

#### Stakeholder involvement

**As a rule, actors responsible for the implementation of the measures should strive for a strong involvement of stakeholders.** This is reflected by the need for stakeholder involvement being rather as medium or high for most actions proposed. Besides the main stakeholders identified as responsible for implementation (national ministries, NRAs and network operators), market players and the broader public should systematically be consulted during the development and implementation of the measures.

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