D7.2 | Final Evaluation Report

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1 REGATRACE in a Nutshell

REGATRACE (REnewable GAs TRAde Centre in Europe) aims to create an efficient trade system based on issuing and trading biomethane/renewable gases certificates/Guarantees of Origin (GO) with exclusion of double sale.

This objective will be achieved through the following founding pillars:

- European biomethane/renewable gases certificate/GO system
- Set-up of national certificate/GO issuing bodies
- Integration of GO from different renewable gas technologies with electric and hydrogen GO systems
- Integrated assessment and sustainable feedstock mobilisation strategies and technology synergies
- Support for biomethane market uptake
- Transferability of results beyond the project's countries

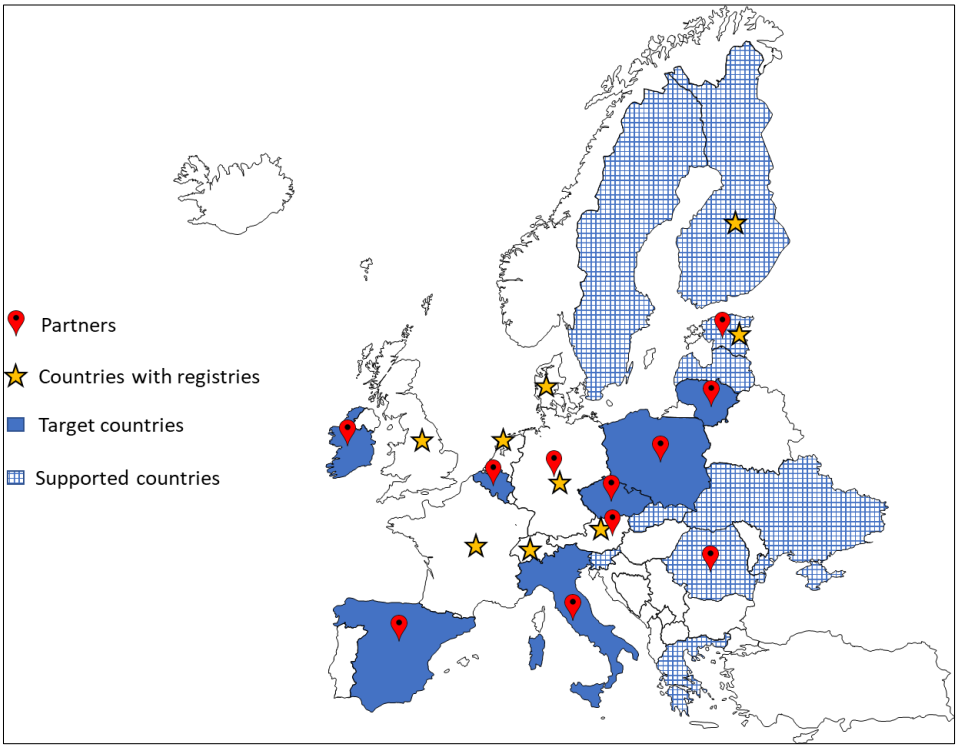

Figure 1: REGATRACE countries and partners

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2 Introduction and structure of the document

Evaluating a project means performing a rigorous analysis to determine the relevance and fulfilment of objectives, activities, effectiveness, impact, and sustainability and to verify whether the project has produced the planned results, delivered the expected benefits, and made the desired changes.

The present document illustrates the results of the evaluation process performed within REGATRACE. Details on the methodologies followed are reported in D7.1 and quoted in the text where necessary.

The report is structured as follows:

- Chapter 2, “Evaluation in REGATRACE”, explains the evaluation approach adopted and provides general definitions.
- Chapter 3, “Monitoring of project activities and results”, details the results of REGATRACE project by Work Package.
- Chapter 4, “Process Evaluation”, focuses on two aspects: assessment of key outputs produced in the project and analysis of the visioning and roadmapping process carried out by the Target and Supported countries within WP6. This second section illustrates the results achieved in terms of increased cooperation among national stakeholders of the biomethane sector.
- Chapter 5, “Impact Evaluation”, where figures on biomethane production and trade, and their evolution during the last 4 years, are monitored and reported in easy-to-read tables and graphs, to better understand and compare the situation in the different European countries.
- Chapter 6: “Policy Evaluation and Replication Assessment”, assesses the most interesting measures on biomethane in the advanced countries (Austria, Germany and Estonia) through specific criteria in order to determine the most successful ones and the reasons behind that. Then, their replication potential in the Target Countries is investigated thanks to a specific methodology (illustrated in D7.1).
- Chapter 7: “National Results achieved thanks to REGATRACE”, reports on the advancements made possible thanks to REGATRACE project in the countries involved.
- Chapter 8: “Conclusions” on the whole work of evaluation carried out in REGATRACE.

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3 Evaluation in REGATRACE

Evaluating a project means performing a rigorous analysis to determine the relevance and fulfilment of objectives, activities, effectiveness, impact, and sustainability and to verify whether the project has produced the planned results, delivered the expected benefits, and made the desired changes. An evaluation should also provide information that is credible and useful, enabling the incorporation of lessons learned into the decision-making process.[1]

Generally, evaluation is also instrumental in:

- Providing key stakeholders with the information needed to guide the project strategy towards achieving goals and objectives;
- Providing early warning of activities and processes that need corrective actions;
- Helping empower project partners by creating opportunities for them to reflect critically on the project's direction and decide on improvements;
- Building understanding, motivation and capacity amongst those involved in the project;
- Assessing progress to enable reporting requirements to be met;
- Assessing distribution of benefits among different beneficiaries and other target groups;
- Continuously improving project technical work and partners cooperation.

As a process, project evaluation takes a series of steps to identify and measure the outcomes and impacts resulted from project completion. Therefore, an ex-ante evaluation was performed within this Project Evaluation Plan, followed by a mid-term assessment of progresses, to be delivered through the Interim Technical Report (M20). Finally, towards the end of the project, an ex-post evaluation was carried out in order to compare the results achieved with the initial expectations and to assess the entire process carried out.

Evaluation in REGATRACE has two main objectives:

- To assess the success of the project by **monitoring** all the activities and outputs and analysing the **process** behind the achievement of them
- To assess the evolution of some key indicators in the project countries, in order to observe the **impact** of **national policies** and **measures** and follow the developments in the set up and run of national registries.

According to that and further elaborating the work done in BIOSURF[2], REGATRACE evaluation activities are structured as follow:

- ***Monitoring of project activities***

Monitoring generally means to be aware of the state of a system and to observe any potential or effective change that may occur over time. Concretely, it refers to the process of keeping track of all project-related activities and outputs oriented at the identification of potential problems in order to

[1] OECD, *Evaluation Guidelines (* https://www.oecd.org/dac/evaluation/seco_guidelines.pdf)
[2] BIOSURF is a H2020 project financed by INEA. BIOSURF Evaluation methodology and results are reported in the Project Evaluation Plan and in the Report on Impact Analysis.

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be able to undertake the necessary corrective actions to ensure that the project remains within scope. This is exactly what REGATARCE evaluation did over the entire project duration, thanks to the contribution and participation of the project partners (Chapter 3).

- ***Process Evaluation***

Process evaluation is complementary to monitoring. Whilst the latter finds out if and to what extent certain results have been achieved, the former allows understanding how and why those results have, or not, been attained.

In synergy with "Monitoring", the rationale behind the achievement of the project results was deepened in order to help current stakeholders and future parties interested in similar areas to REGATRACE understanding what sort of methods are likely to achieve the best results for a given action. In this regard, questionnaires were distributed to key national stakeholders to assess some outputs of REGATRACE (e.g., key deliverables). Moreover, Process Evaluation closely followed the activities carried out in WP6 ("Support for biomethane market uptake") by keeping track of the process of participatory foresight that was carried out in REGATRACE countries and assessing the results from a quali-quantitative point of view (Chapter 4).

Figure 2: Evaluation in REGATRACE

- ***Impact Evaluation***

This is the first topic that most people think of when evaluation is mentioned. An impact evaluation provides information about the impacts produced by an intervention - positive or negative, intended and unintended, direct and indirect. It comprises the work done to measure the results of the project and allows to compare them with the ambition of the project prior to the project start. In REGATARCE, a quantitative estimation of some selected parameter was formulated and carried out with the objective to monitor and update the state of play of biomethane sector as well as the status of development of national registries in the REGATRACE countries (Chapter 5).

- ***Policy Evaluation***

With Policy evaluation, the effects of the European and national policies are examined and assessed in terms of necessity, efficiency, validity, etc. to improve the planning and implementation process. A set of criteria for the analysis of the most relevant policies on biomethane adopted by the different project countries were defined in the Project Evaluation Plan and results were reported in this Final Evaluation Report. This analysis was complemented by a "Replication Assessment" with the ambition to identify the most promising policies/measures that could be best replicated elsewhere (Chapter 6).

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4 Monitoring of project activities and results

Project monitoring is the process of keeping track of all project-related activities and outputs oriented at the identification of potential problems in order to be able to undertake the necessary corrective actions to ensure that the project remains within scope. This process was carried out within REGATRACE with continuity and constancy in order to guarantee and make sure that activities would bring the expected results according to the plans.

Approaching the end of the project, it can be affirmed that, all in all, the activities carried out within REGATRACE brought valuable results and contributed to noticeable achievements.

Here below, the main outcomes of the project are summed up, while, in Table 1, details on REGATRACE's specific objectives and outputs achieved are listed by work package.

WP2 - European biomethane/renewable gases GO system

The specific objectives of **WP2** were multiple and diverse. One of these was to establish a network of national issuing bodies. To this end, the target set at the beginning was to obtain a MoU signed by 7 organizations. This goal was achieved and exceeded, in fact, as of May 2022, 16 organizations from 12 different countries joined the REGATRACE Network by signing the MoU (see D2.3). They meet regularly on topics of common interest. To serve the needs in an optimal way, the network's scope broadened beyond individual issuing bodies only and facilitates a place for multiple stakeholders in the facilitation of a market for biomethane and gas certificates.

Important achievements have been made in determining the contents and attributes of GOs. In November 2021, updated guidelines for creating the European Biomethane GO were published (D2.1). The results of this report facilitated an evolution from the grounds laid out in the BIOSURF project. Project partners AIB, ERGaR DENA, and EBA provided expert advice to the European Commission DG ENER in the framework of the FaStGO project on the technical requirements and the standardization process for guarantees of origin which was fed into the developments in CEN/CENELEC for the revision of the EN16325 standard on guarantees of origin.

In a series of reports, IT-related topics were dealt with. D2.5 provides guidelines and recommendations for tendering IT-services needed to for the databases of issuing bodies. Remarkable contribution from external contributors was received for the preparation of technical specifications for a dashboard and trading platform of renewable gas certificates (D2.6). Six different IT system options for a harmonized European cross-border transfer of renewable gas certificates were assessed in D2.4, concluding that a central IT-system for all services would be the suitable long-term solution from an IT-perspective.

In parallel with the REGATRACE project, evolutions took place on the establishment of IT-platforms facilitating the electronic transfer of GOs and other renewable gas certificates between GO issuing bodies. In June 2021 the ExtraVert Platform being part of the ERGaR CoO Scheme was launched, facilitating the cross-border transfer of gas GOs and other types of renewable gas certificates. More than 1 TWh of biomethane cross-border transfers have been facilitated since. The protocol for standardised certificate transfer over the AIB Hub was updated in Q1 2022 to include the transfer of EECS Gas Certificates

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(including gas GOs) for which the Scheme rules had been initiated in 2009 and finalised in 2019. These developments increased the relevance for the assessment of different IT options for linking/integrating AIB and ERGaR schemes (D2.8), which was finalised in July 2022. **A clear outcome of this work is that it is recommended to develop a single transfer protocol for certificates across Europe, across the various schemes.**
Currently, the biomethane registries operated by AGCS (AT), DENA (DE), VERTOGAS (NL) and REAL (UK) established IT-interfaces with the ExtraVert platform of the ERGaR CoO Scheme. The interface tests with the IT system of ENERGINET (DK) started in May 2022. Other issuing bodies have received individual information regarding the establishment of interfaces with the IT-platform of ERGaR CoO Scheme. The AIB Hub will facilitate standardised cross-registry transfer of gas GOs in Q4 2022, following the same data protocol that also facilitates transfer of electricity GOs.
Currently, discussions are ongoing between the boards of AIB and ERGaR regarding cooperation and potential integration/linking of their Schemes and IT-systems, building upon the content developed in REGATRACE.

WP3 - Set-up of national GO issuing bodies

The work in **WP3** focussed on the set-up of national/regional biomethane registries in the target countries.
Although this objective could not be reached on time for all the Target countries due to delays in the set-up of the legal framework for biomethane and in the development of the electronic registry for renewable gas certificates (including GOs), several countries made much progress on this side (see Table 1 for details). In particular, registries have been successfully established in Ireland and Belgium (specifically in Flanders). The registries in Lithuania and Slovakia will most likely enter operation before the end of REGATRACE and surely before the end of 2022: this is a great achievement of REGATRACE that supported those countries from the nomination of being an issuing body towards the tendering of a registry system. GOs progress is being done in Czech Republic and the required legislation in Spain and Italy will speed up the process for setting up the respective registry. Works are in progress in Poland as well, but the related legislation is needed for continuing with the setup of the registry. Slovenia made progress too and is working on the creation of the registry, even though not being a Target Country.

WP4 - Integration of GO from different renewable gas technologies with electric and hydrogen GO systems

The primary aim of **WP4** has been to establish and guarantee the coordination between the renewable electricity, biomethane/renewable gas, and hydrogen certification systems.
The technical and organisational comparison of the European Schemes for biomethane, hydrogen and electricity provided a good understanding of the main differences and commonalities of the system operated by AIB, ERGaR and CertifHy (D4.1) and helped to accelerate the discussions of a potential collaboration between ERGaR and AIB.
Within REGATRACE it was possible to develop rules for converting the renewable electricity scheme into biomethane scheme. These rules are included in the draft EN16325 standard on GO, while the report gives further analysis on the drivers behind these rules and further areas to evaluate as the market develops.

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Moreover, a design study was done for a coordinated conversion process and several options were identified for facilitating it. To streamline the energy carrier conversion handling, AIB is facilitating the import of GOs of all energy carriers to registries of issuing bodies of GOs for all energy carriers, i.e., electricity issuing bodies enabled to import gas GOs over the AIB hub and vice versa. The finalization of IT implementation is expected at the end of 2022.

WP5 - Integrated assessment and sustainable feedstock mobilisation strategies and technology synergies

One of the objectives of **WP5** was to quantitively assess the potential for renewable gas production in the different countries of the project. In order to achieve this objective, project partners developed a short description of the specific situation regarding capacities and preconditions for renewable gas production in the different REGATRACE countries. These descriptions were based on a questionnaire, which was answered by regional partners and that was further developed, discussed and processed in WP5. As a result of this activity, a comprehensive description of the situation in each REGATRACE country was produced, including a set of country profiles with information about potential future "hot-spot" regions for the development of new renewable gas production capacities (D5.2).
Another important aspect addressed within WP5 was the definition of sustainability certification criteria on renewable gas.
To that purpose, guidelines on renewable gas sustainability certification were developed (D5.3). They include a description of the current status of sustainability certification on renewable gases currently in force, existing guidance and tools, as well as support regarding the implementation of the GHG mitigation criterion. Within this same report, open questions and challenges associated with the certification of biogas and biomethane, as well as other renewable gases, are also addressed.

WP6 - Support for biomethane market uptake

To support biomethane market uptake across EU, several countries were involved in a process of visioning and roadmapping through a participatory process. This process consisted in the implementation of a set of workshops with the national Biomethane Working Groups - a dedicated body set up in each country with the aim to open and maintain a communication channel across the different stakeholders and main players of the biomethane sector - with the objective to define a common and shared strategy.
All the Target and Supported countries of REGATRACE (plus Estonia) finalised the process, defined their strategic vision, and produced the roadmap for biomethane uptake.
Another important objective set in WP6 was to practically assist project developers by providing guidance for feasibility analyses on securing financing for biomethane investments (a guidebook was produced in November 2020, see D6.2).
Moreover, EBA produced a Guidance for feasibility analysis, then adapted by Target and Supported Countries to the domestic environment, under the coordination of EBA. The draft country-tailored guidance was already presented at the third round of participatory workshop for consolidation.
To further validate the effectiveness of the guidance for feasibility analysis and consolidate it, a group of volunteer countries[3] performed a feasibility study

[3] Belgium, Czech Republic, Ireland, Italy, Poland, and Spain.

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applying the guidance (each country has one case feasibility study). The feasibility studies were included in D6.4 submitted in October 2022.

WP8 - Dissemination, communication & exploitation

Finally, since the beginning of the project, REGATRACE has been promoted and presented in 123 events, and mentioned in 108 communications activities, including newsletters, social media posts and articles published by media outside the consortium. The participation rate has always been high, demonstrating the wide interest existing today in Europe on biomethane.
Moreover, the project results have been widely distributed beyond the project's countries with the help of the REGATRACE newsletters, press releases, the social media activities (with 105 followers on Twitter and 369 followers on LinkedIn, as of 31 May 2022). Also, a dedicated online workshop was organised (in June 2022) in Norway (to exchange about the set-up of the registry), as part of exploitation and transferability of project results. Contacts and exchanges were established with biogas associations in CY, HU, PT, and RS to organise additional workshops there, but finally it was not possible to accomplish that task initially because of COVID-19 (effectiveness in those counties required participation in person) and finally because those countries considered premature to discuss and exchange about biomethane market development.

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Table 1: REGATRACE Monitoring Table

WP	Specific Objective	REGATRACE Expected Outputs	Status
WP2	Establish the network of the national issuing bodies.	MoU signed by 7 target countries.	As of May 2022**, 16 organisations joined the REGATRACE Network by signing the MoU from 12 different countries**. They meet regularly on topics of common interest. The framework, procedures and forms for the continuation of the REGATRACE Network was finalised in D2.7 (November 2022), deciding for the continuation of the Network on the basis of an updated Memorandum of Understanding (MoU).
	Determine the content and attributes of GO	REGATRACE definitions on EBGOs formulated and proposed to the CEN standard expert group as support to define content and attributes of GoOs.	D2.1 Updated Guidelines for creating the European Biomethane GoOs was published in November 2021. The **results of the report supported the work taking place in CEN on the revision of the EN16325 standard on guarantees of origin through the participation of , AIB, DENA and ERGaR in the respective working groups**. All three organisations furthermore together with project partners DENA and EBA provided expert advice to the European Commission DG ENER in the framework of the FaStGO project on the technical requirements and the standardisation process for guarantees of origin.
	Establish communication interfaces between the hub and the participating national GO issuing bodies	- Hub has been established and respective processual, administrative, technical and organizational requirements for the hub have been elaborated. - ERGaR and AIB Systems and their compatibility have been reviewed. - Established Biomethane Registries/Issuing bodies are connected to the hub via the established communication interface. - Specifications and review of different technical solutions to provide a communication dashboard have been elaborated.	1) In parallel to the REGATRACE project, the ExtraVert Platform serving the ERGaR CoO Scheme was developed and launched in June 2021. Furthermore, the transfer protocol for standardised certificate transfer over the AIB Hub was updated to include transfer of EECS Gas Certificates (including gas GOs). 2) Based on a comparison of the technical compatibility of ERGaR and AIB systems, an assessment of different IT-options for linking/integrating AIB and ERGaR schemes was performed and finalised in July 2022 (D2.8). 3) The biomethane registries operated by AGCS, DENA, VERTOGAS and REAL are connected to the ExtraVert platform of the ERGaR CoO Scheme. The interface tests with the IT-system of ENERGINET are close to final and SPP-Distribucia (SK) and Amber Grid (LT) are preparing for the connection to the ERGaR CoO Scheme. The AIB Hub will facilitate standardised cross-registry transfer of gas GOs by the end of 2022/beginning of 2023. 4) Deliverable 2.6 Report on design study and technical specifications for dashboard and trading platform was published in November 2021. 5) Discussions ongoing between the boards of AIB and ERGaR regarding cooperation /potential integration, building upon content developed in REGATRACE.
	Definition of tender procedure for the supply of hub the IT-services.	Guidelines for tender process of IT-services are developed.	The Guidelines for tender process of IT-services was published in November 2021. Amber Grid and SPP Distribucia consulted the report for preparing their tenders for IT-systems.

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WP3	Set-up of national/regional biomethane registries in the target countries.	1 biomethane registry for each target country.	The desired dates in the Grant Agreement could not be reached due to several reasons. Delays in the development of the legal framework for biomethane and the electronic registry for renewable gas certificates (including GOs) are the main reason that hindered setting up the registry in each target country on time. Countries with an operating registry or in development: • **Ireland**: in operation since 1 October 2020. Registry's purpose: consumer disclosure (Art. 19 RED II0 and mass balancing (Art. 30 RED II). Gas Networks Ireland (GNI) was officially appointed as the national renewable gas registry through a Statutory Instrument issued in August 2022. GNI is seeking for funding from the Irish Energy Regulator to update the software of the existing registry to a more sophisticated one. • **Belgium** (Flanders): in operation since January 2020. Fluxys has been appointed the production registrar, while VREG is the issuing body. The issued GOs then become tradable in the AIB hub. • **Lithuania**: an IT solution based on MS Access was already in place since June 2019Registry's purpose consumer disclosure (Art. 19 RED II) and mass balancing (Art. 30 RED II). The new registry is almost finished and will most likely go live before the end of 2022. • **Czech Republic**: legal framework for the registry's development is in place. Registry's purpose: consumer disclosure (Art. 19 RED II) and mass balancing (Art. 30 RED II). The Decree on Guarantees of Origin is in approval process and is expected to be approved soon because the RES Act requires the registry to be operational by January 1, 2023. It should also be able to issue hydrogen GOs, but there is still no hydrogen production in the Czech Republic • **Poland**: The revision of the RES Act and the transposition of RED II into national legislation is still in process. The goal was to have a new legislation in place by Q2 2022. Thus, the decision on the solution to implement for issuing bodies (URE and KOWR – the latter only for biomethane GoOs from agricultural biogas plants) is still pending. No final decision yet about biomethane regulations regarding the GO registry. • **Slovakia**: the regulatory framework is in place. SPP-Distribucia (designated registry operator for gas GoOs) signed the contract with the selected IT provider (Grexel) for the biomethane registry on December 17, 2021. The registry license will also include an integration with the ERGaR CoO Scheme. The registry will most likely go live before the end of 2022. • **Spain**: the Royal Decree 376/2022 legitimized the creation of a system for guarantees of origin for renewable gases and designated Enagás (technical manager of the Spanish gas system) as the institution responsible for the system's management and operation. The GoO system will be compliant with Article 19 RED II. Enagás is already working on the setup of the registry. Nedgia has offered help in the setup process by bringing along the knowledge and expertise generated during the REGATRACE project.

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			• **Italy**: the new Decree on Biomethane was recently published (September 2022) and will enable CIB to continue with the setup of the voluntary registry for certificates of origin for renewable gases.
WP4	Coordination between the renewable electricity, biomethane/renewable gas and hydrogen certification systems.	- Conversion scheme from renewable electricity into biomethane; - Design study for a coordinated conversion process.	1) Conversion rules developed in REGATRACE D4.3 report (published in October 2021). Exploitation: - Conversion rules included the draft EN16325 standard on Guarantees of origin. - Conversion rules implemented in the EECS Rules of AIB (a voluntary standard developed by and for issuing bodies of energy certificates, adopted by 33 issuing bodies). - Identification of kick-off recommendations to be monitored for evaluation while the market develops. 2) Design study on the technical requirements of a coordinated conversion process was performed (D4.4). Several options identified for facilitating conversion handling, direct import being the recommended pathway. 3) AIB facilitating energy carrier conversion handling by facilitating import of GOs of all energy carriers to registries of issuing bodies of GoOs for all energy carriers. (= Electricity issuing bodies enabled to import gas GoOs over the AIB hub and vice versa). IT implementation finalisation targeted by end 2022/beginning of 2023.
WP5	Assessment of quantitative potential of promising and competitive production capacities for renewable gases in the different countries of the project.	Identification of at least 1 hot spot region in each country of the REGATRACE project for the future implementation of renewable methane technologies.	In order to achieve this objective, the WP5 partners developed a short description of the specific situation regarding capacities and preconditions for renewable gas production in the different REGATRACE countries. These descriptions were based on a questionnaire, which was answered by regional partners and that was further developed, discussed and processed in WP5. As a result of this activity, D5.2 includes a comprehensive description of the situation in each REGATRACE country, including a set of country profiles with information about potential future “hot-spot” regions for the development of new renewable gas production capacities.
	Definition of sustainability certification criteria, methodology, administrative issues and development of recommendations to remove administrative barriers.	Development of Guidelines on Sustainability Certification for Power-to-methane products in close cooperation with stakeholders.	Deliverable 5.3 includes a description of the current status for the sustainability certification of renewable gases, under consideration of the current legislative framework, existing guidance and tools as well as support regarding the implementation of the GHG mitigation criterion. Furthermore, the deliverable addresses open questions and challenges associated with the certification of biogas and biomethane as well as other renewable gases.
WP6	Create national visions and roadmaps for renewable gases market development.	- Participatory workshops for target and supported countries;	Four rounds of workshops were held for the target and supported countries. Each of the target and supported countries developed a strategic long-term vision and a roadmap, which were presented at the country participatory workshops and discussed at a specific internal workshop in September 2022 with the entire consortium.

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		- 1 Strategic vision and 1 roadmap for target and supported countries.	
	Provide practical assistance to project developers	Guidance for feasibility analyses and Guidebook on securing financing for biomethane investments.	The Target and Supported countries adapted the general guidance of feasibility analysis (D6.4) to the domestic environment. The Guidebook on securing financing for biomethane investments (D6.2) was finalized in November 2020.
	Validate the effectiveness of the guidance for feasibility analysis and consolidate it.[4]	Feasibility studies applying the guidance for the development of a biomethane project (BE, CZ, ES, IE, IT, and PL).	The countries BE, CZ, ES, IE, IT, and PL finalised a feasibility study applying the guidance in a specific case. The feasibility studies are included in D6.4.
WP8	Transferability of results beyond the project's countries.	Promotion of REGATRACE results outside the project community, by organizing 5[5] workshops in countries interested in the project and by regularly exchanging products, news and fact related to the project and the renewable gas world in general.	The project results were already widely distributed beyond the project's countries with the help of the REGATRACE newsletters (the 7th one was released in November 2022), the press releases (the 3rd one was released in November 2022), and the social media activities (with 105 followers on Twitter and 369 followers on LinkedIn, as of 31 May 2022). Since the beginning of the project, REGATRACE was promoted and presented in 123 events, and mentioned in 108 communications activities (including newsletters, social media posts and articles published by media outside the consortium). An online workshop was organised on 28 June 2022 with Norwegian stakeholders to discuss and exchange about mutual progress on GoOs and CoOs. Other planned workshops (in CY, HU, PT, and RS) were not organised, initially because of COVID-19 (effectiveness in those counties required participation in person) and finally because those countries considered premature to discuss and exchange about biomethane market development.

[4] This is a new activity introduced with the second amendment
[5] According to the second amendment

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5 Process Evaluation

Process evaluation is complementary to monitoring. Whilst the latter finds out if and to what extent certain results have been achieved, the former allows understanding how and why those results have, or not, been attained.

Process Evaluation addressed the following activities:

- **Assessment of key outputs**: questionnaires were distributed to key national stakeholders to assess the most relevant reports and guidelines produced during the project in order to check the interest and possibility of each country to adopt similar approaches (see paragraph 5.1 Assessment of key outputs) .
- **Assessment of participatory roadmapping activities in WP6**: in addition to what above, process evaluation closely followed the activities carried out in WP6 ("Support for biomethane market uptake") by keeping track of the process of participatory foresight carried out in REGATRACE countries and by assessing the results from a quali-quantitative point of view (see paragraph 5.2 - Assessment of *roadmapping* process in WP6: estimating the level of cooperation in the Biomethane Working Groups).

5.1 Assessment of key outputs

Table 2 below shows the list of reports that have been processed to an assessment by nation al experts in the Target Countries.

Table 2: REGATRACE deliverables to be assessed

WP	Deliverable N°	Deliverable Name *(click in the hyperlink to go directly to the paragraph)*
WP2	**D2.2**	Report on content and attributes of GO
WP3	**D3.1**	Guidelines for establishing national biomethane registries
WP4	**D4.1**	Guidelines for the verification of cross-sectoral concepts
	D4.3	Harmonised set of rules for the conversion of electricity to biomethane/renewable gas and hydrogen GO *
WP5	**D5.3**	Guidelines on renewable gas sustainability certification
WP6	**D6.2**	Guidebook on securing financing for biomethane investments

** To ease the reading of this chapter, the paragraph related to D4.3 has been moved to Annex E as the assessment and the contents are very specific and technical*

In general, the work carried out by REGATRACE, and the guidelines produced has aroused the interest of various national experts in the biogas/biomethane sector who analyzed and commented on the work carried out very carefully. Both the most advanced countries and those that are just now entering this sector are willing to undertake and carry out a legislative process aimed at promoting this developing segment. Sharing the knowledge and results produced by the project through this process evaluation task was very important and - especially in cases where the right people were

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involved - a stimulus for change. On some occasions, these reports were taken as a cue during the participatory workshops - organized as part of WP6 - and discussed extensively by the stakeholders of the Biomethane Working Groups (as in Belgium). In other cases, the analysis was done individually involving the experts identified as those who could be most interested in the specific issue.

In the following paragraphs, summaries of the feedback received by the selected key experts in every Target Country are reported for the key deliverables mentioned in Table 2.

5.1.1 Feedbacks on D2.2 "Report on content and attributes of GO"

Summary of D2.2

The development of a biomethane market is complex and requires professional experts and tools in order to not only establish trust in the market but also expand production. Some of these requirements include but are not limited to the construction of further production facilities, increase of biomethane production volumes, tracking of biomethane via a renewable gas registry and bringing the product to market level. Different types of renewable gases (biomethane, bio-syngas, green hydrogen, e-gases generated from renewable power) will be part of an integrated renewable gas market. Renewable gases are flexible energy carriers which can be allocated to a broad set of end use appliances (renewable electricity, renewable gas for heating and cooling, transportation sector, etc).

All renewable gas types and all end use appliances (including newly upcoming ones) require secure, trustworthy, and transparent tracking systems based on the documentation via different certificate types. In several European countries, biomethane is produced and injected into the national gas grid, triggering the need of title-tracking of the green value of gas blends from fossil and renewable origin. Biomethane Certificates have been administered by Biomethane Registries in several European countries for the past several years. The underpinning market rules have been developed based on national legislations and on market initiatives mostly.

The definition of the origin, quality and quantity of renewable gases have not been requested by European legislation before the recast of the Renewable Energy Directive (RED II, 2018/2001/EU) in detail, which extends the purpose of GOs for consumer disclosure for the energy carriers' electricity, gas including hydrogen and heating/cooling. The "Guarantee of Origin (GO)" is a specific certificate that is defined under the RED II (Art 19) which may only be issued under the supervision of governments or of government designated bodies.

The centrepiece of such a Certificate or GO is the list of attributes which hold the essential information. From technical and organisational point of view, attributes are considered data fields within an IT-database of the registry/issuing body. On the one hand information about the quality of injected biomethane, its sources, auditor statement and on the other hand information about the biomethane production plant. The categorisation of the GO attribute list suggested by REGATRACE, divides the types of renewable gas GO attributes into four different attribute levels: i) plant/installation-specific information (master database), ii) quantitative information on gas, iii) qualitative information on substrates and raw materials, iv) transfer-specific information (necessary for standardised transfer processes). Each set of attributes of one level, is to be audited via dedicated audits. The extent of the audit depends on the quality criteria, especially the data of attribute level iii) providing qualitative information on substrates and raw materials may cover a broad range of minimum to maximum criteria.

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The authors are aware that the amended, updated and extended EN 16325 standard will regulate the content and attributes of the biomethane GOs (along with other renewable gases). Consequently, **REGATRACE may provide a unique, holistic view to describe the wide range of minimum to maximum requirements on the content of a Renewable Gas GO**. REGATRACE Deliverable 2.1 "Updated Guidelines for creating the European Biomethane GO" already draws up a first picture on requirements and guidelines, based on the knowhow of ERGaR, AIB and their respective members. **REGATRACE Deliverable 2.2 "Report on content and attributes of GO" develops explanations and descriptions further**. Its chapter 4.2 provides **definitions according to Art RED II (Art 19)**, additionally, chapter 4.3 provides **insights on practicalities on the content of renewable gas GO**, collected by the REGATRACE project consortium, which **goes beyond the legal requirements set by RED II.**

Questionnaire and Feedbacks from Target Countries

In September 2020, key experts from the different Target Countries have been asked to read the report and answer to a questionnaire properly created to **assess the relevance of the information provided** for their national context and to get a clear and complete picture of **how and to which extent the REGATARCE categorization of GO attributes is considered and acknowledged by the different Target Countries**.

Main questions addressed on D2.2
- *Was the information provided by report D2.2 useful for your country, being in the midst of establishing a European biomethane/renewable gas market?*
- *Do you think it is possible to adopt/introduce the proposed list of attributes of GO in your country?*
- *In your opinion, is this report relevant only for organisations who work on establishing a national registry (issuing body) or should it be spread to a broader audience? And who?*
- *What is the status in your country on the implementation of Art 19 RED II into national legislation?*
- *Is the categorisation of attributes into four levels, as described in D2.2, reasonable for you and applicable in your country?*
- *Which additional attributes (qualitative and quantitative information) are necessary from your point of view to develop a comprehensive renewable gas GO?*
- *Do you see the demand for inclusion of GHG emission intensity value onto the GO as a significant information to be provided for consumer disclosure?*

The feedback received have been analysed and summed up country by country, as reported below.

In Belgium, different stakeholders and experts from renewable gas/biomethane sector were interviewed during one of the workshops organised in task 6.2, in particular: CEN, Fastgo, Entsog, Prime Movers, ERGaR, AIB, REGATRACE, Florence School of Regulation. For all of them, the report is quite useful for the Belgian contexts for several reasons: it clarifies the difference between GOs for wind and solar for example, as compared to GOs for renewable gases, regarding changing/variable feedstock; moreover, it explains the difficulty to issue GOs without being able to guarantee the veracity of the source based on an audit. All in all, the report is considered to be a support for market development from a commercial point of view. In Belgium, only in Flanders legislation has been adapted via a decree to be compliant with the Art 19 of the RED II. The legislation provides also a GOs for Hydrogen, but it	***Belgium***

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seems that the decree is not fully in line with the CEN 16325 proposal for standardization of GO's. In Wallonia and Brussels, the legislation has not been adapted and so it is not compliant with art. 19 and it is unlikely that by 31 June 2021 the relevant laws will be adapted. Concerning the potential adoption of the attributes to GOs proposed in D2.2, the opinion of the experts is quite controversial. The discussions on what GOs for renewable gases should and should not be is still open, and perspectives are so diverse that it is really hard to keep an understanding on what matters and what to do. Therefore, it seems better to wait until there is a clear consensus before starting to add new attributes to GOs. Stakeholders agree on the fact that the document is mostly relevant for registries and auditors, although complexity of data / attributes needed is a burden for producers and traders as they mainly want to know in case of GO's what the produced energy carrier was, the amount, the country of production, if it is renewable (following the RED II), and what standard method is used for the GHG emission (e.g., RED II method for biofuels). The discussion was then focussed on the possibility to add additional attributes on those proposed in the report. Belgian stakeholders believe that additional information would only be necessary to be compliant within the framework of a certain country. Nevertheless, this additional information should not be an attribute as it is better to keep attributes more general so that they can be relevant in all EU countries. Additional attributes can be issued via voluntary scheme certificates (ISCC, RedCert, …) which can issue a certificate conform to what is needed in a certain country and for its purpose (GO, Biofuel certificate, …).	
The experts' group from Estonia involved in the questionnaire was very diverse: the questionnaire was addressed to traders, producers of biomethane from waste, a member of the ministry and a biomethane register and subsidy scheme operator. All the recipients stated that the information provided in the document is useful, especially for evaluating existing structured registers. It provides a clear and structured overview of the compulsory (in accordance with article 19 of RED II) and optional attributes of guarantees of origin and is helpful for identifying what should be updated/adjusted in the existing registries. Moreover, there is a lot of background information and it is interesting to see that other countries are moving in the same direction. Estonian experts believe it is important that the principles set out in RED II remain unchanged while sufficient flexibility is left to the Member States. In Estonia, the draft transposition of the renewable energy directive is ready. The draft has passed the first round of approval and is currently in the second round. It will enter into force no later than summer 2021. Besides, from the answers received it turned out to be crucial to work on the harmonization of registries to make sure that the information provided is comparable and acceptable so that certificates of origin can be traded also between Member States without worries.	***Estonia***

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Introducing the list of attributes proposed in D2.2 is possible in Estonia. Experts confirm that part of the listed attributes have already been introduced to a large extent but most of the proposals made are sensible and it's too early to make a concrete assessment. Moreover, all the experts propose to add information on CO2 emissions among the attributes and some of them suggest some more that, in their opinion, should be considered to develop a comprehensive renewable gas GO: e.g., advanced/first generation/other biofuel, ILUC feedstock category, ILUC emissions intensity, accounting coefficient (coefficient for accounting renewable energy consumption statistics), CN code, whether the biofuel is sustainable, etc. All of them recognise that the categorization of attributes into four levels, as proposed in D2.2, is reasonable, however it's early to say and further analysis are needed.	
Experts answering the questionnaire in Ireland were traders from the logistics business and developers of renewable gas plants. The information provided in D2.2 was considered useful, because Ireland just launched its first renewable gas registry in 2021, i.e., a Voluntary Green Gas Certification scheme. Thus, at this early stage it makes sense and would be advantageous to be connected with an established EU group of registries to not only share knowledge and experience, but also simply the process and movement of certificates for different end uses. At the same time, it would be easier to implement new or additional attributes at this early stage of the Irish registry set-up. The categorisation of the attributes, as reported in D2.2, appears reasonable and sensible. Indeed, a harmonised set of attributes across member states would support simplicity in the process. A major challenge in the future could be the transfer and management of data between member states. Additional attributes to develop a comprehensive renewable gas GO would be Emission intensity data and Sustainability criteria and this information will be key in the future for consumer disclosure: with businesses of all sizes now focusing on sustainability reporting, key GHG emission intensity information will become a pre-requisite of system availing. Moreover, being renewable gas (Biomethane) generation and the registry in their infancy in Ireland, organisations close to and who work on establishing a registry should also keep end users in mind. Currently there is a lack of knowledge on certification from various sectors. Thus, this report could serve to educate industry on what the future could look like in this regard, and it will be certainly useful to spread it among different stakeholders. Finally, additional information would be needed on the ongoing process of EN 16325 for the establishment of a GO system for consumer disclosure on the energy carriers.	***Ireland***
In Italy, five experts have been addressed for providing their feedback on D2.2 and, according to their respective roles in the renewable gas sector, we have been able to bring together different perspectives: e.g., biogas producers; auditors; researchers and gas infrastructure operators. All of them think that it is possible to introduce the proposed list of attributes in the Italian context and that their categorization into 4 groups is quite reasonable. The GHG emission intensity value could be a significant information to be provided for consumer disclosure but should not be mandatory or it should be based on literature data in order to avoid additional costs and efforts to obtain it.	***Italy***

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There are still lots of steps to do in Italy in order to establish a robust and stable biomethane sector with a complete set of regulations. Therefore, all the experts found the information useful and, for some of them, important to better understand the crucial role of GO for the development of the biomethane sector. For these reasons, beyond auditors and certification bodies, it could be useful to spread this report to a broader audience after the establishment of the registry in Italy.	
Being Lithuania a developing market in this sector, the information provided in the report was found very useful by the experts. In their opinion, the report provides a very good explanation of how the GO is being regulated in other countries and clearly displays what direction the market is taking especially from the energy regulation perspective. Lithuania is becoming increasingly sustainable country over the years, and there is a rising interest in renewable electricity and biogas. In this regard, Lithuanian issuing bodies for both electricity and natural gas already exist and are managed by the respective TSOs for electricity and gas sectors. Therefore, the Lithuanian TSO AB "Amber Grid" is responsible for issuing GO for renewable gas and experts confirm that a lot of requirements listed in report D2.2 are already met but, for sure, it will be necessary to adopt harmonised attributes for the integration of Lithuania's renewable gases with Europe. The four-level categorization proposed in the report is reasonable and would be applicable in the country as it would provide clear and provisional message towards users of Biogas GOs. Moreover, they think that for consumers it would be extremely useful and interesting to have information on GHG emission intensity value within the GO. Finally, they suggest addressing this report to a broader audience that should include market participants, industry, gas producers, auditors and ministries involved in the Energy sector (all over Europe).	***Lithuania***
Researchers, members of NGOs and operators of the existing issuing body for electricity have been involved in the assessment of D2.2. All of them found the information provided in the report important and useful for the polish context where the biomethane market is considered a promising sector especially due to the high raw material potential. Currently in Poland there are 817 RES installations using biogas, biomass, solar energy, wind energy and hydropower. Guarantees of Origins are issued for all of them but not for biomethane, due to the lack of its production, therefore any initiative that could support and facilitate the development of the Polish biomethane sector is more than welcome. Besides, it is common belief among the recipients of the questionnaire that the proposed list of attributes is suitable for Poland, but specific national conditions are to be taken into account, especially legal issues. In any case, the list proposed hold the necessary information on the quality of injected biomethane, its sources, auditor statement and biomethane production plants, which is useful to bring biomethane to the domestic market. Moreover, it is found that dividing the attributes into four levels is a good idea and can be applicable also in Poland. Last but not least, they fully agree on including GHG emission intensity value in the GO as it might be a crucial parameter for the biomethane market demand. Keeping consumers aware about that is extremely important as it allows them to make informed choices in the field of rational energy use and has a high educational value.	***Poland***

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Several experts from the biomethane and biogas sector have been involved in the assessment of this report in Romania: Biogas plant owners, expert lawyers in the Romanian RES sectors and also the president of the Romanian Bioenergy Association. According to the questionnaire, it is widely acknowledged by all of them that this report addresses important and key aspects for the future developments of biomethane in Romania. Indeed, Romania is at the beginning in the process of investments in upgrading technologies from biogas to biomethane and, so far, the business plans for Biomethane in Romania have stalled as they failed to secure a long term, predictable income. Bioenergy as an idea is highly appreciated but poorly promoted and this has slowed down developments in the sector. The first of many problems is the lack of Biomethane plants, which practically undermines the necessity of adoption of the proposed list of attributes of GO. Anyway, this report is a first step in the right direction. It provides arguments which can be used when negotiating with the authorities regarding the Bioenergy sector in general and the Biomethane sector in particular. Sometimes national authorities and stakeholders become "more open to listen" when the arguments come from European best practice studies. To conclude, the list of attributes proposed in D2.2 would be of high importance for the introduction of biomethane in Romania and, as indicated by one of the experts, without a list like this, the Biomethane discussion will remain at a theory level and will not be materialized into facts. Also, it may become an excellent tool for the Authorities to better understand the sector and feel "safe" while advancing in drafting the relevant legislation.	***Romania***
Experts answering the questionnaire in Spain are the President of Spanish Biogas Association (AEBIG) and a producer (biogas plant treating food waste and sludge). The information provided in report D2.2 was considered useful because it defines a harmonised approach regarding the content and attributes of biomethane GO to be issued in the future, in accordance with Article 19 of the RED II, which has not been formally implemented in Spain, and there is no clear indication from the Ministry of Industry (MITECO) on timing for that. The information required to define the GO is something feasible to collect on a biogas plant, and the procedure does not seem too complicated. As for the categorisation of attributes into four levels, while attribute 2 will be the base to know the "energy" sold, attribute 3 would be the added value of the biomethane due to the level of decarbonization depending on the substrates used as a raw material. Thus, attribute 3 should be applicable in Spain, along with the other three and being especially important to define the quality of the biomethane. Additional attributes could refer to the use of digestate, as this could lead to a negative carbon footprint. Finally, experts confirm that the inclusion of GHG emission intensity value onto the GO is a key information and an added value.	***Spain***

5.1.2 Feedbacks on D3.1 "Guidelines for establishing national biomethane registries"

Summary of D3.1

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A renewable gas/biomethane Registry describes an organisation with responsibility towards market participants for being a neutral and trustworthy platform for title-tracking of biomethane/renewable gas Certificates. Its responsibilities may comprise the roles of production registrar of renewable gases injected into the national gas grid, the role of issuing body for Guarantees or Origin according to Art 19 RED II, the role of database/registry to document the fulfilment of the national biofuels' quota according to FQD, management of national subsidy schemes, platform for transactions on the voluntary market, etc.

The biomethane registry should be an electronic account-based IT-system allowing different market participants to register with personalised accounts to fulfil specific roles with pre-defined permissions and obligations within the system. Registered account holders may be production plant operators (biomethane, gasification, P2G, electrification plants/CHP units), subsidy agencies and governmental agencies among other institutions, auditors/inspectors, and traders. The registry needs to adapt the roles, rights and authorities to national demands to fulfil requirements from national legislation and the domestic market.

The attribute list is the core part of each registry providing the necessary information describing the respective renewable gas product. The attribute lists should be versatile and flexible to cover different types of renewable gases and their end use appliances while being harmonised to allow for domestic title-transfer as well as European-wide exchanges based on standardised (semi-)automatic IT-processes. The buyers and sellers of certificates should be enabled to execute the transactions in the registry and between domestic registries themselves, without the assistance of administrators.

Various technical and organisational steps must be taken to develop, establish and operate a registry. On a technical level, the registry should provide a trustworthy, reliable, and secure IT-system with functions which are simple and understandable for market participants. IT-support on first and second level should be provided to all market participants in case of any questions. Data security following the European General Data Protection Regulation (GDPR) must be granted.

The business processes underpinning the renewable gas market comprise the registration of new market participants following a thorough review of provided data. The administration and update of master data must be performed on regular basis. The business processes for the generation of certificates may differ from country to country to fulfil national, policy and market requirements. Cancellation statements must be administered to prevent any double/multiple counting. Transactions of certificates and energy volumes must be monitored to keep a good market overview.

Transparency is the foundation of any functioning market and therefore presents a key challenge. As an independent body, the biomethane registry shall provide information pertaining to participation in the registry and functions of the registry in a transparent manner. Market rules, terms and conditions and information on the legal background on national and European level have to be made available publicly. Additionally, news on the renewable gas market, the registry itself, statistics and reports should be published on a regular basis.

In order to develop a competitive renewable gas market which tackles the challenges of climate change and not only provides a solution of administrative issues of national and European certificate schemes, the registry system should consider tracking all renewable gas types and end-use applications. Often, these responsibilities are taken up by different organisations which might lead to complexities of the market. If the option for one centralised registry system was/is not decided upon, it is still recommendable to have a detailed administrational system prepared as any possibilities for

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double/multiple counting must be prevented. Efficient remedy measures are to either implement a central organisation acting as data provider and transferring national biomethane certificates via interfaces to each respective registry handling the different end uses or implement cooperation agreements with the goal to facilitate information exchange on the respective energy amounts and quality of the energy carriers.

Deliverable 3.1 of the REGATRACE project **provides comprehensive guidelines for the establishment of national biomethane/renewable gas registries** where they do not yet exist in European countries. It describes the structure and operation of a biomethane/renewable gas registry based on the **experience of established national registries** in European countries. It provides **guidelines on the set-up of a domestic registry including templates for stakeholder analysis** and the respective contractual framework. Business processes, responsibilities and actions including their respective timelines are provided. The report also provides **detailed insights on the integration of biomethane into the gas market model and the status of biomethane in Europ**e. In the annex of the deliverable, the mission, functions, and market volume of currently existing biomethane registries is additionally described.

Questionnaire and Feedbacks from Target Countries

In September 2020, key experts from the Target Countries have been asked to read the report and answer to a questionnaire properly created to assess the extent to which such guidelines could be adopted in the different countries.

Main questions addressed on D3.1
- *Was the information provided by report D3.1 useful for your country, being in the midst of establishing a European biomethane/renewable gas market?*
- *Do you think it is possible to adopt/introduce the proposed guidelines of D3.1 in your country?*
- *In your opinion, is this report relevant only for organisations who work on establishing a national registry (issuing body) or should it be spread to a broader audience? And who?*
- *Is there a biomethane certification system in operation in your country? How it works?*

As of August 17, 2019, legislation regarding, among others, GOs for gases from renewable sources have taken effect in Flanders. The certification for GO is split up in two functionalities: Product registration and production coordination. The product registration is performed by Fluxys Belgium who ensures the initial registration of production, checks the necessary audit, collects the meter data and calculates the renewable part of produced energy. The relevant data for the GO are transferred to VREG on a monthly basis. The production coordination is performed by the VREG who creates a GO based on the data of Fluxys, makes them available in the VREG system for trading and cancellation. The VREG system, originally used only for electricity is AIB based and follows the EECS rules. Wallonia and Brussels have no system in place compliant with Art. 19 of the RED II. In this general framework, report D3.1 was considered useful by all the experts involved in the questionnaire, especially in the way it gives a general and	***Belgium***

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comprehensive overview on the functioning of registries in other countries in Europe. Moreover, the information on the market for biomethane in other countries with an existing registry was very useful. Moreover, although the existing system seems to be largely in line with the proposed guidelines, future improvements of the registry are to be expected. At this time, it will be possible to implement changes based on these guidelines and on the experience built up by then.	
From Estonian experts' perspective, the report provides a good set of guidelines for establishing a national registry. However, Estonia already has a biomethane registry in place since 2018, thus most of information is familiar. Today, the Estonian system operator Elering is also the gas (and electricity) GO issuing body in Estonia. The system adopted currently provides for three roles: producer, gas seller and liquid fuel seller. Part of the essential information is provided during the registration process (for example, sustainability certificate, information on the biomethane production plant etc. by the producers). Once a month, Elering issues GOs based on the production quantities that the producers (DSOs) have sent to Elering's central gas data hub and based on the information on the produced biomethane (feedstock, lower heating value, upper heating value, GHG intensity etc.) that the producers have entered into the biomethane registry. All the data that the producers enter into the registry is attached to the corresponding GOs. Gas sellers buy GOs from the producers in the registry via bilateral transactions and can cancel the GOs against real gas consumption. All relevant information that is attached to the GOs is accessible to the gas sellers for reporting to The Environmental Board. Based on the cancellation of GOs against transport sector consumption, transport statistics (TS) certificates are issued in the registry. The gas sellers can sell the TS certificates to liquid fuel sellers in the registry who can then report to The Environmental Board to fulfill their RES obligations with consumed biomethane statistics. Subsidies are paid to biomethane producers on the basis of cancelled GOs (cancelled in the biomethane registry by the gas sellers against real gas consumption). Transportation statistics certificates that liquid fuel sellers can use to fulfill their RES obligations are issued in the biomethane registry based on the cancelled GOs (cancelled by the gas sellers against real gas consumption in the transport sector).	***Estonia***
Experts answering the questionnaire in Ireland were traders from the logistics business and developers of renewable gas plants. The information provided in D3.1 was considered useful, because Ireland just launched its first renewable gas registry on October 2020, i.e., a Voluntary Green Gas Certification scheme, with relevant account holders currently being onboarded (developed by the Renewable Gas Forum Ireland and Gas Networks Ireland in partnership with DENA & DBFZ). The scheme will issue electronic certificates for renewable natural gas delivered to the Irish gas grid. At this early stage it makes sense and would be advantageous to be connected with an established EU group of registries to not only share knowledge and experience, but also simply the process and movement of certificates for different end uses. Moreover, being renewable gas (Biomethane) generation and the registry in their infancy in Ireland, organisations close to and who work on establishing a registry should also keep end users in mind. Currently there is a lack of knowledge on	***Ireland***

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certification from various sectors. Thus, this report could serve to educate industry on what the future could look like in this regard, and it will be certainly useful to spread it among different stakeholders.	
Currently, in Italy, there is a certification system for the sustainability of biomethane and producers must prove its sustainability to obtain subsidies. Work is ongoing on the establishment of a registry and GSE is responsible for that. Concerning the questionnaire on D3.1, only two answers were received from two producers, who declare to be not so much involved in these topics but still interested in the establishment and take-off of biomethane in Italy. Indeed, one of their comments is about the necessity to share these guidelines with the related responsible entities and relevant stakeholders, like GSE and ministries. Moreover, they state that these guidelines are useful and, in their opinion, a paragraph on the economic value of GO and economic sustainability of the registry should be added. They don't have an opinion on the possibility to introduce and apply these guidelines to the Italian context.	***Italy***
In Lithuania there isn't a specific issuing body for gas GO yet, but a similar system is in place for electricity and rules are in force on GO's administration. All Lithuanian experts conveyed in their answers that these guidelines make available all the necessary information on the system requirements to market players in the biomethane sector. The state of the art reported for the other countries is also useful knowledge to share. Therefore, they suggest sharing this document with a wider audience, including all the market-players of the whole value chain.	***Lithuania***
The insight provided in the report was deemed particularly important by the Polish experts. Currently, Poland does not have a biomethane certification system. Biogas and biomethane will be certified under the voluntary biofuel certification systems (REDcert, KZR INiG, ISCC) for compliance with the criteria of sustainable development. Such certification will be possible after the full implementation of the RED 2 directive by voluntary systems. This information could be also a valuable input in the discussion for the establishment of the Polish biomethane market and the guidelines could be adopted at national level. Biomethane fits with national goals set in Poland and also with obligations of reducing CO2 emission and increase biofuel production and use. For these reasons, experts recommend sharing this report to a broader audience made up of all entities involved in the development of the biomethane market: public administration, potential investors, industry institutions, certification units, associations connected with producers, users, researchers of biogas as well as registry operators.	***Poland***
The experts group addressed in Romania included biogas and biomass plant owners, lawyers with expertise in Romanian RES sector and the president of the Romanian Bioenergy Association. They all found the report very useful as, even if the subject is premature for Romania, it is still important to know the correct approach for the future of Biomethane projects and to learn about the registry and its function of tracking. These guidelines would	***Romania***

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help investors to organize their internal structure and work process so as to correlate with the standards that the registry will set. Those guidelines are useful in the way they help understanding how the future of Biomethane will be, how the authorities are going to regulate the market and what will be the opportunities and the limitations for an investor. Even if Romania nowadays has no Biomethane production at all, it is always positive to think forward and start from the correct organization of the whole sector, from the very beginning. Moreover, such guidelines can be relevant for the preparation of more accurate Due Diligence reports on future projects, making them more "bankable" and supporting the transformation from "an idea" to an implemented investment. The president of the Romanian Bioenergy Association was positively impressed by these guidelines and defined them a best practice example and intends to present the document to the Romanian Authorities during their institutional dialogue, with the aim to make them realize that "Biomethane not only represents part of the future, but that this future will be regulated at the EU level, thus the same approach should be considered in Romania, to avoid early problems." Adopting a similar approach in Romania is definitely possible, and without a clear guidance and eventually a biomethane registry, the whole process of including the renewable gas in Romania's energy mix will be more difficult, if not almost impossible. It must be considered that in Romania, the renewable gas sector must co-exist with Natural Gas, which is a heavily regulated sector with decades of experience and local best practice examples. This means that renewable gas should follow a serious organizational approach and careful preparation is necessary from all the market players.	
Experts answering the questionnaire in Spain are the President of Spanish Biogas Association (AEBIG) and a shareholder in a 500-kW biogas plant. The information provided by report D3.1 was considered useful as it provides a comprehensive guideline for the establishment of national biomethane register. Indeed, currently in Spain there is no national certification system, just private initiatives between local biogas plants and international traders. The report well describes the structure and operation of a biomethane registry based on the experience of established national registries in European countries and, in order to raise renewable gas from the domestic to the European level, it is necessary that standardised interfaces and clearly defined procedures are in place among domestic registries to execute the transfer of biomethane certificates. Currently, the environmental requirements that biogas plants must comply with are complex, thus as the guidelines in D3.1 could be the base of a better business, capable of bringing added value to biogas and from the market point of view it is possible to introduce them.	***Spain***

5.1.3 Feedbacks on D4.1 "Guidelines for the verification of cross-sectoral concepts"

Summary of D4.1

Sector coupling is key in order to reach the EU target of a carbon-neutral society by 2050. However, in order to make the success of this pathway traceable, transparent, and accountable, verification guidelines need to be in place for evaluating the performance across energy conversion against various parameters like declaration of renewable origin, efficiency, carbon savings, among others.

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This Deliverable presents verification guidelines for cross-sectoral renewable gas concepts regarding Guarantee of Origin (GO) issuance according to Article 19 RED II and Proof of Sustainability (PoS) issuance according to Article 25-31 RED II.

The cross-sectoral renewable gas concepts covered by this report are:

- Power-to-hydrogen/synthetic methane
- Biomethane to Bio-LNG
- Biomethane to Biomethanol

The results section presents open issues regarding cross-sectoral gas concept verification (chapter 6.1.) and verification methods for cross-sectoral renewable gas technologies to meet RED II requirements as well as the GO/PoS end product (chapter 6.2.1.) after conversion. Furthermore, this report differentiates if the conversion plant is directly or indirectly connected to the input energy carrier plant. This deliverable proposes a hydrogen GO for hydrogen, a gas GO [liquid] for bio-LNG. In regard to PoS, it proposes a hydrogen PoS for hydrogen, a bio-LNG PoS for bio-LNG and a biomethanol PoS for biomethanol.

This document handles the needs and proposes processes related to the verification of (see chapter 6.2. for more details):

- ***Plausibility*** of energy input and output ***quantities*** of the renewable gas installation
- Origin of input energy source/***Renewability***
- ***Geographical correlation*** [Hydrogen]
- ***Temporal correlation*** [Hydrogen]
- ***Additionality*** [Hydrogen]
- ***Water consumption*** [Hydrogen]
- ***Carbon source*** (fossil-based, biogenic) [synthetic methane-specific]
- GHG reduction crediting regarding CCU [synthetic methane-specific]
- Information on cancelled GO/PoS

The report makes concrete suggestions as to what evidence producers must provide in order to verify the renewable electricity input according to RED II Art. 27. ***Additionality*** is to be verified by the absence of subsidies, among other things. For the ***geographical correlation***, the locations of the electricity plant and the electrolyser must be in the same bidding zone, and the ***temporal correlation*** is to be verified by comparing both production periods, where the temporal correlation criterion is to be increasingly narrowed over the next few years.

Questionnaire and Feedbacks from Target Countries

In April 2021, key experts from the Target Countries have been asked to read the report and answer to a questionnaire properly created to assess the extent to which these guidelines could be adopted in the different countries.

Main questions addressed on D4.1
- *Does/will the current/planned certification system(s) for GO issuance (Art. 19 RED II) cover one of the following cross-sectoral gas concepts? Power-to-hydrogen; Power-to-synthetic methane; Biomethane to bio-LNG; Biomethane to biomethanol* - *Does/will the current/planned certification system(s) for PoS issuance (Art. 25-31 RED II) cover one of the following cross-sectoral gas concepts? Power-to-hydrogen; Power-to-synthetic methane; Biomethane to bio-LNG; Biomethane to biomethanol*

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- *Do you agree to issue a hydrogen GO for hydrogen? A gas GO [liquid] for bio-LNG? A hydrogen PoS for hydrogen? A bio-LNG PoS for bio-LNG? A biomethanol PoS for biomethanol?* ***Questions specific to the sustainable electricity criteria for RFNBOs according to Art. 27 REDII:*** - *Could a 15 min billing be easily implemented within your certification system?* - *Is data regarding renewable energy subsidies in your country also stored and easily accessible in order to prove the additionality criterion for RFNBO production?* - *How can a grid congestion be identified in your country? What are the implications of the criterion that the electrolyser and the power plant must be on the same side of the grid congestion?* - *What do you think are remaining open issues/questions regarding cross-sectoral verification of GO and PoS issuance?*	
The current gas certification system is in operation since 2020 for Flanders (on biomethane and hydrogen), where GO of hydrogen is already foreseen. However, VREG has suspended the issue of it, due to uncertainty on CEN 16325 and competence on Hydrogen (regional or federal). In Brussels and Wallonia, the system does not yet exist, and there is uncertainty on who would be the competent authority for hydrogen (regional or federal). Moreover, the draft of a new federal law on renewable fuels (for which the federal government is competent) has foreseen that bio-LNG/CNG, RFNBO's, E fuels, RCF can be registered and are accountable for the targets for transport fuels. For BioLNG, ISCC certification (or other EU schemes) is accepted (as well as mass balance by consignment). However, for other fuels, it is unclear how the renewable part will/can be proven, and the practical recognition of these fuels must still be developed, as they still depend on a number of delegated act (not yet approved) and directives. There should be a GO gas [Hydrogen] and GO gas [biomethane] that is commonly offered to gas consumers independently of the transport system and the commodity off taken. Consumer needing hydrogen will still connect to hydrogen grids and pay separate price for the Hydrogen (which will be higher than for methane), but the green part of it should be offered as a single commodity, creating a liquid and affordable market for consumers, while the origin still remains traceable. As bio-LNG is in most cases a renewable fuel, a PoS, as established by the EU voluntary schemes are sufficient (differently from a GO). A PoS should also be used for hydrogen and for biomethanol. Concerning the possibility to integrate a 15 min billing within the certification system, tools to check on EU level or TSO electricity (REMIT) do not work on this correlation and even on hourly basis are often not correct or data missing. Monthly basis would be feasible. In Belgium, the concept of electrical grid congestion is not well understood, and the criterion of having the electrolyser and the power plant on the same side of the congestion does not help stability of the electricity grid. Without going into details on this complex issue, the view of the Belgian respondents to this survey is that this criterion should not be applied.	***Belgium***
The questionnaire was addressed to the Ministry of Economic Affairs and Communications that considered the information provided in the report useful. As already mentioned, above, since 2018, in Estonia there is as gas certification system, as a voluntary scheme fulfilling market initiatives. The certification system (for GO and for PoS issuance) is in the development phase but it will probably allow all	***Estonia***

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fuels to compete on an equal basis. It should cover GO and PoS for (green) hydrogen, bio-LNG and biomethanol. Concerning the 15 min billing, it could be easily implemented within the Estonian certification system as they have already 100% remote metering installed and a central data hub. Thus, it is planned to achieve the data hub readiness for all metering points by 2031. Data on eligibility for renewable energy subsidies are already available (to prove the additionality criterion for RFNBO production). In order to solve a possible grid congestion, the plan of Elering is to register all respective devices and grid resources in the central data hub. If an overview of all devices with location is available, they can be taken into account in managing and planning grid restrictions. The price of the GO of the supported production plant, including the effect of cross-border trade on the price of GO raises many questions among market participants. For example: how to limit the use of a cheap foreign GO if the domestic GO is more expensive (depending on the subsidies received in the past).	
The experts answering the questionnaires are from an operator of registry and a Renewable Gas importer and Supplier of Bio Propane/ BioLPG. Ireland launched its first renewable gas registry in October 2020, i.e., a Voluntary Green Gas Certification scheme. Moreover, Bio propane/ BioLPG is supplied into Ireland under the ISCC[6] voluntary scheme. Currently, there are no relevant cross-sectoral gas concepts. The report was considered useful. Experts agreed to issue a hydrogen GO for hydrogen, a gas GO [liquid] for bio-LNG, a hydrogen PoS for hydrogen, a bio-LNG PoS for bio-LNG, and a biomethanol PoS for biomethanol. The experts suggest one aspect on which investigate more: the interaction of renewables not involving the natural gas grid at any stage of the supply chain. This will increase the functionality of the scheme and support the wider renewable gas industry.	***Ireland***
The expert answering the questionnaire is a trader. Currently, there is no system in place for gas certification in Czech Republic but the planned certification system for GO will address power-to-hydrogen, while PoS are not applicable. The expert states that it is preferable to have generic GO for renewable gases/ products with just a specification of the product, while PoS is included in the biomethane (the audit of the liquefaction plant would be sufficient). As for 15 min billing, the current system is not able to register it, thus a complete upgrade of the hardware is needed. Data regarding renewable energy subsidies is not stored and easily accessible in order to prove the additionality criterion for RFNBO production: all the data concerning the operation support is handled by OTE (the Czech electricity and gas market operator), but there is no way they would be able to get all the information (including quantities)	***Czech Republic***

[6] International Sustainability and Carbon Certification

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on the investment support. Investment support comes from a range of programs organised by different ministries (Ministry of industry and Trade, Ministry of Agriculture, Ministry of Transportation, Ministry for Regional Development, etc.). The grid congestion is identified by ČEPS (transmission system operator of the Czech Republic). The power plant and the electrolyser would have to be remotely controlled by ČEPS, that can intervene if necessary. Among open issues to consider, the most important is the lack of knowledge of the national administration in the field of technical background and interconnection of these fields.	
The Italian experts addressed are producers. They deemed the report useful as giving a complete overview of the problems and difficulties for generating certificates from/for different energy carriers. As already mentioned above, in Italy there isn't a biomethane registry yet and the existing certification system is dedicated to biomethane used for transport and linked to request of subsidies. As there is not yet a registry for GO issuance and PoS issuance, cross-sectoral gas concepts cannot be assessed and covered. In Italy, Hydrogen is not considered a priority topic, while bio-LNG and biomethanol are of interest. Data regarding renewable energy subsidies is stored and easily accessible.	***Italy***
The expert answering the questionnaire is a trader. Currently, there are GOs system for renewable electricity (administrated by Litgrid), and renewable gases (administrated by Amber grid), however cross sectoral principles are not yet defined. So, the report was deemed useful, as giving deep insight on cross-sectoral certification. For someone who is not deeply involved in these processes this report is GOd starting point for better understanding the problematic aspects and possible solutions. The expert agreed to issue a hydrogen GO for hydrogen, a gas GO [liquid] for bio-LNG. In Lithuania PoS are very important as it is foreseen that GOs with PoS could be used in transport sector. In Lithuania there is only investment support for renewable gases production. The information on who receiving this support is publicly available. Also, the received support is marked on the GO.	***Lithuania***
The expert answering the questionnaire is an operator of registry, who stated that the current gas certification system, based on voluntary scheme fulfilling market initiatives, needs upgrading and presently, national regulations aren't prepared for cross-sectoral concepts in Poland. Moreover, there is no availability of data regarding renewable energy subsidies.	***Poland***
The experts answering the questionnaire in Spain are the President of Spanish Biogas Association (AEBIG) and a biogas plant owner from an engineering company. Currently, no system of certificates in Spain exists, but only a voluntary system fulfilling market initiatives. It covers, for GO issuance (art. 19 of RED II), Power-to-hydrogen,	***Spain***

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Biomethane to bio-LNG and Biomethane to biomethanol. While also Power-to-synthetic methane for PoS issuance (art. 25-31 of RED II). The report was considered useful by the experts, because it shows the interactions between the different gases and the technological paths from one to another one. They also point out that issuing GO and PoS for hydrogen, bio-LNG and biomethanol would be helpful to add value to those chains. A 15 min billing could be easily implemented within the certification system. Availability of data regarding renewable energy subsidies is present, because there is a register of subsidies received by any company, therefore it is easy to check this item.	

5.1.4 Feedbacks on D5.3 "Guidelines on renewable gas sustainability certification"

Summary of D5.3

The Renewable Energy Directive includes sustainability requirements for biofuels, bioliquids, biomass fuels and other alternative fuels. Also, as one of the first policy instruments, the EU RED II defines criteria for the use of renewable fuels of non-biological origin.
These requirements have to be fulfilled by economic operators and are the precondition that the respective energy carriers can be accounted for the specific targets that are defined within the RED II and the respective national renewable energy targets. For biogenic renewable gases, these requirements include, amongst others, criteria that focus on the sustainable production and supply of the biogenic feedstock, the history of the feedstock production site (i.e., in case agricultural feedstocks are being used) to avoid negative land-use change impacts, as well as criteria for minimum GHG mitigation thresholds compared to defined reference values.
For Renewable Fuels of Non-Biological Origin (RFNBOs) the RED II sets a GHG mitigation threshold of 70% for all RFNBO compared to the fossil baseline of 94.1 $gCO_2eq./MJ$. A first draft of the delegated act (RED II Art 27) with the specific methodology for the calculation of this draft has been published on the of May 2022 by the European Commission. Furthermore, RED II defines requirements regarding the source of renewable energy that is used for the production of the RFNBOs (so called additionality criteria).
Compliance with the respective requirements and sustainability criteria can be shown by market actors with a sustainability certification process. For this purpose, the EU Commission has recognised a number of certification schemes, which are qualified to show compliance with the RED II requirements. Most of the relevant sustainability criteria included in the RED II have already been introduced for liquid and gaseous biofuels used in the transportation sector in 2009. The RED II is extending the sustainability requirements to industry, heating and cooling. However, most of the experiences from the practical implementation of the RED I criteria, especially for all non-GHG emission-related requirements can be used by the established certification schemes in the process of the RED II implementation. However, due to the differences in the characteristics of the value chains, additional effort is needed to implement the GHG mitigation criteria for gaseous biofuels.
REGATRACE deliverable 5.3 summarises exiting materials, tools and approaches to support the actual implementation of the RED II requirements for biobased renewable gases into practice. Due to the potentially high effort for stakeholders, an important element in that regard is the GHG mitigation criteria. Due to the lack of sufficient default values for the relevant biogas and biomethane pathways in the EU, several biogas and biomethane producers might be required to conduct individual GHG calculations. Furthermore, the report provides support by discussing an exemplary GHG emission calculation.

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Finally, D5.3 focusses on the discussion of potentially relevant aspects related to the practical implementation of the RED II requirements for RFNBOs, including aspects such as for example compliance with the 70% GHG reduction criteria, the additionality of the renewable electricity used for RFNBO production, as well as the aspect of traceability of sustainability information throughout complex supply chains, potentially featuring different traceability models.

Questionnaire and Feedbacks from Target Countries

In June 2022, key experts from the Target Countries have been asked to read the report and answer to a questionnaire properly created to assess the extent to which these guidelines could be adopted in the different countries.

Main questions addressed on D5.3

- *Are there any guidance documents, tools or materials provided by national authorities of certifications schemes, which support market actors sufficiently in the process of sustainability certification?*
- *From your perspective, how well are the RED II sustainability requirements implemented in your country?*

The experts answering the questionnaire in Belgium are producers, trader, operator of registry and a facilitator for Biomethane in Belgium representing Biomethane producers and industrial user. In Belgium ISCC is mainly used by producers for BioLNG conversion. PoS by EU recognized voluntary schemes are accepted for biofuel registration and for ETS. Both the federal authority health (biofuel registration) and VEKA (ETS in Flanders) provide guidance documents, although additional support is often necessary for relevant stakeholders (producers/consuming industries) which is provided by mainly Fluxys and Gas.be. In Belgium, RED II sustainability requirements are not yet implemented (if not minor aspects). Producers realize that a PoS is necessary to capture the value chains of biofuels and ETS. All new projects are aiming at being certified (in BE mainly ISCC). Producers and industries for ETS, as well as administrations, can benefit the content of this report.	***Belgium***
The expert answering the questionnaire in Czech Republic is a trader, who states that the report brings comprehensive information on this topic which allows the reader to gain a deep view in the problematics, also appreciating the summarization of other valuable sources. There are no sustainability certification systems for renewable gases in operation in Czech Republic, nor guidance documents, tools or materials (despite the sustainability criteria are already implemented in the legislation). The main target groups that could benefit from the document are Producers, Auditors/ Inspectors, Traders, University/ Research, Registry Operators.	***Czech Republic***
The experts answering the questionnaire in Estonia are producers, who considered the document useful, as providing a whole picture of certification process. There are no sustainability certification systems for renewable gases in operation in Estonia, nor guidance documents, tools or materials, but there are local GO systems which requires producers to be certified by REDII.	***Estonia***

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The main target groups that could benefit from the document are Producers, traders, auditors.	
The experts answering the questionnaire in Ireland are producers, end users, and consultants. The information provided by the document is clear and will allow for future budget planning and comply with the urgent need to recognise sustainability requirements as a central parameter to distinguish biomethane as green energy and to ensure the transparent trading of the renewable gases in the future. Gas Networks Ireland registers and issues certificates to Irish producers that inject renewable gas into the gas network. This includes biomethane, which is a renewable gas produced by anaerobic digestion of biodegradable matter that is then upgraded to network entry specifications prior to injection. Each certificate represents a guarantee that the equivalent amount of renewable gas has been injected into the gas network. There are no sustainability certification systems for renewable gases in operation in Ireland, nor guidance documents, tools or materials. The gas industry is driving the initiative of certification through membership of the RGFI and the main TSO Gas Networks Ireland. However, on a national level the certification body NSAI and Government stakeholders are only moving slowly. RED II sustainability requirements are not yet fully implemented, with multiple challenges to deal with. The main target groups that could benefit from the document are organisations from the end user to supplier/producer of the biogas to the national climate change activists. It provides important information on sustainability requirements and offers tools and approaches to support the implementation of RED II requirements into practice.	***Ireland***
The expert answering the questionnaire in Italy is a biomethane producer, who states that the UNI / TS 11567 standard defines the guidelines to qualify the economic operators of the biomethane production chain, asking them to ensure not only the sustainability criteria of biomethane, but also to guarantee the traceability of raw materials and the compliance of the authorizations obtained. The RED II sustainability requirements are already implemented as regards biomethane to be used as biofuel. They will soon be implemented for all other end uses as well. The main target group that could benefit from the document is the one working for the revision of the Italian technical regulation UNI 11567. It is represented by some public and private entities and companies that collaborate with the Italian Thermo-technical Committee for the drafting of a new standard (https://www.cti2000.it).	***Italy***
The expert answering the questionnaire is a trader, who explained the situation in Lithuania. As Lithuania is about to start using biomethane in transport sector (and hydrogen in the future), this information seems to be actual and useful. Traceability topic is one of the key concerns. Presently, there is no certification system, nor guidance documents,	***Lithuania***

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tools or materials provided by national authorities of certifications schemes and RED II sustainability requirements are not yet implemented. Producers, traders, regulators, ministries could benefit from the information in the report.	
The expert answering the questionnaire in Poland is from the Environmental Protection Institute-National research Institute. He/she points out that it is important to ensure that the data is traceable and identifiable in detail as this will help, among other things, to ensure that there is no double counting, which is the greatest risk associated with guarantees of origin. The recommendations are clear and helpful for achieving a harmonised market for certificates for multiple energy carriers and also developments in polish registry. Specifically, defining the common scope and rules for applying the guarantee of origin in the affected EU member states will certainly contribute to the organization of the biomethane market and will also constitute a common and equal support mechanism. Anyway, a clear indication and recommendation is needed on the relationship between guarantees of origin and voluntary certification schemes in accordance with REDII, as well as an indication on what terms biomethane will be eligible for a carbon footprint reduction, e.g., during the production of biofuels. It remains unclear how exactly the market of guarantees of origin is to function and whether and how the guarantees will be related to voluntary certification schemes and PoS documents issued under these systems.	***Poland***
The expert answering the questionnaire in Spain are technicians. Recommendations are aligned with their vision. There are doubts regarding the requirement of physical energy carrier, as it may generate situations where a not very efficient approach could be taken for the GO issuance (as, for example, the situation of liquid biomethane). The document is clear, logic and extensive. It provides an extraordinary clarity on a subject pending to be implemented in Spain, where the knowledge of those concepts is still very poor. An additional recommendation would be to set an obligation from the EU to the national governments to implement these systems. Otherwise, the velocity of implementation varies a lot depending on the different governments. Adopting these recommendations will help a harmonised market for certificates for multiple energy carriers, because national governments should follow them, harmonizing the process, and not trying to define new rules and sets of conditions every time. And they will help the set-up of the registry in Spain as well.	***Spain***

5.1.5 Feedbacks on D6.2 "Guidebook on securing financing for biomethane investments"

Summary of D6.2

Europe is the largest producer of biomethane in the world at present. There are good examples at the government level (Germany, the UK, Italy, France, and Sweden), and, currently, 18 countries are producing biomethane in Europe. This document aims to spread as much as possible information and knowledge about good financing practices from countries with a larger number of biomethane plants to countries where the industry is in the early development stages. Besides traditional financing forms,

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there are also non-traditional ways to finance a biomethane plant, like 'crowdfunding' and 'green bonds'.
The biomethane financing and usage in Europe are facing challenges and obstacles. The biggest economic challenge is the low price of natural gas on the European market. There is a high probability of natural gas to keep its low price in the medium-term. For this reason, at present, the gap between natural gas prices and biomethane production costs is significant. However, the governments of many European countries provide support programmes, subsidies and financial support to overcome this gap, and to facilitate biomethane investments.
Besides fighting with the health, the social and financial impact of COVID-19 on the economy and power market, the European countries' governments have to manage to take appropriate measures to continue their country's engagements under the EU's Green Deal. A new Recovery and Resilience Facility of €560 billion will offer financial support for investments and reforms, including green and digital transitions. Biomethane investors and project developers should turn attention to the additional financing opportunities available in the aftermath of the COVID-19 crisis.
Some international financial institutions, banks, and private equity investment funds have realized the current opportunities to finance biomethane projects. They develop products suitable to support biomethane investments. Many European countries are now aware of specific financial products from financial institutions to help finance biomethane projects. These financial products support a range of projects from the early development stage of feasibility analysis financing to funding of the construction and commission stage of biomethane plant with all the related construction works.
The Guidebook reveals the current state and available opportunities for biomethane financing in Europe and reveals challenges and the existing business environment. The intention is to provide the reader with an overview of the main features and problems of biomethane investment projects, different forms of financial assistance by International Financial Institutions (IFIs), selection of the main financing actors, and tasks for project developers to secure financing. The Guidebook describes the benefits offered by biomethane. Furthermore, it is a source of quick reference for developers looking to understand how to finance their biomethane investment projects.

Questionnaire and Feedbacks from Target Countries

Main questions addressed on D6.2
- *What are the main problems you should face or have faced in building a biomethane plant in your country?* - *Did you know the funding sources described in the document? Have you already used them? Do you know others? If so, which ones?* - *Will you also follow / have you followed the same essential tasks and milestones for your biomethane project? Would you add others?*

The expert answering the questionnaire in Belgium is involved in the gas infrastructure. He/she pointed out that the main challenges can be different region by region: In **Flanders,** policy maker has very limited believe in biomethane (or biogas). Indeed, the investment support for biomethane (injection) is close to zero and the support scheme for biogas with local CHP is decreasing (up to 2025). Moreover, the Flemish Energy and Climate agency and VITO are more focussed on green electricity and hydrogen, and rest heat.	***Belgium***

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In **Brussels,** there are plans are for big municipal waste digester financed by the city, but the focus is on electricity **Wallonia** still believes in biomethane but is also looking to restructure the support scheme for CHP (biomethane via gas grid) or local CHP on biogas. The budget for supporting that might decrease. The expert recognises that there is a lack of adequate support, or an incentivizing measure and thus Flemish (potential) producers look for a full commercial value chain and find it in BioLNG outside Belgium. Wallonia (potential) producers have pick this up and are now also positively investigating this pathway as it seems to be more profitable than the support scheme. In general combination of biogas CHP (still supported until 2025) with a biomethane upgrading (commercial value chain) is the most observed set-up for new plants. Beyond the lack of support, other problems are in the permitting which, especially in Flanders, has become an issue due to recent N_2 emission permitting. From the financial point of view, in general, biomethane is considered as not sustainable solution by most of Belgian academic institutions. Project owners in FEED or FID are quite aware of financing, although for instance leasing solution for the upgrading are a quite new concept (It has been applied in a recent project that went online on September 2022). In Flanders the projects are more industrial as they are bigger scaled (1000 – 5000 m^3(n)/h) and financing up to 50 M€ is not uncommon. Project owners are very aware of how to finance those amounts in the best way. In Wallonia the projects are more agricultural and between 100 m^3 up to 700 m^3 (n)/h and often financed via a "cooperative". IRR of these cooperative are lower (around 10% max. Recently bigger industrial project in Wallonia are being studied again (with IRR above 15%). Most projects have followed the same pathway as in the deliverable. Detailed follow up is common with bigger industrial plants than with smaller agricultural projects. In Flanders there are some recent add-ons: - in the permitting, due to the fact that the N_2 emission have to be calculated in the permitting process and have to be demonstrated afterwards. This has an additional cost → based on this, one project in Flanders risks to be refused because the permits for using manure can't be released, while Flanders has one of the highest concentrations of manure in Europe. - For co-digesters with manure, the mass balance of the manure has to be measured in much more detail with specific manure flow meters along the process- This creates additional cost and administrative burden. To the expert opinion, the report was useful as it allows to see how other countries develop and support biomethane, however impact to policy makers of showing how adjacent countries substantiate their ambition and how they support it is low (mainly in Flanders).	
The expert involved in the questionnaire for Czech Republic is a trader. He/she states that the main challenge for biomethane developers is to secure a long term and sustainable supply of local feedstock usable in the production of advanced	***Czech Republic***

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biomethane and also securing a sustainable use/ disposal of the digestate produced (depending on the feedstock, e.g., WWTP sludges, some industrial wastes). The information provided in the report was considered clear and useful in the expert's opinion, as it provides a comprehensive and interesting overview on financing possibilities and risks for biomethane projects. The funding sources found in the report were not known but the expert affirms that it would be possible for them to follow the tasks and milestones indicated in the report.	
The expert answering the questionnaire in Estonia is a producer who highlights how the main challenges are insecure and unclear price of biomethane GO after cancelling biomethane GO in CNG filling station. To promote and accompany the uptake of biomethane in transport, there should be more incentives. Moreover, the expert highlights the need to: - exempt and differentiate 40% -80% of methane fuel heavy vehicles from "heavy vehicle road tolls" on the basis of EURO classes. - Introduce a purchase aid for the use of local gas vehicles (renewal of the local vehicle fleet from EUROIII to EUROVI on the example of Germany) - exempt heavy goods vehicle tax for gas vehicles and differentiation on the basis of EURO classes - use more environmentally friendly vehicles when purchasing public procurement services (setting an example in the implementation of the Clean Vehicles Directive) - so-called green procurements in road construction, Riigi Kinnisvara constructions, where the consumption of methane fuel provides additional points in evaluating tenders The main problems to face in building a biomethane plant are the low awareness and knowledge among authorities, public servants, public and media about the direct and indirect public benefits of the entire cycle of biomethane production. To the expert opinion, the information provided in the report is useful and the essential tasks and milestones for a biomethane project indicated by the report were followed.	***Estonia***
The expert answering the questionnaire in Ireland is an end user. The main challenges concerns State supports for both capital and operational costs. The main problem in building a biomethane plant will be funding and planning: in particular for planning, we need to build collateral for communities to better understand these facilities, to bring them along on this journey and reduce the barriers to planning approval.	***Ireland***
Some Italian producers were involved in the assessment of D6.2. They confirm that in Italy there is a very interesting support scheme for biomethane especially for the production of advanced biomethane and bio-LNG and observe that one of the main problems is in the selection of the biomass that allow the financial support as advanced biomethane. Another difficulty is in the traceability of the certification, mainly due to fragmentation of the lands.	***Italy***

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They found the information provided in the report useful, because providing a broad description of the financing possibilities. The funding sources described in the report were not known, especially those at international level. Moreover, they confirm their interest and will to follow the tasks and milestones for their biomethane projects indicated in the report and would not add others as the ones described are comprehensive.	
A renewable energy consultant was involved in the assessment of the report for Lithuania, who points out that the main challenges for biomethane developers are the unclear demand of biomethane in Lithuania and the possibility of exporting it abroad. Without knowing demand and future cashflows it is too risky to invest. Other problems that potential producers have identified are administrative burdens (getting permissions) and complicated procedures for building the pipeline to connect to the gas transmission or distribution networks. In 2022, a law promoting alternative fuels has been issued in Lithuania. It creates obligations for transport fuel suppliers which among other measures can be fulfilled using biomethane GOs. Such measures create assumptions for viable biomethane business plans in Lithuania and thanks to them, it is expected that biomethane could be exported abroad in the near future. The expert is very satisfied by the information provided in the report which is a good and comprehensive guideline on financing possibilities and tools, also with interesting examples in other countries. Most of the funding sources described in the document are already known, but also new interesting possibilities are described. The essential tasks and milestones for a biomethane project indicated by the report are similar to those taken into account for their projects.	***Lithuania***
The experts answering the questionnaire in Poland are an advisor for biomethane projects (member of Coalition for Biomethane) and an advisor for biomethane projects developers. They both agree that the main challenges for the development of the biomethane market in Poland are the set-up of an effective financing support mechanisms and the creation of a stable and long-term legal framework in support of biomethane. At that moment they have no support for biomethane, however there is an ongoing intensive work of biomethane chain stakeholders together with national administration for the establishment of such system. Other barriers are found in the complicated and time-consuming procedures for obtaining the necessary permits and in the lack of a regulation specifying the quality parameters for biomethane injected into the natural gas network (the regulation is already after public consultation but has not yet been formally approved). For both the experts, the information provided in the report is very clear, complete and useful as it provides valuable information and knowledge about good financing practices in other EU countries with a more advanced biomethane market. The possibility of non-standard ways of financing biomethane plants, like 'crowdfunding' and 'green bonds' were found very interesting	***Poland***

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As already mentioned, at the moment there are no installation in operation in Poland, however, the experts confirm that several investments are at an early stage of planning and the feasibility studies in preparation for new projects present similar tasks and milestones to those described in the report.	
The experts answering the questionnaire in Spain are the President of Spanish Biogas Association (AEBIG) and a biogas plant owner from an engineering company. They state that while great opportunities can be found in the forthcoming availability of important incentives from the EU Next generation program, in the huge potential of the country and in the increasing interest among all the stakeholders, there are still several challenges to face with. The absence of a national market and of an incentive scheme, the need to have a GO system in place in the country, which would help to trade biomethane abroad and finally, the relatively low inventory of biogas plants, which reduces the opportunities to migrate from biogas to biomethane plants. Experts consider the report very interesting as it shows the models that are being implemented in other part of the world. The funding sources described in the document are already partly known.	***Spain***

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5.2 Assessment of *roadmapping* process in WP6: estimating the level of cooperation in the Biomethane Working Groups

REGATRACE supported the uptake of biomethane market in the Target and Supported countries with the set up and run of a participatory process aimed at the elaboration of medium - long term strategic visions and consequent definition of national roadmaps towards a future biomethane development in all countries involved.

This process was structured in 4 participatory workshops -followed by a joint final event - held in each country with the participation of the key national stakeholders of the biomethane sector.

Table 3: Participatory Workshops (T6.2)

Workshop	Purpose
Kick-off WS: Vision	REGATRACE project and the mapping exercise (T6.1) will be presented with the aim to fill eventual gaps and to collect inputs for the definition of the long-term strategic vision.
2nd WS: Roadmap	The draft strategic long-term vision will be presented, discussed and consolidated with stakeholders while collecting also first ideas and inputs for the definition of the national roadmap
3rd WS: Guidance for feasibility analysis	Presentation of the national roadmaps further elaborated after the previous WS and discussion of the Draft Guidance for Feasibility Analysis to collect inputs for the preparation of the country tailored guidance.
4th WS: Final results and lesson learned	Summing up the entire process with results achieved and presentation of the country tailored guidance for feasibility analysis.
Final joint event	To gather all responsible partners and LTPs from Target and Supported countries to share and exchange results and lessons.

The outcomes of this work are collected and summed up in D6.3 "Long-terms visions and roadmaps."

The aim of process evaluation here is to assess **the process of cooperation** toward the definition of the visions and development of the roadmaps in the Target and Supported countries.

According to the activities carried out in task 6.2, the first step of this process was to identify and involve a number of key national stakeholders in dedicated Biomethane Working Groups. The aim of this group was to open and maintain a communication channel across the different stakeholders and main players of the biomethane sector, with the ambition to work together in an integrated manner towards the definition of a common strategy.

To assess the effectiveness and proper functioning of this working group, the **level of cooperation internally perceived was assumed as key indicator**.

5.2.1 The methodology

According to literature, the term *cooperation* is related to "*the actions of someone who is being helpful by doing what is wanted or asked for*" or "*people working together to achieve results*" and moreover "*an interaction between organisms that is largely beneficial to all those participating*". Despite all the

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different connotations related to this term, we can generally assume that cooperation is about **working together with a common purpose and toward a common benefit**.

According to that, a specific methodology for estimating the **perceived level of cooperation** among the members of the Biomethane Working Groups has been developed in order to assess the roadmapping process in REGATRACE, with the general assumption that a high level of cooperation in the group can positively influence this work.

To best assess the level of cooperation, six indicators have been defined:

1) Leadership
2) Balanced Team
3) Clear Division of Responsibility
4) Overall level of commitment perceived
5) Transparency / Communication
6) Compliance between individual and collective goals

The level of cooperation can be quantified by combining these 6 factors. The more they are successful the **higher is the cooperation level.**

The table below provides a general description of the six components that constitute the cooperation level.

LEVEL of COOPERATION	
Component	Description
LEADERSHIP	Leadership is a complex of beliefs, communication patterns, and behaviours that **influence the functioning of a group and move a group toward the completion of its task**[7]. Aspects of leadership include framing, bridging, lobbying and persistency: • Framing: explaining the objectives of the process. • Bridging: fostering collaboration, bringing people together, connecting different interests, and forming a supportive group of stakeholders. • Lobbying: creating the right connections to government officials and industry and creating support for the project. • Persistency: persevering in his/her endeavour to realise the project plan (including its ambitions & targets), also in adverse conditions, to ensure the continuity of the project.
BALANCED TEAM	A balanced team is an autonomous group of people with a **variety of skills and perspectives that support each other towards a shared goal**. It has **all the resources and authority** it needs to complete projects on its own. It values **cross-disciplinary collaboration** and iterative delivery.
CLEAR DIVISION OF RESPONSIBILITY	It is important that roles and responsibilities are **well defined and clearly assigned to the specific actors and stakeholders involved** in the group. Without a clear division of responsibility, the risk of not achieving the targets and goals set at the beginning could become true.
OVERALL LEVEL OF COMMITMENT PERCEIVED	There are a lot of factors that go into making a successful working group (including autonomy, cross-discipline collaboration, transparency, iterative delivery/improvement, etc.), but without a healthy dose of **trust**, all of the other elements fall apart. This can be reflected in the **level of commitment** of the group and especially in **how it is perceived by the individuals**.

[7] https://2012books.lardbucket.org/books/a-primer-on-communication-studies/s14-leadership-roles-and-problem-s.html

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TRANSPARENCY / COMMUNICATION	**Transparency means communicating openly** and honestly with the other team members and cultivating a culture where **information can flow freely between people and team**. Although transparency is often glossed over in vague terms, its benefits are tangible, indeed transparency allows every individual of a team to feel like they are a part of something bigger**. It's about building trust**. It's about helping the team members to create work that is meaningful and makes a tangible difference.
COMPLIANCE BETWEEN INDIVIDUAL AND COLLECTIVE GOALS	Goals are a key component of any endeavour and are a good way to create a destination for where the team wants to end up. In a diverse group made up of many representatives of different organizations and companies working on biomethane and other sectors, **having the individual company's objectives in line with the overall goal of the group** is a key factor which can **encourage greater cooperation.**

After the Kick-off meeting of the BWG, the participants were asked to answer a short questionnaire in order to define the state of play.

At the end of the visioning and roadmapping process, after the 4th and final workshop, an ex-post assessment was done to assess the cooperation perceived and to check if there were an improvement or a worsening, trying to identify the reasons behind that.

In the following paragraph, the results of this assessment are reported.

5.2.2 Results by country

5.2.2.1 TARGET COUNTRIES

BELGIUM

The REGATRACE roadmapping process was a useful experience and a valuable guideline, but due to the Belgian landscape (mainly political), the final roadmap could only be realized partially for what concerns certification. The Belgian greengasplatform.be used - to the extent of feasible for Belgium - the tools and information offered through the REGATRACE project, but in the difficult regional and federal context was only partially able to implement some of them.

SUMMARY	B	E
LEADERSHIP	2,5	2,3
BALANCED TEAM	2,5	3,0
CLEAR DIVISION OF RESPONSIBILITY	2,5	3,0
OVERALL LEVEL OF COMMITMENT PERCEIVED	3,5	3,5
TRANSPARENCY	3,0	3,0
COMPLIANCE BETWEEN INDIVIDUAL AND COLLECTIVE GOALS	3,0	3,0

LEVEL OF COOPERATION:	
Good	3,0

Intervalli		
Not Working	0	0,8
Poor	0,8	1,6
Acceptable	1,6	2,4
Good	2,4	3,2
Exellent	3,2	4

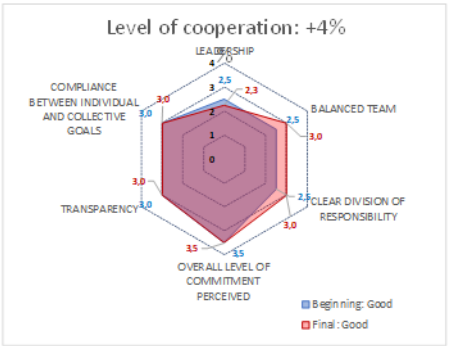

Figure 3: Increase of the level of cooperation in the BWG -Belgium

As shown in Figure , the level of cooperation perceived in the BWG established in Belgium at the beginning of the process was already good and there was a further small increase (+4%) thanks to the work carried out during the project in the participatory workshops of WP6. In particular, in Wallonia biomethane can count on the support of the BWG for the future (format not decided yet), and certainly, this is an achievement of

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REGATRACE. Therefore, the efforts of the Belgian BWG members are and will be important, but it must be said that political context is averse to biomethane.

Another success factor of this activity is related to the people involved. The group was small, but all the key stakeholders from relevant sectors and industry experts were involved with a very clear idea of the task, role, and responsibilities in this activity, although Belgium is not obvious with respect to roles/actors/stakeholders due to regional fragmentation. A good alignment and integrated approach were crucial even though the Biomethane Working Group, for some aspects, seemed to be broader than just the biomethane sector. As a whole, the green gas platform created an ideal way of collaboration in Belgium thanks to the leadership of Fluxys and Biogas-E as formal members of REGATARCE. Participants appreciated the work done.

CZECH REPUBLIC

In Czech Republic the roadmapping process brought evident positive results. The increase in the level of cooperation was quite good (+27%, from "good "to "excellent" - see Figure) and different aspects were determinant for these results.

SUMMARY	B	E
LEADERSHIP	2,3	3,0
BALANCED TEAM	3,7	4,0
CLEAR DIVISION OF RESPONSIBILITY	2,3	4,0
OVERALL LEVEL OF COMMITMENT PERCEIVED	3,0	3,0
TRANSPARENCY	3,0	4,0
COMPLIANCE BETWEEN INDIVIDUAL AND COLLECTIVE GOALS	3,0	4,0

LEVEL OF COOPERATION: Exellent	3,7

Intervalli		
Not Working	0	0,8
Poor	0,8	1,6
Acceptable	1,6	2,4
Good	2,4	3,2
Exellent	3,2	4

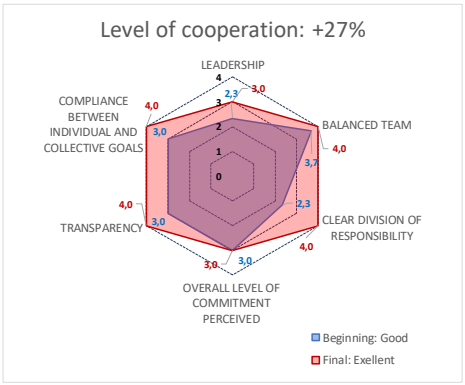

Figure 4: Increase of the level of cooperation in the BWG - Czech Republic

First of all, all interest groups were represented in the BWG and the cooperation between the different stakeholders was smooth. As all participants shared the same goal of enabling the launch of a system for issuing and trading guarantees of origin, the visioning and road mapping process was relatively easy. During all the participatory meetings, there was lively discussion on relevant topics and experts from all key areas participated in the meetings. A really positive influence was the fact that the cooperation was established with the state-owned company OTE, which will issue guarantees of origin in the Czech Republic. Equally positive was that smaller meetings were held online, making it easier to ensure the participation of interested experts and representatives of the state administration, for whom it is often problematic to attend meetings physically (due to workload). On the other hand, the online format is not very convenient in case of participation of a large number of participants, where the possibility of networking and one-on-one discussions is lost.

ESTONIA (Advanced Country)

Estonia was considered an advanced country since the beginning of the project, as there was already a registry in place. Nevertheless, it was involved in the same visioning and roadmapping process of the other Target Countries, and it brought interesting results.

Elering states that this process was a good opportunity to analyse the current biomethane market solutions and document the proposals from the national stakeholders for market development,

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covering different aspects of the biomethane market and their interconnections. The Biomethane Working Group meetings also provided a good platform for discussions between the market participants for identifying the potential areas of cooperation. The Biomethane Working Group meetings took place as part of the Estonian Biomethane Council meetings, where the stakeholders of the Estonian gas market, as well as the transport sector were present: this made possible the set-up of a balanced team that included all the relevant stakeholders and main interests of the market players in Estonia.

SUMMARY	B	E
LEADERSHIP	3,3	3,5
BALANCED TEAM	3,7	3,5
CLEAR DIVISION OF RESPONSIBILITY	3,0	3,5
OVERALL LEVEL OF COMMITMENT PERCEIVED	2,7	3,5
TRANSPARENCY	3,7	3,5
COMPLIANCE BETWEEN INDIVIDUAL AND COLLECTIVE GOALS	3,7	3,5

LEVEL OF COOPERATION:	
Exellent	3,5

Intervalli		
Not Working	0	0,8
Poor	0,8	1,6
Acceptable	1,6	2,4
Good	2,4	3,2
Exellent	3,2	4

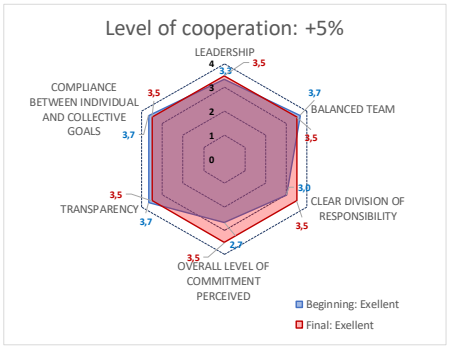

Figure 5: Increase of the level of cooperation in the BWG - Estonia

The level of cooperation perceived was excellent from the beginning (with a slight increase at the end of the process. +5% - see Figure 5).

IRELAND

The substantial interconnecting and distribution infrastructure already in place in Ireland will facilitate the development of biomethane as a renewable gas as it can seamlessly use the existing network and REGTRACE demonstrated what can potentially be achieved. Therefore, in Ireland, the project was successful in "introducing" stakeholders across different countries.

SUMMARY	B	E
LEADERSHIP	3,4	3,5
BALANCED TEAM	3,6	3,5
CLEAR DIVISION OF RESPONSIBILITY	2,8	3,5
OVERALL LEVEL OF COMMITMENT PERCEIVED	3,4	3,0
TRANSPARENCY	3,2	3,5
COMPLIANCE BETWEEN INDIVIDUAL AND COLLECTIVE GOALS	3,3	4,0

LEVEL OF COOPERATION:	
Exellent	3,5

Intervalli		
Not Working	0	0,8
Poor	0,8	1,6
Acceptable	1,6	2,4
Good	2,4	3,2
Exellent	3,2	4

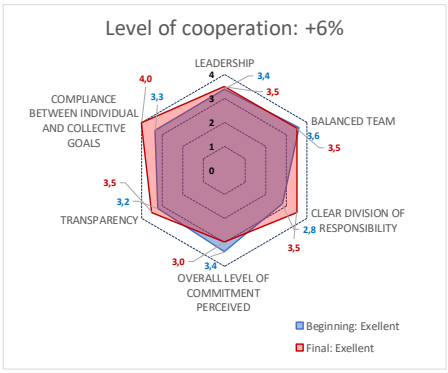

Figure 6: Increase of the level of cooperation in the BWG - Ireland

Biomethane production is a relatively "new technology" for Ireland. The RGFI has been leading the promotion of biomethane for a number of years and through their activities (research, communication, demonstration, education, dissemination, public relations, lobbying) the message about the potential for biomethane in Ireland was efficiently delivered. The activities of the group were coordinated and consistent in showing the potential for biomethane production in the country.

COVID-19 provided additional challenges to communications and limited the opportunities for in-person meetings to take place. The Biomethane Working Group worked effectively to alleviate the issues caused by Covid 19.

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The overall level of cooperation perceived by the group was already excellent at the time the BWG was established and further increased over the course of the workshops (+6%, see Figure 6).

A broad range of expertise was involved in delivering the goals of the project and all of them were and are aligned and focused on the key objectives. There were representatives from:

- Industry = biomethane producers and equipment providers
- Academia = researchers in ROI universities
- Policy Markers = officials from the Department of Energy and Climate Change
- Energy Companies = shippers and suppliers of gas
- Grid Operator = Gas Networks Ireland

The overall aims, objectives and deliverables of REGATRACE were well articulated at the RGFI members' meetings and via RGFI newsletters and events.

ITALY

In Italy, the visioning and roadmapping process carried out in REGATRACE was held within a context of regulatory change.

A new incentive scheme for the production of biomethane, that allows other end uses in addition to that of transport, was under development for several months. CIB, which represents the Italian agricultural biogas sector, organized and participated to numerous meetings (REGATRACE workshops, working groups, B2B meetings, etc.) with the main stakeholders interested in the development of the biomethane supply chain. The main purpose of the meetings was to find a common position on the main barriers preventing the development of the Italian biomethane sector and to draw up valid proposals to be presented to the ministries involved in the drafting of the new decree.

The visioning and roadmapping process was the starting point for the discussion and reasonings on to the new biomethane subsidies scheme, both during meetings with stakeholders and during the dialogue with ministries.

REGATRACE gave a valuable opportunity to discuss those themes with key stakeholders and ministries involved in the publication of the new incentive scheme. This positive and fruitful dialogue led to the achievement of great results in the last 12 months (e.g., the possibility of using liquefied biomethane in the shipping sector; the publication of a list of feedstocks that can be used to produce advanced biomethane for use in the transport sector; etc.).

Unfortunately, in addition to the demanding situation that Europe is currently experiencing (Russia-Ukraine conflict; rising energy costs; risk of lack of natural gas; etc.), the main barrier to the development of the biomethane supply chain in Italy is not at a national level but at a European level. In fact, the Italian Ministry of Ecological Transition sent the draft of the new biomethane subsidies scheme to the European Commission at the end of October 2021. The European Commission approved the Italian proposal only in August 2022 (and the new Decree was finally published in September 2022), causing a sharp slowdown in investments and a delay in the production of renewable gas which could, at least in part, replace imports of natural gas from Russia.

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Looking at the process and at the results achieved, it's easy to conclude that **it would have been useful to involve members of the European Parliament and representatives of the European Commission in the Italian visioning and road mapping process** as well.

SUMMARY	B	E
LEADERSHIP	2,9	3,6
BALANCED TEAM	1,6	3,4
CLEAR DIVISION OF RESPONSIBILITY	2,2	3,8
OVERALL LEVEL OF COMMITMENT PERCEIVED	3,1	3,8
TRANSPARENCY	2,5	3,0
COMPLIANCE BETWEEN INDIVIDUAL AND COLLECTIVE GOALS	1,9	3,4

LEVEL OF COOPERATION:	
Exellent	**3,5**

Intervalli		
Not Working	*0*	*0,8*
Poor	*0,8*	*1,6*
Acceptable	*1,6*	*2,4*
Good	*2,4*	*3,2*
Exellent	*3,2*	*4*

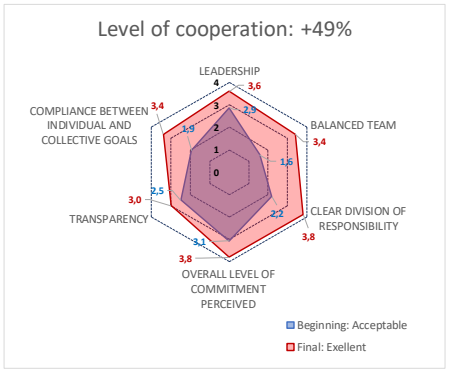

Figure 7: Increase of the level of cooperation in the BWG - Italy

Despite these profound considerations elaborated by CIB, the members of the Italian Biomethane Working Group seemed to be satisfied with the work done and this is evident from the visible increase in internal cooperation perceived (from "acceptable" to "excellent" level, +49%, see Figure 7). The leader of the BWG was able to explain well the activities and objectives of the project by attracting the attention of the stakeholders and involving them in the activities. CIB's commitment and dedication were excellent from the beginning of the process. This was fundamental for the success of this activity. All the sectors involved were represented by different experts who actively participated to the discussion; this made it possible to have a complete and all-round overview of the situation. The objectives of the BWG were clearly explained and the participants knew what the opportunities were for them. Activities were clearly drawn, and each member knew its goal, what to do and who to contact in case of need. The internal communication within the group was always good and the discussion was fruitful. The different topics have always been approached with clarity and transparency and in some cases new opportunities for collaborations have arisen.

LITHUANIA

In Lithuania, biomethane already has its role, targets, and support in national plans, therefore developing a vision and a roadmap was not so challenging.

Although workshops were held online, participants were quite active in expressing their suggestions, problems and insights. The stakeholders' involvement in this activity was very high, averaging 30 – 50

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in every workshop and, overall, the achievements made were quite satisfactory, especially in a pandemic period where organizing online workshops was quite tough.

The answers received to the questionnaire highlight how Amber Grid managed to involve a substantial number of stakeholders from different sectors and this resulted in a balanced team and tight-knit group. The leaders managed to guarantee transparency in the communication and to ensure that the collective goals established took into account the individual position of the different actors involved in the process.

SUMMARY	Beg.	End
LEADERSHIP	3,0	3,6
BALANCED TEAM	3,0	3,4
CLEAR DIVISION OF RESPONSIBILITY	3,5	3,6
OVERALL LEVEL OF COMMITMENT PERCEIVED	3,0	3,8
TRANSPARENCY	3,3	3,8
COMPLIANCE BETWEEN INDIVIDUAL AND COLLECTIVE GOALS	3,0	3,4

LEVEL OF COOPERATION:	
Exellent	3,6

Intervalli		
Not Working	0	0,8
Poor	0,8	1,6
Acceptable	1,6	2,4
Good	2,4	3,2
Exellent	3,2	4

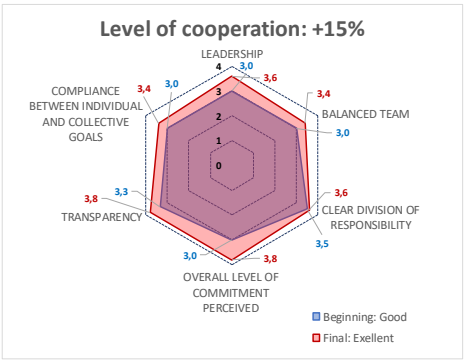

Figure 8: Increase of the level of cooperation in the BWG - Lithuania

In summary, the cooperation level within the Lithuanian BWG was excellent and there was also an improvement compared to the start of the process (+15% - from Good to Excellent, see Figure 8).

POLAND

The set-up of the BWG in Poland significantly increased cooperation among national stakeholders in the renewable gas sector. The visioning and roadmapping process of REGATRACE involved different actors from different sectors: the current electricity GO operator that will be also the future biomethane GO operator (TGE), the Ministry of Agriculture, the Ministry of Climate, the potential biomethane GO issuing body (URE), biogas producers (potential producers of biomethane), gas sector companies (PGNiG, Gas System, PSG), research institutes (IOŚ, PIMOT, INiG).

The process carried out and the discussion that ensued were very positive. Most of the BWG members were highly active in the debate and this initiative, born and brought forward by REGATRACE, was a good example and on the heels of this success other 7 new groups were established under the leadership of the Ministry of Climate, where key representatives of Polish biogas and biomethane sector are involved. This was a remarkable achievement but, on the other hand, the parallel involvement of most of the BWG members in these further groups negatively impacted their availability and their active participation in the visioning process (see the slight reduction in “balanced team”, Figure).

SUMMARY	B	E
LEADERSHIP	3,3	3,6
BALANCED TEAM	3,8	3,4
CLEAR DIVISION OF RESPONSIBILITY	2,8	3,2
OVERALL LEVEL OF COMMITMENT PERCEIVED	3,2	3,2
TRANSPARENCY	3,3	3,4
COMPLIANCE BETWEEN INDIVIDUAL AND COLLECTIVE GOALS	3,2	3,6

LEVEL OF COOPERATION:	
Exellent	3,4

Intervalli		
Not Working	0	0,8
Poor	0,8	1,6
Acceptable	1,6	2,4
Good	2,4	3,2
Exellent	3,2	4

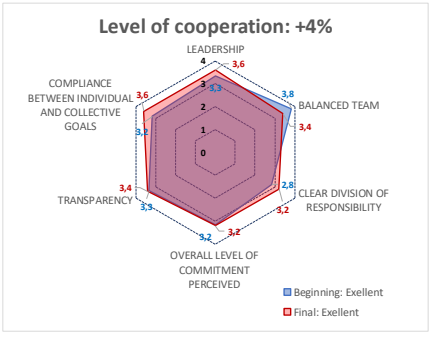

Figure 9: Increase of the level of cooperation in the BWG - Poland

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Nevertheless, the leaders managed to maintain support for the project among this large group of stakeholders.

Another factor that contributed to undermining the cooperation was the COVID pandemic whose restrictions resulting therefrom led to an excessive length of the process, with consequently reduced engagement from some of the participants. However, as can be seen in Figure , the cooperation was considered excellent and, all in all, the process was successful.

SPAIN

The visioning and roadmapping process carried out in Spain was a great opportunity to gradually increase knowledge and raise awareness among the different stakeholders representing different organizations, companies, Ministries, etc. Putting together multiple perspectives helped to understand the main barriers and opportunities for biomethane, while considering a wide range of factors revolving around this sector: waste, digestate, technology, biomethane purchasing or permitting legislation or gas regulation.

Furthermore, this process coincided with a time of change for Spain, especially on the regulatory, energy and geostrategic side. In this context, the Biogas Roadmap and the beginning of the development of the GO system, allowed a more critical analysis to be made for the preparation of the roadmap proposed by REGATRACE. The workshops with stakeholders were really successful, to the point of generating an ex-post interest of the participants. Moreover, presenting progressively the conclusions of the previous meeting was a very well received practice, since it showed that progress and steps forward were made in the right direction.

SUMMARY	B	E
LEADERSHIP	3,0	3,3
BALANCED TEAM	3,0	3,5
CLEAR DIVISION OF RESPONSIBILITY	2,5	3,0
OVERALL LEVEL OF COMMITMENT PERCEIVED	3,3	3,5
TRANSPARENCY	3,1	3,3
COMPLIANCE BETWEEN INDIVIDUAL AND COLLECTIVE GOALS	3,3	3,3

LEVEL OF COOPERATION: Exellent	3,3

Intervalli		
Not Working	0	0,8
Poor	0,8	1,6
Acceptable	1,6	2,4
Good	2,4	3,2
Exellent	3,2	4

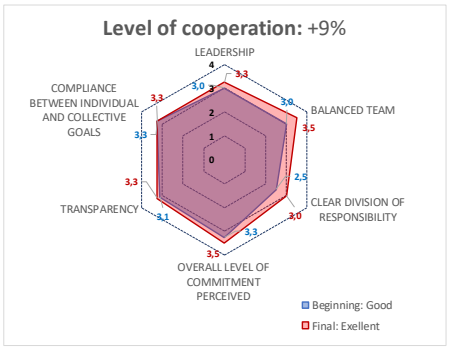

Figure 10: Increase of the level of cooperation in the BWG - Spain

The only weakness found, that should be addressed in the future, is the scarce involvement of the administration in this process. The private sector proved to be more consistent and proactive and perhaps it would have been necessary to select more representatives from the government and public sector.

In spite of this, this path brought a visible improvement in the internal cooperation of the Spanish BWG (from Good to Excellent, see Figure).

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5.2.2.2 SUPPORTED COUNTRIES

FINLAND[8]

In Finland, the target of the project was to create a common vision for the sector, strengthen the cooperation and in this way convince the target groups (new investors, politicians, etc.) about the potential of the sector. The vision, target, and roadmap were created in time. Already in September 2021, the Finnish Government set an official target for biogas and biomethane production (4 TWh in 2030). It was also created a webpage (www.biokaasu2030.fi) and published an article in Finnish about the biogas production and use potentials (https://biokierto.fi/wp-content/uploads/2020/06/Biokaasu2030_raportti_17062020.pdf).

The process carried out thanks to REGATRACE was very successful. The guidelines provided by the project helped to run effectively the process and to avoid missteps.

Three workshops were organized virtually, and the first one was a face2face event. The physical meeting at the beginning was very important, but, after all, the COVID situation didn't disturb the process that much. Instead, the COVID situation negatively affected cooperation with other nationalities, and share of experiences and knowledge on the vision process and results was very minimal.

SUMMARY	
LEADERSHIP	3,1
BALANCED TEAM	2,7
CLEAR DIVISION OF RESPONSIBILITY	2,9
OVERALL LEVEL OF COMMITMENT PERCEIVED	2,9
TRANSPARENCY	2,9
COMPLIANCE BETWEEN INDIVIDUAL AND COLLECTIVE GOALS	3,4

LEVEL OF COOPERATION:	
Good	3,0

Intervalli		
Not Working	0	0,8
Poor	0,8	1,6
Acceptable	1,6	2,4
Good	2,4	3,2
Exellent	3,2	4

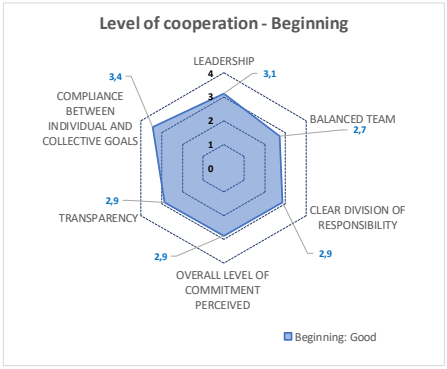

Figure 21: Level of cooperation in the BWG - Finland

The BWG represented a quite large variety of operators and experts in the biogas sector and stakeholders in the value chain with different sizes of companies. All of them were well motivated to take part, but roles and responsibilities should have been explained better. Despite some differences in opinions, a good common vision of the main tasks was created.

The main goal of the different members constituting the group is common, with minor differences in the scope of business, but overall, the group is aligned in terms of objectives. Moreover, the commitment shown by the people involved was very good thanks to the leadership and motivation of the group, which wants to develop a biomethane business in Finland.

GREECE

Being the legislative framework on biomethane production not established yet in Greece, REGATRACE visioning and roadmapping process was an excellent opportunity. Key stakeholders were invited to discuss and together define the next steps for biomethane penetration in Greece.

[8] For Finland it wasn't possible to collect the final questionnaire on the level of cooperation, therefore Figure 10 shows the situation at the beginning of the process, which was already good.

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Despite pandemic restrictions leaded to communication obstacles that did not facilitate the round table discussions within virtual meetings, HABIO succeeded in managing effective communication among the stakeholders, whose role was clearly defined in the holistic value chain of biomethane.

As can be seen in Figure 3, the cooperation perceived by the members of the Greek BWG was very high and it also increased since the beginning of the process (from "Good" to "Excellent, +29%).

SUMMARY	B	E
LEADERSHIP	2,7	3,5
BALANCED TEAM	3,3	3,8
CLEAR DIVISION OF RESPONSIBILITY	2,3	3,8
OVERALL LEVEL OF COMMITMENT PERCEIVED	2,7	3,5
TRANSPARENCY	2,3	3,8
COMPLIANCE BETWEEN INDIVIDUAL AND COLLECTIVE GOALS	3,7	3,8

LEVEL OF COOPERATION: Exellent	3,7

Intervalli		
Not Working	0	0,8
Poor	0,8	1,6
Acceptable	1,6	2,4
Good	2,4	3,2
Exellent	3,2	4

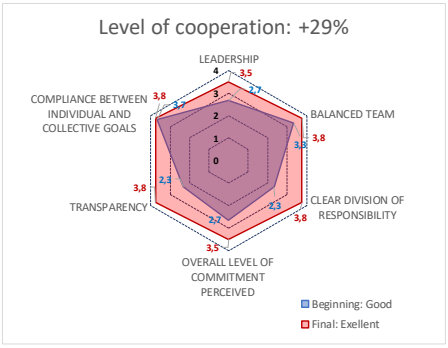

Figure 32: Increase of the level of cooperation in the BWG - Greece

The work of the leaders of the process (HABIO) was very effective. They made significant efforts to motivate the stakeholders in their active participation and in the development of strong connections with the government and public bodies. Indeed, a well-balanced team was set up, including public and private entities. Roles and responsibilities were established from the inception and each member had a clear view of the actions to execute. The communication among the members of the BWG was excellent, each participant was available to share important information with the others, taking into consideration the common good and the realization of the shared goals.

Moreover, thanks to the opportunity given during the workshops at the round table discussion, it was given the possibility to create direct communication with other key stakeholders and policy makers on aspects directly and indirectly connected with the scope of the process itself.

LATVIA

In recent times, the biomethane strategy was stuck in Latvia and it was not possible to make significant progress for a long time.

Although the communication on the part of the Ministry of Economics normally takes place with all the most important participants of the industry and other industries, not all those addressed (institutions) are sufficiently involved. Therefore, the involvement of all the relevant actors in the development of the strategy is a need. Negotiations on the development of the biomethane industry involve so-called social partners - LDDK, LCCI, LPS, most of which are neutral or negative on biomethane development questions.

That said, the biggest issues in the visioning and roadmapping process proposed in REGATRACE was found in the overall level of commitment perceived. The reluctance of the government representatives involved was especially noted.

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The biggest contribution of the project was the opportunity to learn about current situation in the other countries, to view the existing achievements in the field of biomethane, and to outline a common vision in Latvia.

SUMMARY	B	E
LEADERSHIP	3,3	3,6
BALANCED TEAM	3,7	3,6
CLEAR DIVISION OF RESPONSIBILITY	2,3	3,0
OVERALL LEVEL OF COMMITMENT PERCEIVED	3,0	3,0
TRANSPARENCY	3,0	3,2
COMPLIANCE BETWEEN INDIVIDUAL AND COLLECTIVE GOALS	3,0	3,0

LEVEL OF COOPERATION:	
Exellent	3,2

Intervalli		
Not Working	0	0,8
Poor	0,8	1,6
Acceptable	1,6	2,4
Good	2,4	3,2
Exellent	3,2	4

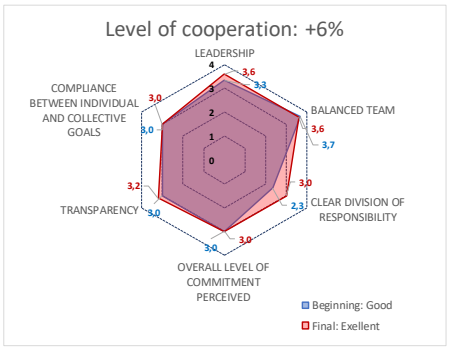

Figure 43: Increase of the level of cooperation in the BWG - Latvia

At the end of the project, the stakeholders showed more cohesion in developing the biomethane market than before the REGATRACE project (see Figure 4). The working group set the goal of reaching 10% biomethane additive in natural gas by 2030 and the Ministry of Economy included this goal in its operational plans.

SLOVENIA

Currently, biomethane is not produced in Slovenia. Therefore, REGATARCE project was a perfect opportunity to prepare the ground and build from scratch a strong network of stakeholders operating in the production sector, professionals in the environment sector, legislators and users. The project accelerated thinking about usability, profitability and, above all, promoted the discussion on the possibilities for biomethane production in Slovenia.

In the ideal scenario, the processes could be further accelerated and investments in production already started, but the procedures in the regulatory environment are also long-lasting.

SUMMARY	B	E
LEADERSHIP	2,7	2,6
BALANCED TEAM	2,9	3,0
CLEAR DIVISION OF RESPONSIBILITY	2,3	2,6
OVERALL LEVEL OF COMMITMENT PERCEIVED	2,7	2,9
TRANSPARENCY	3,4	3,4
COMPLIANCE BETWEEN INDIVIDUAL AND COLLECTIVE GOALS	3,6	3,0

LEVEL OF COOPERATION:	
Good	2,9

Intervalli		
Not Working	0	0,8
Poor	0,8	1,6
Acceptable	1,6	2,4
Good	2,4	3,2
Exellent	3,2	4

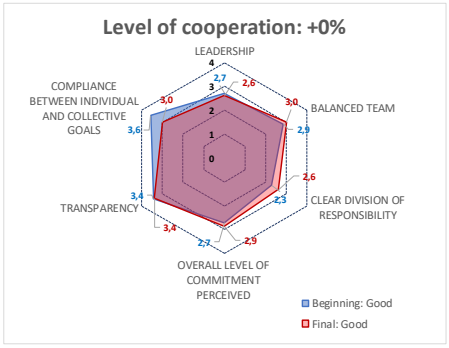

Figure 54: Increase of the level of cooperation in the BWG - Slovenia

The setting of the BWG was an excellent opportunity, the team created was balanced, and the shared responsibilities were clear. Most of the participants turned out to be quite engaged in the process. A progressive misalignment between individual and collective objectives was observed at the end of the process, but this did not affect the general level of cooperation perceived by the group which remains unchanged (Good - see Figure 5).

The excellent initial set-up and the visible engagement that emerged will certainly contribute to adjusting and improving these aspects, bringing to the table the interests of all the key actors in the Slovenian gas sector.

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UKRAINE

The replacement of natural gas with biomethane and other renewable gases is becoming a national security issue for Ukraine. Ukraine has a great potential for the development of these technologies, however, until recently, the country lacked economic conditions and a clear vision of the necessary state policy.

According to experts 'estimations, the total biomethane production in Ukraine could reach 1.0 billion m^3/year in 2030 and it is expected that biomethane could partly be exported to the EU. The rest could be utilized locally for combined heat and electricity generation in CHP units, heating, and industrial applications, and for transportation purposes. In such a way the biogas sector could partially and progressively satisfy the growing demand for sustainable and clean energy from the transport and industry sectors.

The process of visioning and road mapping realized within the framework of the REGATRACE project allowed the Ukraine partner to bring together all stakeholders and experts, who often have different ideas about development priorities, goals, necessary resources, and implementation plans. The multi-stage preparation procedure helped to bring the positions of the parties closer and find ways to solve problems together. Unfortunately, at the later stages of the discussion, joint work was hampered by the difficult military-political situation in the country. However, this situation only increased the importance of the development of these technologies for Ukraine.

However, the level of cooperation perceived by BWG members in Ukraine is excellent (with a small further increase of 3% compared to the beginning of the process). The main reasons for the success of this collaboration are identified in the compliance between individual and collective goals, that is to create clear conditions and the necessary support for the development of the biomethane sector in Ukraine.

SUMMARY	B	E
LEADERSHIP	2,9	2,9
BALANCED TEAM	3,4	3,4
CLEAR DIVISION OF RESPONSIBILITY	2,9	3,3
OVERALL LEVEL OF COMMITMENT PERCEIVED	3,3	3,3
TRANSPARENCY	3,3	3,3
COMPLIANCE BETWEEN INDIVIDUAL AND COLLECTIVE GOALS	3,8	3,9

LEVEL OF COOPERATION:	
Exellent	3,3

Intervalli		
Not Working	0	0,8
Poor	0,8	1,6
Acceptable	1,6	2,4
Good	2,4	3,2
Exellent	3,2	4

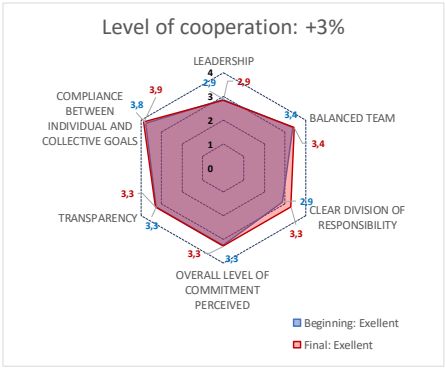

Figure 65: Increase of the level of cooperation in the BWG - Ukraine

This sharing of objectives was facilitated by the creation of a balanced and inclusive team made up of a wide range of stakeholders with well-defined roles and responsibilities: public administration (all key people), market regulator, gas distributors, academics, etc.

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6 Impact Evaluation

The objective of Impact evaluation is to monitor the evolution of the biomethane sector in the Target countries for what concerns production, development of new installations and volume of biomethane traded.

It is important to highlight that, as REGATRACE project is not an Innovation Action, and thus no pilot plants were built within its activities, we cannot establish a direct link with the increase of biomethane production in the different REGATRACE countries; on the other hand it can be said that the activities performed towards the establishment of a common European biomethane market and the support provided to the Target and Supported countries in the set-up of registries and in putting on the table the promotion of biomethane in the political debate, by involving all the key stakeholders (with BWG), indirectly impacted this growth.

Moreover, monitoring these indicators was a useful exercise that, together with the policy evaluation, helped understanding how biomethane market is evolving in the different countries.

Last but not least, it is important to recall that REGATRACE aimed also at providing efficient, practical, "down to earth" support to the biomethane project developers in every participating country and this was realised through the production of decision-making support tools like the Guidelines for establishing national biomethane registries (D3.1) and the Guidebook on securing financing for biomethane investments (D6.2), which were positively received by the experts of the different countries (see Paragraph 4.1 - Assessment of key outputs). It is widely recognised by the different national experts that these are all valid tools for promoting and supporting the development of new projects.

In the following, facts and figures on biomethane market and trade will be provided for the Target countries, both in terms of current situation and future expectations.

6.1 Biomethane production, GHG savings and new investments in the Target Countries

Presently **82 biomethane installations** are operated in the Target Countries of the project (BE, CZ, ES, IE, IT, LT, and PL) plus EE, for a corresponding investment of about 535 M€, producing in total about **4,466 GWh/y**, a remarkable increase with respect to the 860 GWh produced in 2019, when the project had just started.

It is expected that the Target Countries together will reach a production of almost **33,000 GWh/year by 2025**, of which 87% are from Italian plants. The amount of CO_2eq saved is estimated around 1.7 million tonnes within the project duration (cumulative 2019-2022) up to about 13.5 million tonnes by 2025.

The expected impact of the REGATRACE at the beginning of the project in those 8 countries (Romania was replaced by the Czech Republic, so the comparison would not be entirely correct), was more than 10 times increase of **biomethane production** by the end of the project (2022) and almost 20 times increase by 2025. To date, according to the latest updates, this increase has been lower (5 times the 2019 levels) but estimations show how in 2025 the previous expectations will be probably exceeded: in **2025** it is expected a more than **35 times increase**. It should be noted that the most evident increases, which had the greatest impact on these overall estimates, are those recorded (2022

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production compared to 2019 values) in Belgium (+40 times), the Czech Republic (+17 times) and Ireland (+19 times).

In the following table, an overview is provided country by country on current figures and expectations for what concerns biomethane plants and corresponding investments for the development of new projects within REGATRACE (by 2022) and beyond (by 2025).

Table 4: Number of biomethane plants and correspondent investment in new projects (2019-2022,2025)

Country		Indicator	Unit	Current figures				Expectations
				2019	2020	2021	2022	2025
BELGIUM	BE	*Number of biomethane plants*	-	1	2	3	7	11
		Correspondent investment in new projects	*M€*	17	3	5	80	200
CZECH REPUBLIC	CZ	*Number of biomethane plants*	-	1	1	1	2	8
		Correspondent investment in new projects	*M€*	2	0	0	2	12
IRELAND	IE	*Number of biomethane plants*	-	1	1	1	2	20
		Correspondent investment in new projects	*M€*	0	0	0	0	500
ITALY	IT	*Number of biomethane plants*	-	8	21	27	60	800
		Correspondent investment in new projects	*M€*	40	130	175	420	3600
LITHUANIA	LT	*Number of biomethane plants*	-	0	0	0	0	9
		Correspondent investment in new projects	*M€*	0	0	0	0	173
POLAND	PL	*Number of biomethane plants*	-	0	0	0	0	9
		Correspondent investment in new projects	*M€*	0	0	0	0	98
SPAIN	ES	*Number of biomethane plants*	-	1	2	4	5	20
		Correspondent investment in new projects	*M€*	0	15	20	23	84
ESTONIA	EE	*Number of biomethane plants*	-	2	4	5	6	10

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		Correspondent investment in new projects	*M€*	0	0	0	10	30
TOTAL		***Number of biomethane plants***	**-**	**14**	**31**	**41**	**82**	**887**
		Correspondent investment in new projects	***M€***	**59**	**148**	**200**	**535**	**4524**

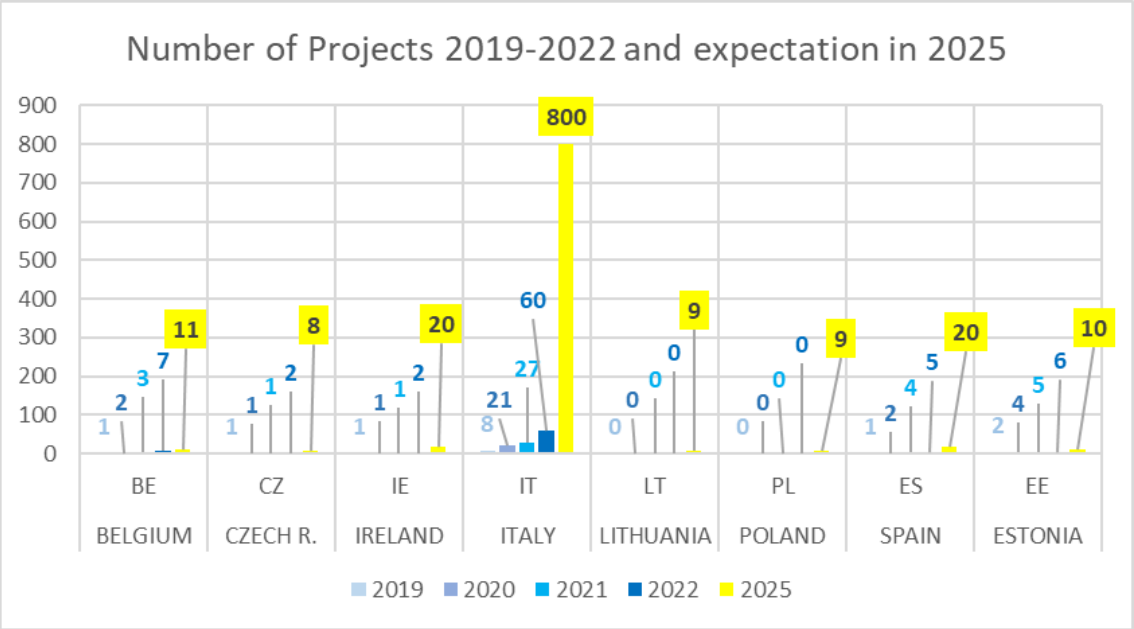

Figure 76: Number of biomethane projects per country (in operation and expected in 2025)

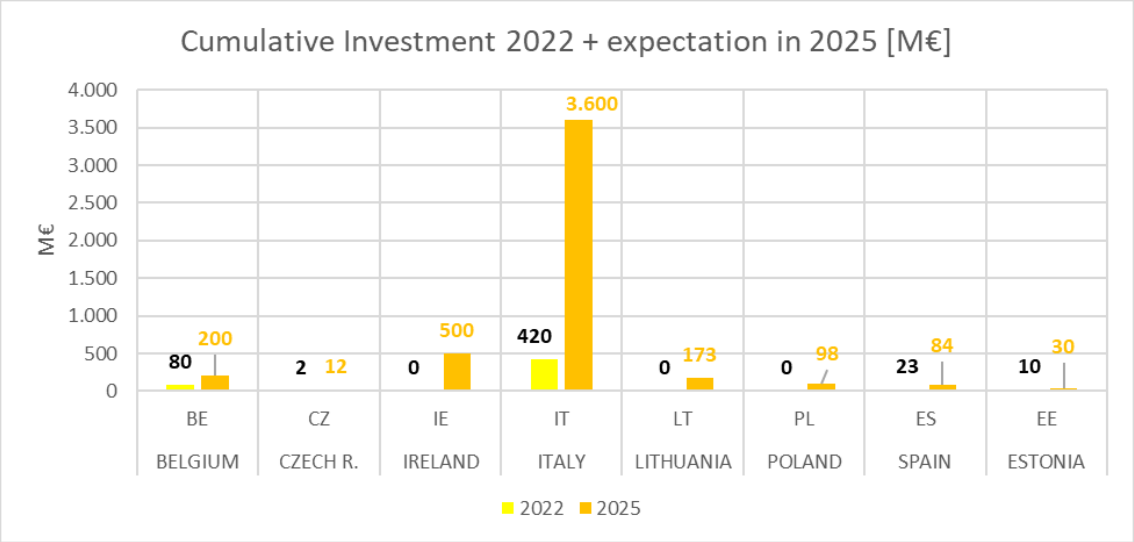

Figure 87: Cumulative investment in new projects per country

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Accordingly, an estimation of the volume of biomethane that will be produced by each country is provided in Table 5 along with the corresponding CO_{2eq} savings achievable thanks to the development of new biomethane plants (Table 6).

Table 5: Yearly biomethane production by country

Yearly Biomethane Production [GWh/year]						
Country		2019	2020	2021	2022	2025
BELGIUM	BE	5	40	100	200	1.000
CZECH R.	CZ	1	8	12	17	84
IRELAND	IE	1	1	5	19	1.000
ITALY	IT	700	1.692	2.880	3.892	28.200
LITHUANIA	LT	0	0	0	0	925
POLAND	PL	0	0	0	0	340
SPAIN	ES	90	95	160	170	700
ESTONIA	EE	63	97	152	168	300
	TOTAL	**860**	**1.933**	**3.309**	**4.466**	**32.549**

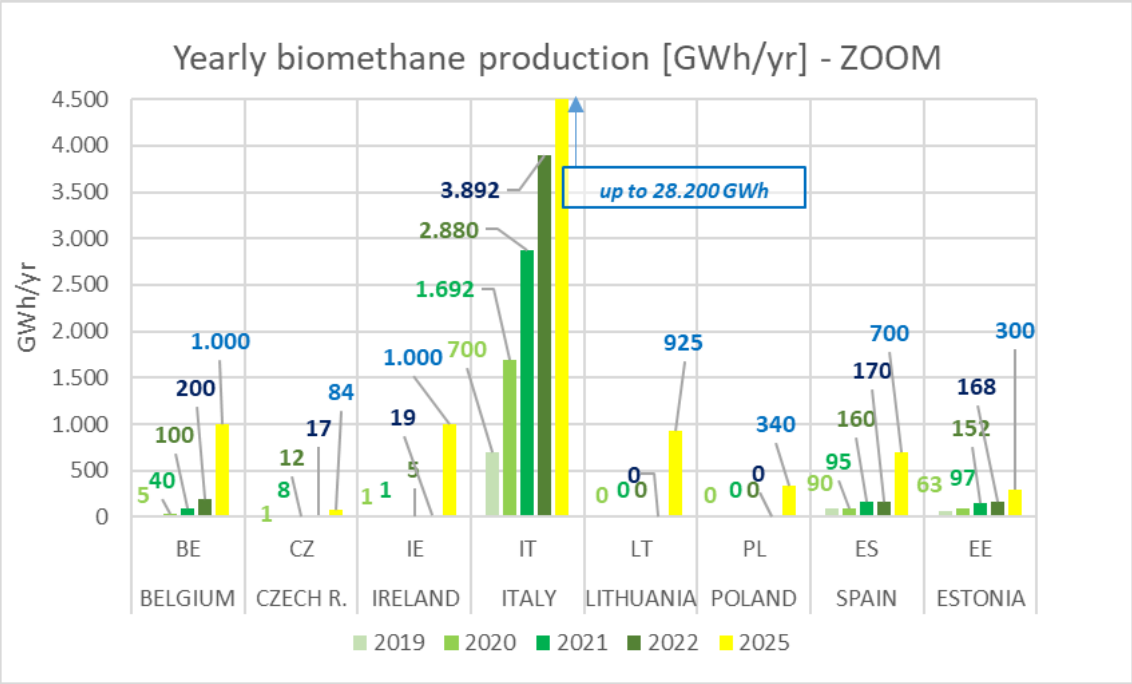

Figure 98: Expected biomethane production per country

Table 6: GHG emissions saved per country within and beyond REGATARCE

Cumulative CO2eq saved [tCO2eq]			
Country		Within REGATARCE (2019-2022)	Beyond REGATARCE (2019-2025)
BELGIUM	BE	58.126	428.782
CZECH R.	CZ	6.333	37.502
IRELAND	IE	4.389	344.562

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ITALY	IT	1.543.951	11.701.947
LITHUANIA	LT	0	311.688
POLAND	PL	0	114.566
SPAIN	ES	86.767	351.281
ESTONIA	EE	81.058	210.496
	TOTAL	**1.780.623**	**13.500.824**

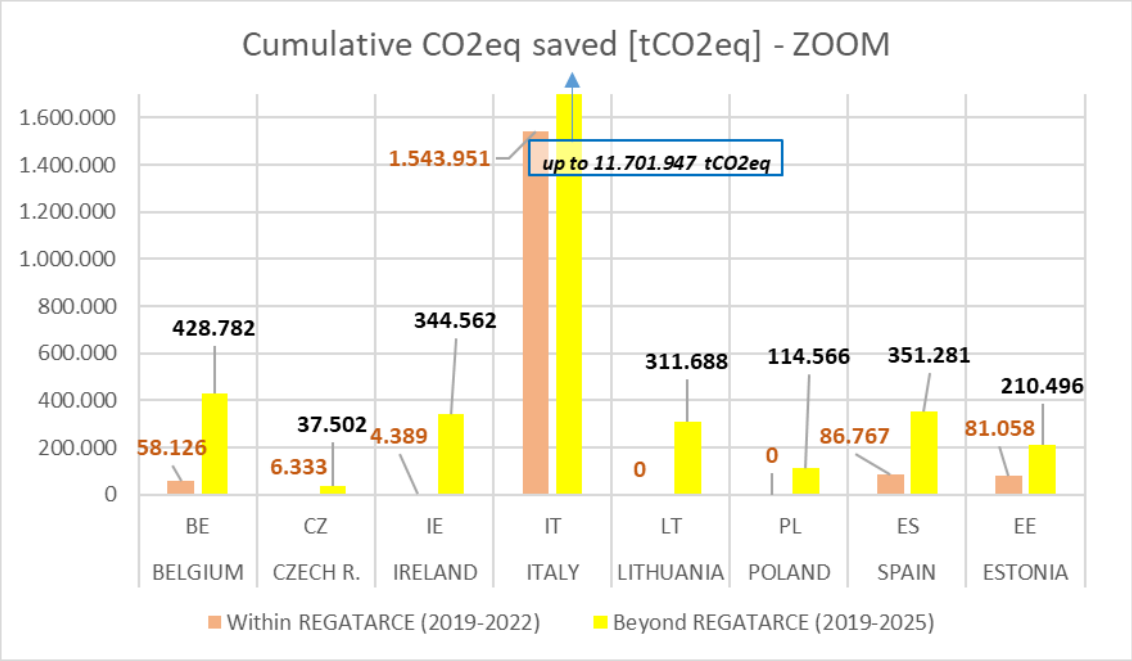

Figure 109: GHG emissions savings per country within (2019-2022) and beyond (2019-2025) REGATRACE

The trends shown above are closely linked to the different policies that these countries are developing to support biomethane. An overview of the policy framework on biomethane established, or to be established, in the different REGATRACE countries is provided in Annex D, where the current figures and the future estimations above reported can be reasonably reflected and contextualized.

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6.2 Cross- Border Biomethane Trade

One target of the REGATRACE project was to significantly contribute to **increasing energy amounts from biomethane and renewable gases transferred across borders**. This goal **has been achieved** by supporting the development of national biomethane markets in REGATRACE Target and Supported countries and by removing non-technical barriers to cross-border transactions of European Biomethane certificates.

RED II introduces the concept of Guarantees of Origin (GOs) for gaseous energy carriers for consumers disclosure (Art 19) and the sustainability and GHG emission saving criteria (Art 25-31) for all liquid and gaseous renewable fuels that shall count towards the targets of the Renewable Energy Directive (Art 3) and **encourages Member States to accept gas GOs from other Member States and PoS issued under the recognized Voluntary or National Schemes**.

Existing bilateral agreements for the mutual recognition of renewable gas certificates between national biomethane registries will be or have been gradually replaced by **the ERGaR CoO Scheme which facilitates harmonised exchange of renewable gas certificates between its System Participants**.

Since its launch in June 2021, AGCS (AT), Dena (DE), GGCS (UK) and vertogas (NL) have joined the ERGaR CoO Scheme. When this report was written, the application of Energinet to join the ERGaR CoO Scheme was being assessed. Since the scheme is not operated for a full calendar year, it is challenging to compare the statistics with the yearly statistics from other sources such as the Dena *Brachenbarometer*.

Nevertheless, in 2022, **620 transfers with a corresponding volume of 1031 GWh of biomethane were done among the System Participants of ERGaR**. All biomethane certificates were transferred to the German Biogas register operated by dena (Figure). It is expected that the total amount of cross-border transfers of biomethane certificates facilitated by the ERGaR CoO Scheme will amount to around **2 TWh by the end of 2022**.

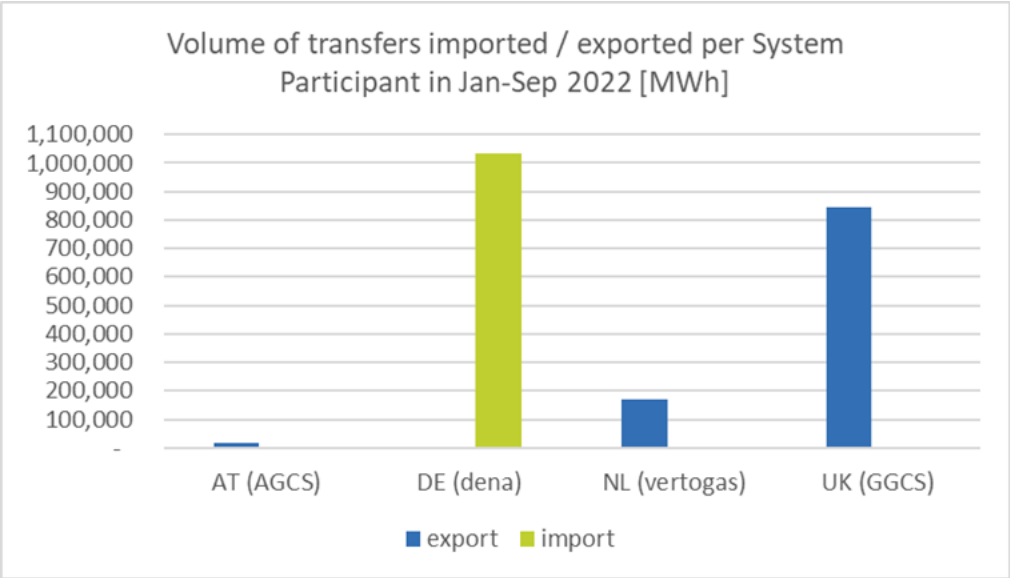

Figure 20: ERGaR CoO Scheme Statistics Jan-Sep 2022

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The following table contains more detailed information on the cross-border transfers for the first three quarters of the year 2022. The ERGaR CoO Scheme covers some of the main cross-border transfer routes in Europe and therefore has facilitated a large increase in the number and volume of transfers between the participating countries. The shown data was attained mainly through the statistics of the ERGaR CoO Scheme, with complimentary data by Energinet.

While the importing country can mainly be identified as Germany (through dena), Energinet also transferred volumes to Sweden (2594.217 GWh) and other European countries (667.671 GWh). Most recent export statistics to Switzerland are not available, but it is assumed that a significant share of the biomethane certificates transferred to dena as well as from Denmark to Europe will be further forwarded and cancelled for consumption in Switzerland. In all, transfers between Denmark, the UK, Austria, the Netherlands, Sweden, and Germany resulted in a total transfer volume of approx. 4300 GWh in the first three quarters of 2022. Cross-border transfers of biomethane certificates between other European countries have been reported by individual economic operators, but it is assumed that they are relatively low in volumes compared with the transfer routes included in this report. Based on these data and observations, it can be expected that the volume of cross-border transfers of biomethane certificates will total to approximately 6000 GWh in 2022 which is a doubling compared 2020. It is expected that because of the ERGaR CoO Scheme and the start of the operation of AIB EECS Gas Scheme, the volume of transfers will steadily increase through the joining of more System Participants in future.

Table 7: Volume of biomethane traded across countries

Countries	Volume of cross -border trade in 2022[9]
	Amount [GWh]
DK to SE	2594.2
DK to DE dena	1418.2
DK to EU	667.6
UK to DE Germany	844.8
AT to DE	15.6
NL to DE	170.8
TOTAL	**5711.2**

Sources:

- AGCS 2022: Statistics of Biomethanregister Austria
- ENERGINET 2022: Statistics on Guarantees of Origin – Gas. Visited 5/7/2022 https://en.energinet.dk/Gas/Biomethane/Statistics
- European Renewable Gas Registry aisbl (ERGaR) 2022: Statistics of ERGaR CoO Scheme
- German Energy Agency (dena) 2021: Dena Branchenbarometer, 2021.

[9] DENA, "Branchenbarometer Biomethan", 2021

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7 Policy Evaluation and Replication Assessment

Following the methodology for **policy evaluation** described in D7.1, the most relevant measures on biomethane currently in force in the three Advanced Countries have been assessed according to 5 different criteria (*Policy Variables*) – i.e., *Potential for Market Transformation, Cost-Efficiency, Environmental impact, Persistency of Impact over Time, Support to Positive Side-effects*.

The partners representing Austria (AGCS), Estonia (ELERING) and Germany (DENA) have been involved in this work and were asked to answer to a detailed questionnaire on their national measures (see ANNEX B - Questionnaire on Policy Variables) by assigning a score from 1 to 5 to each criterion. The results of this assessment led to a **ranking of measures from the most to the least successful** in each advanced country.

It must be noted that, since the assessment was done by the partners representing the advanced countries, a cross-country comparison cannot be done between Austria, Estonia and Germany as the score assigned is the result of a qualitative assessment done by different experts analysing different measures in different contexts and with a different perception. **This means that it wouldn't be correct to make a single ranking list of European policies, therefore we decided to show results in separated national ranking lists.**

After that, the Replication Assessment was performed. The *Policy Variables* obtained from the policy assessment were combined with the responses received to the questionnaires on Context Variables distributed to the Target Countries (see ANNEX C - Questionnaire on Context Variables), which were asked to evaluate the Austrian, Estonian and German measures in relation to different factors related to their national context on biomethane: interest from investors, readiness of the regulatory framework to embed the measure, stakeholders acceptance, government stability, responsiveness of the measures to plans and institutional priorities.

While the *Policy Variables* give a measure of how important it is to replicate a specific policy according to its success in the country where it is issued, the *Context Variables* determine how easily this could be replicated in a certain context. This combined analysis made it possible to identify the measures with a considerable replication potential that, therefore, could be adopted and integrated into the national regulatory system of the Target Countries with a certain ease and without encountering major barriers. This assessment was done following MEETS© methodology (see D7.1).

In the following paragraphs, the results of the Policy and Replication assessments are summed up.

7.1 Policy and Replication assessment of Austrian measures promoting biomethane

The following table lists the most relevant measures on biomethane currently in force in Austria (updated with respect to D7.1). These measures have been assessed through the policy criteria (Policy Variables), and as a result, an overall ranking (Table 9) was produced from the most to the least successful.

Table 8: Regulatory framework in Austria

Code	Name of Regulation/Act/Measure…	Type [1]	Description
AT1	**Feed-in Tariff for renewable electricity from biogas and biomethane**	Feed-in Tariff	**Renewable Electricity Act** (ÖSG 2012) The Renewable Electricity Act implemented a feed-in tariff (FiT) system for renewable power generated on-site at biogas plants

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	(Austrian Renewable Electricity Act 2012 (as amended))		and injected into the Austrian power grid. With the law amendment in 2012, a FiT for power from Austrian biomethane production units injected, transported, and withdrawn from the Austrian gas grid was implemented. Biomethane Certificates created by AGCS Biomethane Registry Austria have to be used as basis and proof for the produced and injected energy volumes from biomethane. Also, their respective quality criteria (biomass information) have to be provided exclusively by authorised auditors. This information may be included on the Biomethane Certificate. To receive the FiT for electrified biomethane, the Biomethane Certificate is transferred from the producer to the operator of the electrification unit (CHP-unit). Further, the operator of the electrification unit transfers the Biomethane Certificate to the Renewable Power Subsidy Settlement Agency (OeMAG Abwicklungsstelle für Ökostrom AG) who pays out the FiT. The ownership transfer of the certificate is performed in the AGCS Biomethane Registry Austria. The biomethane producer does not profit directly from the FiT but thanks to this subsidy scheme, the operator of the electrification unit establishes a supply agreement with the biomethane producer. (FiT are being phased out with the transition from the ÖSG 2012 to the EAG 2021. In the future, the system will be switched from a tariff to a market premium model for renewable power from on-site biogas electrification. The electrification of biomethane transported via the gas grid will not be further supported.)
AT2	**Guarantee of Origin system for gas labelling**	Guarantee of Origin system	The Austrian GO system is enshrined in three different pieces of legislation which represent the national implementation of Art 19 RED II: *1 - Gas Economy Act 2011; 2 - Regulation on Gas Labelling 2019; 3 - Renewable Expansion Act 2021* Still, until the CEN 16325 standard has not been finalised, the full implementation is outstanding: • § 129b, § 129c, § 130 Gas Economy Act 2011 as amended (GWG 2011) • Regulation on Gas Labelling 2019 as amended (Gken-V 2019) • §§81-84 Renewable Expansion Act 2021 as amended (EAG 2021) The EAG 2021 led to an amendment of the GWG 2011. Amendments on § 129b, § 129c, § 130 GWG 2011 – specific to renewable gases – concern the rules on end consumer disclosure (also often referred to as “Gas Labelling” in Austria). The energy regulator E-Control Austria is the mandated party to issue Guarantees of Origins for power and gas and to be monitoring authority for consumer disclosure. The obligatory gas consumer disclosure requests gas suppliers to provide labelling on the annual bill for their end consumers concerning the origin of gases providing percentages of gas composition concerning the delivered gas types (fossil gas vs. biogas, landfill gas, sewer gas) based on the total via the gas grid delivered gas (kWh).

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AT3	**Regulation on transport fuels**	Quota on biofuels	**Regulation on transportation fuels 2012 as amended** (KVO 2012) The regulation on transport fuels represents the national implementation of Art 7b and 17 Renewable Energy Directive. The current version of the regulation relates to the implementation of RED I. An amendment to adapt the regulation according to RED II is under preparation. As of 1 January 2009, the target to substitute fossil transport fuels with sustainable biofuels, in terms of energy content, is 5.75%. To achieve this national target, the market party obligated to substitute • at least a 6.3%-share of diesel fuels, and • at least a 3.4%-share of petrol fuels. The percentages are measured in terms of the total, annual fossil transport fuel amounts (diesel and petrol) which market parties, who are obliged to substitute, have released for free circulation in Austria, or have used in Austria. The Austrian Environmental Agency (Umweltbundesamt, UBA) has been mandated to document the sustainable transport fuels and therefore maintains the national biofuels registry (elNa-database).
AT4	**Tax Reform Act 2020 & Natural Gas Tax Act**	Tax remuneration	**Tax Reform Act 2020 as amended** (Steuerreformgesetz 2020) The fossil gas levy was updated, providing a tax reimbursement valid for sustainably produced renewable gases as of 1st of January 2020. The Implementation Regulation has not yet been published by the respective authority. Thus, processual settlement not yet defined. - Mechanism: the fossil gas tax has to be paid first and a reimbursement can be requested by certificates providing proof for the produced and injected biomethane volumes and their production/sustainability criteria.
AT5	**Market premium for renewable power from renewable gases** (Renewable Expansion Act 2021)	Market premium	Feed-in tariffs according to the Renewable Electricity Act (ÖSG 2012) will be replaced by a market premium model. However, there is a shift anticipated away from renewable power generation and towards renewable gas generation and injection. Thus, market premiums for renewable power from renewable gases are restricted to specific plants. This subsidy is granted only for electrification on-site; it is not granted for biomethane transported via the gas grid. The Implementation Regulation has not yet been published and thus prices for the market premium have not been defined.
AT6	**Investment grants for biomethane producing plants and for plants for conversion of Electricity into Hydrogen or Synthetic Gas** (Renewable Expansion Act 2021)	Investment grants	Investment grants shall be understood as contributions to the investment costs. Investment grants are eligible for • newly built biomethane plants, and • for the conversion of biogas (power generation) to biomethane installations (renewable gas generation and injection), and • for plants for conversion of Electricity into Hydrogen or Synthetic Gas. The connection to the local gas grid is an important requirement. For the conversion of existing biogas plants, investment grants may exclusively cover the processing units, the conversion of raw

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			material use, and the measures for capacity expansion. The Implementation Regulation has not yet been published but is expected for 2022.
AT7	**Green Gas Service Agency** (Renewable Expansion Act 2021)	Green Gas Service Agency	A Green Gas Service Agency will be procured by the Ministry of Climate Protection, a licence for five years will be granted. Its main tasks will be: • Maintain a list of renewable gas plants, • Maintain a list of gas suppliers, • Providing consulting services for renewable gas producers, • the establishment of an electronic platform that promotes the exchange of supply and demand for financial services between producers or generators of renewable gases and providers of financial services; • Preparation of criteria for model contracts, • Market evaluation and preparation of a market report to be presented to the Ministry on annual basis
AT8	**Hints towards a Green Gas Quota** (Renewable Expansion Act 2021)	Green Gas Quota	The Austrian government wishes for a Green Gas Quota for Austrian gas suppliers. However, the Renewable Expansion Act only mentions such a quote but does not implement it. For renewable gas to be eligible, it will have to be certified with a Green-Gas-Seal which comprises the proof of sustainability criteria (Art 25-31 RED II) and Austrian production. Details on the certification criteria and recognised certification bodies are not yet available.
AT9	**National Emission Trading System** Eco-social Tax Reform Act 2022 (part I) & National Emissions Certificate Trading Act 2022	National Emission Trading System	The Eco-Social Tax Reform will cover several parts. Most relevant for the energy sector is the intended implementation of a CO2 pricing system, following the model of the EU ETS, by July 2022. • EU-ETS sectors will be exempt to avoid double charging; • Non-EU-ETS-sectors, such as buildings, transport, parts of industry will be covered by the national ETS; • Renewable energies, including biomethane will be exempt from the CO2 price thanks to the reimbursement of the natural gas tax (see above); A climate bonus for private households is intended to cushion the newly to be implemented CO2 pricing.

Table 9: Policy ranking table - Austria

AUSTRIA							
Rank	**Measures:**	**MARKET**	**EFFECTIVENESS**	**ECOSYSTEM**	**TIME**	**SIDE-EFFECTS**	**TOTAL SCORE**
1	**AT9– National Emission Trading System**	3,5	4	4,5	5	4	**21**
2	**AT8 - REA 2021- Green Gas Quota**	2	4	4	4,5	4,5	**19**
3	**AT3 - Regulation on transportation fuels**	1	5	2	4	3	**15**
4	**AT6 - REA 2021-Investment Grants**	2	2	4	3	3	**14**
5	**AT7 - REA 2021-Green Gas Service Agency**	2	2	1	3	3	**11**
6	**AT1 - Austrian Renewable Electricity Act**	2	1	3	2	2	**10**
7	**AT5 - REA 2021-Market Premium**	1	1	3	2	2	**9**
8	**AT4 - Tax Reform 2020 & NG Tax Act**	2	0	1	4	1	**8**
9	**AT2 - GO System**	1	1	0	1	3	**6**

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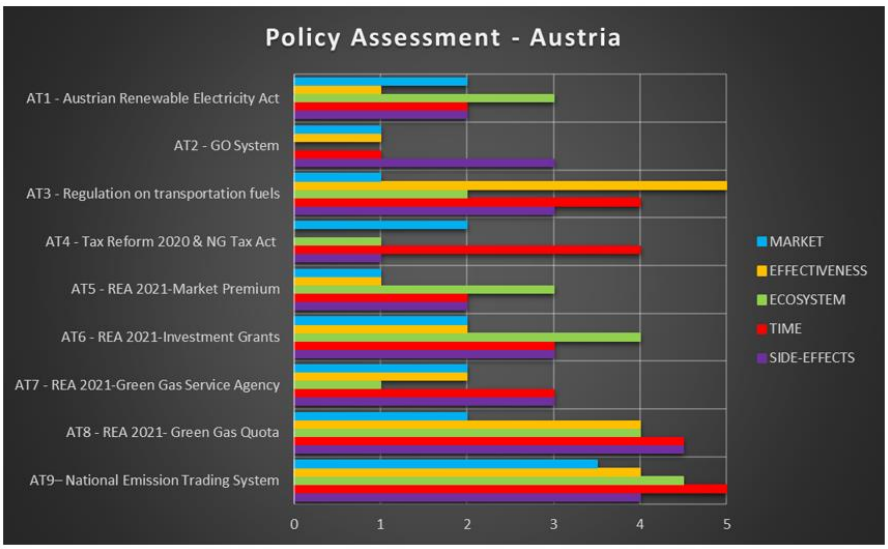

Figure 111: Policy Assessment – Austria

In the following analysis we will focus on those measures considered more relevant for the Replication Assessment performed with the Target Countries (see the next paragraph), namely:

- AT2: Guarantee of Origin system;
- AT3: Regulation on transport fuels;
- AT6: REA - Investment grants;
- AT7: REA- Green Gas Service Agency;
- AT9: National Emission Trading System.

*First ranked - **Austrian Emission Trading System** (AT9)*

From Table 9 and Figure 11, it is evident that the **National Emission Trading system** (AT9) is the **most successful measure in Austria** from various points of view.
First of all, it has a quite high potential for market transformation. The concept of CO_2 pricing adopted in Austria is considered to be following a similar mechanism to the Emission Trading System (ETS). Consequently, according to Austrian experts from AGCS, the **market transformation could be significant** if the CO_2 price is set to be influential. Indeed, the CO_2 price is expected to rise over the years, and this would favour the transition toward renewable energy carriers. Thus, depending on the market price development of CO_2 and energy carriers, **this instrument can be very effective**.
From an **environmental perspective**, the rise in CO_2 price can influence also the consumers' behaviour and this could have a **substantial positive impact** especially if it would lead to the development of new installations that could bring **further positive effects** for Austria as exporting/production country.

*Third place – **Regulation on Transportation Fuels** (AT3)*

Another interesting measure, that will be further explored in the following replication assessment, is the **Regulation on transportation fuels (AT3)** which placed third in the policy assessment.[10] Although it did not have **strong market**

[10] The second place is related to a policy not yet in place, i.e., Hints toward Green gas Quota. For this reason, it will not be assessed in the Replication Analysis.

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transformative potential because the current regulation does not foresee gaseous fuels (yet), it was considered very promising from several standpoints.
From the **cost efficiency perspective**, this measure is **very effective**: due to penalties for not meeting targets, a direct benefit is obtained when production costs are lower than them. Moreover, for the expected amendment of the regulation for transport fuels, penalties are going to rise significantly and even improve the business case for renewable gases.
Concerning the **effects on the environment, this measure has medium/low impact,** as in Austria no renewable gases have been documented so far. Moreover, the advantage to use renewable gases conflicts with electric mobility, which is politically strongly promoted, and other advanced biofuels. Nevertheless, the policy per se supports a higher share of renewable fuels as different energy carriers compete, so as a whole it can be considered a "green policy" with high impact.
Furthermore, the mitigation of CO_2 within the transport sector is an integral part of the FitFor55 program and considered to have an **impact on the fuel market for decades.**
As for the creation of **positive side-effects**, it is well known how the production of digestate as organic fertilizer plays a very important role for the agricultural sector and for circular economy. Local jobs and value creation is an integral part of biogas/biomethane production.

The measure on **investment grants (AT6)** ranks well in this assessment too. Generally, an investment subsidy is considered an incentive support, especially for installations that would not have been built otherwise. It is very important to help the start/kick-off of a new plant. However, it is paid once and does not provide an effect on support to lower production costs, thus the effect on the **market transformation is limited** for this specific measure. For this same reason, this is **not so cost effective**.
Nevertheless, it has **medium/high impacts on the environment** and on GHG mitigation, since it promotes the development of new plants. So, although this support mechanism is a one-time support, **long term impacts from new installations are expected**.

*Fourth place – **REA 2021-Investment grants** (AT6)*

The **Green gas Service Agency** placed in the lower half of the ranking (but still not too low).
Since one of its tasks is to analyse the market and provide a yearly market report and very concrete recommendations on further development to the Ministry of Climate Action, the impact could be considered quite high. However, these influences are rather long-term and for the moment it is difficult to provide an estimation and, thus, the **potential for market transformation, as well as the impact on environment, are assumed to be low**.
Concerning **cost-effectiveness** of the measure, the list of tasks for this agency is quite extensive and covers tasks which are usually covered by different market players (authorities and private companies). There is no information yet on the planned budget, so it is quite difficult to estimate it at this point and, for this reason, a conservative score was provided by the experts on these criteria (i.e., "**Not very efficient**").

*Fifth place - **REA-Green Gas Service Agency** (AT7)*

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What is certain for the moment is that the agency will receive a contract for 5 years with the option to extend once for another 5 years, having potentially a **quite persistent impact over time**, at least in the near future.

*Last ranked - **Guarantee of Origin system for gas labelling** (AT2)*

At the end of the ranking, there is **the Guarantee of Origin system for gas labelling**, which received a low score in most of the criteria. According to the Austrian experts, the Guarantee of Origin system developed in Austria has a **very low potential for market transformation**. Making use of GOs is considered a challenge in Austria, as there is criticism about the fact that end users could be actually influenced to change their energy tariff by receiving information on the bill once a year.
This measure is considered to be **underperforming from the cost efficiency point of view**. Cost efficiency here is influenced by the ratio between the amount of biomethane produced – still very low- versus the number of consumption points. This measure has also low impact from the environmental point of view. Actually, no direct environmental impact can be associated to this measure, indeed the implementation of the gas GOs system - as anchored in the legal framework Gas Economy Act, Renewables Expansion Act, Regulation on Gas Labelling - is merely an activity to implement the legal requirement of Art 19 RED II, which states: "It is important to distinguish between green certificates used for support schemes and guarantees of origin".
Nevertheless, the implementation of GO systems in all European Member States have **positive side effects**, indeed it might increase trading activities and consequently raise attention on renewable gases on the international energy market.

7.1.1 Replication potential of Austrian policies in the Target Countries

It is not surprising to note how the Replication assessment leads to quite different results in the countries with respect to the policy assessment of the same group of measures, although not so far away.

Indeed, the measure considered to be the most successful in Austria - AT9 - Emission Trading System - is not considered the most replicable in all the Target Countries. This is because, in the Replication Assessment, Context Variables also come into play and allow assessing whether (or not) there are favourable conditions for applying such measures in a given country. This can lead some measures to be more easily deployable than others, despite being considered less promising in terms of market potential, impacts, efficiency, etc. in the Advanced country of origin.

Below, the replicability rankings of the Austrian measures in the different Target Countries are reported (Figure 12 and Table 10). The reasons behind these results are briefly described below.[11]

[11] For the sake of brevity, we do not provide a description for every single measure, but it is possible to consult the graphs to view the details.

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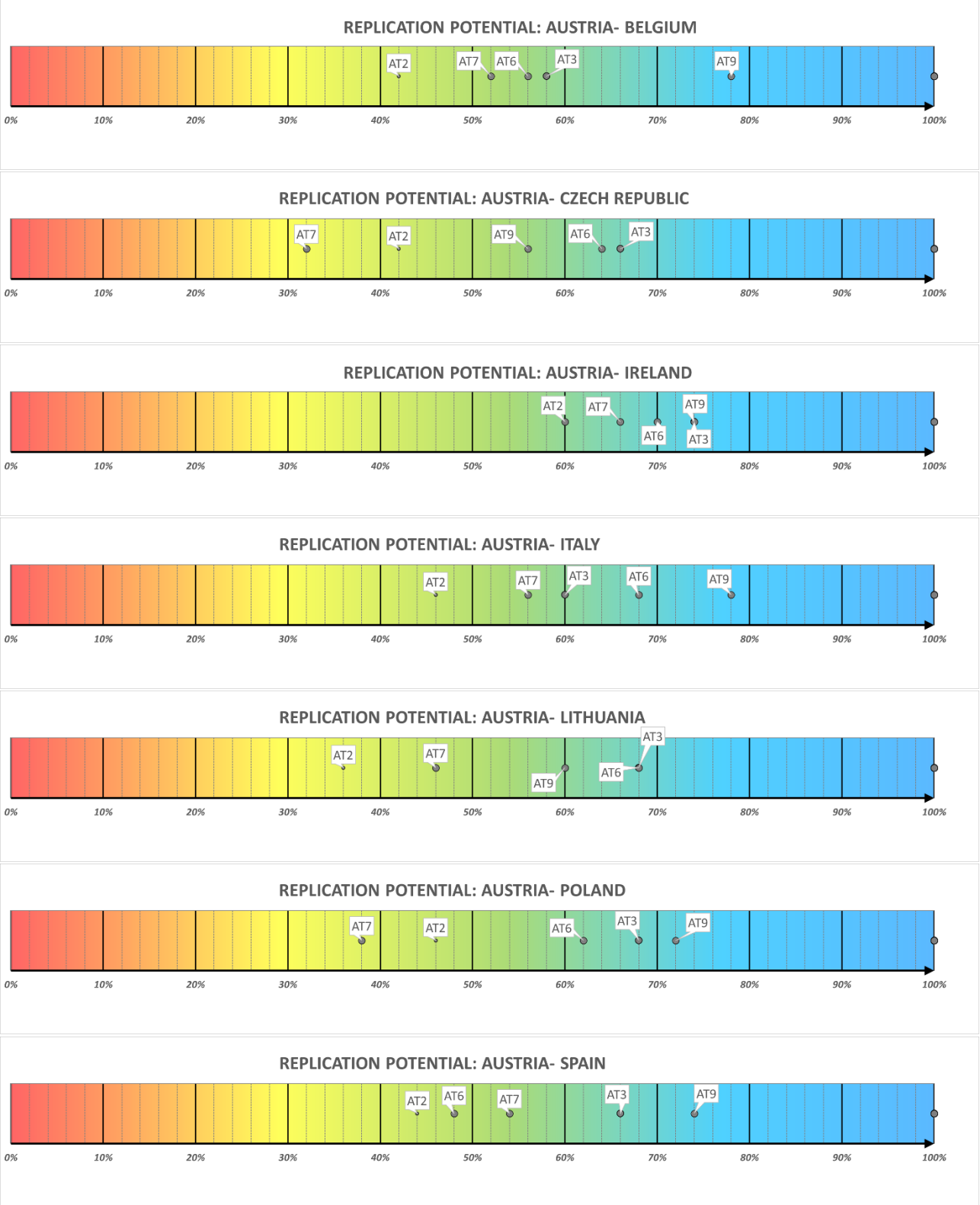

Figure 122: Replication Potential of the Austrian policies in the Target Countries

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Table 10: Replication Potential Austria-Target Countries_ Summary table

	Replicability Potential (RP)						
Measure	*BE*	*CZ*	*IE*	*IT*	*LT*	*PO*	*ES*
AT2 - Guarantee of Origin system for gas labelling	**42%**	42%	**60%**	**46%**	**36%**	46%	**44%**
AT3 - Regulation on Transportation Fuels	58%	**66%**	**74%**	60%	**68%**	68%	66%
AT6 - Investment Grants	56%	64%	70%	68%	**68%**	62%	48%
AT7 - Green Gas Service Agency	52%	**32%**	66%	56%	46%	**38%**	54%
AT9 - National Emission Trading System	**78%**	56%	**74%**	**78%**	60%	**72%**	**74%**

__Austrian ETS__ (AT9) is the most replicable in Belgium, Ireland (on par with AT3), Italy, Poland and Spain

In addition to being the most interesting measure in Austria, the **Austrian Emission Trading System (AT9) turned out to be the most replicable for different Target Countries**: Belgium (RP=78%), Ireland (74%), Italy (RP=78%), Poland (RP=72%) and Spain (RP=74%).

In **Belgium**, the implementation of a national ETS would attract biomethane investors, whose interest is high, as far as willingness to pay is high enough but this would depend on the penalty or ETS price fixed. Stakeholders' acceptance would be high: certainly, a national ETS would be an opportunity for producers, however, consuming industries could see problems in their competitivity. Nevertheless, the regulatory framework in Belgium is substantially ready to embed such measures seamlessly.
Moreover, nowadays in Belgium there are multiple options for the future that the government and politicians are considering as priorities, so after the next elections, it will be clearer what to focus on. On the other end, the moderate government stability normally taking place in Belgium would be a good basis for keeping this scheme sustainable for a longer time.

Under the national emissions trading system, the Government of **Ireland** is aligned with the Kyoto Protocol, meaning atmospheric emissions reduction only and selected afforestation and rewetting of peatlands as the means of reducing national emissions by 26.7 Mio ton by 2030.
Therefore, the government of Ireland is not able to account for carbon savings from biomethane.
The EU ETS system is required to comply with Paris Agreement and decarbonisation measures from January 2021. An RGFI industry-led collaboration initiative has designed a fully integrated business case for biomethane, with the benefits going to industry, and farmers being central to enabling the AD biomethane industry to be scalable, replicable and rolled out at pace. The Integrated business case has the farmers central with the economic and environmental benefits with diverse and secure incomes.
According to the RGFI expert opinion, the regulatory framework in place in Ireland is to a certain extent ready to integrate such policy that would not probably encounter major barriers in terms of acceptance by the key players in the Irish energy and industry sector.

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In **Italy**, the topic of Emission Trading System was introduced and extensively discussed among national key player of the gas sector, and it seems there is a high interest from investors on this scheme. In the previous biomethane decree (March 2018) these rules had not been addressed in detail and could be revised in the new decree currently in preparation. In this first version, those rules were well accepted and received by the relevant stakeholders of biomethane and other involved sectors. This measure responds to a great extent to plans and institutional priorities of Italian Government concerning renewable gasses and biomethane.

In **Poland**, the interest from investors in relation to this measure is high (private and industry sector), as well as from consumers. Nevertheless, the regulatory framework isn't sufficiently ready yet, indeed, to date there is no new legislation supporting biomethane. New amendments to RES Act (including GO for biomethane) and BIO Act (transport biofuels) are after public discussion waiting for final publication by Government, therefore the National ETS system is not yet discussed. What is certain is that this policy can be easily accepted and well received by stakeholders and key players in the biomethane sector. Another key factor that can facilitate the adoption of measures promoting renewable gases and biomethane is the moderate stable government in Poland, even though the global situation cannot be overlooked: war in Ukraine, Russia's aggressive attempt at Poland and EU that could affect this stability. On the other hand, the war in Ukraine is mobilizing attempts to find a replacement for Russian gas and biomethane is an excellent solution. To conclude, there is an ongoing discussion on National Emission Trading System in the biogas and biomethane sector and the Austrian solution may help in finding its own way for Poland.

Spain does not upset the policy ranking of Austrian measures too, recognizing the Emission Trading System as the best solutions to apply in the Spanish national regulation framework.
As well as in the other countries mentioned above, the interest from investors on biomethane is high and the sector in general is experiencing a moment of great dynamism. This policy could have a great replicable potential in Spain and is considered promising for the same reasons for which it is successful in Austria, i.e., high potential for market transformation, effectiveness, substantial impact on environment etc.
Nowadays in Spain, the government priorities are far from biomethane promotion, but it is just a question of time.

The **Regulation on Transport Fuel (AT3)**, which was considered promising in Austria for the reasons reported in the previous paragraph, has also a **high potential for replication in the Czech Republic (RP=66%), Ireland (74%) and Lithuania (RP=68%),** whereby it ranked first in the replicability ranking (Figure 12).
Along with AT6 on Investment Grants, this measure is considered more replicable than the Emission Trading System for different reasons (for Ireland these two are in first position on par).

Regulation on Transportation Fuels *(AT3) is the most replicable in Czech Republic, Ireland and Lithuania*

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First of all, it must be noted that in **the Czech Republic** a similar measure is already in force, and this is the main reason why the replicability potential turned out to be the highest compared with the other policies (this also confirms the effectiveness of the methodology).
In particular, this measure has already created a market demand for biomethane in the Czech Republic for which the interest from investors is high especially for producers, CNG filling stations operators, and petroleum companies. Nevertheless, the responsiveness of this measure to national plans and institutional priorities is relatively low as renewables and green topics, in general, are not particularly relevant and promoted in the country. However, biomethane might become an interesting topic due to the conflict in Ukraine and the NG supplies from Russia.
At the same time, the Czech experts assigned lower scores to the Austrian Emission Trading System (AT9), which ranked third on the replicability scoreboard. The main reason for that is the fact that the interest and acceptance from national stakeholders would be very low. In general, there is no public demand for stricter environmental policies and with the energy crisis of the last period, more stringent rules would not be well accepted.

In **Ireland** the interest from investors is very high, however, the challenge with biomethane in transport is that biomethane is not included in the list of biofuels by the Department of transport.
Carbon targets have been given to the Irish transport sector to be achieved by 2030, and RGFI strongly recommends that biomethane is included within them to incentivise its implementation and take up in the transport sector. Indeed, in recent public consultations, RGFI has called for biomethane to be included and it was established a target for its use in the HGV sector, as this is the most economical solution to decarbonise its fleets.
Most definitely, the interest and support for biomethane in transport is significant, with general acceptance from the relevant stakeholders and key players of biomethane of the socio-economic and environmental benefits, similar to that of the demand from the heat/thermal demand sector representation to decarbonise.
On the other side, a lot of work is required to progress at pace a lot of work is required to progress at pace the regulatory and safety frameworks for biomethane in transport. In particular, the rollout of the infrastructure is extremely slow and cumbersome, causing long delays in progressing the rollout of fast fuelling filling stations across Ireland. To date, there are approximately 4 public filling stations with access to CNG/biomethane, with strong demand from logistics companies with HGV and MGV fleets needing to decarbonise and stay competitive.
To conclude, there is a strong response from the industry to prioritise biomethane in transport and institutions to decarbonise the sector. RGFI believes that progress will be made, as the scale of the targets and challenges are too great to ignore the opportunities and potential for biomethane to be a key player in this regard. For this reason, measures such as this could find fertile ground for successful replication.

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In **Lithuania**, investors are active and show high interest to invest in biomethane and sell it to the transport sector using biomethane GOs. The first biomethane plant should be operating in 2023 but, in parallel, there are other projects being developed. The regulatory framework is in place and ready for introducing this measure and there was an exchange of different opinions and proposals from different stakeholders but all in all it would be well accepted. In the end, this policy has been considered among the top priorities of this legislation.
Quite the contrary, the Emission Trading System (AT9) has not been as successful. Investors are not interested as more focussed on the transport sector at the moment; indeed, this policy has not been discussed or introduced on any level and most likely additional taxes would not be accepted well.

Guarantee of Origin system for gas labeling (AT2) *- last ranked for Belgium Italy, Lithuania, Spain*

As well as for Austria, at the end of the ranking for most of the Target Countries there is the **Guarantee of Origin system for gas labelling (AT2)**. In particular, it has **the lowest replication potential for Belgium (42%), Ireland (60%), Italy (46%), Lithuania (36%), Spain (44%).**

In **Italy**, implementing measures on GO wouldn't be that bad. Indeed, the quite good evaluation from Italian experts is negatively influenced by the low policy assessment performed by Austrian experts on this policy. This contributes to bringing it down in the Italian ranking even though there is a high interest in GOs at the moment.
This same reasoning applies to **Spain, Ireland** and **Belgium**. For the latter, Guarantees of Origin for biomethane are already set up in the RES Act, although the actual implementation is still under development. Moreover, experts from Belgium state that labelling conformed to RED II will contribute to transparency but is not the main driver for the biomethane value chain. However, it must be said that while the regulatory framework already covers rules on biofuels for transport, it is not yet fully ready for this measure as GOs lack CEN 16325 standard.

In **Ireland**, the main regulatory frameworks are mostly in place to enable the deployment of biomethane. Recently the Government formally appointed Gas Networks Ireland as the National Registry for Renewable Gas and the Green Gas Certification scheme is being implemented, a favourable harmonisation of Tariff giving biomethane priority in the gas grid and low tariffs for biomethane, supportive Connection Agreements for biomethane injection into the grid. As the Gas Authority, GNI will monitor, analyse, and measure the biomethane being produced before dispatch to the gas grid. The mass balance will prevent double counting of biomethane and GoO or PoO.
The regulatory framework developed over recent years has been aligned to provisions and structures in other EU Member States and best in class, best scientific advice and innovative technologies.
In conclusion, it is evident that in this case the replicability is negatively influenced by the judgment on the policy variables given by the Austrian experts, which stems from unmet expectations placed in this type of scheme. However, this does not mean that it is not replicable in other countries - as the

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analysis just made shows. In fact, although it came in last place, the replicability values associated with this measure are not so low as to make it impracticable.

Exception to this is **Lithuania**, where the Guarantee of Origin System has not been a widely discussed option from investors side and this is one of the reasons for this very low potential for replication (36%).
The policy could be integrable in the current framework but surely would need additional analysis. Nevertheless, although the low score, it could be an option for discussion in the future in order to promote green gases.

For the **Czech Republic** and **Poland**, the **less replicable measure is the Green Gas Service Agency** (AT7). The Agency already obtained low scores in the policy evaluation performed by the Austrian experts from AGCS, especially because of the potential for market transformation, as well as the impact on the environment which are assumed to be low. The assessment of the context variables led to quite low results as well, both for the Czech Republic (32%) and Poland (38%).

In the **Czech Republic**, the bureaucracy system is already quite massive, therefore a new office operated by the state would most probably bring even more burden rather than help, for this same reason it would not be easily accepted by the stakeholders who must often deal with "red tape". Moreover, the Agency wouldn't be easy to introduce in the current legislative framework, which is not very fast and flexible.

Experts from **Poland** consider the Agency an interesting solution, but it has not been discussed yet among the key players, nor has been brought to the political table. Moreover, for reasons previously explained, the regulatory framework is not yet ready in Poland, and it is difficult to say how much such a measure would be easily integrable.

Green Gas Service Agency (AT7) *– last place for Czech Republic and Poland*

7.2 Policy and Replication assessment of Estonian measures promoting biomethane

Similarly to what was done for Austria, the policy assessment of the measures in force in Estonia was carried out. Below is the description (Table 11) and the ranking obtained (Table 12), followed by the analysis of the results.

Table 11: Regulatory framework in Estonia

Code	Name	Type	Description
EE1	**Conditions and Rules for Using Aid Granted as Support for the Development of the Biomethane Market**	Quota/green certificates scheme	According to this support measure, biomethane producers (01/01/2018- 31/12/2023) can get a fixed subsidy after their production has been consumed. If biomethane is consumed in the transport sector: the maximum subsidy rate is 100 €/MWh subtracted the monthly average natural gas market price (GET Baltic). If biomethane is consumed in other sectors (only on-grid consumers): the maximum subsidy rate is 93 €/MWh subtracted the monthly average natural gas market price (GET Baltic).
EE2	**National Transport Sector Offsetting Platform**	Quota/green certificates scheme	The aim of the national transport sector offsetting platform is to enhance decarbonisation of the transport sector. When a biomethane guarantee of origin is cancelled against transport sector consumption, biomethane transport sector certificates are issued to the gas seller. The certificates can be used by liquid

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			fuel sellers to fulfil the national transport sector obligations. The offsetting platform helps to increase transparency and trustworthiness of national consumption reporting and provides the flexibility for market participants to fulfil the national obligations collectively. Additionally, the offsetting platform is aimed to replace the current administrative support scheme for producers with a market-based support mechanism.
EE3	**Subsidy for building CNG stations**	Investment Support	This subsidy supports the implementation of new biomethane stations that offer the possibility to fill up from a public individual or network station. **The maximum subsidy is 35% of a total project cost with a maximum cap of 350 000 € per project**. Before this subsidy, there were 3-5 CNG stations in Estonia. Today there are 24 CNG stations in total, 15 CNG stations have received this support from the Environmental Investment Centre of Estonia.
EE4	**Subsidy for public fleets**	Investment Support	This subsidy scheme supported the introduction of public buses running on biomethane in the public transport service. The subsidy was paid to the public fleets during the first year for running on biomethane. **The maximum subsidy was 30% of a total project cost with a minimum cap of 400,000 € per project and a maximum cap of 4,000,000 € per project**. Public transport in 4 areas running on biomethane has received support to introduce gas buses.
EE5	**Alcohol, Tobacco, Fuel and Electricity Excise Duty Act**	Tax exemption	According to the **Alcohol, Tobacco, Fuel and Electricity Excise Duty Act**, biomethane which is verified with the guarantees of origin is exempted from excise tax in Estonia.

Table 12: Policy Ranking Table_ Estonia

		ESTONIA					
Rank	**Measures:**	**MARKET**	**EFFECTIVENESS**	**ECOSYSTEM**	**TIME**	**SIDE-EFFECTS**	**TOTAL SCORE**
1	**EE2 - National Transp. Offsetting platform**	4	5	5	5	4	**23**
2	**EE1 - Using Aid Granted as support**	5	4	5	4	4	**22**
3	**EE3 - Subsidy-building CNG station**	5	4	4	4	4	**21**
4	**EE4 - Subsidy for public fleets**	4	4	4	3	4	**19**
5	**EE5 - Fuel and Electricity Excise Duty Act**	2	2	1	2	2	**9**

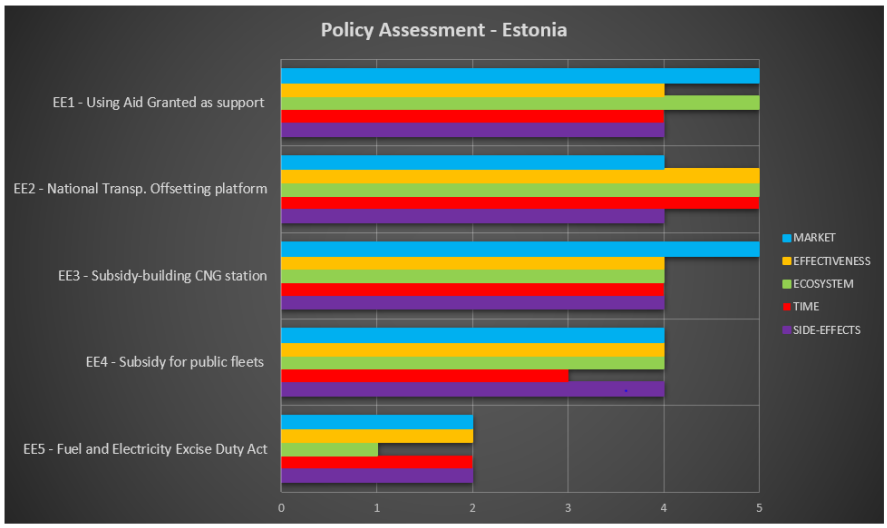

Figure 133: Policy Assessment - Estonia

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*First ranked - **National Transport Sector Offsetting Platform** (EE2)*

According to the policy assessment performed by the experts from Elering, **the most successful measure** promoting biomethane in Estonia is the **National Transport Sector Offsetting Platform**.

One of the aims of this platform is to replace the administrative support scheme with a market-based support mechanism, helping to increase transparency and trustworthiness of national consumption reporting and providing the flexibility for market participants to fulfil the national obligations collectively. Moreover, the platform provides a price reference for biomethane producers by indicating the value of guarantees of origin that are traded on the platform and issued on the basis of cancelled guarantees of origin. **For all these aspects, this measure has a substantial potential for market transformation.**

This market-based support mechanism is **highly cost-efficient,** as it also contributes to minimising the administrative work of national institutions as well as market participants, by sending data directly to the Environmental Board of Estonia.

High potential impact could be achieved **on the environmental side**, since the offsetting platform provides the opportunity for market participants to fulfil the national obligations collectively, making reporting on renewable fuels consumption easier. Therefore, small-scale suppliers can also be involved and contribute to meeting transport sector decarbonisation targets.

The implementation of the platform also contributes to increase **several positive side-effects**, e.g.: it supports the consumption of locally produced renewable electricity, it provides an incentive for gas sellers to develop infrastructure to supply locally produced biomethane, and also incentivise electric vehicle charging operators to expand the network of charging stations. Moreover, diversifying the national energy portfolio with renewable fuels improves the energy security.

*Second place – **Using Aid Granted as Support for the Development of the Biomethane Market** (EE1)*

A good rating (second place) was received by **EE1, Aid Granted as Support for the Development of biomethane market**. This measure, in force for some years now, has proven to have a **high potential for market transformation**: indeed, with the help of this subsidy scheme, Estonia has currently 5 producers and hopefully, more of them will be starting biomethane production in the coming years. Moreover, biomethane production has increased from 39,993 MWh in 2018 to 152,352 MWh in 2021.

Beyond the **high level of cost-efficiency** - amplified also by the fact that this support scheme is integrated in the Estonian biomethane registry and thus the administrative burden is reduced as everything is done electronically – also **environmental impacts are very high**. There are national transport sector obligations set for the market participants to supply renewable fuels (Liquid Fuel Act) and reduce greenhouse gas emissions (Atmospheric Air Protection Act). Biomethane is one of the energy carriers that can be released for consumption to fulfil the obligations and therefore contribute to the transport sector decarbonisation targets.

Concerning the **persistency of these impacts over time, there are good expectations**. It is hoped that this scheme prepares the Estonian biomethane producers for a market-based support mechanism, as there is a market demand created through legislation and a technical solution in the form of a transport sector offsetting platform in place (see EE2).

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This scheme generates many **positive side-effects**: local biomethane production improves the energy security replacing imported gas and diversifying the energy portfolio. Additionally, it provides an incentive for gas sellers to develop gas infrastructure to supply locally produced biomethane, creating new jobs and improving availability of gaseous fuels.

Third place - ***Subsidy for building CNG stations*** *(EE 3)*

The **Subsidy for building CNG stations** ranked third, just few points off the first and second place.
This measure has **substantially influenced the biomethane market** in Estonia.
Before this subsidy, there were 3-5 CNG stations in Estonia. Today there are 24 CNG stations and 2 more are planned to be built. In total, 15 CNG stations have received this subsidy from the Environmental Investment Centre of Estonia. The expansion of gas supply infrastructure enhances the usage of gas vehicles creating the market for locally produced biomethane. Availability of CNG stations is essential to replace public transport running on conventional fuels with gas vehicles.
Moreover, as these projects were large-scale, the Environmental Investment Centre of Estonia found the administrative burden related to the support scheme relatively low and, for this reason, **it can be considered a cost-efficient mechanism**.
Enhancing the use of gas in the transport sector entails rather significant environmental impacts. Compared to petrol and diesel vehicles, gas vehicles emit less soot particles and sulphur dioxide and emit up to 60% less carbon dioxide, 50% less hydrocarbons, and 45% less nitrogen oxides.
Last but not least, **new jobs are created** at the new gas stations and increased consumption of locally produced biomethane also improves energy security.

Fourth place - ***Subsidy for public fleets*** *(EE4)*

Just a few qualifying points away from the subsidies for CNG stations, there is the **subsidy for public fleets** which is another measure able to engage a substantial transformation of the market.
The combination of these two mechanisms (EE3 and EE4) is essential to developing public transport and CNG stations together. Moreover, biomethane consumption in public transport increases the demand for gas also fostering the development of the market for locally produced biomethane.
Similarly to what resulted with EE3, the projects carried out thanks to this measure in Estonia were high-scale and, compared to that, the Environmental Investment Centre of Estonia found the administrative burden relatively low, providing evidence of the cost efficiency of this measure.
Likewise the previous measure, the **impact of this subsidy on the environment is medium-high**. Replacing the public transport that runs on conventional fuels with gas buses significantly reduces the related greenhouse gas emissions. Gas buses are seen as an effective intermediate solution in moving towards public transport with zero emissions.
Several positive side effects are also generated thanks to this kind of measure. Public transport running on biomethane is a good example for the general public to improve the readiness of the society for alternative fuels. Also, as a result of reduced greenhouse gas emissions, the living environment improves.

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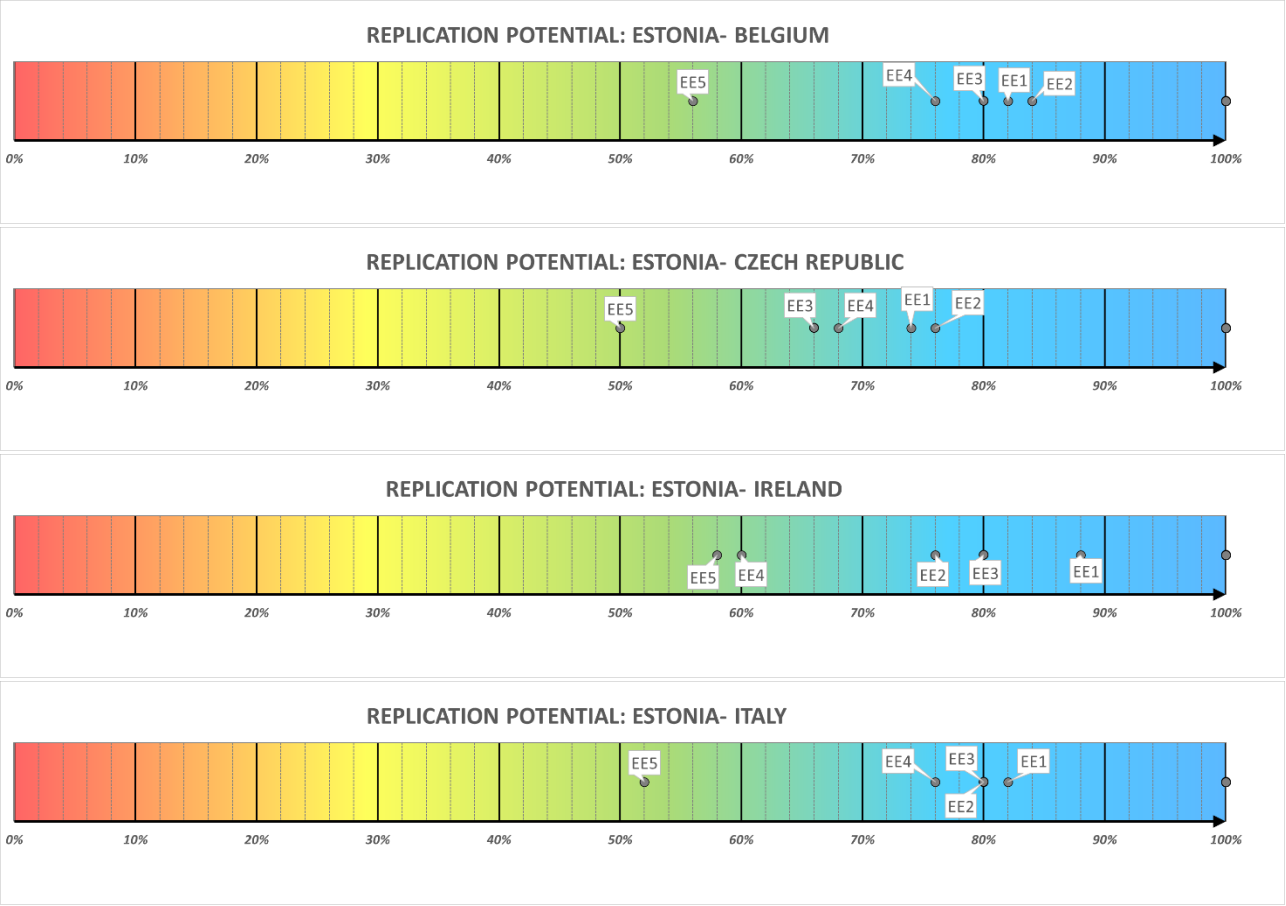
The least interesting solution in regard to biomethane promotion is the Alcohol, Tobacco, Fuel and Electricity Excise Duty Act.
Although the low potential for market transformation, receiving excise duty exemption for the suppled biomethane is a good addition for gas sellers.
At the same time, the cost efficiency is very low. Indeed, it is administratively easy to implement, however, as said, it does not have a huge impact on market development.
Besides the limited influence on the market, even the impact on the environment is very low. Nevertheless, it sends a signal to the market that environmentally friendly biomethane is favoured over fossil fuels.

Last ranked - ***Alcohol, Tobacco, Fuel and Electricity Excise Duty Act*** *(EE5)*

7.2.1 Replication potential of Estonian policies in the Target Countries

Figure 14 shows the Replication Potential of the measures in force in Estonia in the different Target Countries of REGATRACE. As is evident from the graphs and the summary table, the most successful measures are EE1 - Using Aid Granted as Support for the Development of the Biomethane Market and EE2 - National Transport Offsetting platform, while EE5 was unanimously decreed the less replicable.

The reasons that led to these results are partially described in the policy assessment done above by the Elering (EE) experts, but the analysis of the context variables adds completeness by declining the various measures in the different national situations.



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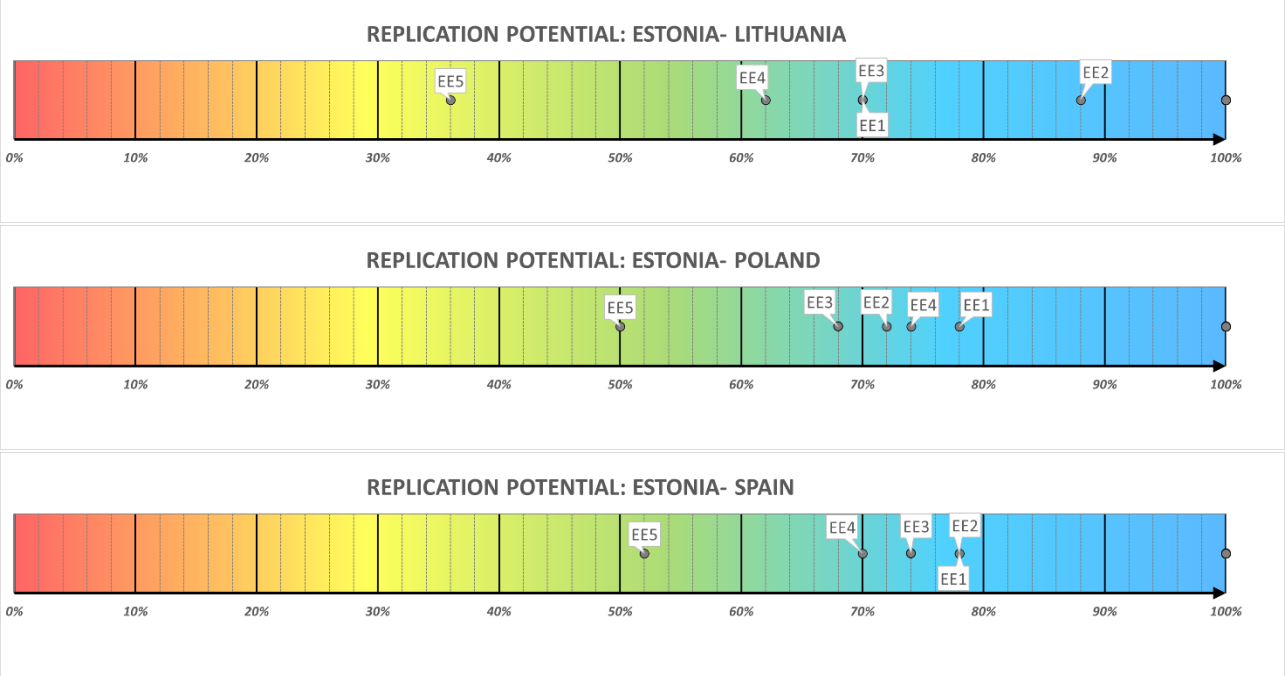

Figure 144: Replication Potential of the Estonian policies in the Target Countries

Table 13: Replication Potential Estonia- Target Countries_ Summary table

	Replicability Potential (RP)						
Measure	*BE*	*CZ*	*IE*	*IT*	*LT*	*PO*	*ES*
EE1 - Using Aid Granted as support.	82%	74%	**88%**	**82%**	70%	**78%**	**78%**
EE2 - National Transport Offsetting platform	**84%**	**76%**	76%	80%	**88%**	72%	**78%**
EE3 - Subsidy-building CNG station	80%	66%	80%	80%	70%	68%	74%
EE4 - Subsidy for public fleets	76%	68%	60%	76%	62%	74%	70%
EE5 - Fuel and Electricity Excise Duty Act	**56%**	**50%**	**58%**	**52%**	**36%**	**50%**	**52%**

The **National Transport Sector Off-Setting Platform (EE2)** turned out to be the most replicable Estonian measure for **Lithuania (88%), Belgium (84%), Spain (78%) and the Czech Republic (76%).**

***National Transport Sector Offsetting Platform (EE2)** is the most replicable for Lithuania, Belgium, Spain and the Czech Republic*

In **Lithuania**, it presents a very high replication potential, as a similar platform is already in place since December 2021, started operating during REGATRACE. The interest from investors is very high: the obligations for gas fuel suppliers will enter into force in 2025, but they could already use this platform to receive fuel statistics units and trade it with liquid fuel suppliers.

There is high interest in this measure also from **Belgian** investors who deem it very efficient as it combines GOs, transport certificates and registration of CO_2eq reduction, with no preference to which system is used (can be ErGAR, AIB, or even both, as long as no double use). For Belgium, this is the ultimate way forward, having a one-system solution answering to requirements for GO (art. 19), PoS in mass balance for ETS, and biofuels and other requirements in the future. In addition, the regulatory framework in Belgium is substantially ready to introduce

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such a measure which is to a great extent in line with national plans and priorities, and this is a further stimulus for replicating it.

In **Spain**, there is high interest from investors and acceptance from stakeholders of the biogas/biomethane sector who are actively contributing to the transposition of REDII in the Royal Decree that was open to consultation since September 2021. However, while the regulatory framework is ready, the measure is not a priority at the moment but, as said before, biomethane is on the list, and it's just a matter of time.

Similarly to Lithuania, the **Czech Republic** has implemented a similar system, which is already creating a demand for biomethane in the country. There is no official platform for transportation, but the outcome is the same and the interest from investors is relevant.

The measure on **Aid Granted as support for biomethane (EE1)** ranked first for **Ireland (88%), Italy (82%),** and **Poland (78%).**

Using Aid Granted as Support for the Development of the Biomethane Market (EE1) has the highest replication potential in Ireland, Italy and Poland

In **Ireland**, there is high interest in this measure. The RGFI Integrated Business case for biomethane production in Ireland is an industry-led initiative and collaboration, with no enduring government subsidy regime.
It does however require Government to provide a Capital Grant of 50% to ensure sustainable biomethane is produced at a competitive level and benchmarked against the cost of biomethane across the EU.
The economic feasibility in line with the public spending code shows that the most economic use of sustainable biomethane is in the thermal heat demand sector of manufacturing and processing industries. Biomethane is the least disruptive and lowest-cost solution for decarbonising thermal demand and is the most reliable technology that provides the required consistency and demand load. Issuing aid granted for supporting the development of biomethane seems to be a good way forward for promoting this sector.

Italy is advanced in this regard and there is already a decree[12] that encourages the use of biomethane in the transport sector and other end uses (e.g., industrial use). Solutions like this find a breeding ground for replication, as demonstrated by the high Replication Potential obtained for Italy.

Investors (especially private and industry sector) in **Poland** would be interested in this support measure as was introduced in Estonia, which seems to be quite effective. The introduction in the Polish regulatory system has not been discussed yet, but the experts convey that it could be easily integrated with the whole framework and well accepted by the main stakeholders, even if biomethane is not at very high priority, but it can change in near future.

The **Alcohol, Tobacco, Fuel and Electricity Excise Duty Act** is confirmed in the last place for all the countries involved.

EE5 is the least replicable for all

[12] A new decree on biomethane has been issues in October 2022

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In **Lithuania**, the replication potential of this solution is very low (36%). This is due to the low interest on the part of investors and stakeholders, whose priority is to use biomethane in the transport sector and not for tax duty exemptions. For this reason, the implementation of a similar exemption policy in the future is not currently in the plans and it is very unlikely that there will be.

In the **Czech Republic** (50%), this measure is already in place, nevertheless the results of the policy evaluation make this solution low replicable in general, even though some countries have already this implemented for years.
The analysis done also by the Czech experts suggests that the impact of this measure on the promotion of biomethane is very low, thus there is no need to replicate it (assuming it is not already in place of course).

The answers to the questionnaire on the context variables provided by the **Polish experts** show a moderate interest on this measure and a reasonable readiness to introduce it. However, the low values associated with the policy variables bring the final results down in the ranking (50%) and this is the same also for some other countries in the assessment.

In **Italy** (52%) and **Spain** (52%), indeed, there's a moderate interest to implement similar measures as these taxes are already very low. Moreover, in the last period, the Italian government has cut the VAT on natural gas and biomethane used in the transport sector to cope with the increases. It would be good if this emergency measure could become definitive, but it seems this is not so likely to occur. Of course, measures like this always obtain stakeholders' acceptance as lowering taxes makes everyone happier.

For both **Belgium** and **Ireland** this measure is highly accepted by stakeholders and especially consumers, as it cut down the final price, regardless of how it is used for.
It must be said that, although it highly responds to the national plans and priorities, it is considered a weak measure, as it is an indirect way to support biomethane production. Nevertheless, the potential for replication in these two countries is not that low, although is in the final part of the rankings (Belgium 56% and Ireland 58%).

7.3 Policy and Replication assessment of German measures promoting biomethane

In the following table, the list of measures currently in force in Germany is reported, followed by the ranking resulted from the Policy assessment performed by the experts of DENA.

Code	Name	Type	Description
DE1	Renewable Energy Act *(EEG)*	Feed-in Premium	**CHP plants which run on biomethane** can submit a bid to **two biomass tenders per year**. The bids with the **lowest prices are eligible to receive a feed-in premium** according to their bid for a period of **20 years** (10 years for biomass plants that already receive a feed-in tariff according to the EEG). Last year the first plants dropped out of the subsidy scheme, however a follow-up subsidy came into force with the EEG 2021.

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			According to the EEG 2021, biomass plants up to 100 kW are entitled to the feed-in tariff until 31.12.27 (§25 para. 1 no. 2) (FNR, 2021)
DE2	Greenhouse gas quota *(37. BImSchV)*	Quota obligation	**Petroleum companies must improve their GHG-balance** by adding low carbon and renewable fuels to diesel and gasoline fuels. The **quota obligation is a 7% -decrease of GHG emissions in 2022** and **25% in 2030**. Biomethane and liquefied biogas can count towards that quota obligation. In comparison to other biofuels, biomethane from wastes and residues has a relatively low GHG emission value. The higher the quota price in terms of CO2-emissions, the higher the value of low emission biofuels such as biomethane.
DE3	Building Energy Act (GEG)	Primary energy factor	Since 2020, biomethane is given an improved primary energy factor for the creditability of renewable energy shares in the building sector.
DE4	Gas Grid Ordinance *(GasNZV)*	Privilege	Biomethane **upgrading** plants have a **privileged access to the gas grid**. The **costs of connecting** biomethane upgrading plants with the gas grid are **shared between the plant operator (25%) and the DSO (75%).** The burden of the biomethane plant operator is capped at 250.000 Euros.
DE5	Emissions Trading Act (Brennstoffemissionshandelsgesetz – BEHG)	CO2-price	The BEHG was adopted in 2019 as part of the federal government's climate package. It creates the basis for trading in certificates for emissions from fuels and for pricing these emissions, insofar as they are not covered by EU-ETS, in order to contribute to the achievement of national climate protection targets. Biomethane without hydrocarbon components is generally not subject to the reporting obligation within the BEHG. If biomethane is mixed with natural gas in the natural gas grid, it is considered as natural gas for energy tax purposes and has been subject to the reporting obligation of the BEHG. The main difference with the EU-ETS is that the obligation is set on the fuel distributors (e.g., gas suppliers or companies in the mineral oil industry) rather than on the consumers (operators with direct emissions), as is the case of the EU-ETS.
DE6	EU-ETS; national implementation via Greenhouse Gas Trading Act (Treibaushandelsgesetz- TEHG)	CO2-price	Within the EU-ETS, biomethane and biomethane imports are considered for the reduction of the emissions allowance as biomethane has a zero-emission factor. The conditions for accepting biomethane imports are a mass balance proof showing that the biomethane was transported to Germany, a cancellation statement of the biomethane certificate (e.g., GO) in the foreign registry and, from 2023 onwards, a proof of sustainability (PoS) for the biomethane volume.

Table 14: Policy Ranking Table - Germany

		GERMANY					
Rank:	**Measures:**	**MARKET**	**EFFECTIVENESS**	**ECOSYSTEM**	**TIME**	**SIDE-EFFECTS**	**TOTAL SCORE**
1	**DE6 - EU-ETS *(National implementation)***	5	5	5	5	5	**25**
2	**DE2- Greenhouse gas quota**	5	5	3	5	5	**23**
3	**DE5 - Emission Trading Act**	5	3	4	5	4	**21**
4	**DE1 - Renewable Energy Act**	5	4	5	2	4	**20**
5	**DE3 - Building Energy Act**	4	3	3	4	4	**18**
6	**DE4 - Gas Grid Ordinance**	4	2	2	4	2	**14**

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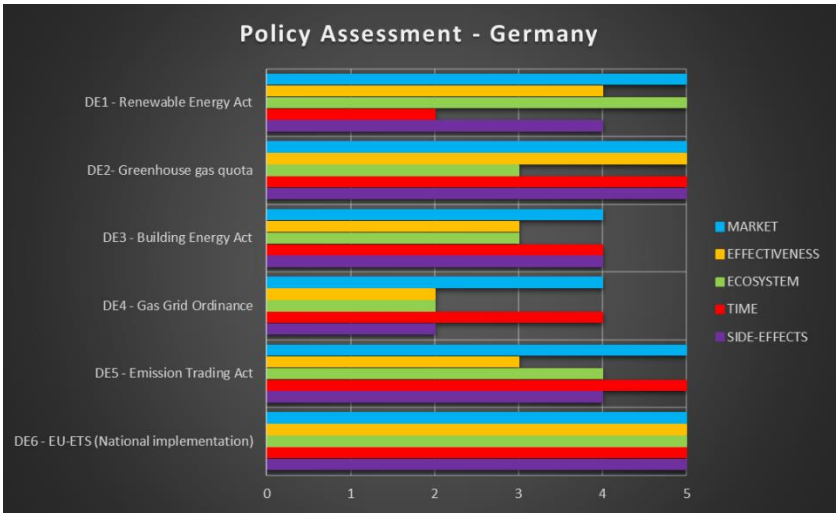

Figure 155: Policy Assessment – Germany

*First ranked – **EU-ETS (National Implementation)** (DE6)*

First and foremost with full scores, there is the regulation on **EU-ETS (National implementation).** As well as pointed out by Austrian experts for their national transposition of the EU ETS, it is believed that this measure can **significantly influence the market transformation,** as it severely punishes parties placing fossil fuels on the market.
Moreover, since a higher demand of emission allowances will likely increase the prices, the obligated parties' desire to avoid emissions would also increase. Avoiding emissions could actually be cheaper than buying the respective allowances. From this perspective, this measure is considered **very cost-effective**.
It must also be considered that a price on CO2 emissions has always a **strong environmental effect** and this explains the high score assigned to this dimension.
Finally, it must be noted that this measure has no time limit, and this can increase the **impact over time**.

*Second place – **Greenhouse gas quota** (DE2)*

The second place goes to regulation on **Greenhouse gas quota**. Thanks to this measure, a lot of EU member states aim to **place biofuel on the German market**.
The strengths of this measure can be seen in the long term, indeed, although the present cost of alternative fuels is higher than their fossil counterparts, the benefits of the former surpass this cost difference. This is shown by the GHG emissions avoidance and its positive impact on the environment and health of the population. Considering that in the long run, such benefits will surpass the supposed cost savings that fossil fuels might have, the continuous increase of the GHG quota in the future will result in a **very cost-effective measure** when considering all externalities and hidden costs from fossil fuels.
It must be noted that this is a market-based instrument (payment per avoided tCO_2) with a **very persistent impact**, as it is of the interest of the fuel suppliers in Germany to reduce their payments for their related emissions.
Finally, it is worth noting that this mechanism has **a strong "pull-effect"** on potential imports. It is the main reason why it is attractive for other EU MS to export alternative fuels to Germany.

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*Third place – **Emission Trading Act** (DE5)*

The Emission Trading Act is apparently very similar to the EU-ETS Regulation, but some differences emerge between them, that are also visible in the scores assigned.

Similarly to the EU-ETS scheme, this measure has **a high potential for market transformation,** as it entails penalties for those placing fossil fuels in the market. In contrast, from the cost-efficiency point of view, it is less performant. Indeed, the price of CO_2 is set in the legislation and hence cannot be established by the market (like in EU-ETS). Nevertheless, the legislation gradually increases the price for the obligated parties from currently €25/tCO_2 to €55/tCO_2 in 2025. In 2026, a price range of between €55/tCO_2 to €65/tCO_2 will be established, together with an auctioning process. Thus, until 2026 the Emissions Trading Act results in an "efficient enough" measure for avoiding GHG emissions. This is because a market-based approach with a high demand for emission allowances would result in higher prices and desire to avoid emissions. The auctioning process from 2026 onwards should remedy part of this, but, until then, it is hard to assure the effectiveness such auctions could have.

For the same reasons above, the impact of the measures on the **environment and eventual positive side effects** have been considered **a little lower** than those resulting from the EU-ETS scheme but since this scheme has no time limit, we could count on **long-lasting impacts over the coming years**.

*Fourth place – **Renewable Energy Act** (DE1)*

The Renewable Energy Act (REA) ranked fourth while holding a quite high score in absolute terms.

As mentioned above, this law regulates the renewable electricity market and its subsidies, and it is the reason why the renewable electricity share accounts for over 49.5% in Germany (January 2022). Thus, **the high influence that it has had on the market in the past years is quite prominent.**

Moreover, the REA has proven to be an efficient measure for increasing the penetration of renewable electricity in the German grid. Even though at the beginning it was based on a feed-in-tariff that proved not to be very cost-efficient, the latest changes have paved the way to electricity auctions.

Now, a certain amount of renewable power and electricity is auctioned per year: the most cost-efficient bids are awarded a contract (power purchase agreement-PPA). The bid prices are impacted by the generation technology, i.e., the cheapest generation technologies can offer the cheapest prices. While wind and solar PV can offer cheaper prices for electricity generation, biomethane-based power plants provide a more stable supply that can be used as base or intermediate load and avoid large power and frequency variations in the power grid. Hence, the population and industry are benefiting from lower electricity prices and the environment from renewables-based power generation.

No need to specify **how high are the impacts on the environment that this measure has been producing.** In 2010, 72 Mio t CO_{2eq} have been avoided from being emitted through the usage of renewable electricity, in 2020 it was 179 Mio t CO_{2eq} (UBA, 2020).

Weaknesses of this measure have been observed for what concern the **persistency of the impacts over time**. The subsidies under the Renewable Energy Act are set to run for 20 years. Since last year, follow-up subsidies have been implemented. The coming years will show whether the established plants are self-

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sufficient after 20 years. However, associations expect a sharp drop in the production volume of plants that fall out of the subsidy scheme.
Positive side effects can be found on several aspects: creation of new jobs in the renewable electricity sector, support for innovative systems, and also provision for solid basis business models in the renewable electricity market for 20 years.

*Fifth place – **Building Energy Act** (DE3)*

The second to last place goes to the **Building Energy Act**, which introduces improved energy factors for biomethane usage in the building sector. This made biomethane for heating an **attractive business case, with a substantial impact on the market**, although not as high as the measures previously described.
Moreover, as the primary energy factor for each house is calculated based on its heat mix compared to a reference scenario, this instrument is **rather cost-efficient.**[13]
The regulation was only introduced last year, then it is too early to assess the **impact of biomethane in the building sector, which has been set to medium/low** in this assessment. In general, however, it can be said that in 2010, 36 Mio t CO_{2eq} have been avoided from being emitted through the usage of renewable energies. In 2020 it was 40.2 Mio t CO_{2eq} (UBA, 2020).[14] On the other hand, the fact that this measure has no time limitation bodes well from the impacts point of view.

*Last ranked – **Gas Grid Ordinance** (DE4)*

The **Gas Grid Ordinance** ended up in last place for Germany. This ordinance **makes it attractive to feed biomethane into the gas grid**, by reducing costs of grid connection on the producers' side, guaranteeing access to the grid, and setting a mandatory timeline for completion of connection, once a connection request is done; nevertheless, it is **not a cost-efficient measure** to implement. The support from the Gas Grid Ordinance does not distinguish between the sustainability performance of biomethane production and injection into the grid. That is, biomethane with a higher GHG emissions avoidance is treated equally to biomethane with worse emissions avoidance. While the Ordinance supports the production and injection of biomethane into the grid, it does not make the next steps in guaranteeing a level playing field for producers whose biomethane has fewer emissions. Thus, **the interest of producers in investing in better production infrastructure is not compensated by the legal framework.**
From the environmental impact point of view, it must be highlighted that even though this law makes feeding into the gas grid attractive, **it will not result in more biomethane capacities being built.**
Moreover, **positive side effects are negligible.**

[13] Due to the fact that the Building Energy Act does not distinguish between the GHG performance of different substrates, then it is rather difficult to assess whether the energy and GHG emissions savings will be much greater than the administrative and financial costs of implementing such regulation. Hence, it has been marked as simply "efficient enough" and looking forward to future developments and changes in the legal framework.
[14] www.umweltbundesamt.de/daten/energie/erneuerbare-energien-vermiedene-treibhausgase#undefined

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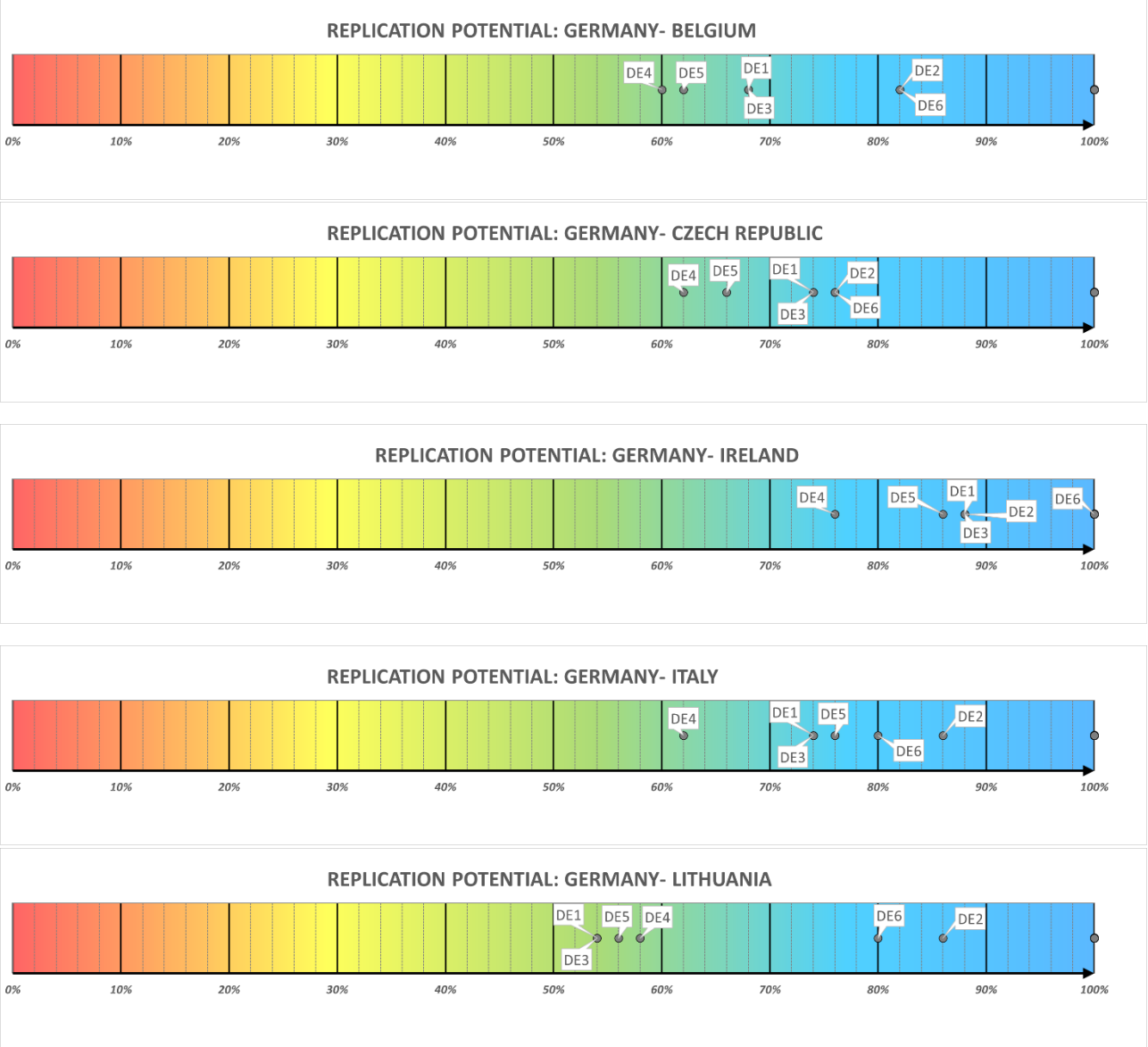
7.3.1 Replication potential of German policies in the Target Countries

Figure 16 shows the Replication Potential of the measures in force in Germany in the different Target Countries of REGATRACE. As is evident from the graphs and the summary table, the most successful measures are DE2 – Greenhouse gas quota and DE6 – EU-ETS (National Implementation), while DE4 was decreed the less replicable in most of the countries, along with DE1 and DE3 in some other cases.

The reasons that led to these results are partially described in the policy assessment done above by the dena experts, but the analysis of the context variables adds completeness by declining the various measures in the different national situations.

In general, results show a good potential for almost all the German measures and even the less replicable measures have RP higher than 50%. This demonstrate how German measures are in any case a good option to apply in the different national contexts.



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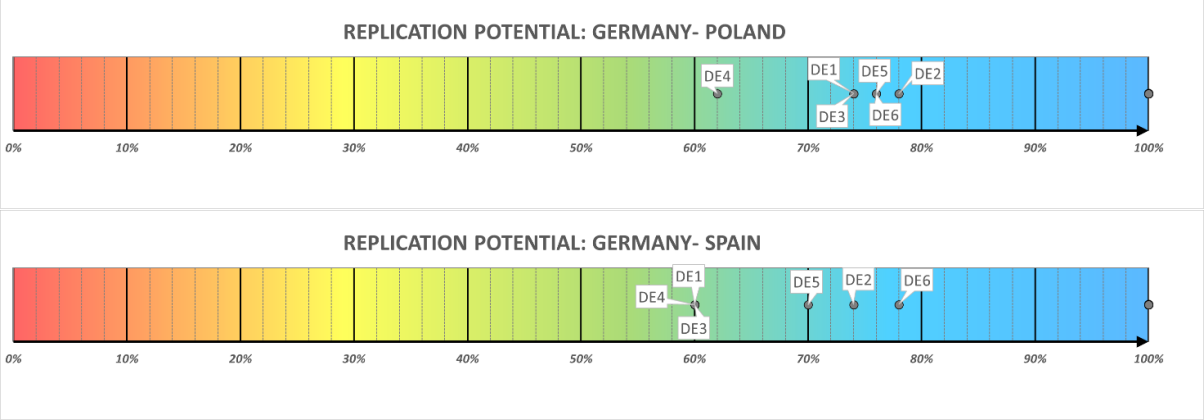

Figure 166: Replication Potential of the German policies in the Target Countries

Table 15: Replication Potential Germany – Target Countries_ Summary table

	Replicability Potential (RP)						
Measure	*BE*	*CZ*	*IE*	*IT*	*LT*	*PO*	*ES*
DE1 – Renewable Energy Act	68%	74%	88%	74%	**54%**	74%	**60%**
DE2- Greenhouse gas quota	**82%**	**76%**	88%	**86%**	**86%**	**78%**	74%
DE3 – Building Energy Act	68%	74%	88%	74%	**54%**	74%	**60%**
DE4 – Gas Grid Ordinance	**60%**	**62%**	**76%**	**62%**	58%	**62%**	**60%**
DE5 – Emission Trading Act	62%	66%	86%	76%	56%	76%	70%
DE6 – EU ETS National Implementation	**82%**	**76%**	**100%**	80%	80%	76%	**78%**

The **National Implementation of the EU ETS (DE6)** turned out to be the most replicable German measure for **Belgium (82%),** the **Czech Republic (76%), Ireland (100%),** and **Spain (78%).**

EU ETS National Implementation (DE6) *is the most replicable for Belgium, the Czech Republic, Ireland and Spain*

For **Belgium**, the Context Variables related to this measure do not have high scores – as well as those reported for DE2, the Green Gas quota - which has the same replication potential.
Therefore, also in this case, what weighted on and influenced this result is the high evaluation done by the German experts on this measure, which indeed is considered one of the most effective and successful policies on the promotion of biomethane, for the reason explained above.
Nevertheless, the interest from the main Belgian investors in the biomethane sector is moderate. This is because in general allowing biomethane for ETS is positive, but the willingness to pay might be still limited (ETS price of 100€/tonCO_{2eq} = 20 €/MWh (when replacing natural gas).
On the other hand, the regulatory framework is ready to embed such a measure and stakeholders' acceptance would be probably high as it is an additional tool (fuel) for industries to avoid ETS emissions to be paid, although willingness to pay will not be very high at 100 € per ton CO_2.
Moderate is also the responsiveness of this measure to national plans and priorities; the question still remains on the import allowed and on the dependence on subsidies.

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For the **Czech Republic**, there are no major differences in the Context variables with respect to those provided by Belgium and the analysis can be similar. The replication potential, also, in this case, is strongly influenced by the effectiveness of the measure according to what was reported in the assessment of the Policy Variables done by dena experts. This same analysis applies also to **Spain**.
Moreover, it must be said that a National Implementation of EU ETS already exists in the Czech Republic, even though it seems that it is not creating a significant demand for biomethane yet, but further developments are expected on biomethane and renewables in general, especially because of the Russia-Ukraine war.

A noteworthy result has been obtained in the case of **Ireland** for which this policy achieved the maximum score for all the Context Variables, and this led to **100% Replication Potential.**
Very high interest and acceptance are evidently expressed from the main stakeholders and from investors. There is very strong buy-in from across the full supply chain of renewable gas industry for the benefits of biomethane to the ecosystem. Moreover, as an industry forum, RGFI is engaged with many of the EU ETS companies in Ireland, as large energy (Gas) consumers and biomethane is the least disruptive and lowest cost technology solution to decarbonise thermal demand.
The current price of carbon is presenting a compelling case for promoting biomethane which is in big demand. In the case of the agri-food and drinks (beverages) industry, there are the additional benefits of decarbonising their supply chain (Scope 3 emissions), inside the farm gate, where 90% of the carbon footprint is on the farm at food production. Moreover, the proposition of displacing artificial fertilisers with bio fertilisers (digestate) is a real alternative now with the increased cost of artificial fertiliser and focus to reduce emissions at the farm level.
Moreover, the Irish Government has been designing the blueprint for the Green Gas Certification Scheme with extensive consultation with industrial gas consumers, key stakeholders, government, semi state bodies and representative groups. In August '22, the Government of Ireland has formally appointed Gas Networks Ireland as the National Renewable Gas Registry, the gas authority having a key role to play as the network operator to support and facilitate the injection of biomethane as a priority with favourable connection agreements for grid injection.
As already highlighted in the previous paragraphs, there is a strong policy commitment to biomethane industry and development at scale, replication and pace to meet the governments objectives. EU ETS companies have, in most cases, mandatory company targets for decarbonization by 2025 in some cases, and 2030 in most companies. This brings into focus the need for Government to support and provide stated policy support for AD biomethane and provide the suitable market conditions that provides confidence and certainty to industry and investors to develop the biomethane industry.
All this creates favourable conditions for the replication of this measure.

The measure on **Greenhouse gas quota (DE2)** ranked first for **Belgium (82%)**, the **Czech Republic (76%), Italy (86%), Lithuania (86%),** and **Poland (78%).**

Greenhouse gas quota (DE2) *has the highest*

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replication potential in Belgium (on par with DE6), Czech Republic, Italy, Lithuania and Poland

In **Belgium**, this measure ranked first on par with the ETS (DE6) with moderate-high scores associated with the Context Variables and an overall Replication Potential of 86%.
In particular, investors are mostly interested to bioLNG for heavy duty and barges/ships which could be a potential promising driver for biomethane. Key stakeholders would be favourable to applying such a policy as especially producers. On the other hand, suppliers could find difficulties in answering that obligation if Germany today keeps its restrictions on the import of BioLNG not eligible for the "quota". Moreover, from consumers' point of view, no import would mean higher prices.
Nevertheless, bioLNG and bioCNG are still considered by the Belgian Government as the next best solution behind electrification and the use of H_2. For these reasons, imports should be allowed.

The biofuel quota is already set in the **Czech** legislation in the Act on Air protection, and it already created a market demand for biomethane. However, the targets are set lower (6 % GHG savings) compared to the German framework. Nevertheless, it is a promising measure especially for producers, CNG filling stations operators, and petroleum companies. Similarly to the Czech Republic, also **Italy** introduced a similar system already in 2014.
This inevitably influences the high replication potential in both countries.
Italy, in particular, was the first European country to introduce a specific incentive scheme for biomethane to be used in the transport sector as a biofuel (in this case “advanced biofuel”). When issued, the policy was well accepted and received by the relevant stakeholders and key players of biomethane and other involved sectors.

In **Lithuania** this policy is considered a high priority and already in the plan. Therefore, the regulatory framework is ready, and moreover investors are active and show high interest to invest in biomethane and sell it to the transport sector using GOs. There was exchange of different opinions and proposals among the main stakeholders, and at the end it was well accepted. Hence the level of Replication Potential (86%).

In **Poland**, there is a potentially high interest from private and industry sectors, as well as consumers in this measure, although it is not yet among the government's priorities: the situation could change, especially now that an amendment of the BIO Act is under public discussion and there is the possibility to introduce some obligations concerning biomethane also on refineries.

The Gas Grid Ordinance *(DE4) is the least replicable for almost all, except for Lithuania and Spain, for which the* ***Renewable Energy Act (DE1)*** *and the* ***Building***

The **Gas Grid Ordinance** (DE4) is confirmed in the last place for almost all the countries involved, expect for Lithuania and Spain, for which the **Renewable Energy Act (DE1)** and the **Building Energy Act (DE3)** hold the last place tied (Lithuania 54% and Spain 60%).
In all these cases, these measures have received a quite good assessment in terms of contexts variables.
There is a moderate to high interest from stakeholders to invest and the acceptance level is good. Moreover, they are all policies in the process to be

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implemented or considered among governments' priorities. The reasons why these three holds the last position in the ranking is just due to the Policy Variables assigned by the German experts in the policy assessment.
It must be noted that in this case, the values of Replication Potential are all higher than 50%, and this suggest that even these last ranked policies could find fertile ground for implementation in the contexts analysed.

Energy Act (DE3) *are in the last place tied*

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8 National results achieved thanks to REGATRACE

This chapter reports the main results acquired by each Advanced and Target Country thanks to the work carried out by the project and more in general within REGATRACE. For a complete picture, see the Annex D which also lists the national policy targets, the barriers and the list of policies currently in force promoting biomethane.

- **AUSTRIA:**
  Thanks to REGATRACE the following results have been achieved in Austria:

  Interlink of Registries in Austria
  Thanks to REGATRACE, the AGCS Biomethane Registry has a boost in resources and available data and can thus act more focused on the building of linkages and interfaces between existing national registries established for different purposes in Austria. It is a common goal to harmonise processual and technical systems between those registries in-line with European standardisation processes elaborated within the REGATRACE project to reduce multiple counting of the same renewable gas volume.

  European Market integration
  Within the REGATRACE Project, several registry systems in Europe have been established and connected to international transfer hubs enabling cross-border ownership transfer. Thanks to WP3, AGCS supports the integration of new registry members and organisations mandated to operate national registries and integrate them into the European market.

  Knowledge base
  REGATRACE enables efficient knowledge transfer between countries through the creation of documents with a wide range of stakeholders. The REGATRACE document packages have substantially supported registry establishment in particular in Lithuania and Slovakia and are subject to exchange during project meetings in target countries.

  REGATRACE Network
  AGCS has joined the REGATRACE Network. The other Austrian operators were invited to join, and Austrian stakeholders are informed. Thanks to the REGATRACE Network Meetings, AGCS receives relevant policy updates, information, and access to opinions of representatives of different sectors (biofuel sector, GO issuing bodies, etc). Relevant network information and market and policy updated can easily be forwarded to the registry users, which are the following (as of July 2022): 14 Biomethane production plants, 12 biogas power generator plants, 9 registry users/traders and 10 auditors.

  Sector coupling
  Thanks to the resources of REGATRACE WP4, non-technical and administrative barriers for sector coupling have been drafted. The results are being discussed with Austrian stakeholders to enable future implementation of sector coupling processes. This includes energy conversion from electricity to renewable gases.

- **ESTONIA:**
  REGATRACE project has increased the readiness for cross-border exchange of biomethane guarantees of origin by providing an overview of the existing approaches in the European

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renewable gas market and proposing solutions for market harmonisation. With improved understanding of the European renewable gas market developments, potential producers are more convinced to invest in the biomethane market.

- **GERMANY:**
  The official mandate to operate the national gas GO system has not been granted yet. However, thanks to the REGATRACE project, it will be possible to provide the competent body who will receive the mandate with guidelines and documents which support the establishment of a national gas registry.

- **BELGIUM:**
  The Belgian federal decree on sustainability has been published on 14 February 2022 related to REDII sustainability criteria for biofuels and GHG reduction of the FQD directive. The registration system for biofuels (federal authority health) allows registration of Bio-CNG and bioLNG in BE and in doing so for fuel suppliers to answer to the 6% GHG reduction target from the FQD. This has been accomplished via **consultations between the responsible federal authority (FPS Health) with Fluyxys (as REGATRACE representative) and the concerned stakeholders**. Especially the possible issues on single use identified in in the relevant REGATRACE work packages have proven to be of interest. The biofuel registry of FPS health also allows biofuels to imported or exported from some member states (e.g., Germany).
  The Belgian transport fuel law related to the RED II target for biofuels (%) is still under revision and is planned to be published end 2022. It will allow fuel suppliers to use bioCNG, bioLNG as advanced biofuels (double counting) for their obligation as from 2023**. Fluxys (as REGATRACE representative) has contributed to the consultations** with the responsible federal authority (FPS energy) as to **ensure that this can lead to an incentive for production of bio-CNG and bio-LNG.**

- **CZECH REPUBLIC:**
  Within REGATRACE project the following legislation to enable the issuance of Guarantees of Origin for biomethane and hydrogen has been developed:
  - the Act no. 165/2012 has been amended – this will enable the Biomethane, and Hydrogen GO to be issued from 1 January 2023
  - A new decree on guarantees of origin, which will be the implementing legislation of this law, is currently in the approval process. It should be effective from 1 January 2023 and completes the legislative package necessary to start issuing GOs.

- **IRELAND**
  REGATRACE contributed to the achievement of the following results:
  - The Shared Vision for renewable gas industry in Ireland has emerged from extensive consultations and collaborative work led by RGFI, through industry partnership, and as part of the REGATRACE Project, to create an Integrated Business Case for biomethane, sustainable agriculture feedstock, standardised cross border trading platform for biomethane, and Guarantees of Origin, with a common set of key attributes and market demand for sustainable biomethane and other renewable gases in Europe.
  - Inclusion of biomethane in the Climate Action Plan 2021 and National Development Plan, NECP target of 1.6 TWh per annum by 2030. Highlighting the potential and opportunities for Ireland and the roadmap for sustainable biomethane in Ireland, with direction on policy and how to support.
  - Biomethane has a key role in decarbonising the Irish economy, being recognised as a “Zero emissions gas” adding to competitiveness and sustainability, addressing the difficult sectors to decarbonise.
  - Harmonisation of Tariffs, with biomethane given priority, providing a clear pathway for

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access to renewable gas, in the immediate term promoting Biomethane, medium term perhaps utilising some capacity for hydrogen and longer term, Carbon Capture and Storage.
- the standardization and simplification of recognising the GOs (CoO) across MS and establishing minimum sustainability criteria for biomethane production.
- Recognising the advantages of achieving the highest carbon intensity savings possible. Inclusion of biogenic CO_2 would be a distinct advantage.
- Definition of green hydrogen, biological sources.
- Distinguish and define acceptable green gases from renewable sources.

- **ITALY:**
  Thanks to the REGATRACE project, it was possible to start a dialogue among the stakeholders in the biogas, biomethane and natural gas sector (transport and distribution, sales for the transport sector, natural gas vehicles, etc.), and policy makers, especially on the issue of raising the percentages of advanced biomethane to be released for consumption, on the use of biomethane in maritime transport and on the adoption of the Biomethane Guarantees of Origin.

  Both the increase in the percentages of advanced biomethane to be released for consumption and the use of biomethane in the maritime shipping sector have already been achieved, respectively in 2020 and 2022. The Guarantees of Origin has been introduced by the new biomethane decree issued in October 2022.

- **LITHUANIA:**

  Thanks to REGATRACE project national biomethane stakeholders were gathered into the workshops to discuss and set Lithuania's biomethane vision and roadmap. The vision and the roadmap developed will help to navigate in the national biomethane market development process.
  REGATRACE project has also highly contributed developing national GO registry IT system.

- **POLAND:**
  Thanks to REGATRACE the following results have been achieved in Poland:

  Knowledge base
  REGATRACE resulted in significant knowledge transfer between experienced countries with significant biomethane development and countries still planning biomethane development, like Poland. Especially important for Poland was the knowledge concerning registries and GO for renewable gases, UPEBI shared this knowledge with potential issuing bodies (URE, KOWR) and potential owner of registry (TGE) by dedicated webinars. It was very important for them, as their knowledge about biomethane was limited. For TGE especially useful was training on IT system prepared by Austrian partner for testing building of registry of biomethane GO.

  Based on REGATRACE knowledge base (deliverables, presentations from workshops and webinars as well as discussion and meetings with partners) UPEBI was pushing discussion about biomethane registry and content of biomethane GO within stakeholders' groups formed by Ministry of Climate.

  REGATRACE Network
  UPEBI has joined the REGATRACE Network. The main Polish stakeholders (TGE, URE) were invited to join, and national stakeholders were informed about this activity. Thanks to the REGATRACE Network Meetings, UPEBI has received relevant policy updates, information, and access to

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knowledge and opinions of representatives from different sectors from other countries (biogas and gas sector, GO issuing bodies, etc). UPEBI was sharing this knowledge with national stakeholders e.g., within REGATRACE participatory and target workshops.

Feasibility study for real, existing biogas plant
Thanks to REGATRACE project UPEBI has conducted feasibility study (based on guidebook prepared by EBA, project partner) for upgrading existing agriculture biogas plant to biomethane producing unit. That document will be used for further promotion of building biomethane market in Poland.

- **SPAIN:**
  The Biogas/Biomethane Roadmap of the Spanish biogas/biomethane sector (REGATRACE Roadmap) sets a target of 30 TWh of biomethane over gas consumption by 2030 (approx. 10% over 300 TWh of gas consumption). In line with the REPowerEU.

  REGATRACE impact has been very positive, as the discussions were not limited to one-way exchanges with the project leaders, but interactive sessions in which stakeholders (public and private actors with different visions and perspectives) discussed with each other. These contacts and the cooperation between all stakeholders help to see the point of view of all parties and all aspects (such as waste, digestate, technology, biomethane purchasing or permitting legislation or gas regulation), making it possible to have a complete and accurate view. Contributions both to remove barriers and to establish ways to promote and incentivise this sector

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9 Conclusions

This document reports an assessment of activities and results of REGATRACE project. What emerges and can be concluded, according to what is shown in the different chapters, is that REGATRACE activities were carried out in line with the objectives of the project and most of them led to noteworthy results.

A network of national issuing bodies was established (REGATRACE network), and this facilitated the development of a market for biomethane and gas certificates. Another tangible result was the set-up of national/regional biomethane registries in the target countries. This objective could not be reached on time for all of them, but this is just a matter of time, and several countries made much progress on this side.

Important achievements have been made in determining the contents and attributes of GOs, establishing and guaranteeing the coordination between the renewable electricity, biomethane/renewable gas and hydrogen certification systems. This was achieved thanks to the cooperation between AIB and ERGaR, made possible thanks to REGATRACE.

Moreover, different guidelines have been produced and shared with different national experts and stakeholders of the renewable gas sector in order to provide guidance, tools and support on different aspects. The work carried out by REGATRACE on that arouse the interest of key players in the biogas/biomethane sector and both the most advanced countries and those that are just now entering this sector are willing to undertake and carry out a legislative process aimed at promoting this developing segment.

Thanks to the participatory process that supported the definition of the vision and roadmap for biomethane, it was possible to share the knowledge and results produced by the project and this was a very important stimulus for change, especially in cases where the right people were involved. The discussion and dialogue, enabled through this activity, increased cooperation among the key players of the national energy sectors and stimulated the discussion, bringing the debate to the main institutional tables.

Concerning the impact evaluation, it should be stressed that REGATRACE project didn't affect directly biomethane production and consequently is not directly responsible for the GHG emissions reduction in the different REGATRACE countries. Nevertheless, it must be said that the activities performed towards the establishment of a common European biomethane market, and the support provided to the Target and Supported countries in the set-up of registries and in putting on the table the promotion of biomethane in the political debate, by involving all the key stakeholders (with the BWG), indirectly impacted this growth. Moreover, monitoring these indicators was a useful exercise that, together with the policy evaluation, helped understanding how biomethane market is evolving in the different countries.

The Policy and Replication Assessment was very useful in understanding how replicability is influenced by several factors that can go well beyond the political priorities identified by a country and cannot leave aside from intrinsic and specific characteristics of the policy, as well as from the context where it is supposed to be replicated. From the analysis carried out, it emerged that many of the promotion policies that have been more successful in the Advanced Countries can be a good solution also - and above all - for the Target Countries in which the market has yet to get space. This exercise helped to identify the most successful policies and those that have not generated important impacts in terms of

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development of the renewable gas sector, as well as those that are more replicable in the various national contexts.

To conclude, the REGATRACE project contributed and will undoubtedly continue to contribute to the evolution and expansion of this sector which, given the international political situation we are experiencing with the Russian-Ukrainian conflict, will certainly make great strides forward in the short term.

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ANNEX A - Policy Evaluation Criteria

To proceed with the identification of the most successful policies in each of the countries examined, a set of criteria must be established. Accordingly, five criteria have been set out and defined as reported in Table 16.

AGCS, DENA, ELRING have been asked to analyse their national policies according to these criteria, assigning them a score from 1 to 5. As a result, a national ranking from the most to the least successful policy can be obtained country by country.

Table 16: Policy Evaluation Criteria

POLICY EVALUATION CRITERIA			
Code	**Criteria**	**Description**	**Score**
C1	**Potential for market transformation**	Capacity of the policy to enhance the market transformation and to strengthen the biomethane market	▪ 5 = very high potential ▪ 4 = high potential ▪ 3 = medium potential ▪ 2 = low potential ▪ 1 = very low potential ▪ 0 = no potential
C2	**Cost Efficiency**	Biomethane production achieved/achievable in relation to the amount of administrative/regulatory/financial resources necessary to support and implement the policy	▪ 5 = very efficient ▪ 4 = relatively efficient ▪ 3 = neutral, balanced relation ▪ 2 = less efficient ▪ 1 = very poorly efficient ▪ 0 = Completely inefficient
C3	**Environmental impact**	Amount of CO2 reduction achieved/achievable by the policy	▪ 5 = high impact measure ▪ 4 = medium/high impact ▪ 3 = medium impact ▪ 2= medium/low impact ▪ 1 = low impact ▪ 0 = no Impact
C4	**Persistency of impacts over time**	How lasting is the impact of the policy in terms of time.	▪ 5 = very persistent/long-lasting ▪ 4 = persistent / lasting ▪ 3 = medium persistent/ lasting ▪ 2 = low persistency / short-lasting ▪ 1 = very low persistency / very short-lasting ▪ 0 = no persistency / no -lasting
C5	**Support of positive side-effects**	Positive side-effects or co-benefits of a policy are e.g.: -Higher economic growth, improved competitiveness and productivity -Creation of new jobs, improved work environment - Improvement of energy security, health etc.	▪ 5 = very high support of positive side-effects ▪ 4 = high support of positive side-effects ▪ 3 = medium support of positive side-effects ▪ 2 = low support of positive side-effects ▪ 1 = very low support of positive side-effects ▪ 0 = no support of positive side -effects

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ANNEX B - Questionnaire on Policy Variables

Name of the POLICY

Market dimension

1. Potential for Market Transformation: To what extent is the policy able to enhance the market transformation and promote the penetration of biomethane in the enrgy sector? [0-5]

- ☐ 0 - No potential for market transformation
- ☐ 1 - Very low potential
- ☐ 2 - Low potential
- ☐ 3 - Medium potential
- ☐ 4 - Substantial potential
- ☐ 5 - High potential for market transformation

Please explain in few lines the reasons:

If you need more space, just extend this text box

Effectiveness dimension

2. Cost Efficiency: To what extent can the policy be considered cost efficient? [0-5] *Considering the ratio between Biomethane production achieved (or achievable) in relation to the amount of administrative/regulatory/financial resources necessary to support and implement the policy .*

- ☐ 0 -Completely Inefficent
- ☐ 1 - Underperforming
- ☐ 2 - Not Very Efficient
- ☐ 3 - Efficient Enough
- ☐ 4 - Efficient
- ☐ 5 - Very Cost Effective

Please argue on this and provide figures (if any):

If you need more space, just extend this text box

Ecosystem dimension

3. Environmental Impact: What is the environmental impact (considering the amount of CO2 reduction) achieved (or achievable) thanks to the implementation of the policy? [0-5]

- ☐ 0 - No Impact
- ☐ 1 - Low Impact
- ☐ 2 - Medium/Low Impact
- ☐ 3 - Medium Impact
- ☐ 4 - Medium/High Impact
- ☐ 5 - High Impact (Green policy!)

Please argue shortly on this and provide figures (in any):

If you need more space, just extend this text box

Time dimension

4. Persistency of impacts over time: How lasting is the impact of the policy in terms of time? [0-5]

- ☐ 0 - Non-lasting impact
- ☐ 1 - Very Short-lasting impact
- ☐ 2 - Low persistency/short-lasting impact
- ☐ 3 - Quite persistent impact
- ☐ 4 - Persistent impact
- ☐ 5 - Very persistent /Long -lasting Impact

Please argue shortly on this and provide figures (in any):

If you need more space, just extend this text box

Side-Effects dimension

5. Support to <u>positive</u> Side-Effects*: to what extent does the policy bring benefits other than those directly linked to the biomethane sector? [0-5]

- ☐ 0 - No support to positive side - effects
- ☐ 1 - Very low support to positive side-effects
- ☐ 2 - Low support to positive side-effects
- ☐ 3 - Medium support to positive side-effects
- ☐ 4 - High support to positive side-effects
- ☐ 5 - Very high support to positive side-effects

Please argue shortly on this and provide figures (in any):

If you need more space, just extend this text box

* A Side Effect is an effect that is secondary to the one intended. More in general, "Side effect" is synonymous with "externality" and is related to the cost or benefit that affects a party who did not choose to incur that cost or benefit. Although the term is predominantly employed to describe adverse effects, it can also apply to beneficial, but unintended, consequences of a specific action. Within the scope of this analysis, we focus on **positive side-effects** or **co-benefits** that could attain from the application of specific biomethane-related measures, **e.g.: higher economic growth, improved competitiveness and productivity of other sectors other than biomethane; creation of new jobs; improved work environment; improvement of energy security, health etc.**

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ANNEX C - Questionnaire on Context Variables

Name of the POLICY

Market dimension

1. Interest from investors. Which is the level of interest from Research/Industry/Private sector to invest in biomethane? [0-5]

- ☐ 0 - None
- ☐ 1 - Very Low
- ☐ 2 - Low
- ☐ 3 - Moderate
- ☐ 4 - High
- ☐ 5 - Very High Interest

Please argue on this:

If you need more space, just extend this text box

Effectiveness dimension

2. Readiness of the regulatory framework . To what extent is the policy integrable/interoperable with existing regulatory framework*? [0-5]

- ☐ 0 - Not at All
- ☐ 1 - Very Little
- ☐ 2 - Little
- ☐ 3 - Somewhat
- ☐ 4 - Substantially
- ☐ 5 - To a Great Extent

Please argue on this:

If you need more space, just extend this text box

*Evaluating the extent to which the regulatory structure of a country is able to accept and integrate a certain policy (and eventually adjust it so that it does not conflict with other policies already in force) is determinig factor. This should be estimation of the level of integrability of the policy with the existing regulatory framework of the reference country under assessment. High values mean that the regulatory context is flexible enough to easily embed the policy in the national regulation system.

Ecosystem dimension

3. Stakeholders Acceptance. Would the policy be accepted and well recieved by the relevant stakeholders and key players of biomethane and other involved sectors (producers, consumers, network operators, inhabitants, farmers, energy utilities, cities administrators, citizens, etc.)? [0-5]

- ☐ 0 - Definitely Not
- ☐ 1 - Probably Not
- ☐ 2 - Possibly
- ☐ 3 - Probably
- ☐ 4 - Very probably
- ☐ 5 - Definitely

Please argue on this:

If you need more space, just extend this text box

Time dimension

4. Government Stability. How would you define the government stability in your country? [0-5]. The government durability and frequency of regime transitions are important factors: the more a country is likely to change government, the lower is the potential for successful implementation of a policy over time, that risks to be utterly forgotten in the transition from one government to another.

- ☐ 0 - Completely unstable situation
- ☐ 1 - Frequent changes and government transitions
- ☐ 2 - Slightly unstable situation
- ☐ 3 - Moderately stable situation
- ☐ 4 - Very stable situation
- ☐ 5 - Extremely stable and reliable government

Please argue on this:

If you need more space, just extend this text box

Side-Effects dimension

5. Responsiveness to Plans and Institutional Priorities. To what extent would the policy be considered among the top politica/institutional priorities (in terms of responsiveness to institutional needs and political will)? [0-5]

- ☐ 0 - None
- ☐ 1 - Very Low
- ☐ 2 - Low
- ☐ 3 - Moderate
- ☐ 4 - High
- ☐ 5 - Top Priority

Please argue on this

If you need more space, just extend this text box

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ANNEX D – Barriers, Targets and Results. Overview by country

Advanced Countries

AUSTRIA:

The former Austrian government published the **#mission2030** as their climate and energy strategy which outlines visions for Austria to become climate neutral. The defined goals also fed into the Governmental Agreement of the current government (published beginning 2020): - By 2030, Austria should have 100% renewable electricity (nationally, on balancing level). - By 2030, 45-50% of renewable energy in the gross final energy consumption. - The development of **a greening-the-gas strategy** is deemed necessary: fossil methane shall be partly replaced by r**enewable methane, hydrogen and synthetic methane from renewable electricity, a GO system shall be established**. - There is a 5 TWh renewable gas target (hydrogen, biomethane, syngas) by 2030. - A Green-Gas-Quota for gas suppliers is under consideration. - Focus on energy efficiency: primary energy consumption should be reduced by 25-30%. - Sector coupling to make use of energy storages beyond electricity storages. - Transport sector will be based on the principles 'avoid, switch, improve' and will focus on e-mobility. - So-called lighthouse projects are envisaged: lighthouse 7 is concerned with renewable hydrogen and biomethane. Moreover, the Austrian National Energy and Climate Plan (NECP) sets out national strategies in five dimensions: decarbonisation, energy efficiency, security of energy supply, internal energy market, Research & innovation & competitiveness.	**National Policy targets**
Barriers on further developments in the biomethane sector are identified in: - **Lack of Regulation** Currently, there are no direct national incentives for biomethane. There are Feed-in tariffs for renewable electricity from biogas and biomethane transported via the grid, according to the Austrian Renewable Electricity Act (Ökostromgesetz, ÖSG 2012). The Renewables Expansion Act (Erneuerbaren Ausbau Gesetz, EAG 2021) presents investment subsidies for the conversion from biogas to biomethane and for the installation of new biomethane plants. The government also envisions a green gas quota for gas suppliers whose implementation will require an additional green gas law which is not yet in place. - **Not one common documentation system for Renewables** Austria depicts the example of having different registries interacting on the national market to cover different purposes of biomethane application purposes. Apart from the Biomethane Registry Austria covering the confirmation for feed-in tariffs for renewable electricity from biomethane, the Environmental Agency (UBA, Umweltbundesamt GmbH) operates the national registry for sustainable biofuels (elNa). The regulator (E-Control)	**Problems & Barriers**

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has been appointed as issuing body for gas Guarantees of Origin for the purpose of consumer disclosure according to Art 19 RED II. Each registry operates based on a separate IT-system, which requires interconnection via sophisticated processual and technical solutions as any possibilities for double counting must be prevented. AGCS is dedicated to elaborating collaboration agreements and interfaces with all existing registries in order to prevent any multiple counting of renewable gas volumes and to allow for a transparent and secure exchange of data and information concerning renewable gases in Austria. - **Unclear policy targets** There are no direct subsidies for renewable gas. The market development is stagnating because of insecurity due to lack of clear directional guidelines. There are several subsidies and strategies for e-Mobility. Biomethane and renewable gases miss such a status.	
- **Interlink of Registries in Austria** Thanks to REGATRACE, the AGCS Biomethane Registry has a boost in resources and available data and can thus act more focused on the building of linkages and interfaces between existing national registries established for different purposes in Austria. It is a common goal to harmonise processual and technical systems between those registries in-line with European standardisation processes elaborated within the REGATRACE project to reduce multiple counting of the same renewable gas volume. - **European Market integration** Within the REGATRACE Project, several registry systems in Europe have been established and connected to international transfer hubs enabling cross-border ownership transfer. Thanks to WP3, AGCS supports the integration of new registry members and organisations mandated to operate national registries and integrate them into the European market. - **Knowledge base** REGATRACE enables efficient knowledge transfer between countries through the creation of documents with a wide range of stakeholders. The REGATRACE document packages have substantially supported registry establishment in particular in Lithuania and Slovakia and are subject to exchange during project meetings in target countries. - **REGATRACE Network** AGCS has joined the REGATRACE Network. The other Austrian operators were invited to join, and Austrian stakeholders are informed. Thanks to the REGATRACE Network Meetings, AGCS receives relevant policy updates, information, and access to opinions of representatives of different sectors (biofuel sector, GO issuing bodies, etc). Relevant network information and market and policy updated can easily be forwarded to the registry users, which are the following (as of July 2022): 14 Biomethane production plants, 12 biogas power generator plants, 9 registry users/traders and 10 auditors. - **Sector coupling** Thanks to the resources of REGATRACE WP4, non-technical and administrative barriers for sector coupling have been elaborated. The results are being discussed with Austrian stakeholders to enable future	**Results achieved thanks to REGATARCE**

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implementation of sector coupling processes. This includes energy conversion from electricity to renewable gases.	

ESTONIA:

The Renewable Energy Directive (RED II) requires all EU Member States to ensure that 14% of the energy used in transport comes from renewable sources by 2030. Estonian National Energy and Climate Plan (NECP 2030) defines that the renewable fuels share is aimed to be covered with locally produced biomethane and sets the target to produce yearly up to 340 GWh of biomethane by 2030. In order to achieve that, Estonia has a support measure for biomethane producers until the end of 2023 (Biomethane Market Development Support Act). The national transport sector obligations of market participants to supply renewable fuels and reduce greenhouse gas emissions have created market demand for renewable energy, including biomethane.	**National Policy targets**
Estonia already has a biomethane registry, but barriers for the development of the sector include fluctuating gas price, limited number of CNG stations and limited choice of gas vehicles. Also, high biomethane production cost as well as poor availability of waste feedstock in Estonia. Moreover, limited grid infrastructure availability is a barrier for new projects. New potential biomethane producers are not very eager to invest in biomethane production because the subsidy scheme ends in December 2023. To secure cash flow to biomethane producers, there is a national transport sector offsetting platform established that will replace the administrative biomethane production support scheme with a market-based mechanism. The Europe-wide market will also create new opportunities for Estonian producers.	**Problems & Barriers**
REGATRACE project has increased the readiness for cross-border exchange of biomethane guarantees of origin by providing an overview of the existing approaches in the European renewable gas market and proposing solutions for market harmonisation. With improved understanding of the European renewable gas market developments, potential producers are more convinced to invest in the biomethane market.	**Results achieved thanks to REGATARCE**

GERMANY

In Germany, very ambitious goals have been established at national level for what concerns the penetration of renewable energies in different sectors. Biomethane could play a key role in the achievement of most of them, as shortly reported below: • Share of **renewable power** of 65% in 2030 (in the current coalition agreement 80% until 2030) ➢ The contribution from biomass shall be stabilised at 42 TWh in 2030 • Reduction of greenhouse gas emissions in **transport** by 40 to 42% by 2030 in comparison to 1990 ➢ share of 0,7 % advanced biofuels in the transport sector in 2025 • Reduction of greenhouse gas emissions in **agriculture** by 31-34% from until 2030 (climate protection plan 2050), compared to 1990.	**National Policy targets**

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• Reduction of GHG emissions in the energy sector by 61 to 62% by 2030, compared to 1990.
  • By 2050, the primary energy demand of buildings is to be reduced by 80 percent compared to 2008. (coalition agreement 50% of renewable energies until 2030).
  • By 2030, the GHG emissions in the building sector are to be reduced by 66 to 67% compared to the emissions in 1990.
 	
The Coalition Agreement of the new federal government aims to work on a sustainable biomass strategy.	

For what concerns biomethane sector, several barriers are hampering its development: • The maximum bid price for renewable power from biomass is about 40% lower than the feed-in premium that was paid for biomethane in 2014. As a result, there is only very little interest from biomethane projects to participate in the tender for biomass. • From 2020 onwards, the feed-in premium for biomethane CHP plants phases out. • Renewable heat from biomethane can only count towards the renewable heating obligation of new buildings if produced in a CHP plant. The obligation to use biomethane in CHP only reduces the economic viability of biomethane in comparison to other options. • There is no political vision strategy for the use of biogas in the short run. Regarding the implementation of RED II, no official mandate has been granted to any entity issuing gas GOs yet.	**Problems & Barriers**
The official mandate to operate the national gas GO system has not been granted yet. However, thanks to the REGATRACE project it will be possible to provide the competent body who will receive the mandate with guidelines and documents which support the establishment of a national gas registry.	**Results achieved thanks to REGATARCE**

Target Countries

BELGIUM

For what concerns legislation on biomethane, the three Belgian regions (Flanders, Wallonia and Brussels Region) are considered as -the competent entities. However, where it concerns renewable fuels, the federal authority is responsible. For hydrogen (both renewable and low carbon), it is still unclear from a legal point of view if this is a federal or regional responsibility. Therefore, in the following, a policy overview (for biomethane) is provided for both for the federal and regional authorities separately.

Federal level

The Belgian federal authority is only competent for renewable fuels used in Transport. In 2022 the revision of the relevant laws has been initiated to implement the RED II rulings on renewable fuels in Belgian Law and Fluxys as	**National Policy targets**

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REGATRACE representative contributed to the stakeholders review of the proposals. Until now only the law on sustainability criteria for renewable fuels is in force as from 2022.	
The main barrier for renewable fuels for Belgium is the fact that biomethane produced in Belgium, although it can be exported via the registries to e.g., Germany or the Netherlands is not illegible for the supplier quota and obligations (RED II or national). This is not only a barrier for Belgium but the protective rules in many countries (although system are connected) in reality de-incentivize cross-border trade.	**Problems & Barriers**
What are the positive results for Belgium related to the REGATRACE objective 1. The Belgian federal decree on sustainability has been published on 14th February 2022 related to REDII sustainability criteria for biofuels and GHG reduction of the FQD directive. The registration system for biofuels (federal authority health) allows registration of Bio-CNG and bioLNG in BE and in doing so for fuel suppliers to answer to the 6% GHG reduction target from the FQD. This has been accomplished via consultations between the responsible federal authority (FPS Health) with Fluyxys (as REGATRACE representative) and the concerned stakeholders. Especially the possible issues on single use identified in in the relevant REGATRACE work packages have proven to be of interest. The biofuel registry of FPS health also allows biofuels to imported or exported from some member states (e.g., Germany) 2. The Belgian transport fuel law related to the RED II target for biofuels (%) is still under revision and is planned to be published end 2022. It will allow fuel suppliers to use bioCNG, BioLNG as advanced biofuels (double counting) for their obligation as from 2023. Fluxys (as Regatrace representative) has contributed to the consultations with the responsible federal authority (FPS energy) as to ensure that this can lead to an incentive for production of bio-CNG and bio-LNG 3. Finally, FLuxys LNG (part of Fluxys) developed in 2020 a scheme for bio-LNG at its Zeebrugge LNG Terminal certified under ISCC EU (EU recognized voluntary scheme for EU compliant biofuels). The scheme and its bio-LNG has also been accepted by the federal authorities for the Belgian fuels supplier to be accounted for in their obligations (FQD and RED II) as an advanced biofuel. **What is not (or to a lesser extent) realized** 1. Due to the fragmentation of the systems and competencies in Belgian the regional GO system is not linked with the biofuel registry and a number of issues remain unsolved. a. It is impossible to ensure single use as there is no information exchange (or link) between the federal biofuel registry and the regional GO system(s) b. The methodology to determine the amount of renewable injected energy is different and even if systems where connected it would	**Results achieved thanks to REGATRACE**

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be very difficult to match produced batches. Although Fluxys as a REGATRACE representative for Belgium has pointed this out to both the federal and regional authorities, a solution on the short term is not envisaged, unless the union database UDB will provide a solution.	
Flanders	
In the region of Flanders, there are no explicit regional targets set out. Nevertheless, there is only a limited investment support for Biomethane upgrading (as outlined in the table below).	**National Policy targets**
The main barrier for biomethane in Flanders consists of the very limited support or incentives. Today the Flemish government is mainly focussing on biogas used to produce green electricity in a local CHP. In this respect operational support is granted by VEKA (Flemish energy and climate agency) for direct use of biogas in CHP. For biomethane upgrading there was a limited investment support possible viaa tender process, but this support is now put on hold by the government. Still, indirect investment support for the treatment of municipal waste from OVAM (authority responsible for waste in Flanders), can be used (only by municipal waste companies) to develop waste treatment in combination with a biomethane installation. The support for green electricity lasts 15 years and many of the existing plants (representing 1.4 TWh) are coming to the end of the support period by 2024. Only completely new build plant (digester+ biogas CHP) can receive new green electricity support, but not many producers are willing to demolish their existing digesters and rebuild from scratch. Additionally, the level of support of this scheme for such new installations is lowered as from 2023 by VEKA. Consequently, most of the producers whose digesters can continue to operate for another 10 – 15 years are looking at biomethane upgrading as an alternative. However, in absence of a balanced support scheme for Biomethane upgrading, the existing 2 TWh biogas (currently produced today) risks to completely fade out by 2030. **Other barriers lay in the regulation on digestates** and permitting (especially for manure) which put additional financial burdens on the sector while creating obstacles for commercialization of the products (e.g., bio-fertilizers). Concretely, the recent Nitrogen Decree in Flanders has made this burden even heavier for producers using manure, while this feedstock is very abundant in Flanders. In general, Flanders does not yet fully recognize the additional benefits of biogas/biomethane upgrading enough to be convinced to activate the sector sufficiently to maintain its current production or even increase the production, knowing that the current 'easy to get' potential in Flanders is around 7 TWh, which would already answer to around 50% of the CO2 emission quota of the region.	**Problems & Barriers**
What are the positive results for Flanders related to the REGATRACE objective 2. The development of guarantees of origin (compliant to REDII), was already	**Results achieved**

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initiated in August 2019 with the publication of the new Flemish energy decree. However, the GO system for registration of the Belgium production - which should be AIB based following decision of VREG (Flemish regulator) - was developed beginning 2020 by Fluxys based on information already available in relevant REGATRACE work packages. The registered biomethane is then made available in the already existing system for GOs for electricity of the VREG for trading and consumption. One of the upcoming challenges is how to make the GO exchangeable between the Belgian regions and in a next step with the adjacent member states.

3. Another important development in Flanders was the realization of a ruling by VEKA to allow biomethane for ETS as from 2022. Fluxys (as an industrial stakeholder and REGATRACE partner for Belgium) contributed to this development, with its acquired know-how from the relevant REGATRACE work packages. This ruling allows to import biomethane from certain member states, the latter being decided by VREG.

thanks to REGATARCE

What is not (or to a lesser extent) realized

1. Exchange of GOs in Flanders is limited to member states that are using the EECS -AIB rules. Consequently, import of GOs from the adjacent countries (NL, FR, DE) is not possible, as they are ERGaR based. Also, the fact that in Wallonia (nor in Brussels) there is not yet a system developed for GO's (compliant RED II), biomethane GOs cannot be exchanged in Belgium between the regions
2. There is a realistic potential of 15TWh for injectable biomethane in Belgium of which 45% in Flanders. Yielding this potential would, in an important way (more than 1.2 mioton CO2eq/y), contribute to the CO_2eq climate objective of Flanders. However current barriers (difficult permitting and lack of an adequate activation scheme) will not allow this potential to developed in the Flemish region. Several Belgian studies (Gas.be (incl. Fluxys), Valbiom, Biogas-E) as well as the positive results of the Regatrace work packages have not yet been able to fully convince the Flemish government to activate this biomethane potential (mainly manure) in Flanders.

In the following table, the only (direct) measure for biomethane upgrading currently in force in Flanders is reported.

Name	Type	Description
Vlaams Energiedecreet van 8 mei 2009, artikels 8.3.1 en 8.4.1	Investment support	Every year (in some case twice per year) a **tender process** is launched by VEA **for biomethane upgrading**. A producer can receive **up to max. 1 M€ of investment support**, limited to between 45% (for large companies) to 65% (for small companies) of the CAPEX for biomethane upgrading

Wallonia

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In Wallonia, like in Flanders, there are no explicit targets but there is an indirect support mechanism for CHP using biomethane.	**National Policy targets**
Wallonia has a support scheme for Walloon biomethane used in a Walloon CHP. Initially Wallonia only had a support system (AGW 2001) focused on biogas to be used in local CHPs receiving green (electricity) certificates. To avoid the phase-out of the existing biogas plants – with the adaptation of the related decree in March 2018 - the Wallonian government extended this support satellite CHPs connected to the natural gas grid. These certificates also reward the level of CO2eq emission reduction of the biogas plants and the support last for 20 years. CHPs using biomethane produced in Wallonia as a primary fuel can receive in average 2.5 times more certificates than for burning natural gas. The height of the support depends on the value of the green certificate and amounts to around 65€/MWh biomethane today. With this additional income the CHP company can pay the biomethane producer for the needed premium for its biomethane. For the smaller agro-producers Wallonia has also set-up a minimum price guarantee of 40-50€/MWh, but this measure is not yet in force, as the European commission still evaluating if this support should be considered as state- aid, in which case it would not be legally compliant. The minimum price guarantee cannot be cumulated with the CHP support mechanism. If the satellite CHP purchases biomethane outside Wallonia, it cannot receive the additional support and is considered as a CHP using natural gas. **The barriers on use of digestate and permitting are limited.** For digestates mainly barriers related to the EU rulings for digestate (e.g., biofertilizer) and besides long duration of the permitting process, there are fewer permitting barriers compared to Flanders. Also, Wallonia does not have cope with a nitrogen issue.	**Problems & Barriers**
What are the positive results for Flanders related to the Regatrace objective 1. 55% of the realistic potential of 15 TWh for injectable biomethane in Belgium or 8 TWh can be produced in Wallonia. Yielding this potential will, in an important way (more than 1 MioTon CO2eq/y), contribute to the CO2eq climate objective of Wallonia. The Wallonian government already recognized the benefits of biomethane through its existing support scheme for CHPs on the gas grid using biomethane. However, the budget for new plants under this scheme (as determined in Walloon law) comes to end in 2023 2. However, due to recent specific results in a number of Belgian studies from Gas.be (incl. Fluxys,) Valbiom, Biogas-E as well as in the relevant Regatrace work packages, Wallonia wants to investigate how it can deploy the full potential. In this respect it has recently expressed its interest in launching a project in 2023 to explore how it can create the adequate externalities and support that can further develop the sector. The REGATRACE project results will further give the right information for the region of Wallonia in the development of a realistic roadmap that would support policy makers in the decision-making process for biomethane market development. **What is not (or to a lesser extent) realized**	**Results achieved thanks to REGATARCE**

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1. The development of guarantees of origin via the system of "l*abel de garanti d'origine* (LGO)" is only usable for CHPs in Wallonia as support is only received when using these LGO. The Walloon system has its merits, but it is not fully compliant with the RED II and is not yet supported by an electronic GO system for trading. The Government is looking to develop a new GO system and will most likely base such system on the AIB rulings (as in Flanders). This would at least allow GO's to be exchangeable between Flanders and Wallonia.

2. As the Walloon industry is also looking to use biomethane for ETS, Fluxys (Regatrace partner) and other stakeholders have initiated consultation with AWAC (Walloon Climate agency) on recognition. This has led to a firm willingness of AWAC to develop a solution by 2023, and to do so it will also concert with VEKA in order to have aligned rules in both regions.
3. Another important contribution expected from the REGATRACE project is to apply in Wallonia for CO_2eq calculations the RED II methodology, knowing that Wallonia has its own CO_2eq methodology. Although this methodology is used for allocation of the existing support scheme, for any new activation scheme the RED II(I) methodology should be envisaged

In the following table, the only (direct) measure currently in force in Wallonia is reported.

Name	Type	Description
"29 MARS 2018. — Arrêté du Gouvernement wallon modifiant l'arrêté du Gouvernement wallon du 30 mars 2006 relatif aux obligations de service public dans le marché du gaz, l'arrêté du Gouvernement wallon du 30 novembre 2006 relatif à la promotion de l'électricité produite au moyen de sources d'énergie renouvelables ou de cogénération et l'arrêté du Gouvernement wallon du 23 décembre 2010 relatif aux certificats et labels de garantie d'origine pour les gaz issus de renouvelables"	Indirect support to CHP using biomethane from the Grid	The support for biomethane is created indirectly via an **increased support mechanism for satellite CHPs on the natural gas grid using biomethane**. This has **to be proven via a guarantee of origin** (called "l*abel de garantie d'origine or LGO*"). The producer is paid through a B2B contract with the CHP company (in relation to the additional support the CHP company receives) for the premium it needs to cover the costs of production of its biomethane. A minimum price guarantee for 'smaller' producer is still under evaluation with the European commission for approval.

Brussels

As there is no biogas/biomethane production in Brussels, its legislation does not provide for a biomethane GO. However, revision of the Brussels energy decree has started, in an attempt to provide for a RED II compliant biomethane GO.

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Although Brussels plans for a municipal waste plant producing biogas and possibly biomethane, it will be mainly dependent on import of biomethane GO's, which due to lack of a system (and system choice) is still not be possible. In this respect the Brussels government seems to be awaiting the final outcome of the RED III to eventually develop an electronic GO system for green gasses. Most likely an AIB based solution will be chosen

Finally, there is possibility for a CHP to run on biomethane and receive more support, but it is not clear how this should be proven, and it has not yet been attempted by a CHP.

In general, it was very difficult to set-up consultations with the Brussels government and regulator as the topic of biomethane is not a priority and consequently the contribution of the REGATRACE work packages (up until now) was very limited.

- **CZECH REPUBLIC**

In the Czech Republic, the only policy targets for biomethane are set by the new Act on Supported Energy Sources (Act on RES) which brings an obligation to ensure a minimum amount of advanced biomethane in natural gas for transport purposes: **0.5%** from 1 January 2023 (approximately 8 GWh*) **2%** from 1 January 2025 (approximately 41 GWh*) **40%** from 1 January 2030 (approximately 1 620 GWh*) *) estimation based on the predictions of the natural gas consumption in the transport sector by Energy Market Operator (OTE)	**National Policy targets**
The main reason for the Czech Republic's lagging behind in the development of biomethane is **legislative barriers**. After the adoption of the amended Act on Supported Energy Sources (Act on RES) in September 2021, biomethane promotion, certification and Guarantees of Origin issuing will be possible from 2023. However, the implementing legislation is still under development. Also due to the exemption for landfilling bio-waste that will expire in 2030, there is currently not high demand for organic waste treatment as well. And, also, the **removal of technical barriers** (especially the required value of combustion heat) remains a crucial point.	**Problems & Barriers**
Within REGATRACE project the following legislation to enable the issuance of Guarantees of Origin for biomethane and hydrogen has been developed: ▪ the Act no. 165/2012 has been amended – this will enable the Biomethane, and Hydrogen GO to be issued from 1st January 2023 ▪ A new decree on guarantees of origin, which will be the implementing legislation of this law, is currently in the approval process. It should be effective from 1 January 2023 and completes the legislative package necessary to start issuing GOs.	**Results achieved thanks to REGATRACE**

Name	Type	Description
Act no. 458/2000 Coll. Energy Act	-	Introducing an obligation to purchase of the production pipeline by the distribution system operator from the manufacturer of biomethane –

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		under the condition of a tender for a building contractor
Act no. 165/2012 Coll. on Supported Energy Sources	Green Bonus, Guarantees of Origin	▪ The Act introduces a Green Bonus for advanced biomethane; ○ The Amount of Green Bonus will be determined by ERO (no more than five times the average market price of gas on the intraday gas market organised by the market operator, determined as the average of the annual weighted average prices for each completed calendar year over the last three years.) ▪ Guarantees of Origin (from 1st January 2023) ○ Will be eligible for producers that do not receive Green Bonus ○ issuing body - OTE, a.s. (Operator of Energy Market) ○ only for biomethane injected into the NG DS
Operational Programme Technology and Applications for Competitiveness	Investment support	Support for the transformation of existing biogas power plants into biomethane plants and the construction of new biomethane plants (purification of biogas to natural gas quality, its carburation, measurement of biomethane quality, compression and data transmission), including their connection to gas networks and/or local infrastructure
State Environmental Fund	Investment support	▪ Operational Programme Fair Transformation ○ Development of clean energy and energy savings ○ In the regions affected by heavy industry and mining ▪ Operational Programme Environment ○ Increase the share of material and energy recovery of waste

- **IRELAND**

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In Ireland, important steps concerning the development of biomethane sector are very close to being achieved, in particular: - Inclusion of agriculture and biodegradable material sourced biomethane in the National Energy and Climate Plan 2021-2030 due to be submitted by Irish Government to EU Commission by 20th December 2019. - Amendment of Climate Action Plan (national policy document) in the current review for 2020, with biomethane from agriculture & biodegradable material sources having accurate data, implementation of a Renewable Heat Obligation Scheme by 2023, under REDII (Article23) an obligation on shippers/suppliers, and Marginal Abatement Cost Curve (MACC) that reflects the factual costs of carbon abatement of agricultural sourced sustainable biomethane. -	**National Policy targets**
The current barriers and constraints identified by Irish Government to the Renewable Gas Forum Ireland (RGFI) in supporting an indigenous biomethane industry are as follows: **EUROSTAT** – (SHARES) being able to account for the GHG/carbon intensity savings in the national GHG inventory, from sustainable biomethane. **Cost of technology** – Irish Government is using the MACC[10] to establish cost of GHG emissions abatement. The Climate Action Plan quoted that agriculture sourced biomethane had a MACC of €377/t CO2, which is referencing the use of micro algae to produce biomethane. RGFI is reporting a MACC range of between €78 to €150/t CO2 for biomethane from various scenarios. **Who pays?** – the Irish Government is seeking to establish who will pay for the support scheme required for biomethane. RGFI has proposed to socialise across all gas consumers through a Renewable Heat Obligation Scheme (RHO) to bridge the funding gap and to support sustainable biomethane at the point of production. Consuklatation across Government and a Public consultation has been carried out on the Implementation of a RHO to support sustainable biomethane production, say 2.5TWh by 2030. Once the RHO is implemented beofre 2023, the targets and level of support required will be subject to annual reviews by an industry steering group. **Sustainability** - Irish Government wants to ensure that the biomethane produced from agriculture based sustainable feedstock, such as Multispecies Sward (MSS) and animal slurry is compliant with REDII sustainability and GHG emissions reduction criteria. This substrate mix has not been used in many cases and there is an absence of real evidence to demonstrate its suitability. There are a number of scientific papers which calculate an exemplar LCA. However, there are a number of variables inputting to the LCA which can produce a range of GHG value end results. RGFI is advising Producers to obtain certification from the existing approved certification enitites in EU Voluntary Schemes such as ISCC/RedCert/BetterBiomass and accreditation is recognised by Global and EU Commission, as authorities on this matter. This will validate the sustainable production of biomethane, the only renewable energy in Ireland to do so. RGFI recognises the vast potential to decarbonise the difficult sectors of agriculture, transport and heat.	**Problems & Barriers**

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Results achieved thanks to REGATARCE

REGATRACE contributed to the achievement of the following results:
The Shared Vision for renewable gas industry in Ireland has emerged from extensive consultations and collaborative work led by RGFI, through industry partnership, and as part of the REGATRACE Project, to create an Integrated Business Case for biomethane, sustainable agriculture feedstock, standardised cross border trading platform for biomethane, and Guarantees of Origin, with a common set of key attributes and market demand for sustainable biomethane and other renewable gases in Europe.
Inclusion of biomethane in the Climate Action Plan 2021 and National Development Plan, NECP target of 1.6TWh per annum by 2030. Highlighting the potential and opportunities for Ireland and the roadmap for sustainable biomethane in Ireland, with direction on policy and how to support.
Biomethane has a key role in decarbonising the Irish economy, being recognised as a "Zero emissions gas" adding to competitiveness and sustainability, addressing the difficult sectors to decarbonise.
Harmonisation of Tariffs, with biomethane given priority, providing a clear pathway for access to renewable gas, in the immediate term promoting Biomethane, medium term perhaps utilising some capacity for hydrogen and longer term, Carbon Capture and Storage.
the standardization and simplification of recognising the GOs (CoOs) across MS and establishing minimum sustainability criteria for biomethane production.
Recognising the advantages of achieving the highest carbon intensity savings possible. Inclusion of biogenic CO2 would be a distinct advantage.
Definition of green hydrogen, biological sources.
Distinguish and define acceptable green gases from renewable sources.

As said, there are no supporting measures on biomethane currently in force in Ireland, however the Climate Action Plan 2021 does recognise Biomethane as a zero emissions renewable gas and Government have carried out a Public Consultation on a Renewable Heat Obligation Scheme to be implemented by 2023. In the following table, some details are reported on the Climate Action Plan 2020-2030 that is currently under review and will include interesting implications for biomethane.

Name	Type	Description
Climate Action Plan – 2020-2030 National Energy & Climate Plan 2021-2030	Support Scheme Renewable Heat (SSRH) and/or Renewable Heat Obligation Scheme (RHO)	The Irish Government is seeking to establish **who will pay for the support scheme required for biomethane**. RGFI has proposed to **socialise across all gas consumers through a Renewable Heat Obligation Scheme (RHO) to bridge the funding gap and support biomethane at the point of production**. We proposed that the Renewable Heat Obligation Scheme is in place by 2023 and support the target of 1.6TWh in sustainable biomethane production, by 2030. Once the biomethane industry reaches a level of maturity, it would be appropriate to consider an auction process and ensure competitiveness in production of sustainable biomethane. RGFI believes that the Renewable Heat Obligation Scheme be instrumental in supporting and delivering 1.6TWh of biomethane per annum in Ireland by 2030.

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Renewable Heat Obligation Scheme		The Renewable Heat Obligation Scheme would fund the Contract for Difference on a fixed price at the point of production allowing for the variations to whole price of gas and value of the GOs over time. The biomethane support scheme would be for a 15-year term.

- **ITALY**

In Italy[15], the growth of RES has been supported by different mechanisms and significant revisions occurred over time, in particular in the bioenergy sector. In order to comply with the **10% EU RES target in the transport sector**, Italy introduced, through the regulations implementing Directive 2009/28, a **quota obligation of biofuels for suppliers of petrol and diesel from fossil sources**. The obligation can be met by acquiring, in whole or in part, the equivalent quota or corresponding rights from others, buying the so-called Biofuel Certificates (CICs). It is relevant to say that a **mandatory quota for "advanced biofuels" has been introduced**. Advanced biofuels are produced from materials listed in Annex 3 of the Decree and include agricultural and industrial wastes (apart from UCOs and animal fats), residues, ligno-cellulosic materials, cellulosic materials and algae. The measure specifies that the **mandatory quota for advanced biofuels must be fulfilled for 75% by biomethane and for 25% by other advanced biofuels**. The respective shares will be reviewed every two years. IN March 2018, a Decree on biomethane to be used in the transport sector as an advanced biofuel, with a production target of 1.1 bcm of biomethane per year, was issued (see table below). A new biomethane incentive scheme is expected in the last four months of 2022, with the aim of reaching a production of approximately 4 billion cubic meters per year by the end of 2026. The new Decree will be based on Feed-in-Tariffs and Premiums granted to producers that will produce biomethane also for non-transport end-use applications. The new decree also envisages the introduction of the Guarantees of Origin of biomethane.	**National Policy targets**
Initially the Italian strategy for the development of the biomethane sector was based on the production of advanced biofuel supported by the Consumption Release Certificate (CIC) allocations scheme and on the sale of biomethane at market price (Italian PSV index). The fluctuating trend of the natural gas market (negative peak of 0.05 euro / cubic meter in summer 2020 and positive peak higher than the euro per cubic meter in 2022) has slowed down investments. Moreover, the decree of 02 March 2018 did not allow the sale of biomethane between Italy and other countries. At present, in Italy the mechanism of the Guarantees of Origin of biomethane has not been introduced and a Register has not yet been created.	**Problems & Barriers**

[15] IEA, "IEA Bioenergy – Country Reports. Italy – 2018 Update.", September 2018

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Thanks to the REGATRACE project it was possible to start a dialogue among the stakeholders in the biogas, biomethane and natural gas sector (transport and distribution, sales for the transport sector, natural gas vehicles, etc.), and policy makers, especially on the issue of raising the percentages of advanced biomethane to be released for consumption, on the use of biomethane in maritime transport and on the adoption of the Biomethane Guarantees of Origin. Both the increase in the percentages of advanced biomethane to be released for consumption and the use of biomethane in the maritime shipping sector have already been achieved, respectively in 2020 and 2022. The Guarantees of Origin will be introduced by the new biomethane decree expected in the last quarter of 2022.	**Results achieved thanks to REGATARCE**

Details on the Italian Decree on biomethane are reported in the table below.

Name	Type	Description
Italian Biomethane Decree	Feed-in premium (FiP)	The Italian Government issued the Decree of the Ministry of Economic Development of March 2nd 2018[16], introducing a support scheme for biomethane injected into the natural gas grid and for advanced biofuels to be used in the transport sector. The measure specifies that the **sub-target for advanced biofuels** must be fulfilled for **75 by biomethane** and for **25% by other advanced biofuels**. The respective shares will be reviewed every two years. **The Decree applies to production plants starting operations between 2018 and 2022**, and to plants already supported under the Ministerial Decree 5 December 2013, that opt for the provisions of the new Decree. The scheme is also open to existing plants for the production of biogas, which is converted, partially or totally, in plants for the production of advanced biomethane between 2018 and 2022. **Only biomethane injected into the natural gas grid can access to the support mechanisms**. Grids are all the networks, transport and distribution systems, including: transport and distribution networks of natural gas whose managers have an obligation to connect third parties, other transport networks, transport systems using cylinder trucks, natural gas distributors for transports, even if not connected to the networks of transport and distribution The Decree provides measures for: Biomethane injected into the natural gas grid without a specific intended use; Guarantees of Origin Biomethane injected into the natural gas grid to be used in the transport sector

[16] Ministerial Decree on the promotion of biomethane and advanced biofuels in transport for the period 2018-2022, IEA

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		Advanced biomethane injected into the natural gas grid with the obligation to connect third parties to be used in the transport sector Advanced biofuels, different from biomethane The biomethane promotion scheme is based on the **allocation of certificates of release for consumption** (*"Certificati di Immissione in Consumo di biocarburanti"*, better known as "CIC") **to be provided by those subjects who release non-renewable fuels for consumption**. The number of CIC that they are obliged to hold must be sufficient to cover the share of energy corresponding to the obligation to release for consumption of biofuels, which is determined every year. As a basic rule, one CIC is assigned every 10 GCal of biomethane produced and released for consumption to the producers; the CIC is assigned every 5 GCal if the biomethane derives from biogas produced by particular matrices (Annex 3 to the Ministerial Decree of 10 October 2014). Once an installation has entered into service and has successfully passed the qualification process at the designated public company (GSE - *Gestore Servizi Elettrici*), the CIC allocation period is not subject to time limits and is available until the compulsory quota mechanism for biofuels is operational. Moreover, the Decree provides incentives for biomethane injected into the natural gas grid and for advanced biofuels to be used in the transport sector.

LITHUANIA

Lithuania's national Climate change plan sets the goal for 2030 to reach 5,2 percent of biomethane and hydrogen in final fuel mix for transport. Ministry of Energy have set a target of 950 GWh biomethane consumption in transport sector until the end of 2030. Although biomethane potential is seen in transport sector, there is chances that biomethane could be used in other sectors as well, for example ETS system. Alternative fuel law sets obligations to natural gas fuel suppliers to ensure that biogas or non-biogas gas fuels from renewable energy sources sold shall account at least 4.2 percentage points in the total energy value of natural gas in 2025. This value shall be increased steadily each year until 2030 when it will reach at least 16.8 percentage points. However renewable gas fuel suppliers can supply renewable gas for the transport sector and receive fuel statistics unit which can be sold to liquid fuel suppliers who have obligations already from 2022.	**National Policy targets**
Key barriers for potential biomethane producers are long permitting procedures and NIMB effect with the local communities.	**Problems & Barriers**

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Although there is investment support for biomethane production but biomethane production on commercial terms is non-redeemable. The potential biomethane market and biomethane price is still unknown in national market. Potential investors also identify expensive and sometimes complex and challenging connection to transportation grid process.	
Thanks to REGATRACE project national biomethane stakeholders were gathered into the workshops to discuss and set Lithuania's biomethane vision and roadmap. Vision and roadmap will help to navigate in national biomethane market development process. REGATRACE project also highly contributed developing national GO registry IT system.	**Results achieved thanks to REGATARCE**

In the following table, an overview on the measures currently in force in Lithuania are reported.

Name	Type	Description
NRA Tariff scheme for biomethane producers	Feed-in Tariff	Feed in Tariff is in place since 2012, but **never applied as there are no biomethane production in Lithuania and the tariff scheme has not yet been agreed with EC** as part of renewable support scheme.
Law on Renewable Energy of the Republic of Lithuania	-	**40% discount for biomethane plant connection fee** (to apply which has yet to be agreed with EC as part of renewable support scheme).
Investment support from National Climate Change program	Investment support	**15 million EUR were dedicated for 8 biomethane production plants or biogas upgrading facilities.**
Investment support from Recovery and Resilience Facility	Investment support	**2022 – 2026 22 million EUR investment support for biomethane production plants or biogas upgrading facilities**

- **POLAND**

The biogas sector is subject to several regulations, one of them is the Energy Policy of Poland until 2040 (**PEP2040**). According to PEP2040, the biogas sector will be playing an important role in increasing the flexibility of the new system as a means of gas storage and increasing Poland's energy security. According to the approved **PEP 2040**, 10% of gaseous fuels transported via gas grids should be renewable and low-emission ones in 2030. According to the Polish National Energy and Climate Plan (**NCEP- 2021-2030**), the following targets are set on the share of RES in the gross final energy consumption: - 15% in 2020 - 21% in 2030	**National Policy targets**

The Act on biocomponents and liquid biofuels – *amendment 19-07-2019 - introduced, among others, new biofuels like biomethane and biohydrogen for fulfilment of national indicative target (NIT, in Polish NCW).*

The draft "revision the Act on biocomponents and liquid biofuels and certain other acts" dated on 11.02.2022 propose:

- *14.8% target for renewable energy in transport in 2030 - 10% from biofuels and 4.8% from electricity,*
- ***3.5%** share of advanced biocomponents (biofuels), **including biomethane for transport,***
- *add new energy carriers in NIT (national indicative target): recycled carbon fuels and gaseous biofuels,*
- *minimum share of biomethane in the NIT realization: **1.75% (obligation for refineries to produce biohydrogen with biomethane instead of natural gas)**.*

The amendment of the RES Act (March 2022)

The changes (chosen) included in the draft RES Act stimulating the development of the biomethane sector:

- introduction of a definition of biomethane, - changes were also introduced in the Act of April 10, 1997 - Energy Law in the scope of the concept - gas fuel;
- extending the area of activity of energy cooperatives with the possibility of producing biomethane;
- introducing a guarantee of origin for biomethane and extending the scope of the subject register of guarantees of origin to include data on guarantees of origin for biomethane;
- change of the definition of gaseous fuels in the Energy Law.

Problems & Barriers

The decarbonisation of transport and the fulfilment of EU requirements concerning share of RES in transport in RED (10% in 2020) and RED II (advanced biofuels) are the main issues to be addressed in Poland and today there are some difficulties in pursuing and achieving these ambitious objectives that would facilitate the uptake of the Polish biomethane market.

Current barriers to the development of biomethane in Poland are still the lack of final regulations in the law, both administrative and regulatory ones, as well as determined support from government for their development. As for today, there is a lack of both operational and expected subsidy support.

In the development of biomethane, the biggest technical problem is still the aspect of connection to local gas networks. The high cost of connecting to the gas network and the problems of obtaining connection conditions, as well as the waiting time for connection, are the most serious technical barriers to the development of this technology. There are high expectations for bioLNG projects, where the product is received by the customer's tanker trucks.

Results achieved thanks to REGATARCE

Knowledge base

REGATRACE resulted in significant knowledge transfer between experienced countries with significant biomethane development and countries still planning biomethane development, like Poland. Especially important for our country was knowledge concerning registries and GO for renewable gases, UPEBI shared this

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knowledge with potential issuing bodies (URE, KOWR) and potential owner of registry (TGE) by dedicated webinars. It was very important for them as their knowledge about biomethane was limited. For TGE especially useful was training on IT system prepared by Austrian partner for testing building of registry of biomethane GO.

Based on REGATRACE knowledge base (deliverables, presentations from workshops and webinars as well as discussion and meetings with partners) UPEBI was pushing discussion about biomethane registry and content of biomethane GO within stakeholders' groups formed by Ministry of Climate.

REGATRACE Network

UPEBI has joined the REGATRACE Network. The main Polish stakeholders (TGE, URE) were invited to join, and national stakeholders were informed about this activity. Thanks to the REGATRACE Network Meetings, UPEBI has received relevant policy updates, information, and access to knowledge and opinions of representatives from different sectors from other countries (biogas and gas sector, GO issuing bodies, etc). UPEBI was sharing this knowledge with national stakeholders e.g., within REGATRACE participatory and target workshops.

Feasibility study for real, existing biogas plant

Thanks to REGATRACE project UPEBI has conducted feasibility study (based on guidebook prepared by EBA, project partner) for upgrading existing agriculture biogas plant to biomethane producing unit. That document will be used for further promotion of building biomethane market in Poland.

In the following table, a list of measures in support of biomethane sector in Poland are reported.

Name	Type	Description
Energy Act (amendment from January 2010**)**	GC	So called "brown certificates" were introduced for agriculture biomethane injected to national gas grid; in practice were not applied as price for green certificates and co-generation certificates was higher so there was no interest in biomethane investment. Moreover, this support has not yet been agreed with EC as part of renewable support scheme.
RES Act *(Amendments in 2019)*	Tender, FiT, FiP	RES Act is the main Polish act defining support system for electricity and heat production from RES as well as for agricultural biogas production. There are defined technology baskets and depending on the scale of technology different types of support for 15 years are possible (tender, FiT or FiP).
Tax Act 2019	Fiscal incentives	CNG, LNG, biomethane, biogas, hydrogen – zero excise tax from 14 August 2019 for use as transport fuel
National Framework for Alternative Fuel Infrastructure Development Policy (2017)	-	Definition of alternative fuels including natural gas CNG (biomethane), LNG, LPG, hydrogen etc. **Requirements concerning location of alternative fuels infrastructure**

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The amendment to the Act on Electromobility and Alternative Fuels (2021)		Requirements for local municipalities to ensure that the share of **zero-emission buses or buses powered by biomethane** in the vehicle fleet in use is 5% (in the period from 1-01-2021 to 31-12-2022), 10% (in the period from 1-01-2023 to 31-12-2024) and finally 20% (in the period from 1-01-2025). Gas system operators are required to provide CNG / LNG refueling points in agglomerations and along the TEN-T corridor

SPAIN

The Biogas/Biomethane Roadmap of the Spanish Ecological Transition Ministry sets a target of 5 TWh of biomethane over gas consumption by 2030 (aprox 1,7% over 300 TWh of gas consumption).	**National Policy targets**
The main barrier in Spain is the lack of support to the development of biomethane market (production and consumption). Thus, it is necessary to implant: - political and legislative support - economic/financial mechanisms to support and promote biomethane market: possibility of economic incentives for producers of biomethane to compensate for the difference between the cost of producing biomethane and the cost of conventional natural gas (Feed-in tariffs, Feed-in premiums; Fiscal incentives; Direct subsidies). - certification system (Guarantees of Origin) Gas sector tax revenues are implemented for environmental protection (example: green cent in Spain), but they should be used to decarbonize the sector itself, instead the electricity sector as it happens today.	**Problems & Barriers**
The Biogas/Biomethane Roadmap of the Spanish biogas/biomethane sector (REGATRACE Roadmap) sets a target of 30 TWh of biomethane over gas consumption by 2030 (aprox 10% over 300 TWh of gas consumption). In line with the REPowerEU. REGATRACE impact has been very positive, as the discussions were not limited to one-way discussions with the project leaders, but interactive sessions in which stakeholders (public and private actors with different visions and perspectives) contrasted with each other. These contacts and the cooperation between all stakeholders help to see the point of view of all parties and all aspects (such as waste, digestate, technology, biomethane purchasing or permitting legislation or gas regulation) making it possible to have a complete and accurate view. Contributions both to remove barriers and to establish ways to promote and incentivise this sector. Biomethane plants in Spain:	**Results achieved thanks to REGATARCE**

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2012: first biomethane plant – Valdemingomez [Organic Municipal Solid Waste]
In the last 12 months, 4 new biomethane plants injecting into the Spanish gas grid have been commissioned:
JUN-2021
ELENA biomethane plant was commissioned.

- Location: Parc de L'Alba of Cerdanyola - Barcelona
- Energy injection into the NEDGIA gas grid: 12 GWh/year
- Origin: Landfill

https://www.europapress.es/economia/energia-00341/noticia-naturgy-realiza-primera-inyeccion-gas-renovable-vertedero-red-distribucion-espana-20210610103342.html

SEP-2021
UNUE biomethane plant was commissioned.

- Location: P.I. Villalonquéjar – Burgos
- Energy injection into the NEDGIA gas grid: 20 GWh/year
- Origin: Agroindustrial

https://www.diariodeburgos.es/noticia/ZD8A756CE-BC3E-36C0-E7A667C9FDA7F8DA/202111/la-primera-planta-privada-de-biometano-de-espana-en-burgos

DEC-2021
TORRE SANTAMARIA biomethane plant was commissioned.

- Location: Vallfogona de Balaguer – Lleida
- Energy injection into the NEDGIA gas grid: 30 GWh/year
- Origin: Livestock

https://www.energias-renovables.com/bioenergia/la-granja-torre-santamaria-comienza-a-inyectar-20220207

JAN-2022
EDAR BENS biomethane plant was commissioned.

- Location: Bens – A Coruña
- Energy injection into the NEDGIA gas grid: 5 GWh/year
- Origin: Waste-water treatment plant

https://www.farodevigo.es/sociedad/2022/02/03/residuo-recurso-gas-fuente-renovable-62008717.html

Name	Type	Description
Royal Decree 376/2022	GO	Ministry mentioned the entity responsible for the GO registry system

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ANNEX E – Description of Rules and Recommendations reported in D4.3 – "Harmonised set of rules for the conversion of electricity to biomethane/renewable gas and hydrogen GO"

Harmonised rules are essential for a functional market for guarantees of origin that facilitates cross-border transfer from nationally governed GO systems. Harmonisation enables trust with regards to imported GOs from other countries and enhances efficiency in the management of the GO system.
This deliverable recommends harmonising the following rules for handling guarantees of origin in relation with energy carrier conversion.

Rule 1. Cancelling GOs for input energy carrier
For issuing GOs for energy produced following Energy Carrier Conversion, GOs of the input Energy Carrier are to be cancelled to prove the energy source of the energy produced in the energy conversion. There are exceptions rules for voluntary equivalent of a GO and for inputs of energy carrier produced onsite.

Rule 2. Issuing new GOs after energy carrier conversion
Following Energy Carrier Conversion, new GOs may be issued upon request, on condition that the origin and other Attributes of the Input Energy Carrier are documented adequately, in accordance with the rules in previous sections.

Rule 3. GO conversion requires physical energy carrier conversion
GO Conversion Issuance is subject to physical energy carrier conversion.

Rule 4. Cancel only GOs of the same energy carrier as the physical energy input into conversion
For cancellation, only GOs of the same energy carrier as the actual energy carrier of the input into the conversion device shall be allowed.

Rule 5. Measuring output energy from conversion
The amount of energy output from the Energy Carrier Conversion shall be measured, for an according number of GOs to be issued

Rule 6. Measuring input energy into conversion
The amount of energy input into the Energy Carrier Conversion shall be measured, for determining the number of GOs to be cancelled in accordance with Conversion Issuance.

Rule 7. Proportional allocation of attributes from input to output GOs
The proportion of measured input that is covered with cancelled GOs, determines the proportion of output for which corresponding GOs can be issued. The Attributes that are conveyed from the cancelled input GOs to the newly issued GOs after conversion, are carried forward in the same proportion, at least for the Attributes informing about the energy source.

Rule 8. GOs are primarily to inform about the energy source
Energy source is the minimum information to retain from cancelled GOs to newly issued GOs

Rule 9. Full chain data traceability
Registries shall keep track, for a period of minimum three years, in relation with every conversion device, of the information on the cancelled GOs for every batch of issued GOs. This enables to back-track original energy production. Particularly, in case of error-handling and double counting suspicion, such information is likely to be helpful.

Rule 10. Information on a Cancellation Statement used for Conversion Issuance
The cancellation statement for the cancelled input GOs for conversion issuance shall record that the corresponding GOs have been cancelled for the purpose of energy carrier conversion. It shall also identify the Conversion Device and the period of energy consumption in which the new Energy Carrier is produced.

Rule 11. Data on newly issued GOs for output of Energy carrier Conversion

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- The Energy Source of the cancelled GOs as an input to conversion is to be recorded on the new-to-be-issued GOs. In case of multiple energy sources of inputs, these shall be distributed to the new-to-be-issued output GOs pro rata these energy sources on the input GOs.
- While the Purpose of GOs is Disclosure, the Purpose of the certificate following Conversion Issuance shall remain the Purpose recorded on the cancelled GOs for the Input Energy Carrier. No certificate with the purpose of Disclosure shall be issued following Conversion Issuance if the correspondingly cancelled certificates for the input energy carrier did not convey this same purpose to be Disclosure.
- The new GO issued following Energy Carrier Conversion shall inform that the GO was issued as a result from Energy Carrier Conversion (conversion-tag).

Rule 12. Attributes on newly issued GOs needing dedicated attention

For determining the following Attributes of the new GOs issued for the output of Energy Carrier Conversion, data from the cancelled GOs for the conversion input is recommended to be used:

- Label/independent criteria scheme: the label scheme operator may decide to use information of the cancelled GOs in order to judge the eligibility for its label for the output GOs to be issued after conversion. A GO following conversion only receives a label/ICS tag after certification by the label/ICS scheme operator.
- Carbon footprint: Where GOs are issued with carbon footprint information, it is recommended that this takes into account the information from the cancelled GOs for Conversion Issuance. As conversion usually impacts the carbon footprint, this implies adding of an additional factor in the carbon footprint calculation equation after conversion. The same methodology and supply chain scope for the carbon footprint calculation are to be applied for both the cancelled GOs for the input carrier as for the GOs resulting from Conversion Issuance, while this methodology is to be displayed on the issued GOs.
- The other Attributes to be recorded on the GOs issued following Energy Carrier Conversion, relate to the Production Device for Energy Carrier Conversion.

Rule 13. Provision of Publicly accessible information regarding national domain scheme rules

It is recommended for every issuing body to transparently publish its procedures for production device registration and inspection, account holder registration, GO issuance, transfer, cancellation, expiry, error handling, dispute handling.

Rule 14. Avoidance of double counting while acknowledging imported GOS:

Criteria for acknowledging imported GOs, in relation with avoidance of double counting, relate to:

- the processes for GO issuance (production registration, data flows, inspection, and control mechanisms); and
- the processes for GO transfer (exclude the risk of duplication during transfer); and
- the processes for GO registration and guarding over their lifetime.
- Rule 15. Transparent liability allocation
- It is recommended to transparently clarify to the parties involved along the chain of custody:
- If and how the liability of the originating issuing body and registry operator of the GOs is limited, and how risk is addressed; and
- What responsibility is allocated to any importing issuing body, registry operator of GOs and, if applicable, the organisation facilitating international transfer; and

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- If and how the liability of specific aspects of the GO system management is regulated towards the market participants / Account Holders who take part in registering, trading, cancelling and using GOs, both for intra-registry as for inter-registry transfers.

Rule 16. Ex ante check on input GO cancellation where possible, alternatively allow ex post cancellation while installing audit and enforceable penalty on fraud

Where resources allow doing so, it is recommended to cancel GOs for the input energy into the conversion device before issuing new GOs for the output generated in Energy Carrier Conversion. (ex-ante cancellation check). Where practices are not ready for performing an ex-ante cancellation check, or where they would cause an undefendable delay in the issuance process, it could be allowed to cancel GOs ex post, after the GO Conversion Issuance, on condition that a regular third-party audit (e.g., annual) checks for the correct amount of GO cancellation. High fraud detection chance and a penalty in accordance with lacking the required GO cancellation could mitigate any risk and maintain the system's credibility.

Rule 17. Classify the cancellation as "Cancellation for conversion" purpose

Cancellations of guarantees of origin are recommended to be categorised in relation with the purpose of the cancellation. When GOs are cancelled for conversion issuance of GOs for another energy carrier, this shall be registered in the type of cancellation and on the cancellation statement.

For a basic kick-off not over burdening the evolving GO system, the following recommendations are brought forward.

Kick-off Recommendation 1. New GO validity period after conversion

The validity period for GOs issued following Energy Carrier Conversion starts at the end of the production period of the new Energy Carrier.

Kick-off Recommendation 2. Plausibility check of input-output flows via default conversion efficiency factors

A sanity check is to be done regarding the plausibility to produce the reported output from the reported input.

Kick-off Recommendation 3. Conditions for using default conversion efficiency to determine the amount of input GOs to be cancelled

For determining the amount of GOs to be cancelled, if allowing to replace input energy measurement by a default conversion efficiency value to be applied on the measured output energy, this should be made subject to a framework of conditions. Such conditions are: existence of fraud detection mechanisms like dedicated inspections; and setting the default conversion efficiency value low enough, to ensure sufficient cancellation of input GOs and stimulate actual measurement but high enough to accommodate for situations with undefendable measurement cost and predictable efficiency.

Where a default efficiency value is available, it shall still be possible for the producer to prove higher conversion efficiency than the default value.

Kick-off Recommendation 4. Limitative description of data format of GOs

When aiming for facilitating a growing market towards high volume of GOs, that enables cross-border transfer between various national registries, there is a need for standardised data formats of the electronic documents that constitute the GOs. For easy ability to import GOs through a one-to-many connection, the definition of the data format should be limitative. For easy operation, the amount of data fields of a GO for the same energy carrier is recommended to be the same regardless of whether the GO resulted from GO Conversion Issuance.

Kick-off Recommendation 5. Immutability

The certificate data shall not change in any way once a GO has been properly issued, except to indicate that it has expired, cancelled, or withdrawn.

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Kick-off Recommendation 6. Limit number of Attributes to be conveyed from input GOs to output GOs

The principles of immutability, standardised data formatting and residue handling imply that for registry set-up, there is a benefit in retaining from the cancelled input GOs to the newly issued Output GOs after conversion, as little data as strictly necessary to serve the market needs. This is to ensure practical operation and not install unnecessarily high overhead cost that hamper market functioning.

Kick-off Recommendation 7. Pre-conversion info on public support: balance complexity of data handling with value for additionality evaluation

When adding information regarding the type of public support on the GO after conversion, the technical complexity of conveying pre-conversion support info should be balanced against consumer need for additionality information, and the overall value of the information. If public support has been recorded on the cancelled input GOs, either Production or Investment support, this could be carried forward as "production support" on the GOs after conversion. Alternatively, if the GO standard would comprise a parameter value for the support information stating "no public support ever granted", a rule could be installed stating that this parameter value is only allowed to be conveyed, where the cancelled GOs for conversion conveyed this parameter value "no public support ever granted". Where the conversion device has received investment support, this is to be recorded on the newly issued GOs as investment support.

As various aspects in the surrounding framework are still developing, it is proposed to evaluate these kick-off recommendations as the market develops.

Questionnaire and Feedbacks from Target Countries

In January 2022, key experts from the Target Countries have been asked to read the report and answer to a questionnaire properly created to assess the extent to which this document could be adopted in the different countries.

Main questions addressed on D4.3

- *To what extent do the recommendations align with your own vision? (Please list the reference numbers of these kick-off recommendations, for specific feedback, numbered as in pages 3 to 7 of the report?*
- *To what extent do the recommendations provide clarity that was not there before the report? (Please list the reference numbers of these kick-off recommendations, for dedicated feedback on added value?*
- *Is the logic sufficiently clear why these rules have been recommended? For which one(s) and what do you miss?*
- *Are there any recommended rules you don't agree with? Which one(s) and why?*
- *Are there any recommendations you would add?*
- *Do you feel that adopting these recommendations will help a harmonised market for certificates for multiple energy carriers? Please elaborate how this helps and/or what other needs you experience*
- *Do you feel that adopting these recommendations will help the developments in your own registry? Please elaborate how this helps and/or what other needs you experience*
- *Do you see other areas, not yet addressed in the report, that need harmonised rules for a consistent handling of conversion in the market, but where it is still ambiguous to make a clear recommendation?*

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The experts answering the questionnaire for the Czech Republic were a CNG supplier and a RES producer. All recommendations are aligned with their vision, with partial disagreement on rules 8, 11, 16, 20, and 24 respectively as follows (and needing some further clarification): - (8) Considering the complexity of attributes in the original GO, the energy source information is the absolute minimum to retain. Other attributes should be retained too. - (11) The purpose of disclosure is abundant. If there is any GO issued for the source, there should be a new GO issued for the output energy carrier; the chain of a new GO issuance should be different, and only after cancelation should the new one appears. - (16) The original GO cancelation should in fact trigger the new GO issuance. Such a scheme would inherently avoid any fraudulent behaviour. - (20) Default conversion efficiency rates need to be thoroughly evaluated for the conversion processes are relatively new technologies, exhibiting rapid development. No rigid default conversion rates should create an obstacle for newly developed technology going beyond state-of-the-art. - (24) Simple statement on 'production support' does not convey the information on the scope of such support. In such a case, marginal support yields the same information as a major investment subsidy, despite the fact that is much closer to 'no public support ever granted'. Information on given support should be kept only if the magnitude of such support is also listed. Some improvements could be useful for the rules above, in particular for rule 20 (the list of default conversion rates needs to be aligned with the latest scientific developments, and regularly updated), and for rule 24 (the information on state aid should be kept with details on the magnitude or should be cancelled altogether).	***Czech Republic***
The expert answering the questionnaire is from Gas TSO, GO Registry Issuing Body. There was a general agreement with recommendations, with some specific remarks: - Rule 1 covers scenario where no GO b/c produced on site and where no GO b/c was issued by a voluntary registry; - Rules 3, 4, 5, 6, 7: conversion is a real and tangible process where one carrier is transformed into another; there are still aspects of conversion which seem to be open for debate; more clarity is needed on the specific attributes that must be carried over from the input GO to the output GO; they must be harmonisation across the EU. - Rule 11: references to 'Disclosure' are somewhat circular in the explanation. It is partly unclear: more details on what is meant by multiple energy sources are needed, i.e., if just renewable gas or individual feedstocks.	***Ireland***
The experts answering the questionnaire were dealing with energy trading and with services in the renewable energy sector. Recommendations align with their vision. As a market is still under development, the best way to avoid blocking it is to try to make the steps simple. It is essential to create conversion tables that can be used by everyone. This would speed up times, lower costs and increase the credibility of the system.	***Italy***

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It is not clear either the measurement system or which parameters should be mandatory or recommended in the converted GO. And it is not clear how the interactions between operators will be managed (whether they will be the same national registers or other voluntary registers). Adopting these recommendations will help a harmonised market for certificates for multiple energy carriers. But rules must be elaborated, and they will have to be more stringent to avoid different behaviours between the different managers. There is a need to clarify what the rules will be and how registries from different countries will interact (who and how will handle this). Concerning other areas to address, the rules relating to the sustainability of biomass and therefore of the GOs produced must be clarified too. Rules must be established that prevent unsustainable GOs from being transformed into sustainable GOs and that prevent the import of GOs that are not allowed in certain countries: for example, if GOs from incentivized biomethane are not generated in a country, there must be rules that prevent this country from importing and using GOs from biomethane incentivized, otherwise there would be a distortion of the market and would decrease the credibility of the system and above all the growth of the biomethane sector in importing countries that do not have it yet.	
The expert answering the questionnaire was a senior engineering and technical specialist. Recommendations aligned with own vision: in particular, the most important thing is to ensure that the data is traceable and identifiable in detail as this will help, among other things, to ensure that there is no double counting. The risk of double counting is the greatest risk associated with guarantees of origin. Rules were clear, even if missing a clear indication of the relationship between guarantees of origin and voluntary certification schemes in accordance with REDII, as well as an indication on what terms biomethane will be eligible for a carbon footprint reduction, e.g., during the production of biofuels. Additional recommendation related to that could be useful. The adoption of these rules could help a harmonised market for certificates for multiple energy carriers: in particular, defining the common scope and rules for applying the guarantee of origin in the affected EU member states will certainly contribute to the organization of the biomethane market and will also constitute a common and equal support mechanism. Recommendations could help to develop the registry in Poland: the biomethane market does not exist in practice (we do not have any functioning biomethane plant yet), therefore we do not have our own experience yet.	***Poland***
The experts answering the questionnaire were from engineering companies. All recommendations aligned with their vision, with partial disagreement on rule 3 regarding the requirement of physical energy carrier, as it may generate situations where not the most efficient approach could be taken for the GO issuance. An example can be found in the situation of liquid biomethane. The document is clear and useful, as it sets a series of recommendations that the national governments should follow, harmonizing the process, and not trying to define new rules and sets of conditions every time this issue is addressed (as it is the case of the Spanish Government).	***Spain***

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