

“Publishable Summary”



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1 Publishable summary

1.1 Summary description of the project context and the main objectives

The development of hydrogen as an energy carrier will be dependent upon the capacity of the market to offer low-carbon or carbon free hydrogen to end-users and consumers. However, the production of green hydrogen and its consumption will most likely be unbundled in order to optimize its transportation and distribution, while enabling cost adequate pricing for green hydrogen. This implies that a robust system of Guarantee of Origin for green hydrogen will be needed, in order for final customers to buy low-carbon hydrogen in full transparency. The objectives of the CertifHy project are to assess the necessary market and regulatory conditions, develop the complete design, and initiate a unique European framework for green hydrogen guarantees of origin. The project will be carried out in consultation with a broad range of relevant stakeholders from all over Europe, including hydrogen producers, traders, and customers. Ultimately the CertifHy guarantee of origin scheme will facilitate the penetration of green hydrogen throughout Europe.

The CertifHy project is divided in 7 work packages. Each work package is conceived as a logical step to achieve the final objective of facilitating the creation of a European system for the generation of GoO for green hydrogen. The project will first deliver a market outlook for green hydrogen (WP1), it will then consider various options for the definition of green hydrogen, followed by a selection of the most appropriate definition of green hydrogen (WP2). In the first part, the project will also identify and compare existing platforms for GoO, which can serve as basis for defining a system for GoO for “green” hydrogen (WP3). In the second phase, CertifHy will define the new frame of GoO (WP4) and as a final step will prepare a roadmap (WP5) for the implementation of a “green” hydrogen GoO to be implemented across Europe. Throughout the project, WP6 will serve the purpose of planning, structuring, and executing shareholder consultations on the specific definition of green hydrogen, methodologies, or topics of relevance to the project, through direct engagement and consultation of relevant affiliated partners and the wider stakeholder community interested in green hydrogen production, trading or consumption.

WP7 (Project management) and WP6 (stakeholder engagement and dissemination activities) are two transversal work packages which supported the overall project delivery. WP7 concerns the general administrative activities of the project. This work package establishes the formal link with the FCH JU and coordinates internal communication activities. All financing and general reporting matters were handled within WP7.

WP1 Generic market outlook for green hydrogen

WP1 aimed to deliver a generic overview of future trends, market outlooks, application areas and segmentation for green hydrogen. The outcome of WP1 also supports the rationale for adopting green hydrogen GoOs by policy makers, by showing evidence of existing industrial

markets and the potential development of new energy related markets for green hydrogen in the EU.

As a first step, WP1 provided a literature review of existing estimates of possible market outlooks for hydrogen in Europe, in industry, energy and transport sectors. It complemented this analysis with generic estimates of market penetration for green hydrogen and its impact on the deployment of hydrogen as energy carrier. Finally, the work package provided a brief segmentation of potential customer groups addressable by green hydrogen in the short-term (industrial use), mid-term (renewable electricity storage), and longer term (transport and personal mobility).

WP2 Definition of “green” hydrogen

The main goal of WP2 was to provide a common definition of green hydrogen which can be applied to all stakeholders (market players and regulators) in the EU. In order to achieve this objective, the Consortium first analysed in detail the overall European legal and regulatory framework in this field. An extended life-cycle analysis was implemented to evaluate environmental aspects and identify methods to assess the “greenness” of hydrogen produced.

All existing and available options for defining green hydrogen have been presented during multiple consultation workshop, surveys and outreach (set up in WP6) to affiliated partners and other stakeholders, through a.o. public events, who were invited to provide feedback and engage with the Consortium. Best (and worst) practices have been identified and consolidated in a concise document, easy to be integrated in the project report. On the basis of this first consultation a hierarchy of technical options and a set of criteria for the selection of technical options were developed. Further consultations (developed in WP6) with other stakeholders (NGO’s, policy makers, etc.) have led to a wider consensus. Difficult topics (e.g. how to deal with residual mix, GHG allocation of by-product hydrogen, etc.) have been addressed by more rounds of consultation with affiliated partners, stakeholders at large, surveys within the consortia, as well as external expert advice (from various parties like AIB, RECS, Vertogas, VREG, etc.). The final definition of “CertifHy green” and “CertifHy low-carbon” Hydrogen has been endorsed by 20+ organisations, including the major industrial gas suppliers (Air Liquide, Air Products, Linde), automotive OEMs (Toyota, BMW, SymbioFC), Utilities (Uniper, EDF, etc), industrials (Colruyt Group, Akzo Nobel, Groep Machiels etc), electrolyser manufacturers (ArevaHGen, ITM Power, Hydrogenics), other stakeholders (H2Mobility Deutschland, Clean Energy Partnership), as well as policy makers, and other stakeholders link NGO’s, standardisation bodies, associations, etc.

WP3 Review of existing platforms and tracking systems for GoO

The objective of WP3 was to review all past and existing initiatives to set up GoO systems, particularly on-going and failed initiatives to certify green electricity, green gas and bio-fuels. This resulted in a set of principles and requirements for the new system for guarantees of origin for green hydrogen. Composed of four tasks, WP3 reviewed and compared existing platforms and tracking systems for guarantees of origins, comparing the different systems,

analysing strengths and shortcomings, and extrapolated the main technical and legal aspects. It analysed all interactions between existing GoOs and green hydrogen, benchmarking existing GoO schemes in Europe with schemes in other similar areas. The results of WP3 have been validated by a number of stakeholder interviews.

WP4 Definition of a new framework of guarantees of origin for “green” hydrogen

The goal of WP4 was to provide a comprehensive definition of a new framework of GoOs for “green” hydrogen. As a first step, with all the results from WP2 and WP3 fed into WP4, the main technical specifications of the framework of guarantees of origins (GoOs) was defined. The work package also defined a set of rules and obligations for the GoO including:

- methodology and certification process, agencies involved, enforcement, and controlling;
- transfer and use process, legislative, normative and regulatory aspects, etc. An impact analysis was performed to evaluate the impacts related to the implementation of the GoO of "green" hydrogen; ,
- Finally, the second consultation with Affiliated Partners was set up in WP6 and performed in WP4 in preparation for the following work package.

WP5 Roadmap for the implementation of an EU-wide GoO scheme for green hydrogen

In collaboration with Affiliated Partners and key stakeholders, the main objective of WP5 was the development of a roadmap enabling the implementation of green hydrogen GoOs in Europe. The roadmap aimed to synthesise and “initiate” recommendations of the project in practical terms. The roadmap was presented to the FCH JU and the European Commission as key outcome of the project and before finalisation, was shared with stakeholders in order for them to provide final comments as part of the final wide consultation steps set up in WP6.

WP6 Stakeholder engagement and dissemination activities

The overarching objective of WP6 was provide the means, structure and process for consultation of stakeholders and dissemination of the final project results in order to enhance the acceptability of the project outcomes and implementation roadmap. It did so by planning and executing a stakeholder consultation process that ensured a two-way engagement process between consortium members, affiliated partners and key stakeholders. WP6 also set up a project website for the dissemination of general information about the project (e.g. project description, members, agenda of events, publicly available deliverables, information and links towards other relevant GoO schemes, etc.). It established and managed an online stakeholder platform for the organisation of online workshops, which allowed stakeholders to provide feedback on the project progress and draft deliverables.

A kick-off and a final open conference presented project objectives and results to all interested stakeholders.

1.2 Work performed by the project and the main results achieved

The project CertifHy, with a total duration of 2 years (24 months), has been structured in 7 work packages. During the project the main three results have been:

- to analyse the potential market demand for premium hydrogen (WP1-Market outlook for premium hydrogen), understanding the various market players, their motivation for producing/purchasing premium green hydrogen, and assessing how the current regulation and future policy goals will affect demand for premium hydrogen. A detailed assessment has been carried out, the results have been published on www.certifhy.eu;
- to provide a common definition of green hydrogen which can be applied by all stakeholders (market players and regulators) in the EU (WP2- Definition of green hydrogen):.
- to develop a first set of principles and requirements for the new system for Guarantees of Origin for green hydrogen by reviewing past and existing initiatives to set up GoO systems, (e.g. green electricity, green gas and bio-fuels, WP3-Review of GoO systems).
- To propose a GO scheme to be endorsed by a wide variety of stakeholders
- To propose a roadmap for the implementation of the GO scheme.

The project achieved a very good endorsement level from industry stakeholders as can be seen by the graph presented below:

Signed endorsement letters

	Air Products	Akzo Nobel	Areva H2gen	Air Liquide	BMW	CCS Global Group	CEP	Colruyt	EBA	EDF	EHA	EkoEnergy	Hydrogenics	Hygear
Definitions of the two types of premium hydrogen	x	x	x	x	x	x	x	x	x	x	x		(x)	x
Guidelines for the setup of the GO scheme	x	x	x	x	x	x	x	x	x	x	x		x	x
Roadmap for the implementation	x	x	x	x	x	x	x	x	x	x	x		x	x
Participation of Stakeholder Platform			x	x	x		x	x	x	x	x		x	x
Set up pilots in which the GOs scheme can be tested	x	x	x	x				x			x		x	x
Manage / Build ICT system and registry platform														
Act as Issuing body														
Creation of EU-wide buy-in for the GO scheme and the CertifHy labels			x		x		x			x			x	x

	Hychico	H2 Mobility	ITM Power	Linde	Machiels	NEN	NG	Polito	Symbio Fuel Cell	Teesing	Toyota	UCL	Uniper	WaterstofNet
Definitions of the two types of premium hydrogen	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Guidelines for the setup of the GO scheme	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Roadmap for the implementation	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Participation of Stakeholder Platform			x	x		x		x		x			x	x
Set up pilots in which the GOs scheme can be tested	x	x	x		x	x		x					x	x
Manage / Build ICT system and registry platform						x								
Act as Issuing body						x		x						
Creation of EU-wide buy-in for the GO scheme and the CertifHy labels					x		x				x			x

1.3 Description of the final results and their potential impacts and use (including socio-economic impact and the wider societal implications of the project)

The fact that hydrogen can be produced “green” from a variety of feedstock is a major motivation and driver for the application of fuel cells for energy production and mobility and also a chance for the hydrogen-consuming industry.

However, hydrogen distribution logistics are strongly interlinked and furthermore have the objective to minimise transport distances to avoid unnecessary costs and emissions. Hence, the molecules at the end user site cannot be distinguished according to their origin. This is similar to the electric power or natural gas grids, where consequently tracking and certificate systems like RECS or the German Dena Bio-methane registry have been created in order to avoid fraud. Such a system is also needed for hydrogen once green production pathways are implemented.

The only known standard that has been established so far is the TÜV SÜD Standard “Green Hydrogen”, which defines criteria for production, handling and sales of green hydrogen, while similar schemes on a national level are being developed (AFHYPAC in France, DECC in UK, etc.). In order to uncouple production and use of green hydrogen on an international level without increasing transport distances, an EU-wide system is desirable. This will bring about the impact of creating a transparent, barrier- and discrimination-free EU-wide system on production standards for green hydrogen as well as its handling, distribution and trading. **This allows for example that hydrogen from Spanish solar energy could be used to power fuel cell cars in Sweden** by trading certificates of origin rather than transporting hydrogen over several thousand km. **The de-coupling of production and consumption through Guarantee of Origin certificates also allows the creation of new business models as GoOs could create extra revenue streams for renewable/low –carbon H₂ production units that do not require all locally produced hydrogen to be renewable/low-carbon, and hence the non-required GoOs could be sold to customers in need of such.** By that, a European certificate system for

green hydrogen will eventually foster the rollout of hydrogen and fuel cells across all Member States of the EU.

In order to achieve this goal, all elements of the chain need to be taken into account. Criteria for best practice on production, handling and transport of green hydrogen need to be defined, taking into account requirements for greenhouse gas reduction but at the same time being practically implementable along with the traditional industrial gases business. Also, a monitoring and trading system for the Guarantees of Origin needs to be set up in the most economic and practical manner, which requires a sound assessment of instruments available today (also for electricity and natural gas).

Last but not least, for the implementation of the system to be successful, buy-in of all stakeholders is required for the solution which is being developed, for which targeted communication and dissemination of the results is necessary. **In this respect, we could note that the CertifHy project has attracted much attention from the stakeholder community: the participation was much higher than anticipated, both from a qualitative as well as from a quantities perspective** which will pave the way for a roadmap to be developed after the project end.