Interreg North Sea Region
European Regional Development Fund
EUROPEAN UNION

2.0 Green transition

10-Pager

LIHYP

Linking Hydrogen Power Potentials

November 2022

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LIHYP IN A NUTSHELL

LIHYP WILL REALISE

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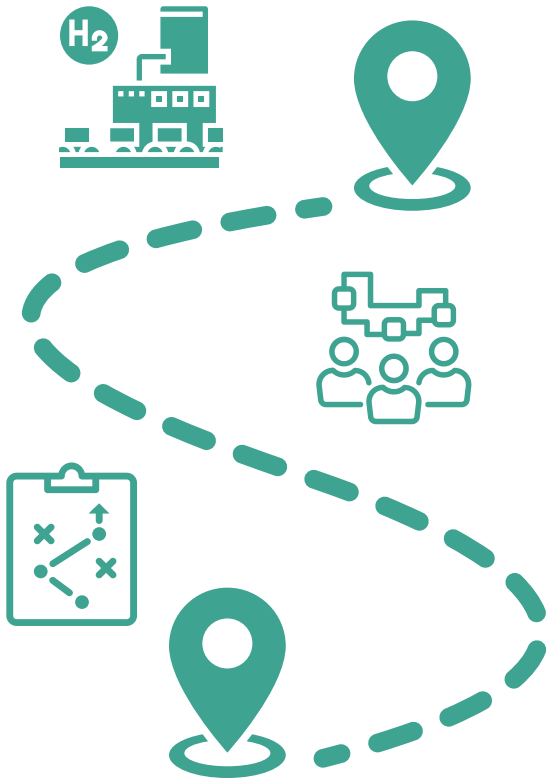
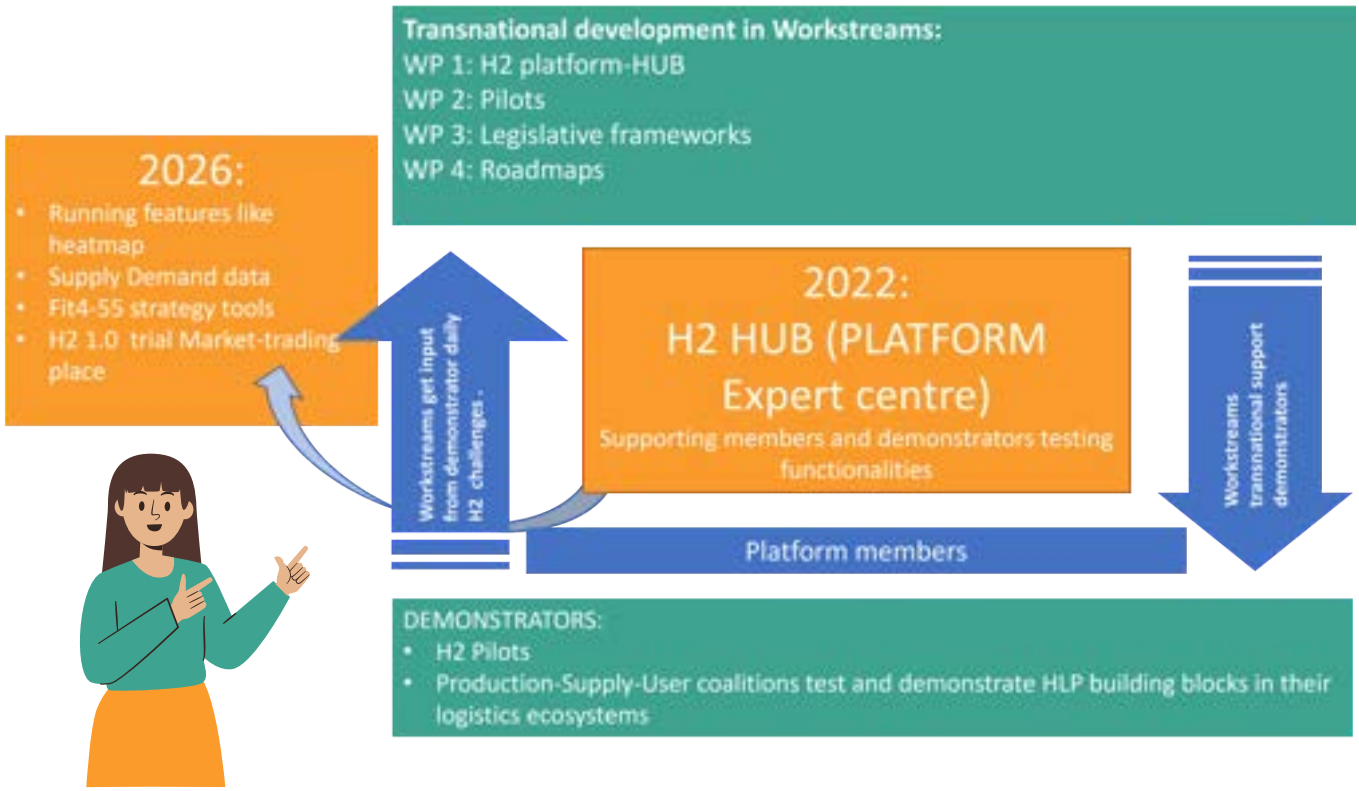
4. Steps to system integration for H2 infrastructures, harmonisation and standardization.
5. Promote incentives for H2, contribute to level playing field with fossil fuels.
6. Commit LIHYP partners and her associates (about 2000 SMES) to Fit-for-55 targets by drawing up and communicate local-regional-NSR (H2) roadmaps/strategy plans till 2030, based on predictive data analysis.
7. Entrepreneurs, investors and public authorities using roadmaps for business modelling to plan NSR investments and capacities.
8. H2 demonstrators to learn from, showcase and promote H2 applications.





LIHYP – Flow Chart

LIHYP – PILOT – BENTHEIM (DE)

Hydrogen driven freight train in the cross-border region DE/NL

The transportation of goods always connects to the emission of greenhouse gases. Different approaches exist to reduce these emissions, for example the combination of different transport solutions (train, truck, barge&ships, aircraft) or the usage of "green" driving technologies like battery electric vehicles.

Though transporting goods via train has generally a low CO2 footprint, freight trains often use diesel engine, since not every track and especially freight railway stations are not fully electrified – and cross border transport even on fully electrified tracks is not always possible. Therefore, alternative driving solutions are necessary for transporting goods without the emission of greenhouse gases on railways – especially in international context.

But what is necessary to run a cross-border freight train on hydrogen? What are the technological challenges, what is the most feasible way for hydrogen supply and what synergies can be generated in the region?

Within the pilot, these questions will be answered and the foundation of deploying hydrogen driven freight trains in the cross-border region Northwest Germany – Northers Netherlands will be laid by performing an in-depth analysis of economic and ecologic feasibility. Beyond the project itself, the results will help other pilots to be implemented more easily and the first steps to CO2-neutral freight trains can be made.

LIHYP – PILOT – GENT (BE)

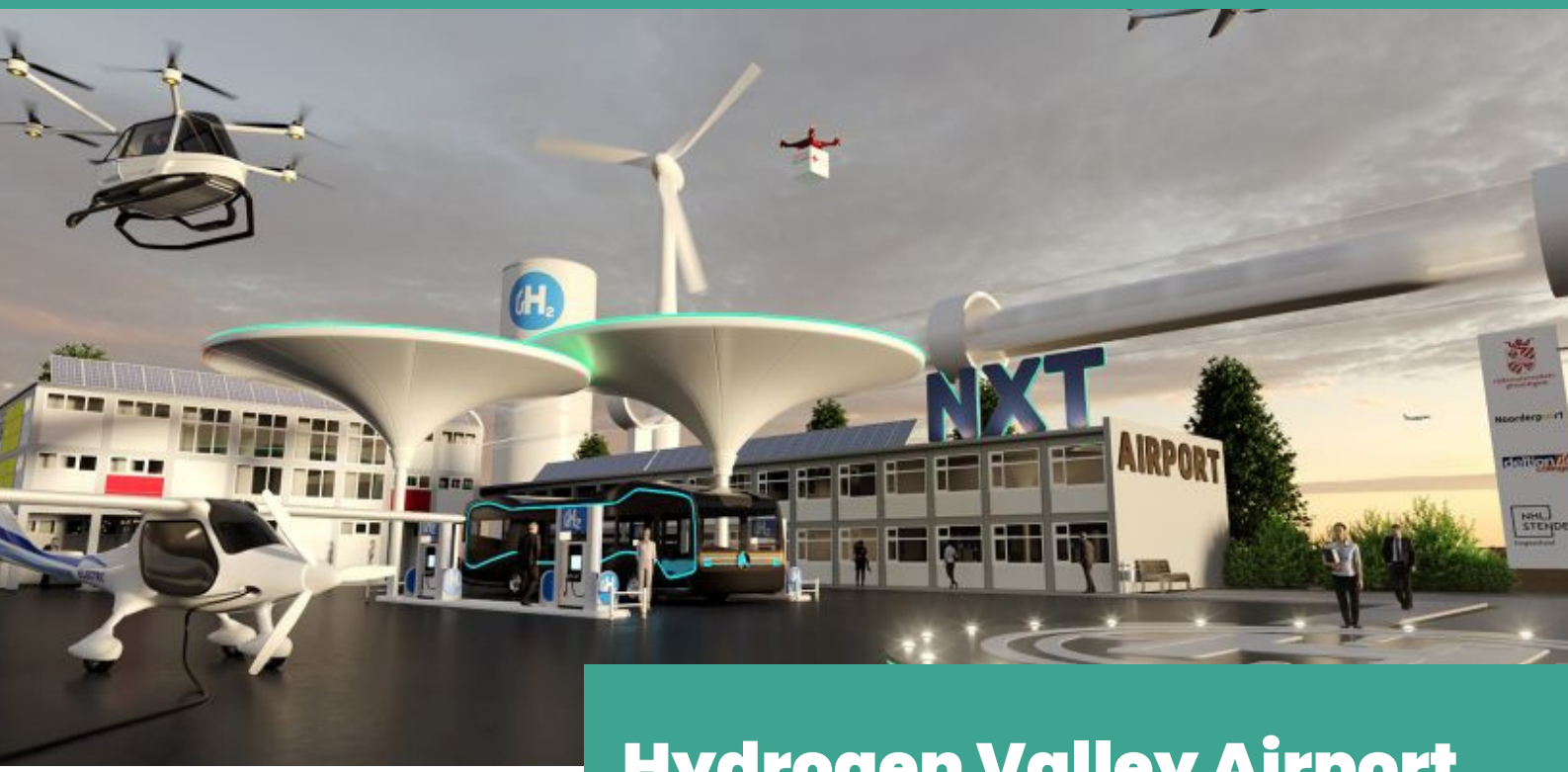
Living Lab Belgium

Usecase Living Lab Belgium : On site surplus power will be stored in an urban barge for movable energy supply + test CHP unit for power and heat production.

Concept:
The principle of cogeneration or combined heat and power (CHP) is easy : residual heat radiated by an electric power generator is collected and then put to good use.
CHP is the most energy efficient transformer of stored renewable energy into useful heat and electrical power. The electrical power generator will power e-vehicles/vessels/e-cargobikes and use the residual heat for heating the building on site.
Electricity from PV (Photo Voltaic Panels) is used for small-scale local (on site) production of H2 and be used as a Smart Grid solution.

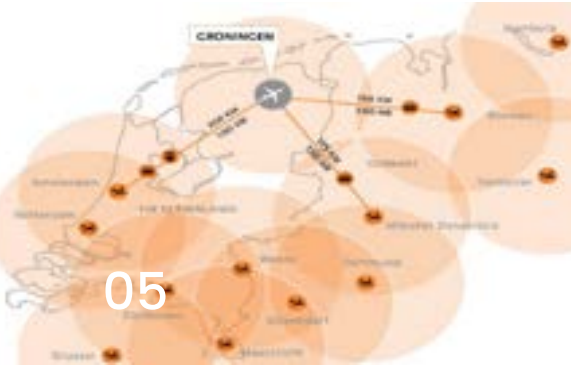
The locally stored H2 is converted energy-efficiently into electricity and heat when there is a demand for electricity (when the vessel is at the quay, e.g. during the night).
The electricity is used to charge the "floating battery" installed the vessel. The heat is used for building/warehouse heating or other heat consumers on site. The "floating battery" can be used as a mobile emergency power supply. The "floating battery" can be used additionally (if it is not sailing) together with the CHP (Combined Heat & Power) on H2 for grid support. The latter can be very important in critical situations (black out threat in crisis situations for example).
If not enough hydrogen can be produced locally (due to weather conditions), the hydrogen can still be supplied from larger production sites in Gent area along the available waterways. Alternatively, a strategic stock could be kept on site since H2 can be stored for long periods without loss of energy and is therefore extremely interesting as a strategic storage of energy.

LIHYP – PILOT – GRONINGEN (NL)



Hydrogen Valley Airport Goningen Airport Eelde

The Hydrogen Valley Airport project will focus on the feasibility of utilizing the on site-generated green solar power as feedstock for a direct coupling with an (airside) 1MW electrolyser system thereby ensuring full green hydrogen production.
Optimization and simulation studies will outline the optimal operational characteristics and the sizing of the electrolyser.
The switch towards green hydrogen will ensure the demonstration of the full decarbonization of the described airport operations (landside, airside). The green hydrogen production will be connected to a trailer fill installation to enable filling of mobile storage equipment (hydrogen trailers or cylinder racks).



This will enable the effective distribution of the green hydrogen to locations on and off site including a hydrogen refuelling station (HRS), that serves both land and airside vehicles, to be realized on or in the vicinity of the airport. Here the fuel cell electric vehicles (FCEV) can be fuelled with green hydrogen. Moreover, connections will be made to the regional hydrogen distribution system as already in place in the region developed under various EU supported projects thereby making effective use of the zero-emission infrastructure. Optimal control strategies will be developed to ensure that the energy delivery targets are reached.
Feasibility studies will be executed, and optimization and simulation models will be developed to extend the value chain by a closed loop covered walkway test/trial-installation on landside, combined with direct individual charging stations for vehicles and powering public lighting.
End goal of the project is to implement the system at a fully covered parking area. A connection will be made to the SkyNRG DSL-01 project which will produce 100.000 tons of Sustainable Aviation Fuel (SAF) at the Chemical complex in Delfzijl (province Groningen) as of 2022. This connection will ensure that the aircrafts at GRQ Hydrogen Valley Airport will have access to regionally produced SAF with clean kerosene. The bulk of this clean kerosene will be shipped and trucked via Pernis (Shell Aviation) to Schiphol Airport (not included in this project).

LIHYP – PILOT – LE HAVRE (FR)

Hydrogen Bus Station Le Havre Seine Métropole

The French pilot involved LIHYP revolves around H2 buses development in Le Havre, Normandy, France and includes CIRCOE and the local authority "Le Havre Seine Métropole."

Le Havre Seine Normandy is responsible for public transport in Le Havre. As such, it owns a fleet of 140 buses serving all of the 54 municipalities it represents. Between 2024 and 2026, LHSM plans to acquire 18 hydrogen buses and to build its own hydrogen station to supply them.

Within the same time frame, half of the fleet will be replaced in order to be supplied with natural gas.

At the end of the hydrogen experiment, LHSM that ultimately aims at a 100% carbon-free fleet will decide whether to supplement with hydrogen or not.

LIHYP is a great incentive to test this evolution towards hydrogen and to work an in-depth analysis.

It will contribute to building a business model which will include incentives, barriers, lessons learnt and future projections towards H2 local distribution and use. The project will be an opportunity to strengthen the regional chain for H2 and to develop the national and European hydrogen transport network.

As an innovation and technologies transfer centre, well rooted in Le Havre since 1992, CIRCOE specializes in Transports and Logistics, optimizing the logistics processes of the local companies. Thanks to its long-lasting experience with European projects and innovative logistics solutions, CIRCOE has built a strong regional, national and international network. CIRCOE will lead the pilot for the French region. This will entail drafting a feasibility study covering the regional hydrogen chain from producer to end-user involving LHSM, key stakeholders and clusters such as Logistique Seine Normandy (LSN). It will work on a Business model based on incentives, barriers and future evolution of regulations in the region, to collect and optimise the Data which will feed the platform. CIRCOE will propose a roadmap with future projections in the region and organise communication activities with its partners to promote the LIHYP project and the growing need for hydrogen.

Normandy is a region that is thriving with various chemical industries and Le Havre's key geographical position gives this pilot a strong incentive to accelerate the development of hydrogen in France and in Europe, also thanks to communication activities promoting the project.

LIHYP – PILOT – OLDENBURG (DE)

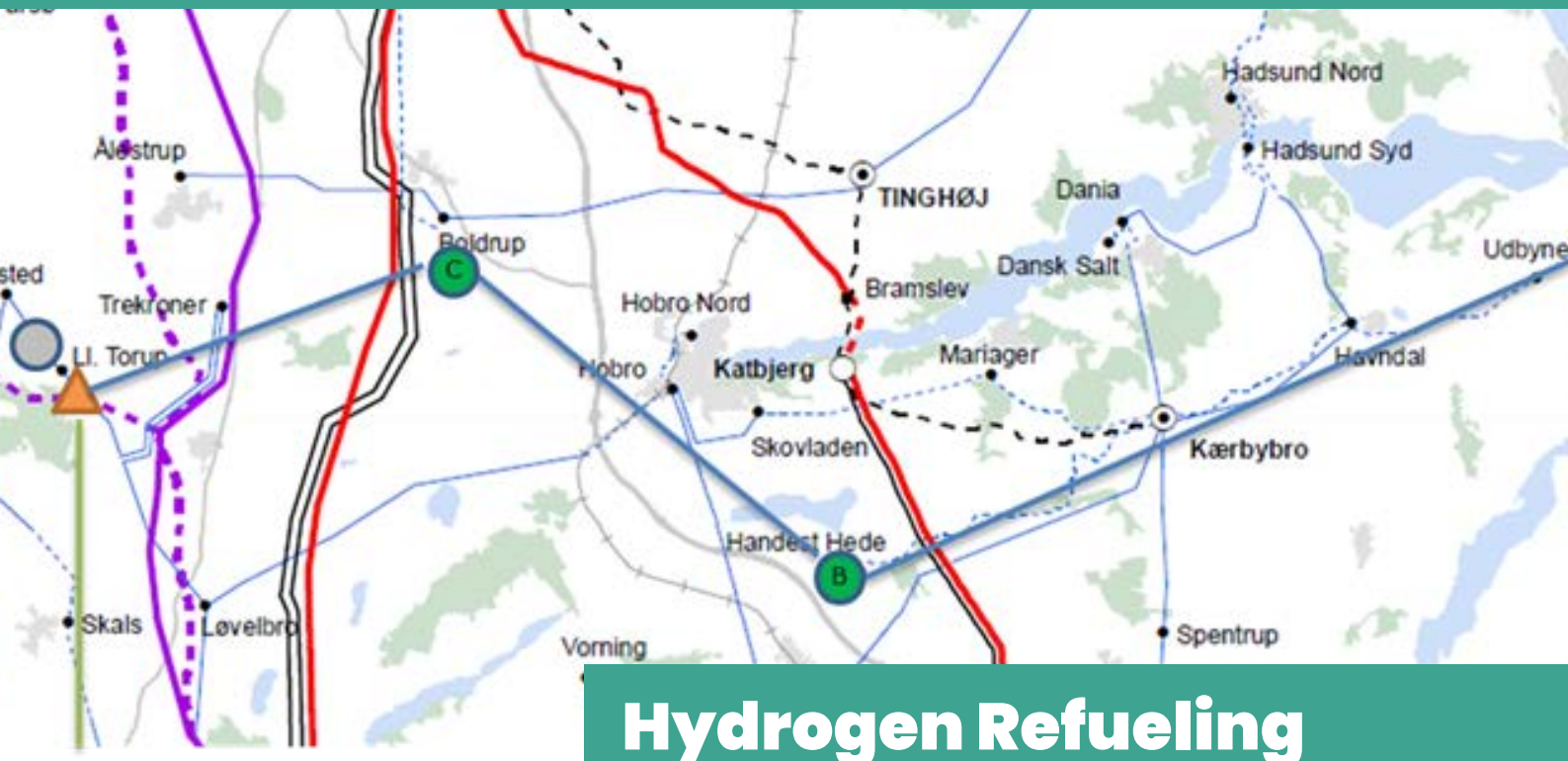
Development of a local Energy HUB for city cargo

Internal logistics with many start and stop cycles and limited accessibility through desired emission reduction measures need an energy supply that meets the operating and usage expectations of the users.
The supply of the application with green hydrogen allows the reduction of emissions and long operating times of the cargo bike.
The rapid restoring readiness will then also allow for reliable delivery in cold periods of the year with increased goods traffic.

Operation in several shifts and optimised conditions for trained staff through changing or refuelling times and heat supply for the driver of the vehicle also offer advantages here.
How can and must green hydrogen reach the customer?
How should the application be supplied with hydrogen in the best way for the user? Which requirements on the personnel and on the filling functionality have to be considered? All these questions are to be investigated in practice in the LIHYP project and provide answers to the required infrastructure and the provision of the fuel.

Fuel cell cargo bikes for inner-city logistics allow longer operating times and advantages for the operator. This proof will be investigated in the project as a technical demonstration. Both the supply of green hydrogen and the provisioning will be investigated. In addition, influences of the fuel quality and the refilling of the tanks for use in the vehicle will be conceptually and prototypically implemented. In the process, both official regulations and labour law requirements for handling hydrogen must be implemented accordingly.
In addition to the reduction of emissions and the new logistical advantages, the pilot should also be able to be recommended to other regions for as a blueprint. To this end, appropriate communication and presentation of the concept to interested parties will be promoted within the framework of the project.

LIHYP – PILOT – HANDEST HEDE (DK)



Hydrogen Refueling Station connected directly Wind/PV site

Eurowind is the owner of a large scale onshore wind/PV site, located at Handest Hede, Northern Denmark. Eurowind is currently developing a Hydrogen Refueling Station (HRS) connected directly to the Wind/PV site. The permitting application for electrolysis on site is being developed at this moment. The technical solutions for HRS are well known, but the direct connection to renewable energy sources creates the necessity for a revised design, based on the needs of the customers, which is the goal of this pilot.

The activities will include the following:
Activity 1: Techno-economic specifications
Specifications of hydrogen pressure, buffer tank size, locations/piping, connection to existing infrastructure, usage of excess heat in district heating.

Activity 2: Stakeholder study
Eurowind and Hydrogen Valley have received multiple requests from local distribution companies, as these are beginning to test hydrogen trucks in their fleet. The need of these stakeholders are key to creating the optimal system design for the HRS.

Activity 3: System integration
Optimal System Design, based on activity 1 and 2 (Wind to Truck), different scenarios can be utilized, as Eurowind is an integral partner of Green Hydrogen Hub Denmark, it will be analyzed whether to connect to the GHH infrastructure or use a closed-loop, "behind the meter" setup – or a combination, based on the delivery of documented green hydrogen following the ISO standard

LETTERS OF SUPPORT

Letter of Support LIHYP

By 2030 the European hydrogen targets set under the Fit for 55 package are clear: 40 GW of electrolysis capacity should be deployed, 2.6% of the domestic transport fuels should be replaced by renewable hydrogen related fuels, 0.7% of fuels for aviation and 50% of the hydrogen used for energy and non-energy purposes by industry should be replaced by renewable hydrogen as well. The technologies to realise the hydrogen uptake are close to the market. However, production, transport, storage, distribution and demand should be aligned at the right time and place in order to be able to result in hydrogen off-take. Therefore, regional collaborations to harmonise the lacking infrastructure, matching supply and demand and embedding the developments in regional legislative frameworks to integrate hydrogen into the existing regional energy systems is needed.

The INTERREG project Linking hydrogen power potentials (LIHYP) aims – by its 20 partners and around 2000 associated SMEs – to accelerate the development of regional hydrogen value chains, with special emphasis on the transport sector. This will be done by the realisation of a North Sea Region H2 platform-marketplace where relevant stakeholders along the value chain will be matched. Besides, regional insights will be generated on the demand, production and supply of hydrogen towards 2030, including potential shortages and surpluses. Further, focus will be on system integration of infrastructure and standardization, the level of playing field with fossil fuels, demonstration pilots to showcase and learn, and finally to develop regional roadmaps, strategies and investment plans to meet the Fit for 55 targets.

By signing this letter of support the partner confirms the importance of this project, its goals and intentions, and is willing to support it.

Name partner: TKI New Gas | Topsector Energy

Signed by: dr Jörg Gigler, managing director

Signature and Date: November 11, 2022

Reason for commitment: For the development of hydrogen it is very important that besides large scale developments also regional initiatives receive support in order to achieve CO2 emission reduction on local and regional level, to help local and regional stakeholders to become more carbon intensive, and to take solid steps in the energy transition. This project focuses on these elements. One of the many advantages of this approach is that a regional approach can be very successful for the involvement of local industries, mainly SMEs. Due to local congestion issues regarding the electrical infrastructure hydrogen is important to harvest the full potential of local sustainable energy production.

Niedersächsisches Wasserstoff-Netzwerk

Klimaschutz- und Energieagentur Niedersachsen GmbH
Osterstr. 60 · 30159 Hannover

OLEC e.V.
Marie-Curie-Str. 1
26129 Oldenburg

Letter of Support LIHYP

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Name partner: EWE

Signed by: Peter Schmidt, Managing Director of EWE GASSPEICHER GmbH

Signature and Date: 10.11.2011, _____

Reason for commitment: The North Sea region has the best conditions to become a leading region for hydrogen in the transport sector. EWE initiated and implements in a number of projects in the region, most notably our Hydrogen Valley HyWays for Future and the aspired IPCEI project Clean Hydrogen Coastline. The INTERREG LIHYP project optimally complements and supports these activities and is necessary to put the ramp-up on a broader footing.

LETTERS OF SUPPORT

University of Stavanger

Letter of Support LIHYP

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With this letter we confirm our support of the LIHYP project and the goals and intentions of this project.

Organization: University of Stavanger, Department of Energy and Petroleum Engineering

Signed by: Øystein Arild, Head of Department

Signature and Date:

08.11.2022

Reason for support: The international, European and national hydrogen investment will require international cooperation and knowledge exchange. UiS has its own agenda for hydrogen research and an interdisciplinary network that will be strengthened by close collaboration with international partnerships. The INTERREG project will develop networks and databases containing active industries and authorities. Membership in the advisory board (if the project is granted support) would give us direct access to the collected information and the network, which would facilitate future collaborations and participation in externally funded projects.

LOGISTIQUE SEINE-NORMANDIE

Letter of Support LIHYP

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Name partner: Logistique Seine Normandie

Signed by: Florence Robinet-Guentcheff – General Manager

Sign:

LOGISTIQUE SEINE-NORMANDIE
26, RUE ALFRED KASTLER
76130 MONT-SAINT-AIGNAN
Tél: 02 76 30 50 84

Reason for commitment: Hydrogen represents the future energy for Transport & Logistic's actors. They need new solutions and alternatives. As a network, we need informations et solutions for our members

HY NORTH Transformation & Coordination Office

LIHYP

Letter of Support LIHYP

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Reason for commitment:

Setting up a hydrogen economy: no one can do it alone. The challenges that arise for an individual company are complex and time-consuming. That is why HyNorth, with the support of industry, governments and knowledge institutions, will work as a chain director to boost the development of hydrogen chains in the Northern Netherlands. Market development is a key challenge in achieving the hydrogen economy. We therefore support this LIHYP initiative to develop the market place.

Name partner: HyNorth

Signed by: René Schutte **Signature and Date:** November 12th 2022

Connecting hydrogen hynorth.nl