Interreg
North-West Europe
GenComm
European Regional Development Fund

H_2GO NEWS

March 2022

Energy Sustainability gets top billing in Europe

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Thank you very much to Gencomm to give me the opportunity to share some thoughts about my first year as Interreg North-West Europe (NWE) Programme Director and the role of energy sustainability in the new Programming period.

I joined Interreg North-West Europe in September 2020, in the midst of the 2021-2027 programming preparation. The United Kingdom announced during that summer its wish not to take part in European Territorial Cooperation anymore. A blow for cohesion policy and our programme since the UK had been a historic player and a major Interreg NWE financial contributor. Past the initial disappointment, the Interreg North-West Europe actors rallied “en force” to make sure we would continue to be the leading and strong programme we had always been.

On the 10th of February 2022, Member States reached an agreement on the NWE Interreg Programme which has now been submitted to the European Commission. Our 2021-2027 programme is ambitious and creative. With its 310 million euros ERDF it remains the Interreg transnational programme with the largest budget. With new territories in Germany and the Netherlands, its outreach continues to grow and with 60% of its budget dedicated to the Green agenda, it should continue to be a favourite among sustainability stakeholders.

Promoting climate change adaptation and renewable energy, reducing all forms of pollution, furthering energy efficiency and reducing greenhouse gas emissions are key aspects in our new Programme. I can therefore only encourage all Hydrogen actors to continue considering our Programme as a valuable cooperation facilitator on green topics.

With currently six hydrogen projects worth 48.9 million euros, Interreg NWE has been a pioneer in supporting H2 as part of the EU Green strategy and is, to date, the Interreg programme with the most experience in the field. Four of these projects (H2SHIPS / H2-SHARe / FCCP / HECTOR) are implementing low carbon solutions in transportation and two (ITEG / GenComm) are facilitating the uptake of low carbon technologies.

GenComm has proven to be successful in promoting the use of green Hydrogen as an energy vector to support communities in NWE to become energy secure.

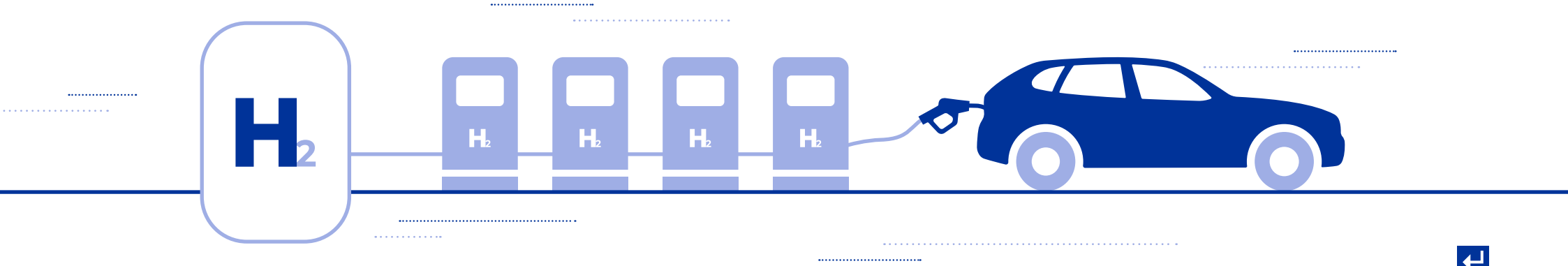
I would like to commend the hard work and promising results of the project consortium.

I hope Hydrogen actors will continue to set up such great projects and will continue to see Interreg North-West Europe as a supportive Programme.

Our first call for projects will open on **Tuesday 22 March**, a new online community tool has been created to help you network and find partners and an online event to prepare the first call will take place on **Thursday 31 March**. Everything you need to know to start preparing our first call is already on our website.

Wishing you good luck and looking forward to reading your applications!

Mathieu Mori
Director, Interreg NWE



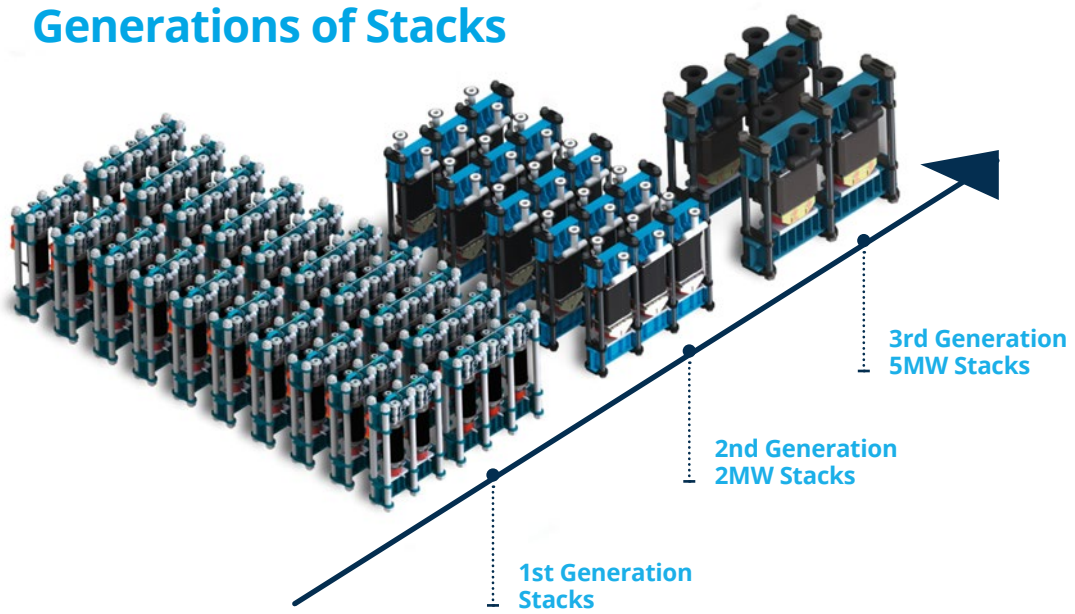
The ITM Power Electrolyser journey

ITM Power's journey mirrors the growth and development of its technology. From a small university spin-out twenty-one years ago that initially designed small green hydrogen production systems for use in homes, we have grown to become a world leader. Following an incredibly successful 2021 – in which we opened the world's biggest electrolyser factory and raised £250 million – we are in our strongest position to date.

Despite our evolution over the last two decades, our mission remains resolutely the same: to utilise and store surplus renewable energy; to decarbonise transport and industry; and to ensure we all have clean air to breathe. In order to reach net zero in a meaningful and lasting capacity, our technology will prove fundamental. Our patented electrolysers made entirely in Sheffield are based on proton exchange membrane (PEM) technology and require just renewable electricity and tap water to produce clean, green hydrogen. As water vapour is the single by-product, this is the only true zero-emissions fuel source.

Owing to the versatility of both green hydrogen and the PEM electrolysis process, our technology is ideally suited to enable decarbonisation and act as a catalyst for the green transition. The key lies in the inherent scalability of our systems. As our electrolysers are modular in design, they can be grouped together to create large-scale systems to meet the demands of carbon-intensive users (such as refineries) and store an abundance of renewables. However, simply stacking small electrolysers is inefficient and requires a greater footprint in order to house a system. We have therefore developed larger electrolysers specifically intended for large-scale projects.

10MW using different Generations of Stacks



ITM POWER
Energy Storage | Clean Fuel

REFHYNE
CLEAN REFINERY HYDROGEN FOR EUROPE

Our first generation stacks were 1MW, while the second doubled that capacity at 2MW per unit whilst reducing the footprint. The third generation went even further, creating a 5MW stack and further reducing the footprint. **Now, building a 10MW system requires only two of our third-generation stacks rather than the ten first generations needed previously**. De-risking execution of these systems is our groundbreaking partnership with world-class EPC provider, Linde. The company chose to invest in ITM Power after due diligence on the whole market. Now our joint venture, ITM Linde Electrolysis (ILE), is the benchmark of what's possible in the deployment of large-scale electrolyser systems.

The 10MW example wasn't arbitrarily chosen, instead marking a key milestone in the large-scale deployment of our technology. Last summer, the 10MW REFHYNE PEM electrolyser we built at the Shell Energy and Chemicals Park Rhineland in Wesseling, Germany was opened. **This electrolyser can produce 1,300 tonnes of green hydrogen a year, making it the largest of its kind in Europe, and the largest of its kind to be deployed on a major scale to date.**

The aim is to supply clean refinery hydrogen for Europe, significantly decarbonise one of the most carbon-intensive industrial sectors. REFHYNE II is a ten-fold increase and aims to develop a 100MW electrolyser at Shell's aforementioned park. Towards the end of 2021, the consortium secured €32.4 million from the European Climate, Infrastructure and Environment Executive Agency (CINEA) to accomplish just that.

Our 5MW third-generation stack was developed for the ongoing Gigastack project.

The project involves ourselves, Element Energy, Ørsted and Phillips 66 and aims to demonstrate that renewable hydrogen is essential to the UK's 2050 net zero greenhouse gas emission target and the decarbonisation of large industrial clusters. Renewable power is produced at Ørsted's Hornsea 2 then fed from a substation into an ITM Power PEM electrolyser to split water into oxygen and green hydrogen. The Phillips 66 Humber Refinery will then use the green hydrogen, reducing CO2 emissions.

The Gigastack

But what does all this mean for Ireland? At 13.3 metric tonnes of CO2 equivalent per person, Ireland has one of the highest greenhouse gas emissions per capita in the European Union, according to Statista. In 2020, the nation produced 32.8 million metric tons of carbon dioxide emissions. While this was a decline on the previous year – owning in large part to the coronavirus crisis – Ireland's decarbonisation journey is still ongoing. Using our technology can enable a substantial reduction in carbon emissions from large industrial applications such as energy and manufacturing – as we have already demonstrated in the UK, in Europe, and globally.

With a major bus network, Ireland also stands to make profound carbon savings where its public transport is concerned. At present, there are no hydrogen refuelling stations in Ireland. Yet hydrogen fuel cell busses have been shown to be not only the equal of their diesel counterparts, but often outstrip them in distance between refuelling. Best of all, they result in no tailpipe emissions. The beauty of an ITM Power green hydrogen refuelling station is that the hydrogen can be produced on site via a located wind turbine. Locating hydrogen refuelling stations at bus terminals will lessen the industry's need for diesel at a time when fuel costs are spiking, whilst ensuring that journey lengths and refuelling times are unaffected.

With huge potential in the floating wind power market, Ireland is poised to become a leader in renewable power. In order to nurture that growth and utilise that power, storing renewable energy needs to be a major priority. Fluctuations in wind power production and issues with grid balancing can be overcome by deploying our technology. **A PEM electrolyser takes surplus energy and turns it into green hydrogen that can be stored for months a time for use during high periods of energy demand.** To that end, we are part of a consortium behind the Oyster project to study the production of green hydrogen offshore. The aim is to demonstrate a 'marinised' electrolyser that will work offshore and along the coast, providing a robust, workable, and scalable solution for countries like Ireland with offshore resources and capabilities.

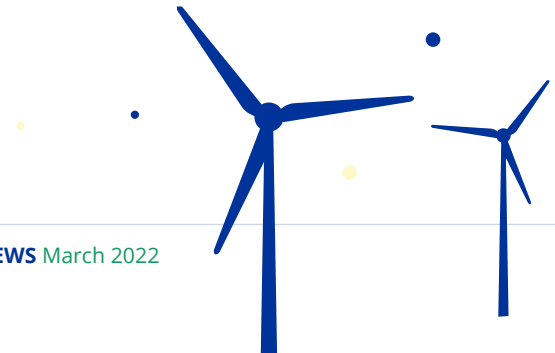
In order for Ireland to continue its decarbonisation journey and make the best use of its burgeoning wind power potential, PEM electrolysers will prove critical. With a number of major projects and partnerships to our name, and many more ongoing, we enter our 21st year of operation ready to work with partners on even more large-scale projects.

Jon Hall
Marketing Manager, ITM Power

Islands and regions to benefit from SEAFUEL

SEAFUEL is an Interreg Atlantic Area funded project with the aim of demonstrating harnessing the power of local renewable resources and using them to provide a sustainable fuel for local transport fleets.

The project, which is led by National University of Ireland Galway (NUIG), will realise a hydrogen production location and refuelling station on the island of Tenerife, in particular at the Institute of Technology and Renewable Energies (ITER). These facilities will fuel a fleet of fuel cell vehicles, including a Toyota Mirai, Hyundai Nexo, and a number of Logan Energy repurposed Nissan ENV200 electric vans. SEAFUEL is focused on the implementation of these technologies in isolated areas, such as islands, which face substantial challenges due to the high cost of energetic feedstocks, particularly in the transport sector - which can consume up to 30% of all fuel.



The project, which is also a member of the Hydrogen Triple Alliance alongside GenComm and HUGE – the first cross-Interreg regional partnership - was progressing smoothly until it was hit by two major disruptions. Brexit and Covid-19. **The pandemic created lead time issues for basic components and materials across the value chain. In addition, new regulations inhibited the importing and exporting of equipment**.

Resourcing start-up equipment also became problematic due to rules allowing the transfer of tools across the EU-UK border. However, as a consortium, we overcame these issues with unique problem-solving approaches – including members of Logan Energy taking a weeklong road trip from Wallyford, Scotland, to Tenerife to deliver the vehicles themselves rather than wait for a shipping opportunity. Looking back Logan's CEO Bill Ireland mused 'The whole team across the project partners and within Logan worked long hours to keep the project on track. It's a testament to their dedication that we have delivered such an impressive station'.

In spite of these challenges, SEAFUEL has been continuing to make progress both in terms of its physical installations and study-work. The hydrogen refuelling station has now been delivered to site and is undergoing final tests and network integration before becoming fully operational in March of this year. Whilst, here at HyEnergy, we have been developing a set of roadmaps for regions within the project – including the West of Ireland, Northern Ireland, South West UK, Madeira, and Tenerife. These documents assess the current energy landscapes of these areas, and evaluate how hydrogen can make a positive benefit to the community, whether that be through decarbonisation or tackling energy poverty and fuel dependency issues. These documents culminate in a set of policy recommendations and hydrogen-focused SECAPs (Sustainable Energy and Climate Action Plans), unique to each geographic area. We expect that the policy briefs will increase the public awareness and influence of the project and show policy makers the required steps to successfully foster a thriving hydrogen sector within their jurisdictions.

HyEnergy's CEO, Ian Williamson, outlined the importance of these reports saying:
'This allows SEAFUEL to have an influence beyond a normal demonstration programme. The partners are using their global expertise and engaging with island/more remote regions as they believe in highlighting the long term benefits renewables and hydrogen can bring when strategically deployed'.

The project is set to hold an official launch for their hydrogen refuelling station on 31st March 2022 and invites all those interested to attend.

Dr. Pau Farràs, the SEAFUEL project coordinator, discussed the plans for the launch saying:
'We've been working towards this milestone for a long time now and are so pleased to be able to share the outcome of our work with the community of Tenerife and the Atlantic Area. This event will not only mark the beginning of the operational phase of the project but will act as a chance to hear about SEAFUEL's future and how we plan to maximise its influence and legacy in the years to come.'

Josh Williamson
HyEnergy Consultancy, SEAFUEL Project Manager

Clean Hydrogen Partnership Call For proposals

The Clean Hydrogen Partnership is launching its hydrogen research call for proposals – €300.5 million will be made available for proposed projects in an unprecedented drive to support the creation of cutting-edge hydrogen technologies. The calls open on 31st March 2022.

View for more information

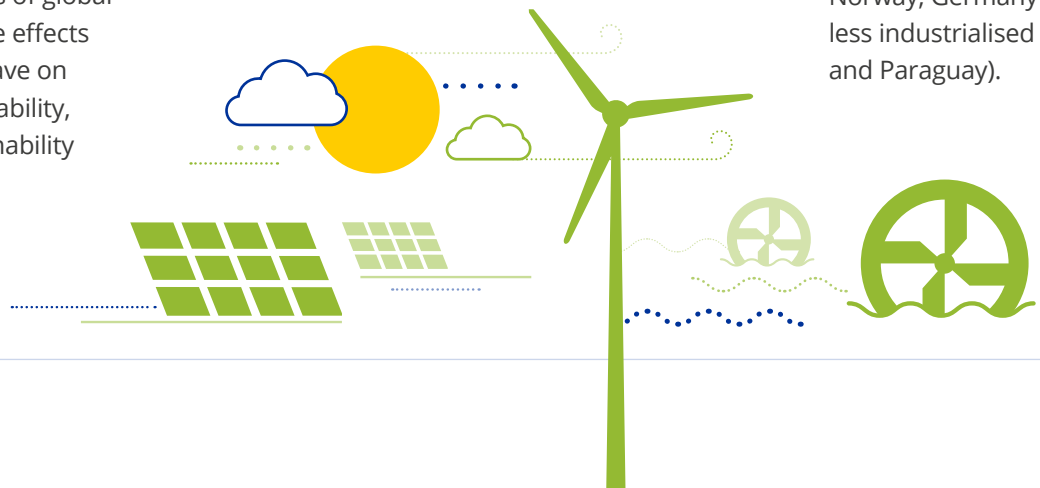
Clean Hydrogen Partnership

“HALLIE” - Hydrogen applications on a scientific/industrial level as a leading instrument for decarbonisation of the future energy system in Europe

The HALLIE project was submitted in the HORIZON-MSCA-DN-2021 call of the MARIE SKŁODOWSKA-CURIE ACTIONS as Doctoral Networks (DN) in November 2021. Four of the GenComm partners and some of the associated partners are involved in this network. A funding decision is expected early in the second quarter of 2022. The motivation and general content of HALLIE includes:

While the consequences of climate change are becoming more evident and widespread with every seasonal change, the European Union (EU) is still going through the complex process of decarbonising its economy. Such transition is inevitable when trying to comply with the terms of the Paris agreement and to avoid the potentially irreversible consequences of global temperature increase. Furthermore, due to the effects that climate-change-related natural hazards have on infrastructure, food production and political stability, the world’s economy struggles a lot from the inability to accelerate the required transition.

Hydrogen enters the global scene as a fundamental pillar towards independence from fossil fuels. With mass-related specific energy density significantly higher than the one of gasoline or diesel, Hydrogen could potentially be used in a wide range of economy sectors such as heating, transportation and energy storage becoming the basic chemical and fuel to be applied in industrial processes. **The main caveat, however, is that Hydrogen in this case must be produced using renewable energies, that is, by using renewable energy sources like solar, wind or hydro power plants to split the water molecule into its constituent components.** When Hydrogen is produced in such a way, it is referred to as green Hydrogen; and the only by-product from using it as fuel is water vapour.

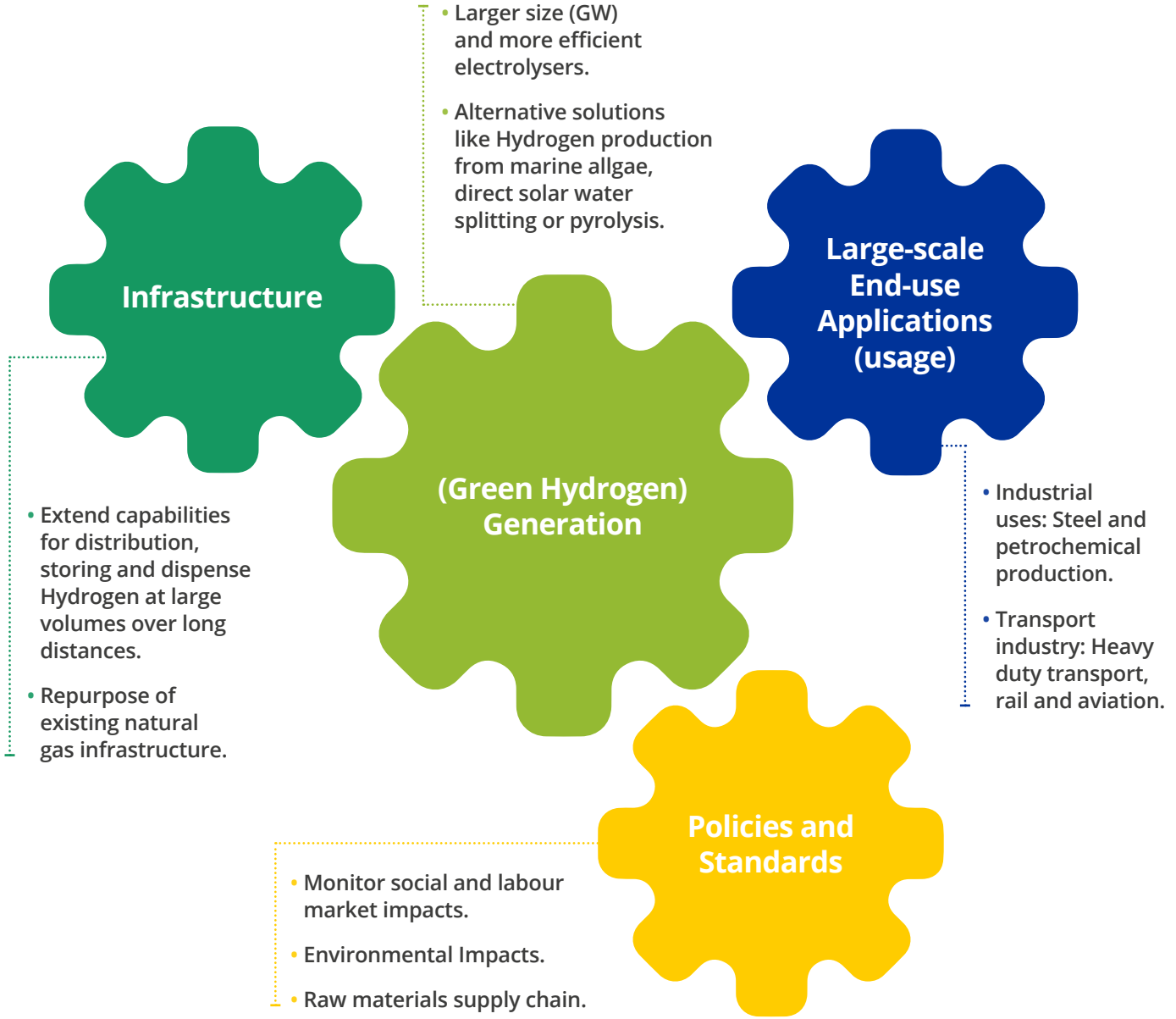


It is precisely due to its versatility and potential to be produced and used without generating any CO_2 emissions that the international community is turning its attention into the creation of the so-called Hydrogen economy. This endeavour requires trillions of Euros to be invested in the different necessary infrastructure to produce, transport and store Hydrogen as well as to develop the necessary technologies to make proper use of it.

Many countries around the globe have already presented official strategy reports on their individual take towards their transition to a Hydrogen economy. Among these different players it is possible to find highly industrialised nations (like Japan, Korea, France, Norway, Germany or Canada) and a handful of other less industrialised nations too (like Colombia, Morocco and Paraguay).

The EU foresees Hydrogen as a priority area in its European Green Deal report, and has the potential to lead the global transition to a Hydrogen economy through the envisioning of a modern, competitive, prosperous and climate neutral economy committed to achieving net-zero greenhouse emissions by 2050.

It is worth mentioning that Germany, the leading economy in the EU, has committed itself to achieve this in an even shorter time frame (by 2045). Likewise, **the EU has made it clear that the use of Hydrogen on a large scale is integral to the decarbonisation process and could not be achieved otherwise**. In principle the technology already exists, but has to be ramped-up and further developed to an industrial scale. To accomplish this, the EU has identified four key sectors, where further research, innovations and investments are essential. These key sectors are: generation, infrastructure, large-scale end-use applications as well as improved policies and standards.



The current situation with regard to Hydrogen in the EU highly contrasts with the aforementioned vision and plan for its future. **Almost 96% of the Hydrogen used in the EU today is produced by means of steam reforming of natural gas or coal**. This accounts for less than 2% of EU energy consumption, with the produced hydrogen being mostly used as feedstock for specific industrial processes including the petrochemical industry and ammonia production. This reality conflicts with the urgent need to deliver net zero-greenhouse emissions and accentuates the need for immediate action to start and enlarge green Hydrogen production on industrial scale and develop Hydrogen appliances for broad use to close the gap between the current status quo and the projected vision of a Hydrogen-based economy by 2050. In this context, green Hydrogen plays a key role in achieving the 2°C target of international climate policy.

The HALLIE proposal establishes its aims and objectives as a mean to diminish the aforementioned gap and to constitute itself as a kick-starting project in the frame of the envisioned Hydrogen economy.

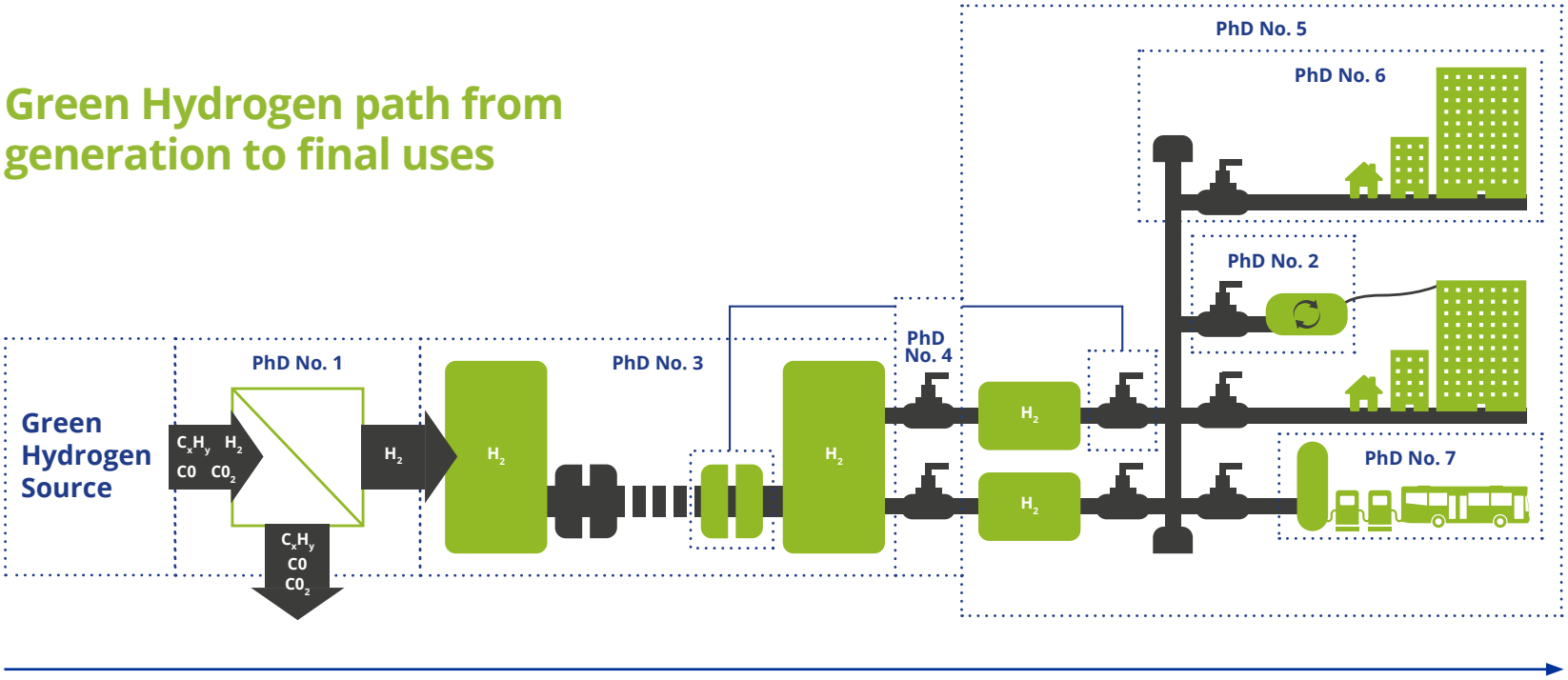
Viewed in this way, HALLIE is made up of seven PhD-projects that interlink specific Hydrogen-related topics. The PhD projects selected for HALLIE represent all processes within the entire value chain of green Hydrogen from production to end use. **HALLIE starts with the production of green Hydrogen from synthesis gases (in this case from the gasification of waste, PhD-project No.1) and the resulting downstream separation of Hydrogen from such gas mixtures**. In the medium to long-term, Hydrogen has to be transported over long distances, independently from the production method. In PhD project No.3, HALLIE investigates the opportunities, risks as well as resulting chances and the related issues when using the existing natural gas infrastructure. The PhD project No.4 deals with the development of new and innovative ball valves for high-pressure Hydrogen applications as well as the necessary sensor technology to check their quality. Such devices will also be needed in large amounts for a Hydrogen-based energy system in the medium to long run. The Project No.5 deals with the distribution of the produced Hydrogen, which may be transported over long distances, by an energy service provider/ supplier on a local/regional level.

This addresses one of the currently most important questions with regard to the upcoming energy transition: How can a local energy service provider/ supplier manage the upcoming tasks concerning the zero-emission strategy of the European Union?

The HALLIE PhD-projects No.2, 6 and 7 are directly related to this task. Project No.2 aims to improve fuel cells or the activation procedures for low temperature membrane fuel cells; Project No.6 addresses the necessary supply solutions from the perspective of future end users or the demand side using the example of a new housing development; Project No.7 deals with issues relating to public transport based on Hydrogen and fuel cell technology from the perspective of a manufacturer of fuel cell electric buses.

In addition to technical aspects, HALLIE also addresses socio-economic issues in the framework of the proposed PhD-projects No.5 and No.6, from which the remaining PhD-projects can benefit directly.

Green Hydrogen path from generation to final uses



The main goal of HALLIE is to develop and support a new generation of researchers with the necessary knowledge and skills to lead each of the four different key sectors needed for the Hydrogen economy, not only from an academic point of view but also build on first-hand experience of the non-academic sector.

Dr. Bodo Groß
Leiter Arbeitsfeld Technische Innovationen / Head of department Technical Innovations, IZES

The curse of convenience

In our modern world we have used technology to make our lives easier and more convenient than that of previous generations. Many of our advances over the years has eased the burden on our lives, none more so that ease of transport has become part and parcel of our lives - a convenience but at what cost.

As we strive to reduce our C02 footprint and move away from fossil fuels especially in our transport use and we must overcome the curse of convenience. Ease and speed of global travel is convenient to all but it comes at a cost - a heavy cost in pollution, greenhouse gases and climate change.

Fossil fuels are relatively cheap. It's relatively easy to find and produce these fuels, supply chains are well developed and significant investments have been made delivering the required infrastructure for production, storage and distribution. In today's world we face a climate crisis, our use of fossil fuels is severely damaging our environment. Fossil fuels causing local pollution where they are produced and used, and their ongoing use is causing lasting harm to the climate of our entire planet. However, despite all the overwhelming evidence, meaningful changes to the ways we use energy has been very difficult.

Something that is hard and time consuming, requiring greater investment in terms of time and of effort must have a greater value placed upon it. If it takes 4 hours to recharge a battery electric vehicle, or if it takes an extra 10 minutes to fill a fuel cell electric car with hydrogen compared to filling a fossil fuel powered vehicle, are we prepared to accept for this perceived lack of convenience? Is it worth the effort? Simply put - yes, especially if the impact on our environment is zero.

The so called convenience of fossil fuels has come with a devastating downside. The release of carbon dioxide (CO_2) from fossil fuel use is warming our planet faster than anything we have seen in the geological record. One of the greatest challenges facing humanity today is slowing this warming before it changes our world beyond recognition.

In order to balance our energy needs with tackling climate change we need technology and policy to move in unison to a new green direction. To date our energy solutions have been based on concentrated, convenient, and flexible forms of energy that have met the convenience our society demanded… In addressing this convenience expected by society we must address the advantages of today's green energy sources, make defined energy transitions and move to low-carbon energy solutions.

With greater understanding of the climate challenge, we are making huge strides in developing the technology we need to move towards a low-carbon future.

We must strive to take the sustainable pathway in life and not just the convenient one. **The need for new energy sources has never been greater**. Our society needs a sustainable system to replace fossil fuels and their CO_2 emissions in the long term and to overcome the convenience of such fuels.

Hydrogen is a pivotal technology, it moves the fulcrum on the energy balance to enable sustainable energy to become sustainable and fit for our future. Hydrogen is a key component in the sustainable energy value chain required to meet our net zero goals by 2050 and will help industry create multi-dimensional and climate neutral value chains.

Convenience does not always improve our quality of life. **If we are to save the planet we need to intentionally reject the ease of convenience when it comes to choosing sustainability.** Convenience is a short term gain and does not contribute to environmental sustainability and climate stability.

It is my belief that just as fossil fuels opened new doors for humanity our new zero carbon solutions as part of our energy matrix will herald a new dawn delivering enhanced technological, social, commercial and environmental benefits and deliver societal convenience. If we look to green energy vectors as solutions to meet our energy challenges we will find that our thirst for convenience will be slated by significantly more benefits.

Summarising the challenge we face in overcoming our climate destroying reliance on fossil fuels Bart Biebuyck, Executive Director of the Clean Hydrogen Partnership stated: *"When convenience becomes inconvenient for someone else, hydrogen could be the answer!"*

Paul McCormack
GenComm Programme Manager

Interreg North-West Europe GenComm
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For more information

on the GenComm Project and our work in the green hydrogen arena contact

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