



Delivery of Hydrogen Refuelling Station

In November 2020 the first renewable operated Hydrogen refuelling station in the Federal State of Saarland was installed near the IZES headquarters in Saarbrücken, Germany.

Minister of Economic Affairs, Employment, Energy and Transport **Anke Rehlinger** visited IZES on Wednesday, 25 November to see for herself and learn about the start of the practical phase of the GenComm project.

Minister Rehlinger said:

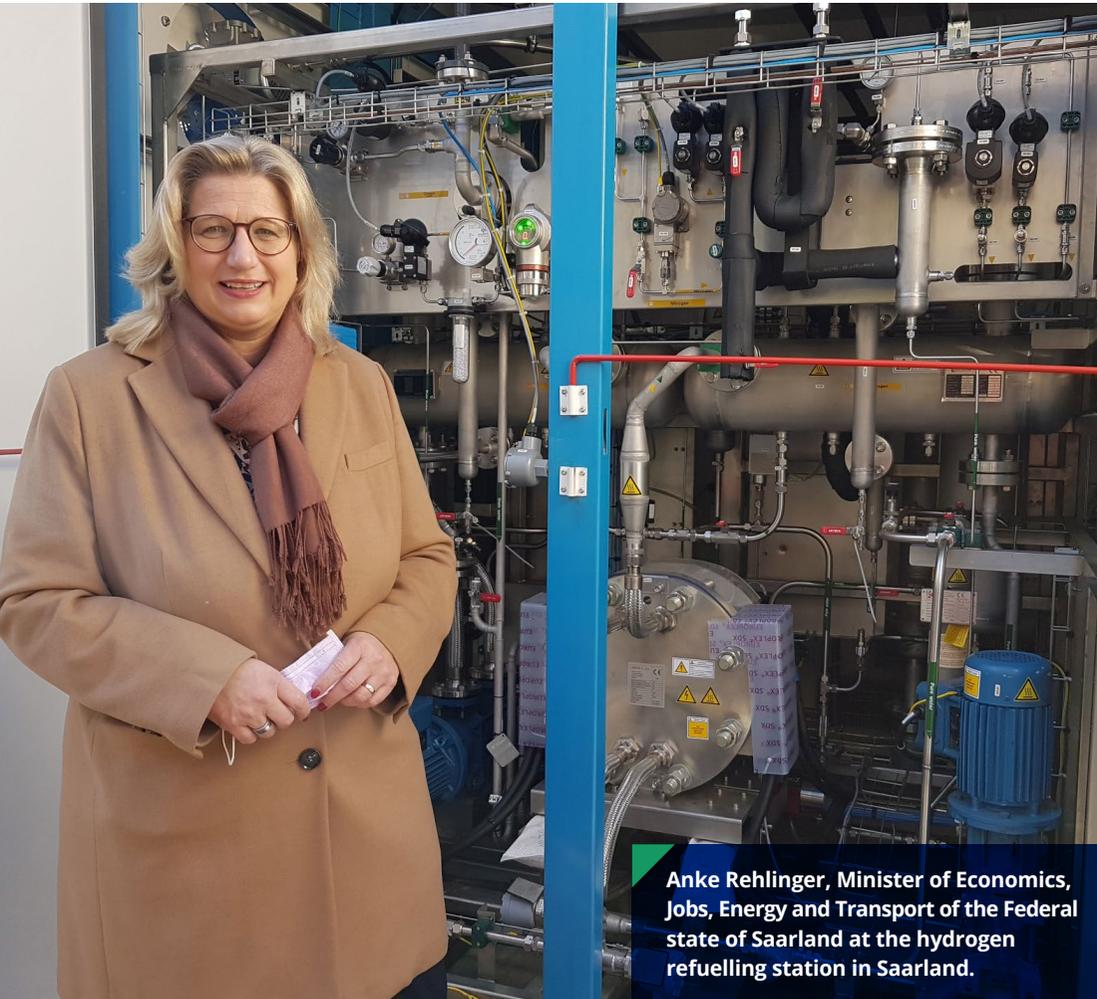
'Our goal is to become a Hydrogen model region. There are many roads leading to this goal, and we have to take them together. In addition to research on transport and production, we also need knowledge on application and use.'

The IZES experts can gather valuable knowledge about Hydrogen as a fuel under real conditions, which can then be transferred to the entire Saarland. This will help us to set up an effective and economical refuelling infrastructure for the Federal state of Saarland step by step'.

The Hydrogen refuelling station is located at the headquarters of IZES at Saarbrücken's Innovations Campus Saar. The refuelling station itself works on the basis of renewable energy: It is supplied with solar power via a PV array. Hydrogen is produced via electrolysis, using two different types of electrolyser, an AEM and a PEM. The Hydrogen refuelling station stores up to 58 kg Hydrogen. The refuelling station itself is designed for refuelling 700 bar vehicles within a maximum of 30 minutes.



The hydrogen refuelling station being installed in Saarland.



Anke Rehlinger, Minister of Economics, Jobs, Energy and Transport of the Federal state of Saarland at the hydrogen refuelling station in Saarland.

➔ **Dr Bodo Groß**, Head of the department of Technical Innovations at IZES, said:

'The construction of a Hydrogen refuelling station at the Innovations Campus Saar plays an important role in the development of sustainable energy solutions in the field of alternative transport infrastructures.'

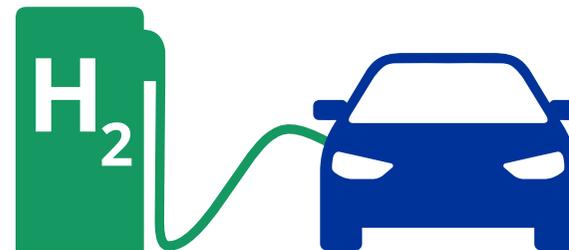
'In the past, the staff of the department have already successfully built and operated a renewable powered charging station for battery electric vehicles. The solar-powered Hydrogen refuelling station builds on this work and one can say, that this is the next evolutionary step in the field of alternative mobility and thus an important factor in the upcoming transition of the energy system.'

The Managing Director of IZES gGmbH, **Dr Michael Brand**, said:

'The success of this research project has the potential to play a crucial role in the introduction of Hydrogen fuelled vehicles by making the refuelling process easier and more flexible.'

'The use of fuel cell electric vehicles will underpin the necessary efforts to decarbonise the transport sector and ultimately help to achieve the zero emission targets in both Germany and Europe.'

—
Dr Bodo Groß
IZES gGmbH





GenComm Partner INSA PhD Clean Energy Work

The world's population and associated energy needs have grown tremendously since the start of the industrial revolution in 1760. As a consequence, there has been an unprecedented increase in the consumption of fossil fuels and carbon dioxide (CO₂) emissions. These CO₂ emissions are closely tied with climate change, as CO₂ has been proven to be the main greenhouse gas behind global warming.

To address this we, at INSA Rouen and LCS Caen, have focused an important part of our resources in understanding, conceiving and optimising technologies capable of reducing CO₂ emissions. This focus of ours led to a collaboration with the other partners of the GenComm project. One of the main aims of the GenComm project is to produce hydrogen gas (H₂) from green electricity (issued from wind and solar energy).

We decided to combine this carbon-free hydrogen with CO₂ to produce methanol (CH₃OH), which will be used as an energy carrier to store the energy produced from green electricity according to the following reaction:



Hydrogen gas is often referred to as the preferred molecule for green energy storage, but methanol presents lower storage risks, as it can be stored as a liquid at atmospheric pressure. This strategy would allow, at the same time, to provide long-term storage for intermittently produced energy and to mitigate the previously mentioned CO₂ emissions.

In our work, we tuned up the industrial process to produce methanol from CO₂. We synthesised and optimised several catalysts, which are materials that allow you to speed up and increase the methanol yield of the process. These same catalysts were tested in a self-build pilot unit, capable of producing up to 10 kg/day of methanol. Besides optimising the process conditions to maximise methanol yield, some important parameters, such as catalyst life and stability, were also addressed.

We were also able to scale-up our pilot plant to even higher levels of production through the use of simulation software. This allowed us to evaluate the performance of our process at the highest possible level to ascertain its industrial interest and feasibility.

A comparison with the more conventional processes showed a considerable increase in the methanol yield, as well as a decrease in the overall energy consumption of the process. The developed process was able to treat up to 1.2 ton/day of CO₂ to produce 0.7 ton/day of methanol.

Even though additional work is required to industrialise this process, our results showed the feasibility of clean energy production, storage and manipulation. We will continue to optimise and develop processes such as this because we are convinced that such efforts are highly needed to be able to preserve our planet.

Maxwell Quezada Feliz
Insa





NI Renewables Success Story

Powering A Green Recovery

Last year Northern Ireland hit a significant milestone in our journey to reach net zero. For the first time, renewables overtook fossil fuels for power generation in the UK. Renewables generated a record 42% of UK electricity last year, while fossil fuels produced 41%. Given almost half of our electricity locally is generated from renewables, Northern Ireland has played a significant role in helping the UK achieve this milestone.

This showcases a massive transformation of the UK's power system, which only a decade ago generated more than three-quarters of its power from fossil fuels and just a small fraction - 7% in 2010 - from renewable sources. It also points to the power of renewables to help us achieve these essential targets.

As we face the twin challenges of Covid and a climate emergency, we need a green recovery plan to ensure that Northern Ireland's economic strategy is one that is based on sustainable investments and maximising our potential. While many other industries seek government support to survive, with the right policy framework the renewables sector can thrive.

Our research shows that setting a target of 80% renewable electricity generation by 2030 would leverage over £1 billion of private investment in Northern Ireland, creating 2,750MW of new renewable generation. We forecast this will create an ongoing annual spend of £235 million in operational support and maintenance, a particular boost to local areas where developments take place.

This builds on the economic, environment and social achievements already brought about by the renewables sector in NI. In the last two decades, renewable electricity has resulted in a net £135 million benefit to consumers, a 9 million tonne reduction in carbon emissions and the creation of 2,000 jobs.

However, we are only at the beginning of what we can achieve. Due to the absence of an effective renewables policy, we have gained these achievements despite no new large-scale renewable projects becoming operational in the last two years.

As well as an effective route to market to support renewables, we need an efficient planning system that facilitates the delivery of net zero. RenewableNI and its members are committed to collaborating from the outset with local communities, listening to any concerns and taking on board so renewables projects can help support these local areas through employment, conservation and educational benefits.



➔ With every economic and environmental measure pointing to the positive impact of renewables, the onus therefore must be on creating a cohesive Energy Strategy that harnesses the opportunities it presents, both now as part of the green recovery, and in the future, by setting a target for 80% renewable electricity by 2030.

While the coronavirus pandemic has had devastating impact, touching each of our lives, we should take encouragement from the behavioural changes we collectively made to protect ourselves.

Together we demonstrated that in the face of an emergency, we could quickly adapt and roll out the necessary changes. We can and must do the same as we face the critical climate crisis. We have an unparalleled opportunity to make the necessary environmental improvements for all our futures. We cannot let it pass.

Steven Agnew
Head of RenewableNI





Will Hydrogen Deliver the Goods for Ireland?

Think about a day at a beach, breathing fresh, clean air; and now compare this to walking on a footpath of a busy street, congested with cars, trucks and buses. There is no comparison! We don't notice the potentially severe damage to our health of conventionally fossil fuelled vehicles until we are on a beach smelling the fresh air, miles from the city boundary!

As we decarbonise our energy system, the path for transport is clear... Or is it?

One thing for certain is; it will be electric, battery electric passenger vehicles are aimed to scale to almost 50% of the fleet by 2030 and scooters, bicycles, city cars, small delivery vehicles, segways, lawnmowers, small construction vehicles and city buses may also convert to battery electric. **We have a winner... Or do we?**

What about intercity trains, large trucks and delivery vehicles, tractors, coaches, taxis, commuter cars, diggers, boats, ferries and airplanes? How will these reduce their emissions and will they go electric... possibly but probably hydrogen fuel cell electric!

Dublin City University is conducting research funded by **Science Foundation Ireland** to gauge the level of interest in Hydrogen for heavy-duty vehicles across the island of Ireland in the coming years.



If you are a company that has a fleet of HDVs / HGVs we would like to hear what you have to say! It would greatly be appreciated if you would complete the survey.

It is straightforward and should take no more than 4 minutes. Please feel free to pass the survey along to those who might be interested to take part.

GO TO SURVEY ▶

Dr James Carton
Assistant Professor in Energy Sustainability & Hydrogen Mechanical & Manufacturing Engineering
Dublin City University



Eco Gardening in the Context of Hydrogen Mobility

I'm always amazed, when I visit the stately garden of a big house, at the visionary work of landscapers like Capability Brown. These guys moved earth and planted small saplings and shrubs to produce amazing landscapes that would not become evident for decades.

The fact that they got paid, when they probably left the garden looking worse than before they started, means that someone else shared their vision and was patiently committed to delivering on it. I think many of us working on the planning and roll-out of a Hydrogen Mobility project know pretty much how those people felt, in many ways it is a case of *"nothing to see here yet folks... come back in 10 years"*.

We all know that delivering H₂ Production, a viable H₂ Refuelling Network and a fleet of suitable and affordable vehicles, all have to occur at the same time and, given the scale of investment, vehicle numbers need to ramp up fairly quickly thereafter.

The prospect of what is possible and the game-changing potential of what we are about is enough to keep teams of committed, visionary people of various disciplines working away to deliver on this enormous project, out of the view of the vast majority of the population. But we need the population to come with us on this journey, to be enthusiasts who are impatient for its delivery, because we will need them to literally buy-into the vehicles from the very beginning.



Pictured at the Dublin hydrogen bus trial are the **Minister for Climate Action, Communication Networks and Transport, Eamon Ryan TD** and **HMI member Steve Tormey, Chief Executive, Toyota Ireland.**



➔ So while people are beavering away in dark rooms to deliver the project, it is also crucial that we carry the public along with us, to develop their understanding of what may be seen as a new and untested technology, to allay any doubts or fears they may have and to excite their interest and enthusiasm for an amazing future energy solution. When I was a very small child I remember a really great primary school teacher talking about what things we might see in the future, which included the crazy idea that cars would someday run on water... The story we have to tell is amazing, almost too good to be true, so it is vital that we have visible milestones in our progress towards delivery, confidently reassuring and normalising this incredible futuristic green transport solution.

In October 2019 Hydrogen Mobility Ireland publicly launched its Hydrogen Roadmap and through it its members have been working away on a practical phased delivery strategy over the coming years. As part of this approach, a Bus Trial in conjunction with Caetano Bus of Portugal was organised for the Last Quarter of 2020. The idea was to see this particular bus in operation on some public service routes around Dublin, to see could we deliver a workable fuel solution in advance of the roll-out of a proposed future Network and to give the public, the media and state policy decision makers the opportunity to see and travel in in a Hydrogen Fuel Cell Bus.

The **Caetano H₂ City Gold Bus** arrived in Dublin at the end of October and the practical issues of registration may have given us some Brexit-related VAT questions if the Bus was to move onto the UK, after the end of December, but it returned back to Portugal. With no existing H₂ vehicle refuelling facility, HMI member BOC put one in place at their Dublin plant using green electricity from ESB (HMI Member) and throughout the Trial this solution worked extremely well.

The Bus spent a week at HMI Member Toyota Ireland's Dublin Training facility where training was provided by Caetano for Bus Drivers, support staff and first responders from Dublin Fire Brigade. The Bus underwent a structured Trial on behalf of the Department of Transport and then started on a standard Bus Éireann (HMI Member) bus route between Ashbourne (Co. Meath) and Dublin Airport. This was followed by a Dublin Bus (HMI Member) Route covering the Dublin City University (HMI Member) Campus and Dublin Airport.

Unfortunately a more stringent Covid 19 Lockdown kicked-in prior to the trial so that plans for public events and invitations to groups to travel on the bus had to be shelved and replaced by socially distanced photo shoots and media releases. The bus performed extremely well and was well received by passengers who used it, but because of Covid there were relatively few of them, essential workers making essential journeys on a bus allowed to carry just 25% of its normal total. Feedback from the drivers has been very positive and enthusiastic, which is a huge plus. A large amount of data has been collected by DCU on the operating performance of the bus during the trial, which is currently being processed and is due to be reported on shortly.

So where does all this fit-in to our H₂ journey and what was the big learning experience, given the limitations of a public Trial during Covid lock-down? In many ways, for me, the key issue has been the communications around the whole H₂ Mobility Project. In this first small Trial we established a Communications Team involving 11 different organisations each with their own corporate message to carry. In normal circumstances this would be a challenge but in Covid with the only coverage coming from releases, there was a real danger of competing stories and a confused message.



➔ With HMI acting as the centre, carrying the agreed long-term message about the huge potential of H₂ mobility and giving planned space for individual releases, the story about this Bus Trial and its place in the bigger picture was well told and very well covered on TV, radio, on-line and in the printed media. Working together and using the combined strength, influence and creativity of such a diverse group of communications professionals was a revelation as to how we can best carry our message going forward.

Right through our messaging on this trial we have underlined that while this was a first visibility of a H₂ vehicle actually working as a public transport bus on the road in Ireland, this will be quickly followed by others; the hugely significant GenComm project in Belfast, involving HMI member Energia and Wright Bus, who are also supplying three H₂ buses for a Transport for Ireland project due to start in Dublin in the next few weeks. It is hard to overstate the significance of the GenComm project which puts Belfast at the forefront, with both H₂ production and refuelling solutions in place, and opening up the possibility not just of this zero emissions public bus transport but also the potential particularly for HGVs, and even trains. The environmental benefit even goes beyond that as it is effectively saving renewable energy that would be lost when grid demand is low. For an island that imports the bulk of its energy needs, H₂ promises fuel security and self-sufficiency.

As each such project is delivered it is important to highlight that these are steps in the context of the overall H₂ project because this is not a dream of the distant future; the delivery has already started. In this, the all island challenge of decarbonising and the economies that scale and co-operation can deliver, while working within the context of different jurisdictions, will continue to be an important driver in the project.

Returning to the gardening analogy; while we may have some time to wait to see the fully developed H₂ mobility project North or South, we are now seeing the first reassuring little buds beginning to appear. While our teams work away on the bigger overall project we need to ensure that we will have other regular visible indicators of our progress in delivery and of course we will need those who must finance these projects at this early stage, whether commercial companies or state agencies, to have faith in the future that will be delivered. In this we may not need green fingers but a green heart.



Pictured are **Lorcan O Connor**, CIE Group CEO and **Caoimhe Donnelly**, Chief Sustainability Officer, CIE.

Alan Nolan
Hydrogen Mobility Ireland Coordinating Director





Navigating the on Ramp for a Hydrogen Community



As Hydrogen sentiment globally is rising how do communities and other groups near the end of the current energy distribution network navigate this rising tide and as a result reposition themselves and as a result start to achieve energy security?

The level of governmental commitment, globally and especially in Europe, along with greater availability of cheap, renewable power, has positioned hydrogen as one of the key energy matrices in the drive to reduce our dependence on fossil fuels. The recent EU Green Deal has placed hydrogen at the centre of its de-carbonisation plan and key to achieving their target of net-zero greenhouse emissions by 2050. In Germany there is a 'national strategy for hydrogen', involving €9bn of potential funding and an ambition to build 5GW/10GW of electrolysis capacity by 2030/40.

The term now widely used 'hydrogenewables' producing GreenH₂ from renewable sources has opened the gates to a burgeoning hydrogen economy. So why all the talk and headlines of a hydrogen economy now? Hydrogen as a key energy source is not new, it first raised its head way back in the 1970's, and despite several attempts it has never reached the energy starting gate, there have been a number of 'false starts' in the energy race. That is until now. We are in the middle of a perfect storm that has created the perfect conditions for a future role for green hydrogen.

We have a climate crisis to tackle, we must wean ourselves off fossil fuel dependence, environmental challenges must be addressed and the green economy is seen as a key provider of sustainable economic growth. All of these conditions combine to create perfect social, commercial, environmental and sustainable conditions for the hydrogen economy to take root and bloom. Decarbonising the energy sector is the first step in building a new hydrogen economy.

There are sequential energy applications where Green Hydrogen is gaining traction and others areas where there are grounds for optimism for hydrogen as an energy vector to make significant impact. If we are to look at the situation with just our economic glasses on there are no easy or low-cost solutions to decarbonisation of the energy system and this is certainly the case for possible deployment of low-carbon hydrogen.

However when we look at green hydrogen as an energy vector with all of our technical, economic, social and environmental lens in, then we can see the where and the how of hydrogen as an energy solution. Hydrogen will certainly play a role in decarbonisation of the energy system, and it will be part of a hybrid set of solutions. Hydrogen is not a silver bullet but rather a silver buckshot with significant benefit to be gained in many areas either on its own or as part of a zero carbon hybrid solution. Hydrogen has a hugely significant role in reaching net-zero emissions, requiring a dramatic scaling up of its production and use.



➔ Whilst the production of hydrogen from electrolysis is currently more expensive as an energy solution it brings many other environmental benefits, which when taken in the round will ensure hydrogen has a key role in our energy spectrum especially when economies of scale are achieved. It will therefore be dependent on government policy to promote the required investments. Once low-carbon hydrogen production has been established at scale, it will enable incremental addition of new applications and push the hydrogen economy to new heights.

In a hydrogen economy, hydrogen would be used in place of the fossil fuels that currently provide four-fifths of the world's energy supply and emit the bulk of global greenhouse gas emissions. This will help achieve climate goals because hydrogen only emits water when burned. The hydrogen economy will be sector and geographic specific addressing energy need depending on hydrogen availability, cost and performance relative to zero carbon alternatives. The energy solution with hydrogen for Western Europe with an abundance of offshore wind opportunities will be different from other areas with solar potential.

Therefore, the Hydrogen energy equation is not a simple yes or no, it is a question of hydrogen when and where and this will depend on several variables such as renewable energy opportunity, need and optimisation.

As Europe embraces the Green Hydrogen revolution many are confused and wonder how they can participate in the drive to a zero carbon destination. We all agree that we have an ever pressing need to tackle climate change and the best way to address this is to reduce our dependence on fossil fuels for transport, industry, heat and

other sectors. The ever rising demand for more renewable electricity is facing many hurdles and the production of Green Hydrogen from renewable sources is a promising way to overcome these hurdles. The core rationale for green hydrogen is that it is as a clean energy alternative and is capable of tackling our huge CO₂ emission targets.

The picture of the emerging Hydrogen economy is a confusing one for many. The 5 W's - who, why, where, what and when of this new energy solution remain to be properly answered. To date there has been much talk but little discussions and engagement to explain and outline the benefits to society, communities and individuals.

The Community Hydrogen Forum (CH2F) is the starting point for meaningful engagement, information and discussions. It is agreed that Green Hydrogen is a versatile fuel that offers a path to sustainable long-term economic growth. It is a carbon free solution in our battle to tackle climate change whilst developing new commercial opportunities for our industries.

In order to make a just transition to a new green energy solution we must endeavour to leave no stranded assets. This includes communities, people and regions. As we map out the hydrogen highway we must ensure there is an on-ramp for all to join. The CH2F is this on-ramp, it is a forum for all to engage, be informed and inform and importantly allow people to appraise the opportunities for themselves.

Paul McCormack
GenComm Programme
Manager



**How to access
the Hydrogen
Highway?**

**SET YOUR
H₂ SAT NAV
HERE**





Don't COP-OUT from Building a Zero Carbon Future



As the much awaited COP26 (UN Conference of the Parties) in Glasgow draws near the question is are we committed to the challenge of climate change. This 26th Conference takes place between 1st-12th November 2021 and at GenComm we would encourage all to help shape and inform the conference by working through their representatives and professional bodies.

On the Island of Ireland the Electricity Industry supported by Government have built the foundations and have made a way for other sectors to start building a smart renewable future and to avail of the many commercial opportunities that the new low carbon sector will offer.

While different paths can mitigate climate change, renewables and energy efficiency provide the optimal pathway to deliver most of the emission cuts needed at the necessary speed, there is a lot of work to do and it is essential that all companies involved in the energy industry ensure their plans are backed up with quality research working together with policy makers and regulators.

As we have consistently said there is not one solution and we have shown how through our work in the GenComm project we have demonstrated how Green H₂ is optimised, can become SMARTH₂ (Smart Hydrogen) and can be a key solution in our zero CO₂ energy future by acting as a storage vector that increases renewable energy generation. We have provided detailed information to governments, local communities and industry across the EU, a picture of how the Hydrogen can help remove the roadblocks on our journey to a Zero Carbon solution.

The COP26 conference gives the opportunity for countries to agree and legally commit to ensure carbon reductions and we believe the energy industry are key to delivering on these commitments.

However; we have to be realistic, yes great strides have been made and we have captured the low hanging fruit, but we now have to reach further, and this requires additional technical work, further R&D and this does come at a cost. The resources will have to be made together with a consistent and well thought out argument for implementing a net zero solution. We believe when this investment is made as part of an integrated energy strategy communities will see real

savings in economic and environmental terms and will live better in a new smart enabled world. It is essential Governments take the lead in delivering this message.

The current Covid pandemic should serve to reinforce our thinking in that what we thought as impossible can be made possible as hurdles can be circumnavigated and overcome. The way in which our private sector in the pharmaceutical Industry has worked with Governments to deliver and roll out the much needed vaccines within months, is an incredible feat. This is a perfect example of cohesive action and should spur all to fresh thinking and come up with innovative ideas and solutions necessary for a sustainable future and a just transition for all.

At GenComm we are focused on raising the issues along the entire transition journey, delivering a just transition for all, using technologies that are safe, reliable, affordable and widely available.

Mark Welsh
Energia





WEBINAR

How Can Renewables Sustain Resilient Communities?



'How can renewables sustain resilient communities?' - Utilising hydrogen to increase coastal sustainability'. Three projects from three interreg regions combined synergies as the Hydrogen Triple Alliance and presented a highly successful webinar on Thursday February 18th.

The webinar focused on the Community Hydrogen Forum (CH2F) as the starting point for the meaningful engagement, information and discussions for communities to engage in the Hydrogen energy revolution.

With an international line up of speakers the webinar opened the doors onto the Hydrogen economy, informing and stimulating discussions on how can hydrogen incrementally decarbonise our energy use spectrum. The webinar initiated discussions on how communities can utilise hydrogen for transport use, land, sea and air. It is widely agreed that Green Hydrogen is a versatile fuel that offers a path to sustainable long-term economic growth.

It is a carbon free solution in our battle to tackle climate change whilst developing new commercial opportunities for our industries.

The first speaker in the webinar from the Canary Islands, Spain, was Irene García Fernández from the Instituto Tecnológico y de Energías Renovables (ITER) Institute of Technology and Renewable Energies). Irene addressed the topic of 'Zero Emission Road Transport'.

Avril Ni Shearcaigh from the Aran Islands Energy Co-Operative was next up on the agenda. Avril spoke on 'Sustainable Maritime Transports'. Avril is the manager of Comharchumann Fuinnimh Oileain Arann Teo, (Aran Islands Energy Co-Op).

GenComm partner Ian Williamson, presented on 'The opportunity for low carbon air transport'. Ian has been president of the European Hydrogen Association for the last 10 years.

The fourth speaker was Galway based Dr Rory Monaghan, who outlined 'The Community Hydrogen Forum, CH2F' to the webinar audience.

Concluding the webinar, the three Interreg directors jointly addressed the topic of 'Collaborating to meet Europe's energy challenges'. This Hydrogen Triple Alliance webinar focuses on the three projects that make up the Triple Alliance, namely, GenComm, HUGE and SeaFuel.

The Hydrogen Triple Alliance (HTA) are collaborating and integrating resources to extend the reach of the Community Hydrogen Forum (CH2F), to share expertise and amplify the different resources developed in the projects, and most importantly, deliver enhanced benefits for European communities.

With a global audience of over 350 registered the webinar had significant new geographic reach for the three individual projects and has assisted in the projects aims of engaging, informing and empowering communities in accessing the hydrogen highway.

The presentations and recordings from the highly successful webinar are available here 



For more information

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

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Engage in the hydrogen
evolution and join the CH2F



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