Interreg
North-West Europe
GenComm
European Regional Development Fund
EUROPEAN UNION

H2go News

March 2019

Overview of the GenComm project

The €9.39 million GenComm project funded by Interreg North West Europe aims to address the energy sustainability challenges of NWE, by technically and commercially validating renewable hydrogen technologies. The project will develop three pilot plants, in Northern Ireland (wind power), Scotland (bioenergy) and Germany (solar power), linking the three main renewable sources, Solar Power, Wind Power and Bioenergy, with energy storage and the main forms of demand - heat, power and transportation fuels. Based on the pilot plants, technical and financial models will be developed, with the overall aim of developing a Decision Support Tool (DST). This DST will then provide a roadmap for communities to transition to renewable, hydrogen-based energy.

BURN host our latest Open Meeting

The GenComm open meeting in Brussels, looked at the possibilities of hydrogen as a green energy carrier of the future under the title 'Future of Hydrogen as Energy Carrier'. The participants are investigating new possibilities for the storage of renewable energy. With the new European climate targets, there will be a switch to renewable energy anyway. To make this change possible, new ways are needed to store that energy, and then use it when we need it.

If we rely on the GenComm open meeting as an indicator we could all be driving cars powered by ammonia in the near future. This can relatively easily be extracted from the atmosphere. Ammonia - the chemical formula NH3, contains a lot of hydrogen and is easier to store than hydrogen (H2), which requires a lot of energy for storage, because it only liquefies at extremely high pressure and very low temperatures.

"Most scientists agree that the growing share of green energy can cause problems for our energy supply," said Professor Francesco Contino of host partner, the BURN research group at the VUB. "The energy we need will not always be available at the right time. That is why we are looking for new ways, in addition to batteries, to store this energy sustainably. There have been experiments with hydrogen for years. But we get stuck in the storage of that hydrogen, which is still a fine and clean fuel. You can produce hydrogen with renewable energy, but it remains problematic to store it. "

For this reason, the scientists started looking for alternatives and ended up with ammonia. With ammonia you avoid the storage problems ", says Contino. "It becomes liquid under low pressure and the binding element nitrogen is massively present in our atmosphere. Ammonia (NH3) is a compound of nitrogen (N) with three hydrogen atoms (H). The storage therefore does not cost a lot of energy. "

This ammonia thinking track was already explored in the 1940s, when the shortage after the war made tests to let gasoline engines more or less successfully run on ammonia. "The problem with ammonia is that it is difficult to ignite," says Contino. "But we can solve that. It is also CO2-neutral. " During the open meeting, ideas were exchanged about a software program that helps communities and administrations to switch to a more sustainable energy policy. In this context, Brussels Minister for the Environment Céline Fremault also took part in the meeting.

BURN, Brussels

The GenComm partners at the Brussels partner meeting venue

WRIGHTS GROUP TO SUPPLY FUEL CELL BUSES TO GB JIVE PROJECT

In 2018 it was confirmed that Northern Ireland based Wrightbus has been selected as the sole supplier of double deck buses in the UK for the Joint Initiative for Hydrogen Vehicles in Europe (JIVE) following a competitive tender process. The company has also been confirmed as one of two providing single deck buses for the scheme.

Since this announcement Wrightbus have displayed the first double deck in the world to use fuel cell technology at the Euro Bus Expo show in NEC, Birmingham and the vehicle has also completed a route shadowing trial in Aberdeen. Built to meet TfL specification, the vehicle operates on a Ballard FCveloCity fuel cell, a Siemens drivetrain and a 48 kW traction battery pack. It has a passenger capacity of 64 seated and 21 standing, with an overall length of 10.9 metres and width of 2.55 metres. Fuel cell technology works by mixing hydrogen and compressed air (oxygen) in a chemical process to generate electric power to drive the bus. The power generated is emissions free, save for harmless water vapour and waste heat which can be used for the on boarding heating system.

Hydrogen, which is one of the most abundant elements in the universe, provides safe and reliable power and can be generated from renewable energy sources (such as solar, wind or wave), minimising the 'well to wheel' impact of the new StreetDeck FCEV. Zero emissions are delivered alongside a 200-mile operating range, with an extended storage option which increases the range to 265 miles. The bus typically re-fuels at the end of the working day, and refuelling takes around just 7 minutes.

The fuel cell vehicle features an electric drive axle packaged to allow a full flat floor throughout the bus, a zero-emission heating/cooling system and remote diagnostics. Key to the success of this concept are the lightweight hydrogen storage tanks, and the automatic battery management system which continuously monitors and balances the stored power while the vehicle is in service.

The modular platform concept developed by Wrightbus means that the new StreetDeck FCEV shares the same chassis as the full Electric (EV) models in the range, with the rear module containing overnight charging, opportunity charging or fuel cell components as appropriate. The chassis also provides the same platform for single or double deck models.

The JIVE initiative has been created to promote the development of fuel cell technology in buses throughout Europe. In the UK, the project involves three 'cluster' cities which are; Aberdeen, Birmingham and London with the operation of up to 50 fuel cell powered vehicles. Plans to expand the JIVE initiative are expected to be announced in the near future.

A Wrightbus hydrogen powered bus

Among its activities, JIVE aims to assist the commercialisation of fuel cell buses by deploying 139 vehicles across nine locations in Europe and will effectively double the quantity of fuel cell buses operating across the continent. The initiative uses coordinated procurement to unlock the economies of scale required to reduce the cost of the vehicles.

David Barnett, Business Development Director for Wrights Group, said: "Our mission has always been to lead the way in terms of innovation, including the development of clean bus technology to improve the environment, particularly in towns and cities. Working closely with key partners such as Ballard and Siemens, we have, given operators and the various authorities more choice when it comes to choosing the low-carbon approach most suitable to their cities' needs."

The Wrights Group, Ballymena, Northern Ireland

Hydrogenics sees need for regulatory framework

At the recent partner meeting in Brussels Denis Thomas, EU Regulatory Affairs and Business Development Manager, Renewable Hydrogen spoke on hydrogenics. The title of his presentation was 'Hydrogen in the Energy transition from niche to mainstream, the way forward'.

In terms of the world hydrogen market, 96% of the hydrogen produced today is not CO2 free (from gas, oil and coal). If produced from renewable power via electrolysis, hydrogen is fully renewable and CO2 free.

Mr Thomas was able to point out how hydrogen complements the direct use of electricity in transport for demanding applications. He gave a projected development of hydrogen fuel cells by transporatation segment in 2050.

The projected stock in 2050 of hydrogen fuel cell electric vehicles as percentage of total fleet at year end by vehicle type was outlined including 50% plus for buses and coaches.

Hydrogen providers were discussed including electrolysers and power systems using fuel cell solutions. The main pieces of EU legislation affecting the development of hydrogen markets in Europe between 2021-2030 were discussed. These are: the Renewable Energy Directive II, the Clean Mobility Package and the Gas Package.

Denis Thomas

For the use of hydrogen to develop further there is a need for a regulatory framework according to Mr Thomas. This framework needs to create the economic conditions for several business cases to emerge in transport, industry and heating.

Eugene Mc Cusker, GenComm

Sinn Féin launches Powering Ireland 2030 policy

Sinn Féin's Energy spokesperson Cathal Boylan MLA, has outlined his party's proposals on energy and its contribution to addressing Climate Change. Following extensive consultation across the sector Sinn Féin launched its Powering Ireland 2030 document at its Árd Fheis in 2018.

The primary aim of the policy is to move away from fossil fuel use to a cleaner and more environmentally sustainable energy mix. Sinn Féin recognises it must prioritise investment in the delivery of a wider portfolio of energy sources including a much greater emphasis on off-shore wind and sustainable replacements. Its policy priorities are to ensure that energy is sustainable, secure and affordable.

Sinn Féin's vision will only be achieved by working in partnership, redirecting investment into a new energy mix and by continuing to support householders, communities, farmers and small businesses with a broader range of grants and supports and introducing measures to enable them to reduce and produce the energy we need.

Some of the measures we would like to introduce to reduce our dependency on fossil fuels would be to conduct a comprehensive spatial mapping exercise of the entire island of Ireland and it's surrounding waters to identify the optimal locations and potential output for the many different energy technologies; to reform planning processes, to provide greater certainty for security of supply and potential investors including the establishment of a single planning body for the approval of offshore applications similar to that introduced in Scotland.

Sinn Féin would also like to see the establishment of an equivalent to the SEAI for the North to work with the SEAI in the South and a new North-South Implementation Body to further bolster co-operation in the wider field of Energy, with its primary objective being the transition to a low carbon energy system and society.

Learning from the positive experience of other countries, Sinn Féin believes the introduction of a subsidised low cost green loan scheme would enable the purchase of energy efficiency and microgeneration technologies by a wider cohort of households so that increasing numbers can enjoy the resulting lower energy bills.

The above proposals and those contained in our Powering Ireland 2030 document can only be realised through a combination of public and sectoral cooperation.

Cathal Boylan,
Member of Legislative Assembly, Northern Ireland

H2-Future Opportunities By Sam Knox, from Invest Northern Ireland

According to the United Nations, sustainable economic development depends on the availability of two resources, water and energy. Northern Ireland has good natural resources in the plentiful supply of water in the form of underground aquifers and energy from our wind resource. The present scenario where we are curtailing our wind resource due to oversupply presents us with an opportunity to make zero emission hydrogen cleanly through the electrolysis of water and the utilisation of low cost renewable electricity. This will enable us to contribute to the objectives of the UK Industrial Strategy to reduce carbon and particulate emissions as highlighted under the Clean Growth theme.

London, already an acknowledged leader in deploying zero emission hydrogen and fuel cell technologies, has pioneered a fleet of hydrogen powered buses and taxis, installed the largest total capacity of stationary fuel cells in any European city and established a commercial market for transportable fuel cell applications. The cities of Leeds and Aberdeen are also following this lead through the deployment of hydrogen buses for public transport, all of which are manufactured by Wrightbus in Ballymena.

However, there is still much to be done if we are to reap the environmental and economic benefits from deploying hydrogen as a low carbon fuel. Overall the environmental benefits are quite clear. The uptake of hydrogen powered vehicles, fuel cell units in buildings and portable applications will all help meet energy and transport requirements with ultra-low emissions – offering a pathway to delivering cleaner air and significantly enhanced health benefits. Additional future opportunities for hydrogen could be the decarbonising of the heating and industrial process including steel making, synthetic aircraft fuels and cement manufacture. Hydrogen can be produced from a range of low carbon sources such as biogas and solar to be stored to help support a more resilient energy network for security of supply.

To accelerate the potential opportunities we need to take the lead in innovation. Being ahead of the game ensures the development of a specialised and skilled industry, which in turn attracts further investment and demonstrates ambitions to drive positive change. When completed, the GenComm project will be in a position to inform government and business stakeholders when it will be the right time to invest in economically viable commercial opportunities associated with hydrogen generation from wind, biogas and solar power for use in transport, power generation and energy storage. The project will also advise on the associated training requirements for the future development of the sector.

To find out more and get involved in the low carbon economy why not attend All Energy, www.all-energy.co.uk/ where you can attend workshops and seminars on hydrogen and fuel cells that will highlight energy conversion; re-energising the UK industry for clean growth; and promotion of innovative solutions.

If you wish to attend All Energy as part of the Invest NI Energy Storage delegation on 14-16 May, contact Sam Knox at: sam.knox@investni.com

Sam Knox is a Business Development Executive in the Strategy Team at Invest Northern Ireland. He is an Energy Engineer with over 30 years' experience in the sector and has delivered new business opportunities in the technology areas of energy efficiency, bio-energy, offshore wind, water and waste water. He is presently responsible for the development of opportunities associated with smart grid including energy storage and intelligent energy systems.

GenComm Outreach

Applications from the GenComm team have been submitted recently for two notable awards. The Sustainable Energy Europe Awards were launched by the European Commission in 2006. The closing date for the 2019 award was February 11.

The aim of the awards is to promote sustainable energy by highlighting outstanding and innovative projects which have the potential to be replicated. The GenComm project has been entered in the leadership category. This award recognises activities that, if replicated can contribute to the European energy and climate targets and long term decarbonisation objectives, having significant socio-economic benefits. Winners are announced as part of the EU Sustainable Energy Week.

A submission was also made to the Royal Society in London to host a scientific meeting, bringing together scientists to present and discuss research in hydrogen as an energy carrier. GenComm hope to have the opportunity to present at an international, two day conference, with the chance of publication in Philosophical Transactions of the Royal Society or Interface Focus.

Irish government policy to support community involvement in Renewable Energy projects

The growing Energy Co-operative movement in the Republic of Ireland was highlighted at the recent 'National Renewable Energy Co-operatives Ireland Conference', in October in Tullamore, Co Offaly, with the agreement of a new government policy on community involvement in renewable energy projects.

Senior representatives from the Republic's Department of Communications, Climate Action & Environment (DCCAE) discussed the 'Renewable Energy Support Scheme' (RESS), which was recently published by community renewable energy developers. Agreement was reached for the development of a policy on community involvement in future renewable energy projects, with a specific category to be set up for Community Renewable Energy projects.

The finer details of the policy will be developed in the coming months with the Department continuing consultation with communities and developers.

Cormac Walsh, Energy Co-Operatives Ireland

Final results of Belgium's Don Quichote project

The Don Quichote project (Demonstration Of New Qualitative Innovative Concept of Hydrogen Out of wind Turbine Electricity) demonstrated that the use of hydrogen as a large scale renewable energy storage solution is not "tilting windmills" anymore, but has technical and economic viability.

It represents an interesting commercial opportunity to connect intermittent renewable electricity to transport applications.

The Don Quichote demonstration plant was implemented at a large logistic centre of the Colruyt Group in Halle, Belgium.

The plant at this centre is interconnected to an existing hydrogen refuelling facility that supplies hydrogen to a fleet of material handling vehicles. It receives energy from renewable energy sources: wind and solar power.
In the project, components of an existing hydrogen refuelling system were replaced by innovative, more efficient components, and integrated with a renewable energy source, thereby realizing a renewable energy storage capacity based on hydrogen.

By demonstrating the impact on efficiency and costs of the operations of a large logistics centre, the project demonstrated the market readiness of the components needed for storing renewable energy in hydrogen.

Diederik Coppitters, BURN, Brussels

Don Quichotes hydrogen plant in Halle, Belgium

Department for Infrastructure Northern Ireland – Connecting people, supporting opportunities and creating living places.

In July 2018 the Secretary of State for Transport in the United Kingdom the Rt Hon Chris Grayling MP published the UK Governments "Road to Zero" Ultra Low Emission Vehicle strategy. The strategy provides one of the most comprehensive packages of support for the transition to zero emission vehicles in the world with nearly £1.5 billion of investment pledged for the sector.

One of the key messages from the strategy is that Government cannot deliver its ambitions to put the UK at the forefront of the design and manufacturing of zero emission vehicles alone. At the heart of the strategy is the commitment to work in partnership with industry, businesses, academia, environmental groups, devolved administrations, local government, consumers and international partners.

The partnerships referred to by the Secretary of State could not be better demonstrated than those which have been put together in the GenComm project. Over the past 18 months I have been able to observe how the Hydrogen Technologies being developed across North West Europe can be brought to the market, driven by a spirit of co-operation and desire to make things happen by all of the partners involved. Clearly GenComm has demonstrated that funding alone from Government and the European Union does not deliver solutions, it is the shared commitment of the partners and the desire to make a difference that will continue to drive the project forward.

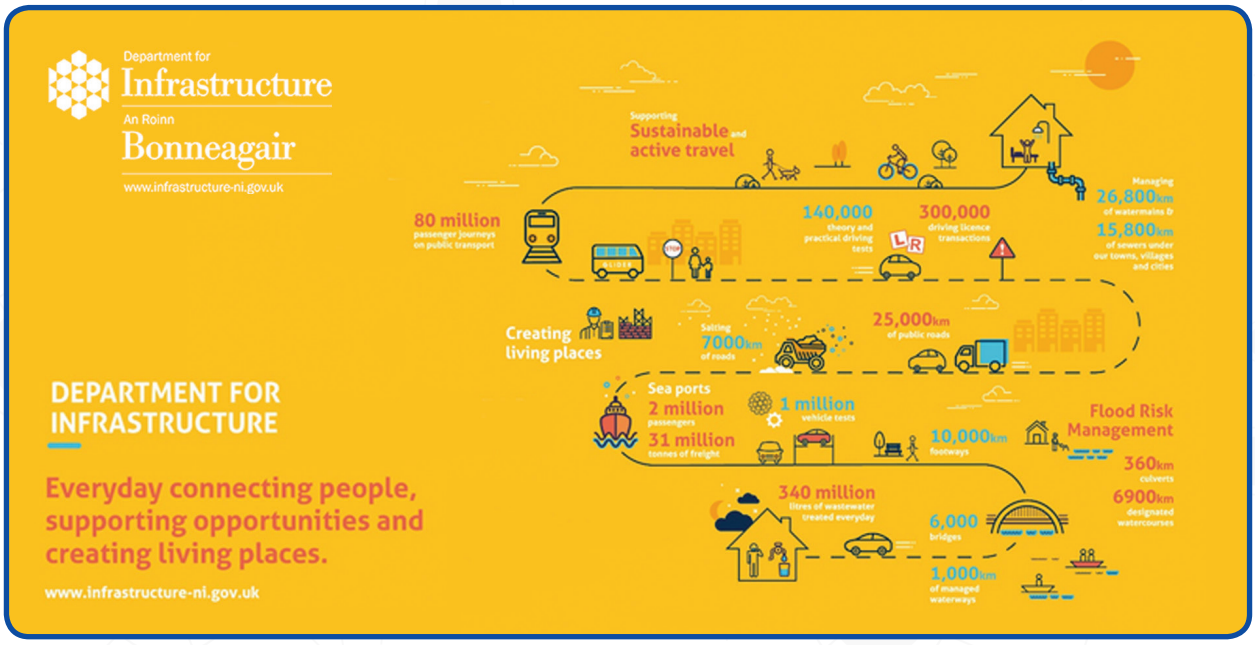
In Northern Ireland, the Department for Infrastructure has responsibility for driving change in the transport sector to secure infrastructure which will support technology neutral transport solutions, reduce emissions and connect people and opportunities in a more sustainable way.

GenComm is helping to map out the solutions in these areas of responsibility. During visits to Galway, Stornaway and Rouen, the partners were able to clearly demonstrate how this work will help the Department and its officials to shape the policies of the future in the transport sector. Northern Ireland has a great history of innovation, from Dunlop's invention of the pneumatic tyre to Sir James Martin's invention of aircraft ejector seat, the development of the modern Tractor by Harry Ferguson, and portable defibrillator by Frank Partridge to the introduction of the penalty kick in association football by William McCrum of County Armagh.

Hopefully the platform for the development of new technologies, provided by these early innovators here in Northern Ireland, can be built upon in this modern age with the forging of new international partnerships to develop targeted energy solutions for communities across North West Europe.

GenComm I am sure will meet that test and would have had the approval of Ferguson, Martin and company.

David Strain
Transport Projects Division
Department for Infrastructure,
Northern Ireland



DFI –Connecting People

GenComm partner Dr Rory Monaghans Renewable Journey

After completing his mechanical engineering degree at NUI Galway in 2002, Dr Rory Monaghan travelled to MIT to complete a master's and PhD in hydrogen fuel cells as well as carbon capture and storage. After six years there, he returned to Ireland to take a postdoctoral position at his alma mater, and in 2012 took up a position there as lecturer of energy systems engineering within mechanical engineering. He also helps run the award-winning Galway energy-efficient car (Geec) project, with the aim of creating the most energy-efficient car possible.

What inspired you to become a researcher?

Three key memories come to mind in my path to becoming a researcher. Lego and art were my passions as a kid, and I loved turning my drawings into physical creations. When I was six years old, my dad, who is an engineer, brought me a Technic Lego set from Sweden before anyone had seen one in mid-1980s Ireland! After that, my brother – who also became an engineer – and I spent most of our free time building treehouses to stand up to the west-of-Ireland wind, and go-karts to survive a gravel driveway. We were engineering 24/7 without realising it! Another key moment came after Junior Cert year, when my mum insisted I study chemistry for the Leaving Cert. I resisted at the time, but it was just as well I relented as virtually every piece of research I do now is underpinned by an understanding of chemistry.

Can you tell us about the research you're currently working on?

Society's burning of fossil fuels in the world's power plants, engines and furnaces is far and away the biggest source of the greenhouse gases that are accumulating in the atmosphere, and is destabilising Earth's climate. My research team is working to understand and develop new fuels that are renewable and environmentally sustainable. We particularly focus on trying to transform unwanted waste from one process into valuable fuel for another. We do this at many levels of depth and breadth, including: understanding the fundamental chemical processes at play when waste materials are transformed into renewable fuels, optimising engine performance to minimise pollutant emissions, designing nationwide networks to gather waste products, and upgrading them to fuels and distributing them to where they are needed. We have recently started an exciting project called GenComm, which is funded by the European Union's Interreg programme, on converting a totally different form of waste into a new type of fuel. Waste occurs in renewable electricity produced by wind farms when the wind is blowing, but at a time when people don't need electricity. Since it is very difficult to store large amounts of electricity for long periods of time, this resource is typically wasted. GenComm will take this otherwise wasted electricity and use it to produce hydrogen, which is an exciting energy carrier of the future. Hydrogen can be used to fuel heavy vehicles like trucks and buses, and can also be injected into the natural gas network so that renewable fuels can be piped directly to people's homes.

In your opinion, why is your research important?

My team's work is important because of the sheer scale of the environmental and energy challenges that Ireland, Europe and the world face. Recently, the IPCC warned that we have about a decade left to take drastic action before the world is locked into the two degrees Celsius global average temperature increase that signals widespread climate destabilisation. For Ireland, this could mean more droughts in summer and more floods in winter. It would also put our major cities, all of which are on the coast, at risk from rising sea level.
Even if we disregard the health of the environment and humans, continuing to burn fossil fuels at the rate we do now does not make economic sense. Ireland imports over four-fifths of the fuel we use, at an annual cost of over €4bn. The fact that the UK supplies the vast majority of this – and there is still no Brexit deal in sight – should be a big worry for policymakers. When you include the fact that my research team studies the use of waste residues and waste electricity as clean-fuel building blocks, I really believe we are tackling a tough and worthwhile task.

continued

What are some of the biggest challenges you face as a researcher in your field?

In common with researchers in many fields in Ireland, finding funding to support and grow my research team is my biggest challenge. Ireland does not fund its universities or researchers to the same extent as other countries. We have high student-staff ratios at Irish universities, which makes it difficult to carve out the necessary time for research. Energy decarbonisation is a relatively new addition to the Government's research prioritisation, but we are now seeing a real willingness from the public to act. There needs to be what we call a 'just transition' from our current energy system to a decarbonised future that manages these costs and adjustments fairly across society.

Are there any common misconceptions about this area of research?

A huge misconception is that energy and electricity are the same thing! Electricity is one useful form of energy, but it currently only accounts for one-fifth of the total energy we use each year in Ireland. We will soon realise that decarbonising our electricity supply, while difficult, is more straightforward than decarbonising the other 80pc of energy use, which is mostly in the form of transportation and heating fuel. A second major misconception is that hydrogen is an especially dangerous substance. Much of this fear stems from partial awareness of two things: the Hindenburg disaster and the hydrogen bomb. The Hindenburg was a hydrogen-filled airship (really called a dirigible or a zeppelin) that spectacularly and fatally caught fire on film in 1937. It has since been shown that hydrogen was not responsible for the Hindenburg fire. In fact, hydrogen is much safer than everyday fuels like petrol or diesel. Hydrogen bombs (or thermonuclear devices) are the most destructive weapons ever devised by humankind. The good news is that the conditions needed to create a hydrogen bomb are impossible to create accidentally!

What are some of the areas of research you'd like to see tackled in the years ahead?

Given the need to move beyond decarbonisation of electricity generation and electrification of light-duty vehicles, I think we need to move towards deeper integration of our entire energy system and away from our segregated power, transport and heating sectors. We need to turn our research attention to design, demonstration and implementation of the technical, economic and policy solutions that this decarbonised future requires. Central to all of this are energy citizens, who will not only consume, but produce energy as well. Developing groundbreaking technologies in the absence of informed and engaged energy citizens would severely limit the impact of our research.

Dr Rory Monaghan , GenComm Partner, Work Package, Long Term Effects

Open Meetings!

We invite you to our March 12th Open Meeting hosted by Energia at Belfast City Hall

We invite your feedback at our upcoming Open Meetings!

12 June 2019..... Pure Energy Centre (Scotland)
11 Sep 2019 ..... IZES (Germany)
11 Dec 2019 ..... ENSI Caen (France)
11 Mar 2020..... Belfast Met (Northern Ireland)

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