



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.

Pure Energy Centre's bio-energy plant driving one of the first circular hydrogen economies

The Pure Energy Centre (PEC) in Stornaway in the Outer Hebrides, one of ten European partners involved in the project, is due to soon complete works on the installation of its anaerobic digestion plant. This innovative bio-energy plant will generate fully renewable hydrogen from biodegradable waste, to not only generate electricity for the local community on the Isle of Lewis and Harris, but also generate oxygen for the island's fish farms for the breeding of salmon.

The main aim of the GenComm project is to enable remote communities to access renewable energy in the form of hydrogen, in a bid to tackle the ongoing and long-term challenge of unreliable grid connection. As part of the 'smart' hydrogen project, Pure Energy Centre's work package has looked at how waste streams can be optimised to produce biogas and generate clean hydrogen.

Elizabeth Johnson MBE, from Pure Energy Centre, explained how their circular economy has been developed at the recent GenComm Open Meeting in Stornaway:

"The biogas produced from the anaerobic digester on our Stornaway plant fuels a Combined Heat and Power Engine (CHP), where it generates both heat and power. Some of that power then feeds back into the electrical grid network. Any excess electricity generated from the CHP is then directed to an electrolyser, where hydrogen and oxygen are produced through a process of electrolysis, where water gets split into hydrogen and oxygen. The fully renewable hydrogen has then a dual use. It is used to power local businesses on the island, all-importantly avoiding the need to import power from the grid which to a large extent is not renewable. One of the greatest environmentally sustainable and commercial benefits of the green hydrogen is that it can also be used



From left: Paul McCormack, Belfast Met, Wolf Clemens and Bodo Gros, IZES Germany pictured with Elizabeth Johnson MBE at PEC's bioenergy plant.

to fuel vehicles, reducing the high CO2 emissions that are heavily associated with the transport sector. What is possibly more interesting however about the Stornaway plant is that the oxygen produced from the electrolytic process is compressed and stored, and used by a local fish farm for the breeding of salmon. The circular economy then continues, with the fish waste being directed back to the anaerobic digester to produce biogas, where the circular process begins again."

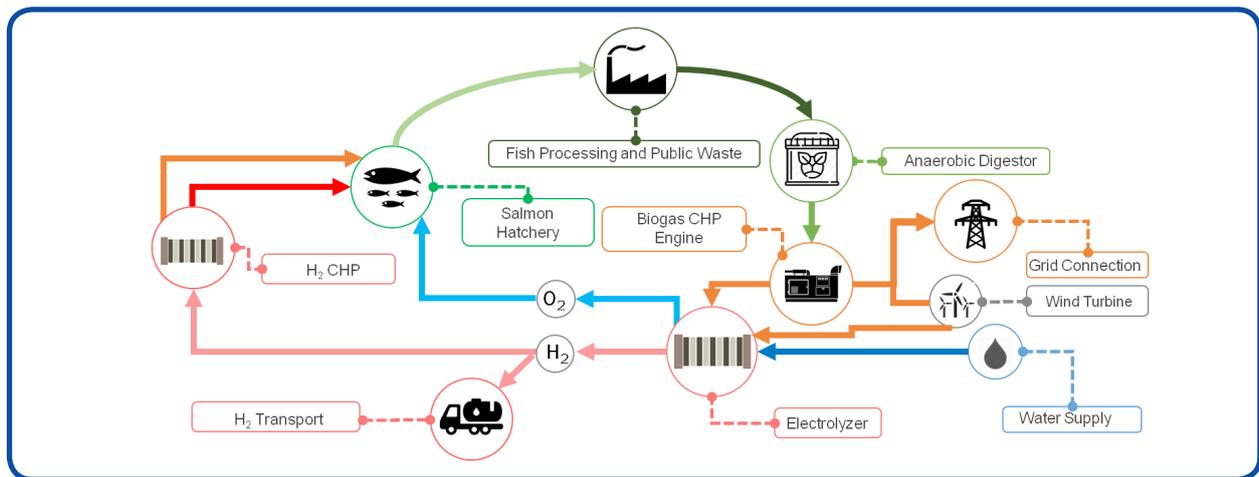


Figure 1. Circular economy model for PEC's plant at Stornaway

The recent Open Meeting at Stornaway's Lewis Castle College, which was supported by Comhairle nan Eilean Siar (the Western Isles Council), gathered experts and project partners from across North West Europe - Germany, France, Belgium, Scotland and the North and South of Ireland.

To be kept informed about future GenComm meetings and to join the Community Hydrogen Forum (CH2F), please visit <http://www.nweurope.eu/gencomm> or contact the Gencomm team.

SMART H2 bid submitted!

The Gencomm team are delighted to confirm that the SmartH2 bid was submitted at the end of July, after a consolidated team effort by all involved. Let's hope all the hard work has paid off, as we await the news from Interreg NWE.

The aim of the SmartH2 bid is to ensure commercial flexibility in the coupling of the renewable energy sector and the transport sector. Energy supply and transport account for 39% of the world's CO2 emissions. If we want to achieve a position where energy demand can be met from renewable energy supply, then we can look where SMART H2 has the potential for real 'sector coupling' in linking the renewable energy sector with the transport sector and achieving demand/supply balance with a zero CO2 footprint.

SMARTH2 has been specifically designed to respond to the current policy and market shifts from fossil fuels and non-sustainable energy carriers to be replaced by Smart green fuels. The Smart Hydrogen project will deliver 3 zero carbon hydrogen hubs which will demonstrate how SMARTH2 can be optimised and rolled out to the NWE transport community. The three pilots are:

1. SMARTH2 FUELLING (Refuelling Stations) - PILOT 1

- This pilot will deliver SMARTH2 from 2 refuelling stations
- It will ensure the demand or the transport fuel will be matched by supply of renewably generated H2 at all times with the development of new smart monitoring and delivery mechanisms

3. SMARTH2 INDUSTRY TRANSPORT (Intra- and inter-facility goods transport) - PILOT 3

- This pilot will deliver an efficient supply chain solution between different intra and inter production facilities
- It will ensure the demand or the transport fuel will be matched by renewable generation at all times with the development of new smart monitoring and delivery mechanisms
- It will deliver a new innovative closed loop supply chain fleet management system ensuring the availability/ demand for transport is matched.

2. SMARTH2 TRANSPORT (Commuter public transport) - PILOT 2

- This pilot will deliver an efficient public transport solution on the Island of Ireland by complimenting the existing delivery infrastructure.
- It will support the EU Infrastructure - TEN-T - Connecting Europe programme see; https://ec.europa.eu/transport/themes/infrastructure_en
- It will ensure the demand or the transport fuel will be matched by renewable generation at all times with the development of new smart monitoring and delivery mechanisms
- It will also be fully integrated with the energy market taking advantage of the capacity mechanisms and system services on the electricity network ensuring the efficiency of the electricity network is maximised
- It will deliver a new innovative community transport management system ensuring the demand for community transport is match by the availability of the fleet.

The role of BURN in GenComm

We have all encountered at least once a situation when we were influenced by uncertainties. For example, you drive to the train station to catch a train, but you arrive late due to a traffic jam on the highway. Considering the uncertainty of possible delays on that highway could have modified your decision on when to start the commute. Moreover, if the probability of a delay shows to be high, a more robust route might be necessary.

To ensure you will get to the train station on time, you might consider taking a route which has a longer distance but ensures the lowest probability of large delays. As illustrated by this example, real-world uncertainties are present in our daily life and can have drastic consequences.

In the Gencomm project, Burn's role is to consider all uncertainties that might influence the performance of the hydrogen-based pilot plants. As a holistic approach is considered, we will take into account uncertainties on multiple technical, economic, environmental and social parameters.

This will result in a mean and standard deviation for the considered goals of the plant (e.g. cost, production, downtime, pollutants, job creation). As a high variation on these goals might be found for some of the designs, no concrete conclusion can be drawn on the plant performance. Therefore, by applying robust design optimization, we will look for a design that is least sensitive to these uncertainties.

This design might achieve a less optimal mean for one of the goals (i.e. higher mean cost), but ensures the lowest variability of these goals during the system lifetime. In a novel renewable energy system where prediction becomes more valuable than production, a shift towards these robust designs is inevitable. Therefore, BURN will ensure an optimal, least sensitive design to variations for all hydrogen-based renewable energy systems developed using the decision support tool.

INSA win best poster award

Silvia De Los Santos, a PhD Student at INSA Rouen Normandie, won the prize for Best Poster at the recent GPE Congress in Toulouse.

Silvia's poster was elected by the participants of the congress, receiving the Award in recognition of her significant work on the subject of 'Electrochemical hydrogen production from urea.'

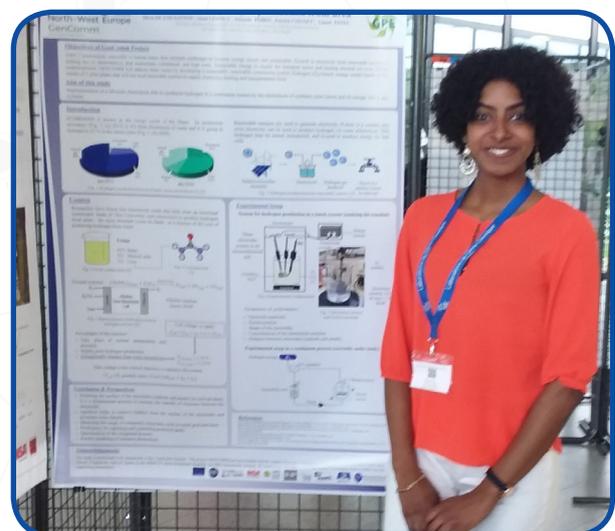
INSA staff delivered presentations on methanation, and electrochemical methods at the Green Process Engineering Congress, and also presented on the wider GenComm project.

INSA is the partner responsible for the project's technical models, which form part of the development of the project's key output - the Decision Support Tool. INSA are also carrying out R&D into methanation, as part of the analysis of PEC's bioenergy plant in Stornaway.



Diederik Coppitters from BURN, Brussels presenting at ECOS 2018 Portugal

In our recent work, we applied robust design optimization on a photovoltaic-electrolyzer system. We considered 18 uncertain technical and economic parameters, which affected the production and cost of the system. We found that sunny locations are both optimal for the mean and variation of the cost per kilogram of hydrogen produced. Therefore, robust designs of photovoltaic-electrolyzer systems are found at sunny locations, achieving the lowest average cost per kilogram of hydrogen produced, as well as the highest probability of achieving that optimal average.



Silvia De Los Santos with her winning poster at the GPE Congress in Toulouse

Development of the Community Hydrogen Forum (CH2F)

Hydrogen is a multipurpose energy carrier that can be produced from renewable electricity through electrolysis. The roles of hydrogen in the future energy system are: short or long-term energy storage, a zero-carbon transportation fuel, a zero-emission heating fuel, a high-purity gas for industry, and an essential substance to produce synthetic natural gas.

The knowledge of the GenComm partners in the technical and economic aspects of hydrogen utilisation will be summarised into a web-based decision support tool (H2GO). As one of GenComm's objectives,

this tool will guide energy communities, investors, policymakers, academia and industries to build hydrogen storage.

Those stakeholders will form the Europe-wide Community H₂ Forum (CH2F). The main objectives of CH2F are (1) to educate its member and stakeholders towards a hydrogen economy, (2) to develop strategies and policies for hydrogen advancement, interaction and discussion among CH2F members, which will enable understanding of the practical aspects of hydrogen as well as its investment costs. Ultimately, our CH2F can help to

coordinate plans to broaden hydrogen penetration as energy storage. CH2F covers the Northwest Europe region including Ireland, UK, France, Belgium, Netherlands, Luxembourg and Germany.

If you are interested in joining the CH2F or have any queries, please contact:

Dr. Rory Monaghan
 (rory.monaghan@nuigalway.ie)
Arya Gunawan
 (t.gunawan1@nuigalway.ie)

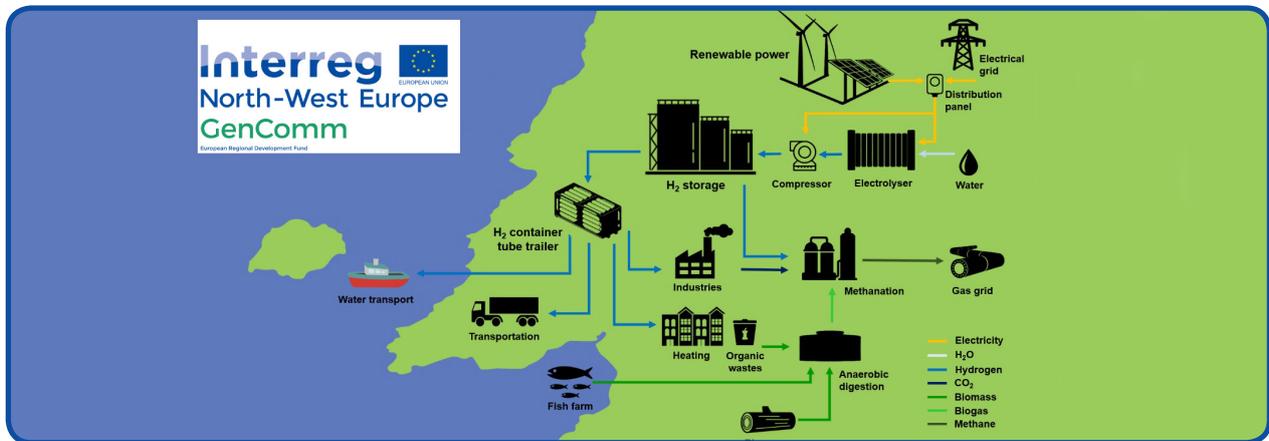


Figure 2. Flow diagram of hydrogen production and its usability

New members to our CH2F

We are delighted to welcome our new French members to our Community Hydrogen Forum (CH2F): Région Normandie, Energies Normandie, Communauté d'Agglomération du Cotentin, Seine Normandie Agglomération, Métropole Rouen Normandie and Saint-Lô Agglo. The new members will observe the findings of our project and receive our quarterly Newsletters, and will become more closely involved once the CH2F has been officially formed. If you wish to join the CH2F please contact the Gencomm team.



We invite your feedback at our Open Meetings!

17 Oct 2018..... INSA Rouen (France)
 12 Dec 2018 BURN (Brussels)
 Mar 2019..... Energia (Northern Ireland)
 June 2019..... Pure Energy Centre (Scotland)

Sep 2019 IZES (Germany)
 Dec 2019 ENSI Caen (France)
 Mar 2020..... Belfast Met (Northern Ireland)



For more information on the GenComm Project contact:

Anne Artt
 Operations & Communications Manager
 Tel: +44 (0) 28 9026 5276
 email: aartt@belfastmet.ac.uk
 www.nweurope.eu/gencomm

Eugene McCusker
 Communications Officer
 Tel: +44 (0) 28 9026 5277
 email: emccusker@belfastmet.ac.uk
 www.nweurope.eu/gencomm