Interreg North-West Europe GenComm

European Regional Development Fund

H2GO

Associated Partner Workshop

Project Summary

Project GenComm will address the energy sustainability challenges of NWE communities through the implementation of smart, hydrogen-based energy matrixes. The project certifies the commercial maturity of hydrogen technologies by implementing three pilot plants, linking the three main NWE renewable sources, Solar Power, Wind Power and Bioenergy, with energy storage and the main forms of energetic demand; heat, power and transportation fuels. Based on the pilot plants; integrated technical and financial simulation models will be developed.

Together, both models will form a Decision Support Tool (DST) that provides a roadmap for communities from transition to renewable, hydrogen-based energy matrixes. The final goal of the project is, through the combination of sources and forms of demand, to lead NWE's road to sustainability while granting hydrogen its position as a commercially viable energy medium for the future.

Project Objective

GenComm will technically and financially validate and model the renewable H2 value chain and adapt it to a DST that leads NWE communities into sustainable, local and autonomous energy matrixes. The DST is directed to community energy stakeholders (utilities, policy-makers and private firms in the energy sector), as the key agents to implement the proposed matrix. The project will first engage energetically and territorial remote communities to then address the rest of NWE.

Project Sub-Objectives

1. Empower communities to implement hydrogen-based energy matrixes to sustainably satisfy their energetic demand.

2. Stimulate the uptake of renewable hydrogen-based technologies by successfully running three demonstration facilities.

3. Establish a strong group of energy stakeholders devoted to, through the use of hydrogen, "sustainabilise" the energy matrix of the NWE region.

Hydrogen Mobility is coming to Saarland

IZES gGmbH, a partner in the GenComm Project, will be in charge of developing the first Renewable Hydrogen Refuelling Station in Saarland.

The research institute IZES gGmbH will be the partner in charge of developing a solar-fuelled hydrogen refuelling station and analyse the renewable hydrogen mobility value stream as a part of the INTERREG North-West Europe funding bid for the €9.39m GenComm Project.

GenComm aims to answer the current energy sustainability challenges being faced by communities across North-West Europe through production, storage and utilization of smart renewable hydrogen. In the current context, where decarbonisation of the energy matrix is mandatory and there is a need of an energy carrier that can serve as a buffer between renewable sources and the different forms of energetic demand, hydrogen production from renewable sources has acquired the outermost relevance. Hydrogen generated from electricity relies in electrolysis. Electrolysis is the electro-chemical process in which water is split by an electric current- into its constituent elements, (di)-hydrogen (H2) and oxygen (O). Hydrogen can then be used in multitude of applications through, (1) hydrogen fuel cells, (2) combustion and (3) power to hydrocarbons applications. Both technologies can be used for re-electrification and heat production supplying the demand of the 3 main sectors: Power, Heat and Transportation.

Smart Hydrogen combines the mentioned challenges for mature renewable electricity technologies, the opportunities in hydrogen supply pathway and applications with the different trends in the energy markets with "Power to X technologies" in order to create a hydrogen value chain that is optimal in technical performance and financial revenues.

GenComm will develop three pilot facilities fuelled by Solar Power, Wind Power and Bioenergy to measure their ability to produce and store hydrogen, together with its viability as a sustainable energy solution for heat, power and fuel for communities across North-West Europe.

The pilot facility in Saarland will be located in the Innovation Campus Saar in Saarbrücken, where the IZES gGmbH is located. It will be fuelled by a 35 kWp PV Array and it will have an on-site nominal hydrogen production capacity of 5 Nm^3/hr (6,25 Nm^3/hr maximum capacity). The plant will be able to fill most current versions of hydrogen Fuel Cell Vehicles (FCEVs) at 700 bars and 350 bars. Overall, the plant is projected to support one FCEV as part of the IZES fleet and will count with enough storage capacity to supply the vehicle during the low solar power production, and hence low hydrogen production, periods along the year.

Virtual Render of the Solar-fuelled Hydrogen Station to be built in the Innovation CampusSaar in Saarbrücken

The GenComm Project is led by the Belfast Metropolitan College, Belfast Met (NI) and beside the IZES gGmbH it counts with the following partners, National University of Ireland Galway (ROI), University Institut National des Sciences Appliquées Rouen Normandie (France), Vrije Universiteit Brussel (Belgium); ENSICAEN – CNRS (France); Pure Energy Centre (Scotland) and three further NI organisations; Viridian, TK Renewables, and Williams Industrial Services.

Key Note Speaker

Axel Rücker

Head of Sub-project Component Control & Technology Management
Department of Hydrogen and Fuel Cells, BMW Group

The BMW Group is with its brands BMW, MINI, Rolls-Royce and BMW Motorcycles, the world's leading premium manufacturer of automobiles and motorcycles and also provides premium financial and mobility services. As a global company, the BMW Group operates 31 production and assembly facilities in 14 countries and has a global sales network in more than 140 countries.

In 2016, the BMW Group sold approximately 2.367 million cars and 145,000 motorcycles worldwide. The profit before tax for the financial year 2016 was approximately € 9.67 billion on revenues amounting to € 94.16 billion. As of December 2016, the BMW Group had a workforce of 124,729 employees.

Long-term thinking and responsible behaviour have always been the basis of the economic success of the BMW Group. The company has firmly anchored environmental and social sustainability along the entire value chain, comprehensive product stewardship and a clear commitment to conserve resources.

The BMW Group is conducting intensive research and development in the area of fuel cells and hydrogen tanks, with the aim of series-producing emission-free vehicles combining extensive range with short refuelling times. The development of cars powered by fuel cells has received additional impetus from the research cooperation between BMW Group and Toyota in this field. In 2015, BMW unveiled its 5 Series Grand Turismo Hydrogen Fuel-Cell Car. BMW is expecting to produce a low-volume fuel-cell car in 2021, with wider availability in 2025.

Sub Partners

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Associated Partners

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Hydrogen & Fuel Cells

Did you know that...?

Hydrogen presents a multitude of application within an outside energy Markets

STATIONARY ENERGY

The use of hydrogen for energy purposes occurs mainly in fuel cells. In 2016 alone some 50,000 fuel cell systems were delivered worldwide, with a total generating capacity of approximately 200 MW_{elec}. Around 80% of the fuel cell systems supplied and 60% of the fuel cell capacities shipped were stationary applications.

Commercial micro CHP fuel cell systems have an output range of 10 kWe and usually rely on polymer electrolyte (PEMFC) and solid ceramic oxide (SOFC) fuel cell technologies.

The combined efficiency, electrical and thermal, can be as high as 95% while, the electrical efficiency is up to 45%.

Stationary fuel cells generate both power and heat. Major demonstration projects for fuel cell heating systems have already been introduced in Germany. Major demonstration projects for fuel cell heating systems have already been introduced in Germany, Europe and Japan under the names “Callux”, “Enefield” and “Ene-Farm”.

The European projects have installed more than 1500 PEMFC and SOFC systems that are currently operating in houses and apartment buildings. In the meantime, the first fuel cell systems for domestic energy supply are now commercially available.

Japan leads the micro-CHP market with 200,000 units by 2016 and 5.3 million are expected by 2030.

TRANSPORT

Hydrogen fuel cell systems are suitable for virtually all means of transport.

The use of hydrogen –both as a propellant and as an on-board power source for spaces developed with the space race in the 1950s and 1960s. Currently there is a small market for launch vehicles with few applications.

Hydrogen for aviation purposes have been proven by a series of demonstration projects, particularly for on-board power supply. The first miniature/small aircraft have been demonstrated but its use in larger commercial aircraft is not yet in sight.

Concepts for small ship/boat propulsion and fuel cell for on board power generation are being trialled. Emerging concepts for commercial maritime shipping.

Ground transport have different levels of maturity levels. Several demonstration projects are currently active for light rail vehicles.

There are over 11, 000 fuel cell material handling vehicles in North America alone with demonstration fleets in Japan and Europe for industrial trucks, forklifts and tow-trucks.

Mass transport fleets in the form of busses are being tested in numerous small projects worldwide. Larger projects with several hundred buses are now at the planning stage. These projects rely currently only in public funding.

Lorries, passenger and light commercial are already technologically proven and commercial fleet projects are staring to spur at public and commercial level worldwide. Incentive schemes are still necessary to support its development.

Prototypes of hydrogen motorcycles and e-bikes have been developed and early commercial applications are on sight.

RAW MATERIAS

Hydrogen as a raw material for the chemical industry represented a worldwide market of approximately US$ 110 billion in 2016 and is expected to continue to grow to approximately US$ 150 billion by 2024.

Currently around 55% of the Hydrogen produced worldwide is used for ammonia synthesis (NH_3) which in turn is used as a fertilizer, fermenter, cleaner and refrigerant.

Hydrogen is a by-product of crude oil refining in refineries, in particular catalytic reforming of naphtha, on the other hand it is used for the processing and refining of oil products in refineries – in processes such as hydro-treating and hydrocracking. As the world energy matrixes pursue the independence from fossil fuels, the hydrogen supply pathways will be considerably affected opening an opportunity to cost effective renewable hydrogen.

ENERGY PRODUCTS

Hydrogen can be used to synthetize potential renewable fuels. In the case of biogas, Hydrogen is necessary to upgrade it to grid-level Natural Gas.

Carbon Dioxide (CO_2), from Carbon Capture and Sequestration (CCS) Schemes for example, can also be upgraded to grid-level Natural Gas with the use of hydrogen.

In both cases, Hydrogen can also be used to produce Methanol (CH_3OH), a liquid fuel with characteristics very similar to the current conventional fuels.