Belfast Met Team Drives Energy Transition

By Paul McCormack, Belfast Met's GenComm Project Manager

Abraham Lincoln once famously stated "The best way to predict your future is to create it."

That is what the international GenComm team led by Belfast Metropolitan College are working on, driving energy transition. The team are working to create a new secure energy future utilising renewable energy to produce zero carbon hydrogen and using this as an energy carrier. The energy transition from dependency on fossil fuels across Europe is already well underway but is happening at different speeds across the continent. With the support schemes for renewable energy and the rise of 'off grid' systems, the energy system is taking a new course towards greater democratization and decentralization. With the Paris climate agreement, Europe is facing the global responsibility to keep global warming within 1.5°C. North-West Europe is one of the highest energy consuming regions in the EU and faces a number of energy-related challenges, including the low share of renewables in the production and consumption mix and NWE's strong dependence on non-renewable energy sources. NWE regions thus need to improve renewable energy distribution and generation infrastructure to reach the EU 2030 targets and to reduce GHG emissions.

Renewable capacity in the EU has increased by 71 percent between 2005 and 2015, contributing to sustainable development and more local jobs. In the most advanced countries and regions in Europe it is often the local government and citizens who are driving the transition.

The challenge faced by Europe is how to increase the share of renewable energy supply and demand in North-West Europe when the electricity grid is at maximum capacity and expanding or increasing grid capacity will require major capital cost.

This lack of grid capacity is the biggest limiting factor in increasing the utility and community scale renewable energy supply in North West Europe. Rural and isolated communities in NWE face unique energy issues related to efficiency, reliability and sustainability. This is commonly due to dependency on external and fossil fuel energy supply, low electricity grid capacity and limited or no connection to wider grids. As a result these communities have higher than average carbon emissions and are more vulnerable to fluctuating fuel prices.

The GenComm team are seeking to achieve successful energy transition to renewables in North West Europe by demonstrating the full commercial opportunity for renewable energy through renewable energy sector coupling by utilising SMART H2 (Hydrogen produced from renewable energy sources) as an energy carrier to achieve this goal.

Hydrogen has the potential to become one of the main energy carriers of the future as it can be easily produced using renewable energy, stored using commercially available technologies and used throughout the entire energy system. Hydrogen is a clean fuel that has the possibility to produce electricity, motive power and heat. Hydrogen is a versatile, clean, and safe energy carrier that can be used as fuel for power or in industry as feedstock. It can be produced from (renewable) electricity and from carbon-abated fossil fuels. It produces zero emissions at point of use. It can be stored and transported at high energy density in liquid or gaseous form. It can be combusted or used in fuel cells to generate heat and electricity.

Hydrogen produced via electrolysis requires only electricity and water, and returns to pure water when used to produce end-use energy. The process does not emit any pollutants. Therefore, hydrogen is a highly suitable fuel for carbon-free energy production and transport systems. Supplying the required electricity by excess renewable energy results in renewable hydrogen that can carry energy that would otherwise be lost, and unleash it whenever required. Since hydrogen is a highly diffuse gas, it must be stored under very high pressures, up to 700 atmospheres, which requires further energy. Hydrogen fuel cells are used to extract the energy from hydrogen, by performing electrolysis in reverse.

The GenComm team are working to resolve grid constrained, renewable energy deployment issues, greening the energy infrastructure, creating and demonstrating the appropriate environments and setup required to utilise the excess renewable energy, transforming and storing it as a Hydrogen Gas and then using this as an energy carrier for multiple uses within the energy demand spectrum.

This Belfast Met work in partnership with other innovative energy projects will ensure that Northern Ireland remains a hotbed of renewable energy innovation.