



# Hydrogen Utilisation and Green Energy Project

## Case Studies

The HUGE project aims to...



**Provide** communities with energy security and self-sufficiency through increasing awareness and facilitating uptake of hydrogen utilization from excess renewable energy.



**Increase** the awareness of hydrogen as a viable energy option for a variety of end uses in the public infrastructure domain - housing, transport and industry.



**Facilitate** the decision-making and implementation of hydrogen solutions for public infrastructures and energy storage, suitable for cold climates and dispersed settlements.

# Aran Islands

The Aran Islands, located off the west coast of Ireland, explored the potential for green hydrogen to act as storage with multiple end uses including marine transport.

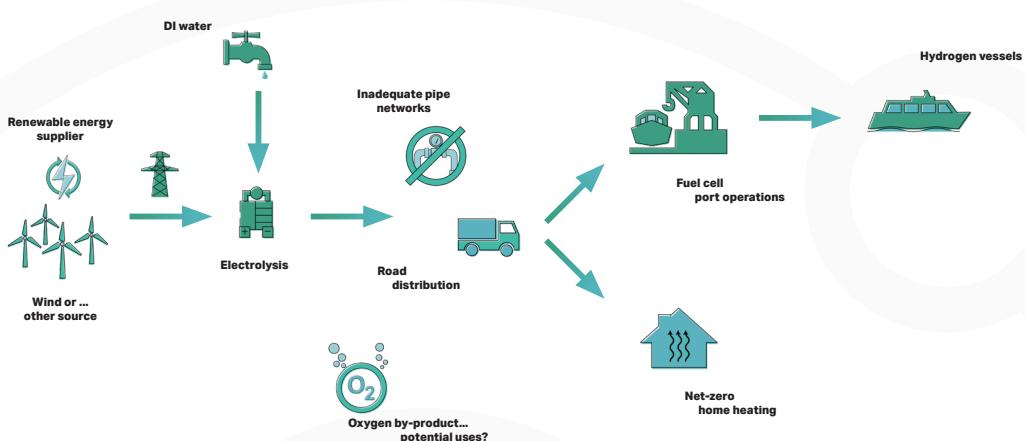
There is currently no green hydrogen being produced in the islands. The local energy co-operative is working towards complete decarbonisation and installation of a 2.3MW wind turbine.

Ferries are the largest consumer of fossil fuels in the islands and ferry operators serving the islands have shown a keen interest in investigation of green hydrogen vessels.

The case study offers maritime regions lessons on green hydrogen generation and fuel for marine transport. Due to the size of vessels it may also be of interest to lake and river cruises.

## Key Objectives:

- Is green hydrogen as a marine fuel economically viable from a private business perspective for ferry operators in the Aran Islands?
- What impact can green hydrogen have on the cost of importing and exporting goods for local businesses?
- Are there public acceptance issues around safety and do these issues impact on the tourism sector?
- Can local infrastructure on the islands support the generation of green hydrogen as there are frequent water shortages in the summer months when ferries are most busy?



# Faroe Islands

The Faroe Islands, located in the North Atlantic, explored the potential for green hydrogen to be used for marine fuel for the fishing industry, as well as hydrogen bunkering and heating for port buildings.

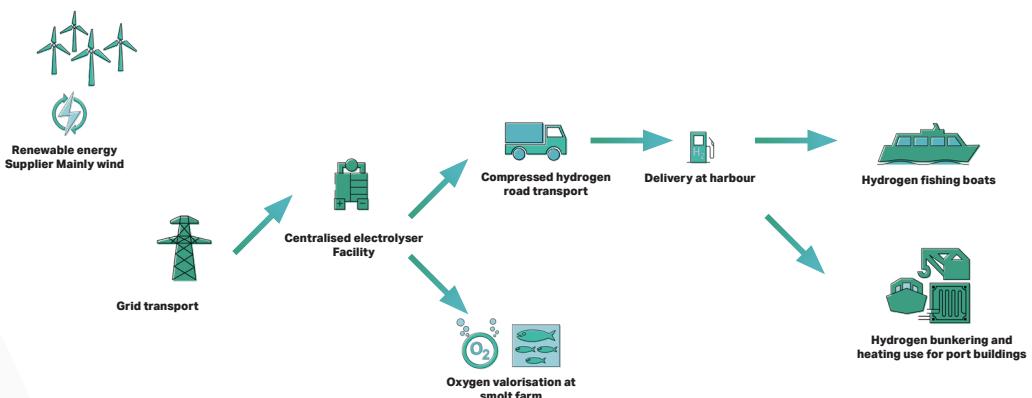
There is currently no green hydrogen being produced in the Faroe Islands but there is an expansion of renewable capacity in the form of wind turbines and other technologies over the next decade.

Work vessels and fishing vessels are currently powered by oil fuels but there is interest in marine companies to work with innovative fuels to reduce emissions.

The case studies offer marine transport lessons, specifically to islands with a strong fishing sector, as well as island grid stabilisation.

## Key Objectives:

- To what extent wind power and green hydrogen can replace oil from the energy supply on an island?
- What is the potential of using green hydrogen as a fuel in the marine sector, specifically the potentials and barriers in near-shore work vessels in the aquaculture sector and fishing industry?
- Development of financial models that can work towards green hydrogen as a solution.
- Can there be reliability in supply of green hydrogen be ensured to meet demand?
- Establish knowledge that can be useful in scaling green hydrogen across the marine sector.



# Finland

The Faroe Islands, a northern European country, explored the potential for green hydrogen to be used to create synthetic fuels.

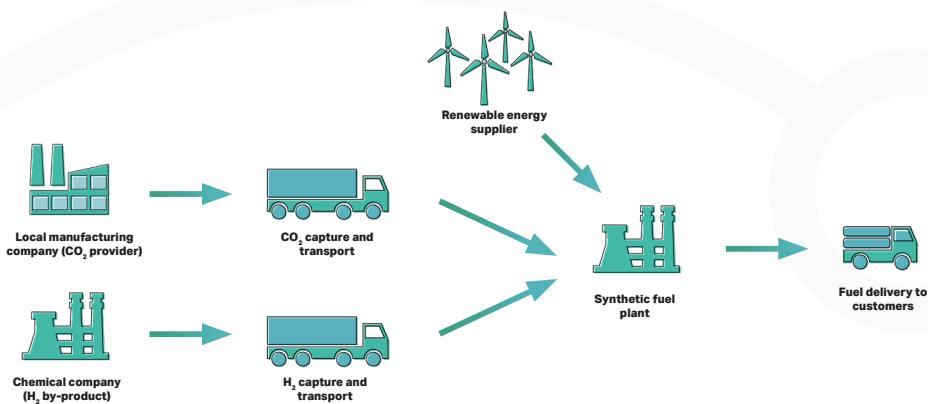
There is currently hydrogen being created as a by-product from the chemical industry. Combined with carbon dioxide captured from a local manufacturing company the raw materials, and utilising renewable energy, the case study looks at how to make synthetic fuel from hydrogen.

Although utilising hydrogen which is a by-product the methanol fuel can also be created with green hydrogen. This case study looks to understand processes involved in fuel production for which green hydrogen at scale can be substituted in the future.

The methanol and refined synthetic fuels created can be used in both industry and transport.

## Key Objectives:

- Is there technological and business potential in a synthetic fuel plant in Finland and how does price of hydrogen impact on fuel costs?
- What role is there for synthetic fuels produced from non-green hydrogen and will this impact on possible credentials as a renewable fuel?
- If green hydrogen is used as a substitute in the plant what scale of renewable electricity generation is needed and at what electricity price is needed to achieve affordable fuels?



# Iceland

Iceland, a country located in the North Atlantic, explored the potential for green hydrogen to be used for road transport in heavy goods vehicles.

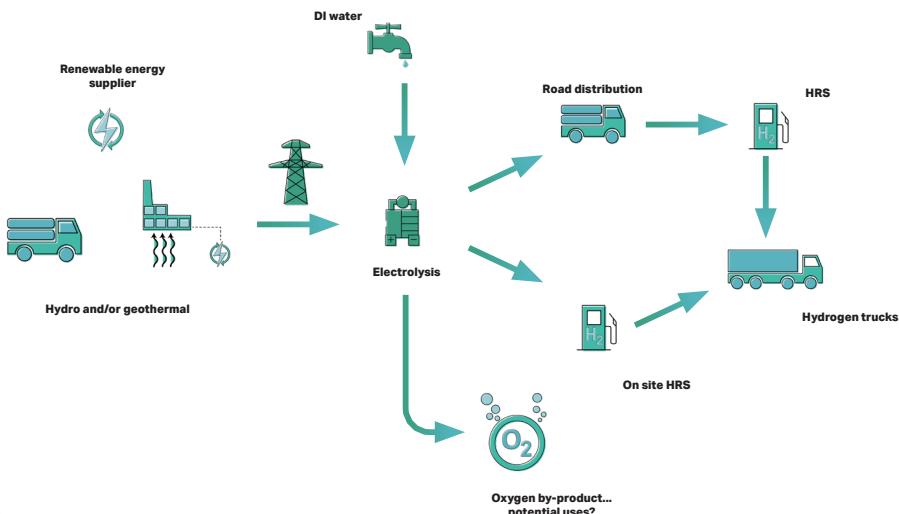
No green hydrogen is currently being produced in Iceland although there are plans announced to explore production from hydro power and geothermal power.

Hydrogen refuelling stations in Iceland are an integral part of the case study, building on existing infrastructure for Iceland's small fleet of hydrogen vehicles.

There is however increased interest from original equipment manufacturers to build larger vehicles using fuel cell technology for road transport utilising a supportive Icelandic government.

## Key Objectives:

- What are the demands of vehicle operators for the truck technology?
- How can existing hydrogen refuelling systems be scaled to fulfil demand for green hydrogen to replace all diesel truck transportation?
- What service and maintenance schemes would be needed in place to support this new green transport sector?
- Are new staff training procedures required to transition to green hydrogen?



# Northern Ireland

Northern Ireland, a country in the United Kingdom, explored the potential for green hydrogen generated from wind to decarbonise public transport via busses.

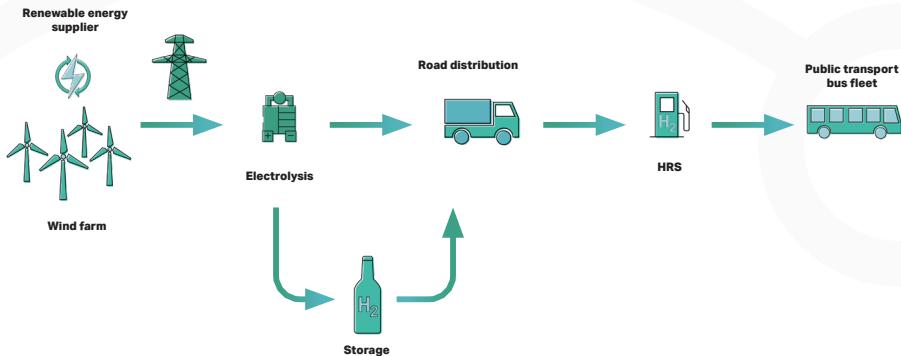
An agreement is in place between the public body responsible for public transport and an energy company which operates an onshore wind farm in Antrim to produce green hydrogen.

The green hydrogen supply chain was an integral part of the case study, examining green hydrogen generation through to use in the public transport sector.

This case study has wide scalability across the region and further afield in understanding both green hydrogen from wind and hydrogen use in bus transport.

## Key Objectives:

- To understand how innovative bus supply companies can utilise green hydrogen and fuel cell technology for net-zero transport.
- To establish supply of green hydrogen from onshore wind generator through to end user.
- To examine how green hydrogen can be utilised to provide public benefit through public sector organisations.



# Scotland

Scotland, a country in the United Kingdom, explored the role of green hydrogen in decarbonising buildings including off gas grid schools in remote and rural areas.

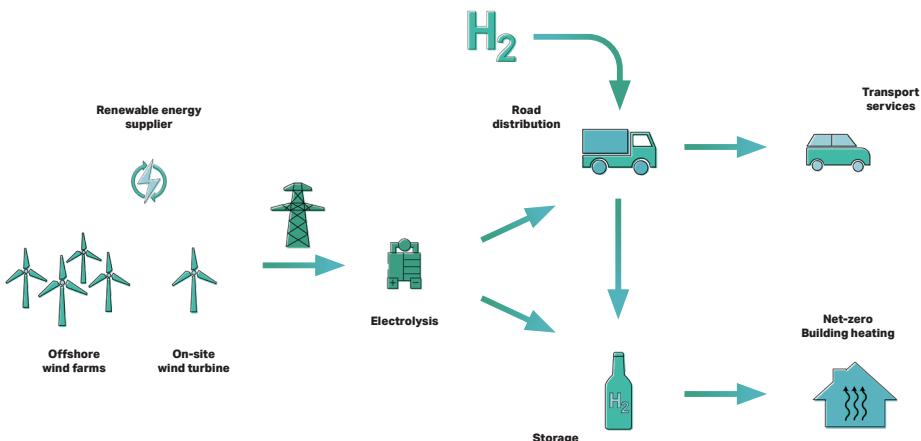
There are currently no green hydrogen producers however the case study looked at understanding how both utility scale renewables as well as local generation can provide green hydrogen to the public body end user.

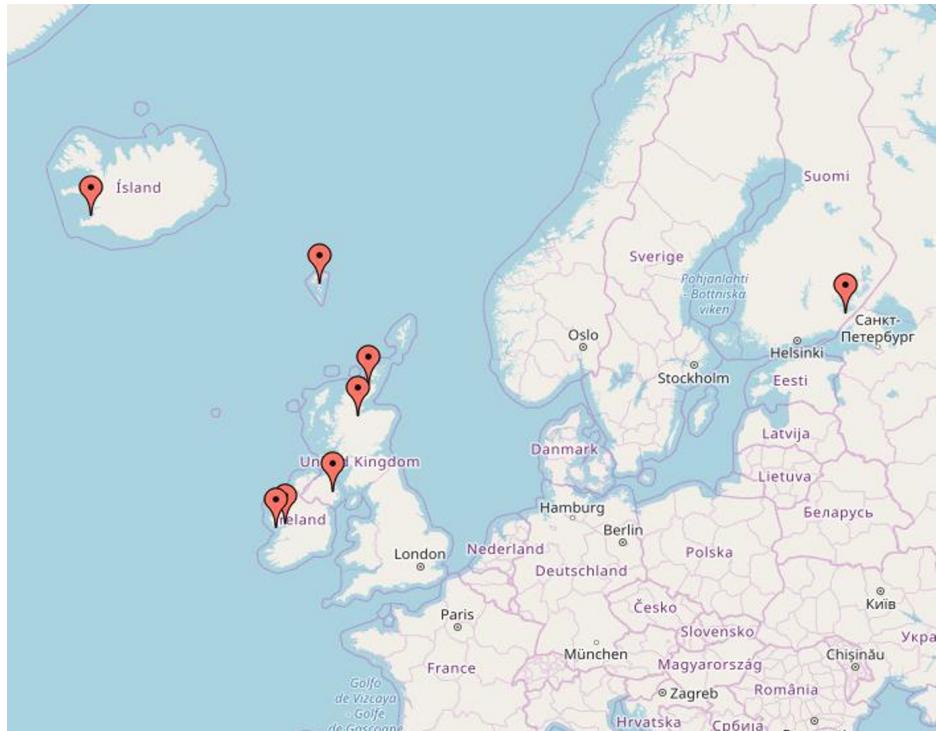
The unique aspect to the case study with high scalability was the approach to using LPG gas as a transition fuel for both supply chain and technology.

The case study was undertaken by the local authority which gives insight and scalability for municipalities across the region.

## Key Objectives:

- To investigate the feasibility of using hydrogen as the heating source for an off-gas grid primary school.
- To utilise a theoretical hydrogen heating system to promote a wider understanding of wider commercial heating projects.
- To investigate how green hydrogen can be utilised in the Highlands of Scotland to prove technology and explore the infrastructure involved.
- To analyse the public support and economic feasibility for the fuel to become a leading heating support in the region.





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