HyTrEc2

Newsletter 2019

Interreg
North Sea Region
HyTrEc2
European Regional Development Fund

EUROPEAN UNION

HyTrEc2
Hydrogen Transport Economy
for the North Sea Region

HyTrEc2: Delivering green hydrogen, innovative transport solutions and future skills as part of a shared vision for a cleaner economy in the North Sea Region

The €5.2 million HyTrEc2 project funded by the Interreg North Sea Region Programme brings together Partners from the UK, Germany, The Netherlands, Sweden and Norway to support the use of hydrogen in the transport and energy sectors. Project Partners are aiming to produce, store and distribute renewably produced hydrogen for refuelling a variety of innovative hydrogen vehicles, including vans and waste trucks. By offering hydrogen training and skills development alongside practical sessions for businesses interested in entering the hydrogen supply chain, the project is stimulating the hydrogen economy across the North Sea Region.

Innovative Transport Solutions

Our goal in HyTrEc2 is to demonstrate that hydrogen vehicles can successfully operate in both urban and rural environments. We are in the process of retrofitting both electric and diesel vehicles with hydrogen range extenders thereby improving range, air quality, noise and carbon emissions. HyTrEc2 vehicles are then being tested by Cenex under various conditions to produce standards that can be used across the North Sea Region for others interested in hydrogen vehicle applications.

In October 2018, the Municipality of Groningen added an electric-hydrogen Renault Kangoo and electric-hydrogen Street Scooter (or tipper van) to their growing hydrogen fleet. In addition to two Hyundai ix35s being deployed since October 2017, which have raced from The Netherlands to London, they are also in the process of retrofitting two electric – hydrogen refuse trucks. These will be showcased in 2019.

Aberdeen City Council (ACC) has also been deploying Renault Kangoo electric-hydrogen vans. In a first for the UK, the van went on the Co-wheels Car Club (car sharing) fleet for business trials. A second van, a Nissan env200 has also been retrofitted with a hydrogen range extender and entirely new components have had to be made to deliver this model, which will also be shortly made available on the Co-wheels fleet. In another first for the UK, two HyTrEc2 Toyota Mirais were launched for public use on the Co-wheels fleet, and another one went to the Robert Gordon University for staff to use in March 2019.

As partners in the HyTrEc2 project Aberdeenshire Council hosted the project partners to help evaluate the issues using hydrogen technology in a diverse rural terrain. Aberdeenshire has promptly invested to place a number of hydrogen cars operating as a small pooled fleet from their head office. The first two of these hydrogen vehicles have now arrived and are being monitored by Cenex alongside a range of comparable electric, hybrid, and diesel cars and vans. The monitoring will help establish how they perform in the rural setting where a reliable extended range is essential. Aberdeenshire Council is one of the larger rural authorities in Scotland and these vehicles will need to prove that they can be managed in a way that meets the operational business and user requirements in this testbed. The learning from this will help the project promote wider adoption of hydrogen technology in similar situations.

RISE has also been undertaking computer simulation testing for vehicles and has produced some very interesting results for the practical application of hydrogen technology in 5-9 tonne forklift trucks. This demonstrates that the addition of hydrogen can increase the practical time these for forklifts can be used without the negative implications of hours of recharging that is required in their electric battery only equivalents.

Establishing Hydrogen Vehicle Standards

Cenex has been collating information on all HyTrEc2, electric and diesel baseline vehicles with initial results now emerging. The findings have identified fleet vehicles which are suitable for battery electric vehicles and those vehicles which require fuel cells to complete their work. This research is likely to impact on the application of both hydrogen and electric vehicle deployment in future.

Case study of Aberdeen City Council:

It has been possible to identify individual vehicles in the ACC fleet that are suitable for zero emission transport on fully electric (battery electric vehicles or 'BEVs') and those vehicles which are not. The graph in Figure 1 shows that eight out of the 18 vehicles measured can comfortably perform their duties as BEV. The remaining 10 vehicles would struggle to perform their duties as a BEV on a single charge. The remaining ten vehicles, which have a maximum range requirements (the blue bar in Figure 1) which approach or crosses the red line in Figure 1, may be better suited to fuel cell electric vehicles to achieve zero emissions.

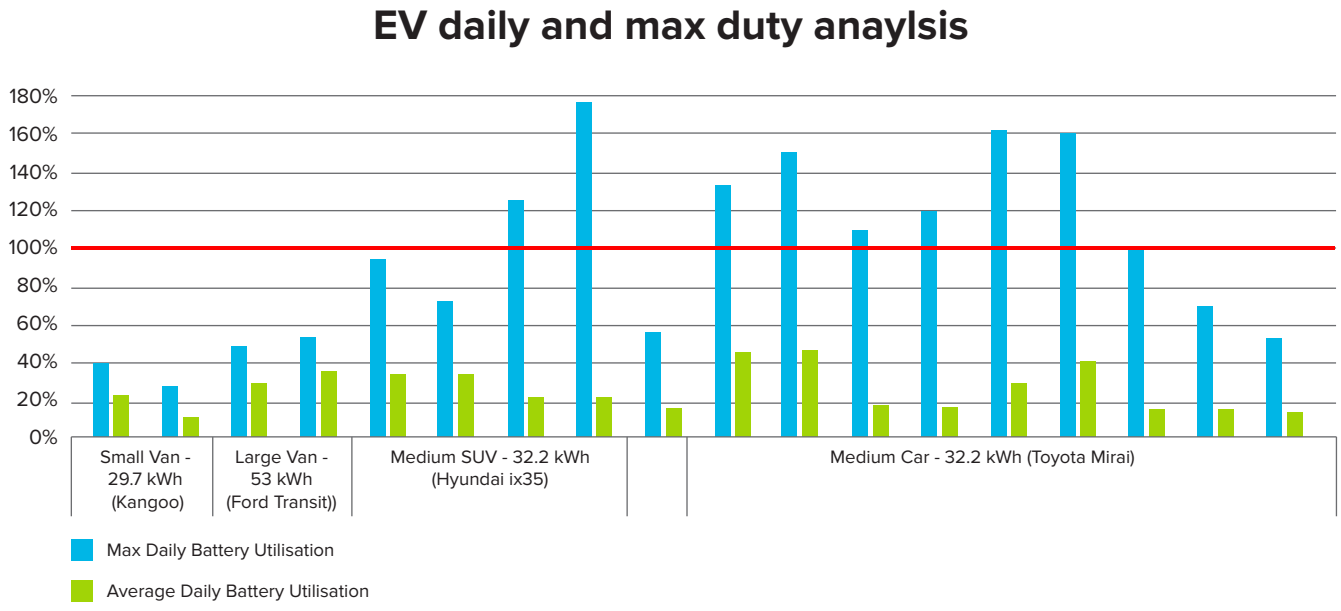


Figure 1: ACC fleet BEV and duty cycle comparison

Cenex's findings also indicate that it is critical that the hydrogen supplied must be generated renewably, or supplied as steam methane reformed (SMR) hydrogen, to achieve well to wheel (WTW) CO2e reductions. Hydrogen electrolysed from the national grid offered little or no CO2e reduction. As can be seen in Figure 2, Cenex's analysis indicates WTW emissions for SMR hydrogen range between 44% to 53% better than diesel equivalent vehicles, and that hydrogen electrolysed from renewable energy (for example with electricity supplied through a green tariff scheme), offer 100% reduction in CO2e emissions.

Green tariff carbon intensity (0g co2e/kWh) is direct emissions only. This does not account for renewable technology construction or maintenance (life cycle emissions), frequency balancing or energy storage, which may increase the carbon intensity of a 'green tariff' offered by energy suppliers.

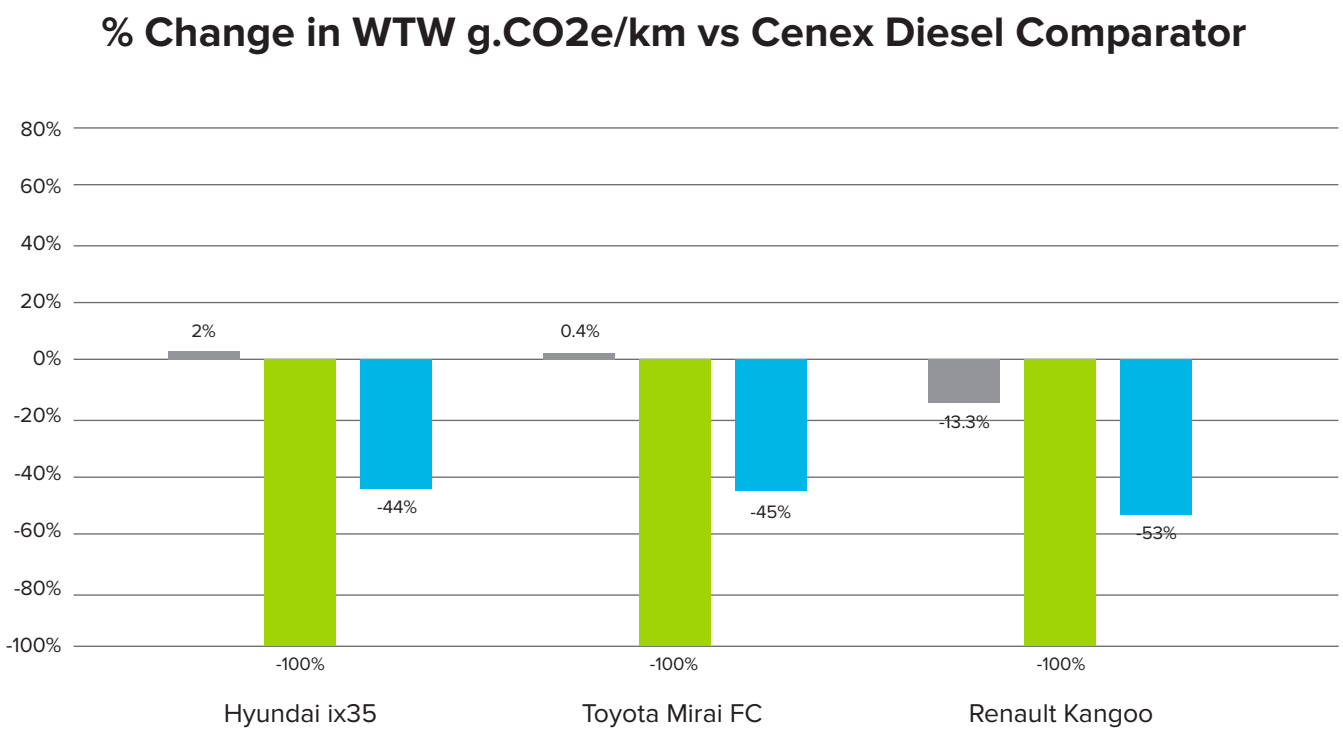


Figure 2: Percentage change in emission for FCEVs compared to diesel equivalent vehicles

Greening Hydrogen

While hydrogen transport emits no CO2 emissions some hydrogen production processes do. The HyTrEc2 Partners are therefore focussed on undertaking innovative demonstration projects in hydrogen production, storage and distribution that both reduce the cost of hydrogen but also have a low/ zero carbon footprint. Once these demonstrations have been delivered and assessed learnings on how to develop renewable hydrogen will be shared with the North Sea Region.

The municipality of Groningen has been leading the way in this area; working with Enterprise Holthausen to develop a temporary hydrogen filling station that is connected to a nearby solar park. The arrangement is resulting in a reliable supply of energy that is more than meeting the needs of the hydrogen production facility. In fact, this pilot scheme has been so successful that a new permanent and publicly accessible hydrogen production and distribution facility is being planned and will be available in 2020.

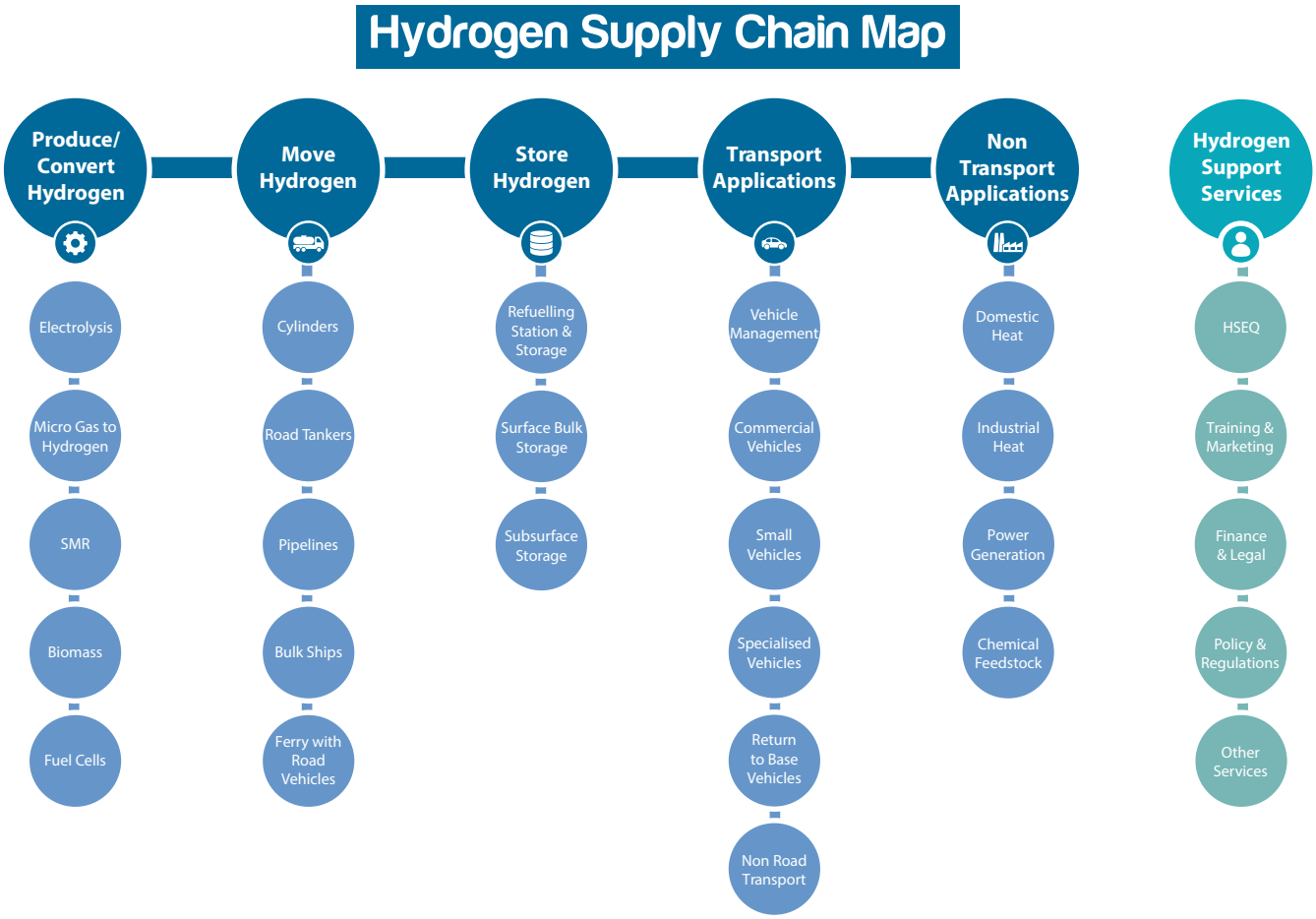
The development of this filling station has successfully demonstrated that hydrogen can be produced in remote areas where it isn't practical or necessary to transport. The local supply chain has also felt the benefit and this project has resulted in a huge amount of interest in the region and across the Netherlands. As part of a Northern Netherlands hydrogen network, Provincie Drenthe is now working on the business case for solar hydrogen in their area as well.

Groningen's Hydrogen Refuelling Station with solar park in the background

Aberdeen City Council has appointed Element Energy to develop the business case exploring the development of a sustainable and commercial supply of green hydrogen in the city, which can then be adopted by other Scottish cities in future years. The study has been part funded by Opportunity North East and Scottish Enterprise, demonstrating the national interest in establishing hydrogen as part of the energy transition in order to deliver environmental, economic and social benefits to the City.

Developing the Supply Chain

While the discovery of hydrogen and the creation of the fuel cell isn't new, the roll out of hydrogen technology is. All Partners are actively engaged in developing the hydrogen supply chain across the North Sea Region in order to reduce costs, identify linkages with existing suppliers who could move into the hydrogen market, increase the number of products on the market, improve the efficiency of hydrogen technology and roll out skills and training. One of the first activities undertaken by the HyTrEc2 partnership has been the development of a Supply Chain Map for the North Sea Region. It was prepared as a basis for assessing and developing hydrogen supply engagement and identified how different regions could develop strong hydrogen supply chains by building upon existing hydrogen transport activity and regional supply chain activities. The HyTrEc2 Supply Chain map now has been presented to a number of different audiences as part of business to business meetings across the North Sea Region to demonstrate how different organisations can align their business to the hydrogen supply chain. The full report can be found at northsearegion.eu/hytrec2



Training Technicians

HyTrEc2 Partners have also been working together to identify potential hydrogen training opportunities that can be developed and shared throughout the North Sea Region. Course materials with practical green hydrogen and vehicle deployment examples from the HyTrEc2 partnership have been identified in the Northern Netherlands, Germany, Norway and the UK. Led by the Artic University of Norway, where higher education fuel cell courses are already offered, the Partners are working on practical training course materials for real world application and hope to have an online version available in 2020. Aberdeen City Council has also produced a series of online training videos that include: how to refuel your hydrogen vehicle and how a hydrogen refuelling station works. These can be viewed on YouTube. A link to the video can be found on the HyTrEc2 website: northsearegion.eu/hytrec2/

Developing a Hydrogen App

The European Institute for Innovation (EIfI) and Partners have set themselves the target of creating one customer interface for all European hydrogen car drivers by providing a complete, consistent, cross-device interactive Hydrogen Refuelling Station (HRS) 'app'. Alongside HyTrEc2 Partners, European operators have been supplying information to integrate their stations into the app. This app is now providing real time data for the majority of HRS around the North Sea Region. From the operator's perspective the app provides a tool to generate operational HRS data and European wide statistics for HRS usage, improve the communication and feedback channels between them and their customers and a significant improvement in general HRS usability. In the next development step, the app is going to integrate tools for maintaining a personal profile such as green statistics, invoices, trips etc.
To view the app go to: https://h2.live/en/

Developing the Hydrogen Transport Economy for the North Sea Region: HyTrEc2

Partners

Aberdeen City Council, UK
www.aberdeencity.gov.uk

Centre of Excellence for Low Carbon and Fuel Technologies, UK
www.cenex.co.uk

Aberdeenshire Council, UK
www.aberdeenshire.gov.uk

European Institute for Innovation, Germany
www.eifi.eu

Research Institutes of Sweden
www.sp.se

Province of Drenthe, The Netherlands
www.provincie.drenthe.nl

City of Groningen, The Netherlands
www.geemente.groningen.nl

UiT The Arctic University of Norway
www.uit.no

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