Position paper of the Energy and Climate Change Working group of the North Sea Commission (NSC).

Hydrogen as renewable energy and alternative renewable fuel for transport for the North Sea Regions

Background/summary:

On 28 November 2018, ahead of the COP24 in Katowice, the Commission presented its strategic long-term vision for a prosperous, modern, competitive and climate-neutral economy by 2050.[1] This strategy will be debated and discussed with the EU Institutions during 2019. The EU is required to submit a revised Strategy to the UNFCCC in 2020 as part of the commitments agreed in the Paris Agreement in 2015. A consultation round for stakeholders has run from 16 July to 9 October.

The strategy shows how Europe can lead the way to climate neutrality by investing into realistic technological solutions, empowering citizens, and aligning action in key areas such as industrial policy, finance, or research – while ensuring social fairness for a just transition.

Following the invitations by the European Parliament and the European Council, the Commission's vision for a climate-neutral future covers nearly all EU policies and is in line with the Paris Agreement objective to keep the global temperature increase to well below 2°C and pursue efforts to keep it to 1.5°C.

On the side of energy, the targets to improve the EU's energy efficiency by at least 32.5% and to increase renewable energy to at least 32% of the EU's final energy consumption by 2030 are now approved and the proposed legislation to improve the CO2 efficiency of cars, vans and trucks will spur the transition in the transport sector.
Combined, these climate and energy policies will deliver on the EU's contribution under the Paris Agreement to reduce emissions by at least 40% by 2030 compared to 1990. In fact, when the agreed EU legislation is fully implemented, total greenhouse gas emission reductions are estimated to reach around 45% by 2030. The policies put in place will have a continued impact after 2030 and will therefore already go a long way, with projected emissions reductions of around 60% by 2050.

Confirming a target of 32,5 % renewable energy of EU's overall energy consumption by 2030, the Council also set a target of 14% in each member state for the use of renewable energy in transport. In fact, the Council "strongly encouraged" electromobility uptake in road and rail

[1] 'A Clean planet for all. A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy' (Brussels, 28.11.2018). Communication from the Commission to the European Parliament, the European Council, the European Economic and Social Committee, the Committee of the Regions and the European Investment Bank.

transport; doubling its current use in rail and quintupling the amount currently used in road transport.

While this is an admirable ambition (according to the European Environment Agency (2017), road transport accounts for more than 70% of the total greenhouse gas emissions of the entire sector in the EU), hydrogen, produced by renewable electricity to power fuel cell electric vehicles, is excluded from consideration in the Council and EU parliament position.

Currently, the EU position has been rather reluctant to invest in 'unproven' technology, which of course is often the case with innovations such as hydrogen. In the recent communication however the potential advantage of hydrogen and power-to-X is mentioned; synthetic fuels can be stored and used in multiple ways across different economic sectors where it is otherwise hard to decarbonise (e.g. transport and industry).[2]

Hydrogen for transport and green energy use is being successfully tried and tested across a number of projects in the North Sea Region: Aberdeen, Groningen, Drenthe, Hordaland, often with very encouraging results and in some cases proving more reliable and useable than their electric counterparts.

But we see that there is current market failure in investment in hydrogen and this relates to initial high costs and low volumes of h2 vehicles produced, perception of investment and technology risks and the need for bespoke hydrogen refuelling infrastructure. Uptake of electric vehicles has only come after significant public investment in recharging infrastructure, vehicles subsidies and promotional campaigns. We need the same level of investment and consideration for hydrogen uptake.

The NSC regions of Aberdeen, Hordaland, provinces of Groningen and Drenthe therefore call for EU institutions:

-To be technology neutral, and promote all types of alternative fuels. Hydrogen, produced by renewable electricity to power fuel cell electric vehicles provides high grade heat, helping to meet a range of energy needs that would be difficult to achieve with just electrification. Key sectors for green hydrogen include: industry, the chemical sector (for example in the Northern Netherlands regions Groningen and Drenthe), building power, warming houses and transport.

-Hydrogen Fuel Cell Electric Vehicles (FCEVs) cars can have the same potential environmental as evs, but suffer less from the same moral and ethical sourcing issues as full electric vehicles do in relation to cobalt mining for lithium ion batteries, for instance.

[2] 'A Clean Planet for all' page 9 and 10.

Hydrogen (FCEVs) can double the range of an electric battery vehicle. This extended range is essential in those North Sea Regions which have numerous small sized towns and cities with large suburban and rural hinterlands (Aberdeen and Aberdeenshire).

-EU funding should be made available to scale up innovations in hydrogen mobilty and to invest in the deployment of hydrogen refuelling stations as part of a wider roadmap of hydrogen refuelling across Europe.

-Next to funding it is also important to create some space within the current EU tender rules for experiments. This is necessary to create better possibilities for public private partnerships for green hydrogen and to give energy companies more space for things like storing overcapicity of energy in hydrogen. In the current starting phase of development of the hydrogen market this space within tender (and state aid) rules is a necessary step.

The need for dedicated hydrogen refuelling infrastructure (on land and in ports), including standards and regulations is one of the key challenges in the role out of hydrogen vehicles. Also this needs to be complemented by national programmes for hydrogen and facilitating NSR approaches and standards. The lack of standards and regulations for fuel cells and hydrogen in the maritime sector, vehicles and harbours is an identified barrier that slows down the technology development (Hordaland, Norway).

-we need the skills and expertise to be able to maintain our vehicles and hydrogen refueling stations (Aberdeen city).

-Comprehensive funding and financing programs in the next EU MFF that allow for sectorial integration of EU's energy (electricity, gas and heat), transport and industrial infrastructures to ensure optimal use of EU's renewable power potential, long term supply and use of renewable energy in key industrial sectors and to cement Europe's position of market leader in this field (Northern Netherlands).

-Sufficient funding for clean mobility should not be limited to the regions on the TEN-T Core network but should include the Comprehensive network as well.

-We need a coordinated EU program, funded by the EU Connecting Europe Facility, to supply EU's core, comprehensive and local transport networks (including a hydrogen refueling stations infrastructure) with the largest possible amount of zero emission fuels, produced by renewable electricity in key locations in Europe and in close cooperation with public and private stakeholders.

-We need a continuation of the Fuel Cell and Hydrogen Joint Undertaking as a key EU instrument, to allow for accelerated penetration of renewable energy in Europe, by facilitating the necessary cost reductions of key fuel cell and hydrogen equipment and applications, sustainable use of rare, raw materials and continuation of fundamental fuel cell and hydrogen research.

North Sea Regions and the role for hydrogen as an alternative fuel and renewable energy.

Here we give an overview of the policies, recent developments and needs in the different regions in the North Sea Region concerning hydrogen:

The Region of Hordaland:

Hordaland has developed a hydrogen strategy for the county and is now working on a common strategy with the neighboring counties on the west coast. The goal is to establish a value chain for hydrogen on the west coast of Norway, and hopefully connect this with neighboring countries around the North Sea. The main drivers are an abundance of hydropower combined with a lack of power grid to make use of the electricity and a need for zero emission solutions in the maritime sector.

An identified barrier that slows down the technology development is the lack of standards and regulations for fuel cells and hydrogen in the maritime sector, in vehicles and harbors. The ships around the North Sea will need the same kind of infrastructure in the ports they are visiting. Cooperation with neighboring regions is therefore vital to make sure the development doesn't slow down due to regulatory issues.

The county is supporting the development of a network of refueling stations for hydrogen and is also part of the user group. The county has at the moment two fuel call cars and is part of a fleet of apr.25 cars in the Bergen area. By the end of 2018 8 taxis will also be added to this group. EV is an important part of the transport mix in Hordaland and has a market share above 50 % of new car sales. By 2021 the county will have 20 battery electric car ferries running on the fjords. However, to fill the gaps from fossil fuel transport, there is need for other zero emission technologies with other advantages than battery electric vehicles provide.

Aberdeen City Council:

Aberdeen City is well-known as an oil and gas City and this has served us well in the past. After all, 93% of transport in the EU is currently oil based (https://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Table_5-Share_of_renewable_energy_sources_in_transport_2004-2016.png#file). The slowdown in oil and gas has meant a readjustment in Aberdeen's thinking and with it has come an understanding that oil and gas isn't the only possible future. In fact, no economy wants to be based on one industry. Diversification is the key to a successful economy.

It is a trap that Aberdeen has fallen into with energy and one that Europe is also in danger of falling into with the electric vs hydrogen vehicle argument. We aren't in the age of betamax vs. video anymore where we will only have electric **OR** hydrogen vehicles. Actually, the future is very likely to be both and we need policy, backed up by investment, in both.

That is why for the past five years Aberdeen has been investing in a hydrogen programme, alongside ev infrastructure, for economic and environmental reasons. Our Aberdeen City and Region Hydrogen Strategy & Action Plan (2015-2025) lays out a blue print for how we plan to develop a hydrogen economy over the next ten years. It focusses on delivery of 7 objectives including: vehicle deployment; renewable hydrogen; refuelling infrastructure; non-transport applications; supply chain and market development; communication and education; and, policy and regulation.

Aberdeen and its rather significant hinterland of Aberdeenshire, covers over 6,500 sq. km. It isn't an easy distance for travelling by electric vehicle. But Hydrogen Fuel Cell Electric Vehicles (FCEVs) can double the range of an electric battery vehicle. This extended range is essential in those North Sea regions which have numerous small sized towns and cities with large suburban and rural hinterlands, with associated cold, dark winters!

That is why Aberdeen City is a part of the Interreg HyTrEc2 (Hydrogen Transport Economies of the North Sea Region) project. We see that there is current market failure in investment in hydrogen and this relates to initial high costs and low volumes of h2 vehicles produced, perception of investment and technology risks and the need for bespoke hydrogen refueling infrastructure (preferably powered by green energy). Bespoke hydrogen vehicles are excellent, and are proving themselves very reliable, but choice is limited, and sales are small when there is no or limited public access to hydrogen refueling stations (HRS). Uptake of electric vehicles has only come after significant public investment in recharging infrastructure, vehicle subsidies and promotional campaigns. We need to see the same level of investment and consideration for hydrogen uptake.

Not only do we need green powered (from wind or solar) hydrogen production to supply our vehicles but we also need the skills and expertise to be able to maintain our vehicles and HRS. And with this comes ensuring that our supply chains are robust and that we can source replacement parts for vehicles and our refueling stations without having to wait for expertise or specialist equipment from across the world.

Our objectives for HyTrEc2 include:

- Implementing innovative hydrogen transportation solutions involving cars, vans, large trucks and refuse collection vehicles to advance the case for zero emission solutions for public and private sector fleets.
- Improving the supply chain and training so that the NSR becomes a Centre of Excellence for hydrogen transport.
- Developing innovative methods for the production, storage and distribution of green hydrogen.
- Complementing national programmes for hydrogen and facilitating joint NSR approaches and common standards

With the Scottish and UK Governments ambitions for decarbonizing the transport fleet (phase out of petrol/ diesel vehicles by 2032 and 2040 respectively) and EU targets for clean mobility, we all have to deliver decarbonization targets. Successful demonstration projects in Europe, led by European Partners, means that learning can be shared. Local Authorities have a huge amount of purchasing power; for instance, through the FCH JU JIVE project Aberdeen City Council is purchasing 10 hydrogen buses alongside another 15 authorities purchasing a total of 291 buses – with the intention of reducing the average cost of an h2 bus from over €1 million to €600,000. There is no reason that prices won't continue to decrease in the next wave of buses. We not only need to invest in infrastructure and projects that create a demand for hydrogen, we also need to ensure that there is a level policy playing field, to allow this to happen.

The region of Groningen and Drenthe (Northern Netherlands):

The Northern Netherlands want to create a zero emission (ZE) transport system ultimately by 2035 (buses by 2030), encompassing road, rail and inland waterway transport. Hydrogen will play an instrumental role in achieving this, we are already testing hydrogen buses and will test a hydrogen train as well, but other technologies and alternative fuels which can lead to ZE mobility in the region will also be considered and facilitated.

A vision for Green Hydrogen Economy from 2017 sets out a roadmap and structured five-phase plan for the development of a Green Hydrogen Economy in the Northern Netherlands by 2050. It is the result of a collaborative process among industry, governments and organizations.

The provinces of Groningen and Drenthe support the Council's renewable energy ambition and are actively pursuing a fact-based valorization of their renewable energy and alternative transport options. However, increasing renewable electricity production from wind power in and around the North Sea merits a review of the current position of hydrogen in EU's energy policy, more specifically the recast of RED II and MFF.

Like in many regions in Europe, facing a rapid increase of the number of on- an off-shore wind and solar plants, Transmission System Operators (TSO) of electricity and gas networks in Groningen and Drenthe have started to investigate sectorial integration of energy (electricity, gas and heat), transport and industrial infrastructures with a view to accelerate a cost-effective penetration of renewable energy sources.

Using the opportunities in the last EU Connecting Europe Facility Synergy Call, the provinces of Groningen and Drenthe have been selected in 2017 as the location of one of the first two EU Synergy Actions in Europe. The TSO2020 Action resulted in a unique cooperation of the TSO for electricity, TenneT and TSO for gas , Gasunie, to validate the use of hydrogen, produced by electrolysis and distributed through the gas grid, in managing the dispatch of 10GW potential of wind power into the Dutch national electricity grid.

The TSO2020 Action over the last year resulted in a significant rise of interest, within regional industry clusters in the Northern Netherlands, to pool green hydrogen demand to reduce CO2 emissions. This aggregated industrial “market for green hydrogen” has led to important projected reductions in the costs of both electrolysers and hydrogen. Many SME stakeholders have become actively engaged in regional initiatives to facilitate the distribution and use of this locally produced hydrogen.

Eventually this large renewable energy potential in the Northern Netherlands could facilitate the coverage of significant parts of two TEN T core network corridors, running through the Netherlands, with renewable electricity and renewable produced hydrogen, to power battery and fuel cell powered electric vehicles, as well as fuel cell powered trains, replacing diesel fueled railway lines. The two corridors are part of a EU Flagship Action, as described in the Action Plan on Alternative Fuels Infrastructure (COM2017/0652), that seeks to install recharging and refueling stations along these corridors in the coming five years.