First meeting of the Hydrogen Energy Network (HyENet)

Brussels, 26 June 2019

DRAFT MINUTES

Participants

About 50 participants in total, with 27 Member States represented, representatives from the European institutions and stakeholders.

Introduction and keynote address
Dominique Ristori – Director-General, European Commission DG ENER

D. Ristori launched the new Hydrogen Energy Network (HyENet), stressing that hydrogen represents a priority for the energy transition in Europe. He recalled the ministerial declaration on hydrogen prepared by the Austrian Presidency in September 2018, which triggered new dynamics. He underlined the EU technological leadership on electrolysers, and the need to consolidate it.

Very recently, the EU put in place the most advanced regulatory framework for the clean energy transition, giving a big advantage to operators and investors. The Clean Energy Package was finalised with massive support from Member States (MSs) and the European Parliament (EP), setting clear targets for energy efficiency and renewables. The European Commission (EC) presented its long-term decarbonisation strategy, largely supported by MSs. Before the end of this year, also a long-term strategy for industry will be developed, and hydrogen should be present at the centre of the scene, with some other technologies.

D. Ristori stressed that hydrogen will play a crucial role for energy storage, as electricity will double its share in final energy consumption by 2050, increasing the need for security. It will be important for decarbonisation not only of the energy sector (power-to-gas), but also for transport (road transport, maritime and rail applications) and industry (especially steel, refinery and chemical industries, where industries are developing new promising approaches).

In this context, D. Ristori emphasised the need for a clear common approach among MSs. He also acknowledged the increased awareness in the context of the International Energy Agency (IEA) and of the G20, and the importance for the EU to work in an international collaboration context in order to be a leader.

The challenge is to use hydrogen in various sectors, combining decarbonisation with competitiveness but also with energy security. Hydrogen should contribute to the modernisation of our economy, to create new jobs, increase efficiency, and reduce emissions.

D. Ristori insisted on the urgency to join expertise and knowledge, and to use this knowledge to create new markets also at the international level. He was pleased that MSs reacted very positively and rapidly, and encouraged the network to keep in permanent contact with EC services and all actors.

Session 1: Hydrogen in the energy transition: 2050 perspective
Moderator: Tudor Constantinescu, DG ENER

T. Constantinescu thanked D. Ristori for his support on bringing energy storage and hydrogen high in the agenda of the EU energy policy. He stressed that the aim of the HyENet is to build the capacity of energy ministries in order to treat hydrogen as an energy carrier and have it considered in the energy policy making. This will allow creating an environment to develop the best technological opportunities, with a view to contribute to the decarbonisation of our economy. He introduced the agenda and explained that the purpose of the first meeting was also to capture the first perspective from MSs and understand their priorities and their expectations from this network.

1. **The EC long-term decarbonisation strategy**
   Andreas Zucker, DG ENER

A. Zucker gave a brief overview of the Communication "A Clean Planet for All", the EC proposal for a long-term decarbonisation strategy for the EU. The document is based on a number of scenarios, which vary by the overall ambition and by the main energy carrier (e.g. mostly using electricity or gas), but not so much for the energy production technology. A. Zucker stressed that renewable energy sources (RES) will play a dominant role in all modelled scenarios and nuclear energy will be responsible for the remaining 15-20% of the electricity. Storage will have a much more important role doubling by 2030 compared to the current levels and growing by 10-15 times by 2050, with batteries playing an important role and hydrogen being the dominant technology for long-term storage. Hydrogen is expected to play an important role in the transport sector, mainly on heavy-duty applications. In the industrial sector, A. Zucker highlighted a strong decrease in the use of natural gas and coal, with different solutions ranging from the use of hydrogen to direct electrification and increased energy efficiency.

2. **The Hydrogen Roadmap Europe Study**
   Jorgo Chatzimarkakis, Hydrogen Europe

J. Chatzimarkakis introduced Hydrogen Europe, the European hydrogen industry association, which partners with the EU in the Fuel Cells and Hydrogen Joint Undertaking (FCH JU). He stressed the issue of renewable electricity curtailment and that hydrogen could help integrate higher shares of renewables. In particular, the storage capacity of the gas grid is 340 times bigger than the power grid. To kick-start a hydrogen economy and keep European leadership on technologies such as electrolysers, J. Chatzimarkakis mentioned the possibility offered by industrial hubs: e.g. if renewable (instead of fossil fuel-based) hydrogen were used in the refineries in the Port of Rotterdam, CO2 emissions would be reduced by a factor 10. He briefly presented the results of the Hydrogen Roadmap study, showing that in 2050 H_2 could represent 24% of final energy consumption, 560 Mt CO2/year abated and 5.4 million jobs. Starting with an ambitious scenario, hydrogen would already be present in most sectors in 2030. The biggest market for hydrogen is the refinery industry, followed by the ammonia industry. He stressed that about 200 regions in Europe are interested in hydrogen.

J. Chatzimarkakis insisted on the need to secure investment on hydrogen technologies in Europe, in order not to lose leadership on electrolysers, especially considering that other economies are also starting to invest heavily. He stressed the need for instruments at the EU level and mentioned the

collaboration with DG GROW, in particular on the Hydrogen & Fuel Cells Value Chain under the Strategic Forum on Important Projects of Common European Interest (IPCEIs).

3. Presentation of the Hydrogen report for G20
Timur GUL, IEA

T. Gul presented the study on "The Future of hydrogen" by the IEA, requested by the Japanese presidency of the G20. He stressed that it is not the first time that hydrogen obtains so much attention, but this time in an unprecedented way. Hydrogen can help with some challenges: RES integration; electricity storage over days, weeks and months; back-up power or off-grid locations; decarbonise hard-to-abate sectors; air quality; energy security. However some issues need to be addressed: reduce costs, develop infrastructure, produce clean hydrogen, tackle regulatory barriers. Every year, 70Mt hydrogen are produced in the world, mainly from natural gas and coal, linked to 800 Mt CO2 emissions (equivalent to the emissions of UK and Indonesia combined). At present hydrogen from RES is far more expensive than hydrogen from NG and from coal, but falling costs of solar photovoltaic (PV) and wind could make them a low-cost source of electricity for hydrogen production. According to IEA estimates, 6% of global gas use goes into hydrogen production. Carbon capture use and storage (CCUS) could be a way to decarbonise this production. For hydrogen to play a role in the future, we need to move out of existing applications: dependable demand of hydrogen (about 20Mt) will come from industrial sectors, but the scale of additional demand is not yet huge 3-4 Mt of hydrogen by 2030 from buildings and transport sector. T. Gul concluded that the next ten years are critical for hydrogen to scale up: opportunities come from industrial hubs, natural gas grids, mobility, international trade.

4. Tour de table - Member States share their vision regarding hydrogen

- ***What role is foreseen for hydrogen in the energy policy?***
- ***For which sectors/applications do you see the best potential for hydrogen?***

BE (Walloon region and Federal authority): regions and federal authorities have made some studies on hydrogen. The Belgian Energy Pact (which was not adopted by all governments) considered hydrogen as a key resource for the energy transition by 2030 and 2050. Some studies are ongoing to identify priority sectors for future investments, looking at all applications. There are also some plans to invest in demo projects in the future.

BG is in an initial phase of assessment of the hydrogen potential and is participating in some R&D projects.

DK is currently working on a gas strategy, which is subject to changes in government. They are involved in a few demo projects, mainly on biogas upgrading and sector coupling (electricity storage).

DE: Energiewende is built on three pillars: renewable electricity, energy efficiency but also molecules for a successful energy transitions. There is a need to import green hydrogen. The priority sectors are industry (especially refinery) and transport. The Energiewende from 2010-2011 does not mention hydrogen. Two papers on the role of gas and on hydrogen in the Energiewende are currently being prepared.

CZ: Hydrogen so far has been a residual product. Currently some research institutions are focusing on the handling of hydrogen in industry, and one project on the use by busses.

EE: hydrogen was not a political priority. There are interesting developments especially on fuel cells, now mainly using methane. Hydrogen is an intermediate product in the energy chain, to upgrade biogas or biomass as fuels. There is interest on transport applications and some efforts are ongoing to map hydrogen potential in the country.

IE: there is very limited hydrogen production, mostly used in the industrial sector. The challenge of growing shares of variable RES may be addressed via hydrogen, to store excess wind energy. The distribution system is suitable for hydrogen, while the transmission may require some adjustments. The transport sector currently does not use hydrogen at all but is considered as having the highest potential (esp. heavy-duty vehicles). A "Hydrogen mobility Ireland group" was set up to map out possible hydrogen deployment. Overcoming the capital costs will be a challenge.

EL: At the moment there is no clear political agenda on hydrogen. The situation may change with the new government. Most interesting sectors are maritime (commercial fleet) and refining industry. Given the country's big capacity for RES, there is great interest in clean hydrogen, especially for not interconnected islands and contribution to grid stability.

FR: hydrogen is considered as an enabler of reduction in GHG gases. The priority is to decarbonise industrial hydrogen (using hydrogen from RES). An important issue is the cost. The best potential is seen for mobility (captive fleets and heavy-duty vehicles), followed by storage (first in remote regions and not connected areas, then on mainland).

HR is currently preparing a new energy strategy to 2030 and looking to 2050, which mentions hydrogen potential. The priority sector is transport (first hydrogen refuelling station opened end-May in Zagreb), in the future possibly also on trains.

IT: hydrogen is considered as a mean to reduce CO2 emissions and improve flexibility. It is at the top priority of energy policy for the current government, esp. for large-scale integration of RES. A task force on hydrogen has just been set up in the Ministry with more than 30 participants from industry and organisations. In the Transport sector, hydrogen is expected to contribute 1% to the renewable energy in transport by 2030. On power-to-gas, Snam, the gas TSO has realised a test facility in southern Italy to test the production and the injection in the gas grid.

CY is at the initial stages of thinking on hydrogen. They have a pilot programme for green hydrogen busses and one project on storage of RES from PV.

LV is also at an initial stage on hydrogen. They see good potential for the future, especially in industry and transport. A pilot project in Riga for hydrogen in public transport, facing some problems with hydrogen production.

LT: the energy strategy adopted last year did not foresee many applications of hydrogen. Some initiatives are coming from the private sector and research organisations. They have an agreement with Scania on hydrogen and gas-powered experimental trucks. There is a plan to introduce hydrogen in the energy strategy and in the NECP. LT would have a suitable network for hydrogen transport, as there is a decreasing natural gas demand.

LU is involved in regional cooperation as member of the PENTA forum. They have a project to build HRS. For the mid-term, LU is looking at the use of green hydrogen in industry (especially steelmaking), whereas for the long-term they look at hydrogen for energy storage.

HU: hydrogen still in its infancy. It raises some safety issues especially in relation to hydrogen injection; therefore HU is recommending examining safety at EU level. Generally open to wider use of hydrogen according to economic and technical possibilities.

NL: hydrogen is playing a fast growing role, being a key part of the climate agreement currently under negotiation. Priority sectors are considered to be industry, heavy-duty transportation, seasonal storage, but also built environment where hydrogen could be more cost-effective than heat pumps.

AT is currently working on a hydrogen strategy. With the country's target of 100% RES electricity by 2030, hydrogen would be important for seasonal storage and sector integration. Priority sectors are industry (especially steel) and transport (5 HRS in AT).

PL is producing a considerable amount of hydrogen from fossil fuels for refining and chemical industry, but not to be used in transport (due to low purity). Dependable demand from industry could be used to boost clean hydrogen production. In the Polish energy policy 2040, hydrogen is indicated as one of the key products. Priority sectors are the gas grid, heavy-duty transport and public transport.

PT has been very active on R&D on hydrogen. Two policies are being drafted: carbon neutrality 2050 (focused on electrification) and NECP. Storage is an issue, given PT's ambition as to the share of RES and hydrogen is considered a main option. A 2030 hydrogen strategy is being prepared. Identify the potential and roadmap being finalised. Two applications considered as priority: mobility and injection in the gas grid. PT is working with gas distribution and regulatory entities also on legislation and regulation. These projects are also being coordinated with financing agency. The industry is also very active.

RO sees the main potential in industry. Perceive problems with fuel cell vehicle costs and availability of fuelling stations, but still consider transport also a possible source of demand.

SI: hydrogen is produced and mainly used by the chemical industry.

SK is currently at the very beginning. A proposal for a gas storage PCI linked to hydrogen is being developed.

FI has a technology neutral approach to decarbonisation. Deep decarbonisation is needed in industry (esp. refineries under the ETS, chemical and steel industry) and transport. Some fuel cells and hydrogen related research. Further R&D being promoted by the government through a network.

SE has two main projects: Hybrit, funded by the Swedish energy agency on fossil fuel-free steel by 2035 and a project in Gothenburg on a production facility for biofuels.

UK welcomes discussion on hydrogen and sees great potential in terms of feedstock, fuel-switching, storage and transport. Hydrogen is part of the UK's strategy to get to net-zero GHG emissions and 120 million euros invested in research.

Session 2: Stakeholders' perspective
Moderator: Tudor Constantinescu, DG ENER

1. Green hydrogen opportunities in the energy system
Luc Graré, Nel Hydrogen Electrolyser

L. Graré introduced Nel, a Norwegian company who started in 1927 with Alkaline electrolysers and then expanded its business to PEM electrolysers and hydrogen fueling stations. He presented the main advantages offered by hydrogen as a fuel for the transport sector (notably zero emissions, light weight). He stressed that today in Norway fossil parity for the mobility sector is achievable for centralized production of already 4-8 tons/day, close to power or heat sources, with a final price of 5€/kg of hydrogen. With declining levelised cost of electricity (LCOE) for solar and wind, new opportunities for clean hydrogen will open up, especially for industry. In Nel's current portfolio of projects, there are applications using ammonia: in some regions of the world, where the price of electricity from solar and wind is 2c€/kWh, there are opportunities to convert it to ammonia and export over long distances. Regarding the steel industry, he mentioned the pilot project Hybrit in Sweden, which is expected, once it reaches full scale, to reduce the emissions of the country with 10%. L. Graré highlighted the need to reduce capex cost on electrolysers (to this end, Nel is establishing a new manufacturing plant targeting a >40% cost reduction). Further efforts are needed to reduce opex (i.e. power prices). At present, for large scale electrolyser plants (50 MW), costs are already in the range of 400€/kW. Further work to reduce the costs will further expand the market. L. Graré finally highlighted Nel's plans to scale up their capacity in production from 40 MW to 360 MW.

2. Perspective from GRTgaz
Thierry Trouvé, GRT Gaz

T. Trouvé highlighted the potential of the existing European gas infrastructure to store variable renewable energy and enable sector integration. In future, the grid will transport decreasing quantities of natural gas and could transport other gases. In this context, infrastructure operators could have a key role by preparing the grid to transport and store growing shares of biomethane and hydrogen, connecting production with consumption centres. T. Trouvé underlined that three types of barriers need to be overcome: of psychological nature (belief that full electrification can be achieved), of technical nature (in particular gas quality and safety) and of legislative and regulatory nature. He highlighted the R&I centre created by GRT Gaz and briefly presented two projects: Jupiter 1000 and FenHYx. The former aims to produce both renewable hydrogen and methane (using CO_2 captured from a nearby industrial process) and to test simultaneously different technology blocks, the latter aims to reproduce all the elements of a gas network to solve technical barriers for hydrogen injection in the natural gas grid, by testing equipment for different parameters. He argued that 10-20% admixtures of hydrogen into the natural gas grid could be possible with a limited investment level. In terms of enabling framework, he advocated for: "colour-blind" approach, to assess different technologies for the benefits they can provide (incl. SMR with CCS/CCU and pyrolysis); support for R&D efforts (esp. continuation of the FCH JU); adapted criteria for PCIs to make the contribution to decarbonisation a decisive criterion; definitions of green and low carbon hydrogen and EU wide Guarantees of Origin scheme; harmonized framework for hydrogen injection in the natural gas grid; framework for P2G which is smart and flexible enough (e.g. regulatory sandboxes to foster technologies with challenging business cases to reach commercial scale).

3. Green Hydrogen for Sector Integration
Gunnar Groebler, Vattenfall

G. Groebler presented the perspective of an electricity utility on hydrogen. He highlighted that green electricity is the most efficient way to decarbonise, however it is not always suitable. Hydrogen could be used as a mean of flexibility. G. Groebler presented the activities of Vattenfall, starting with hydropower and then expanding to wind and solar energy, but also storage and hydrogen. Vattenfall is especially active in the North Sea region (more than 3 GW of installed capacity). Find other means to use cheap possibility to produce electricity, overcoming the congestion seen at the electricity TSO level. Volatile renewable production can be mitigated by sector integration. Vattenfall is in the consortium developing the Hybrit project to decarbonise steel manufacturing and also engaged in other projects such as Preem on biofuels. G. Groebler highlighted the huge market potential for hydrogen in transport, very close to profitability. In terms of desired regulatory framework he highlighted: carbon pricing in non ETS sectors; RED II transposition; Guarantees of Origin; support with funding for projects still lacking a business case.

4. SolidPOWER Fuel Cells micro-CHP – Low Carbon on the path to zero carbon
Olivier Bucheli, SolidPOWER

O. Bucheli presented the solid oxide fuel cells (SOFC) manufactured by SOLIDpower. He briefly presented the principle of micro-cogeneration as an efficient home energy technology. At present SOFC mainly use methane as a hydrogen source, but could also work well with ammonia, biogas, etc. Current FC are already compatible with 15% hydrogen. As there is no combustion, they generate no emissions of NOx, SOx or PM, and no noise and vibration. There are currently 1400 units installed in 12 countries, and there is interest from countries like Korea and US. The main challenge right now is the cost. The core unit is at the same time a FC and an electrolyser, thus showing opportunities for an efficient storage system. Other potential applications are in the steel industry and in the chemical industry, but also data centres and Auxiliary Power Units (APUs) for ships. The latter would be particularly important to scale up production. O. Bucheli concluded advocating for a policy framework which would create a level playing field and recognise all the benefits (e.g. reduced primary energy consumption, reduced CO_2 emissions, avoid grid upgrading, environmental benefits).

5. Hydrogen related research at organizations like VTT
Jari Kiviaho, VTT

J. Kiviaho briefly introduced VTT, Technical Research Centre of Finland and in particular the activities on FC and hydrogen (in PEMFC, SOFC, electrolysis, hydrogen quality and all kind of demonstrations). On hydrogen production, VTT is engaged in the Balance project (to develop electrochemical energy storage based on combination of fuel cell and electrolyzer), in the Vetaani project (to produce hydrogen from biomass via gasification). On hydrogen quality, it is involved in two projects looking at hydrogen for automotive application: HyCoRa, aimed to reduce the cost of hydrogen quality assurance and focused on impurities coming from hydrogen production, and HYDRAITE, focusing on hydrogen supply chain derived contaminants. Regarding storage, VTT participates in LOHCNESS (studying the Liquid Organic Hydrogen Carriers (LOHC) solutions for hydrogen storage and transport) and HySTOC, demonstrating LOHC technology. Finally on the use of hydrogen, J. Kivaho mentioned the projects

Maranda (develop and demonstrate FC for marine applications) and Flagship (to install a total of 1 MW on-board fuel cell power for waterborne transport).

Session 3: Hydrogen projects and demonstration activities
Moderator: Tudor Constantinescu, DG ENER

1. Overview of FCH JU projects
Bart Biebuyck, FCH JU

B. Biebuyck, Executive Director of the Fuel Cells and Hydrogen Joint Undertaking (FCH JU) explained that FCH technologies are important in the context of the European Energy policy for industrial competitiveness, energy security and sustainability. The FCH JU is a partnership between the EU and the private sector (represented by Hydrogen Europe and Hydrogen Europe Research). It supported 244 projects so far (since 2008), for a total 893 million euros from public money (matched on an equal basis by the industry). The five objectives of the JU relate to clean transport, green hydrogen production, heat and electricity production, critical raw material, energy storage. B. Biebuyck presented the main projects funded by the JU.

On green hydrogen production, the main focus is on electrolysers (mostly PEM, but also SO and alkaline) and industry is increasingly interested in the technology (as shown by the following projects: DEMO4GRID – food industry, H2FUTURE and GrInHy – steel industry, REFHYNE – refinery industry). He also presented the example of a hydrogen territory (Orkney Islands, UK), using green hydrogen to store wind energy and then use it for transport and heating. Future challenges are to bring down costs while reaching the GW scale and to keep EU leadership through market acceleration. Two projects on hydrogen injection in the gas grid will be financed under the work programme 2019. Another important project funded by FCH JU is CertifHy, on guarantees of origin for green and low carbon hydrogen.

B. Biebuyck highlighted the contribution of the JU to the rollout of hydrogen in transport. For hydrogen cars the EU is still lagging behind Japan and US, but it is leading on hydrogen refueling stations (about 120 already in place, with a target to reach 850 by 2025). On buses, costs have declined from 1.8 million euros in 2010 to 600,000 euros today, with 10 European OEMs developing hydrogen buses. B. Biebuyck underlined a clear traction towards hydrogen for trucks due to the limited range of batteries and stressed the need for European OEMs to speed up in order to compete with Asian and American ones. He also highlighted the potential of hydrogen for the rail (especially on non-electrified railways) and the maritime sectors (where the lack of regulation is one of the main barriers), but also in aviation, and the research priorities in all these sectors.

On heating and cooling, B. Biebuyck highlighted the cost reduction in micro-CHP thanks to EU projects, the applications for medium size FC (e.g. DEMOSOFC project) and for MW scale FC (for large-scale industry).

B. Biebuyck described the cross-cutting activities coordinated by the FCH JU (e.g. on safety, public acceptance, regulations, codes and standards) and also the activities of outreach towards regions and cities in Europe, and concluded on the importance of a public-private partnership for the FCH sector in Europe.

2. **Hydrogen: State of Play in Austria**
Jürgen Streitner, Austria

J. Streitner started introducing the climate and energy strategy in Austria, which aims to 100% renewable electricity and 45-50% share of renewable energy in final energy consumption by 2030, and carbon neutrality by 2050. A major challenge for Austria is to decarbonise heavy industry. An important opportunity comes from the well-developed gas grid. In this context Austria sees a good potential for sector integration and therefore promotes this approach at the EU level (starting from the Hydrogen initiative under the AT Presidency). He presented the main discussion points on P2G in Austria: regulatory framework (definitions, GOs); fair levies and network charges (avoiding double tariffs; network charges for all network levels; grid-supportive behaviour; natural gas tax act); support schemes (role of TSOs/DSOs, regulatory sandboxes); overcoming technical barriers (hydrogen-fitness in the gas grid; quality standards; customer billing; end-user units). Austria is currently working on a new renewable deployment act (which should also support the production of hydrogen and green gas and link green electricity production with storage capacity) and on a hydrogen strategy, involving all relevant stakeholders, to be adopted early next year.

3. **Hydrogen: Perspective from The Netherlands**
Noé van Hulst, Netherlands

N. van Hulst stressed that industrial hubs and gas grids provide great opportunities to scale up hydrogen (as highlighted by the IEA report), and this is what the NL is looking at. He briefly presented several projects now starting in Northern Netherlands, especially in port areas (e.g. HyStock, a 1 MW electrolyser connected to storage). NL is phasing out gas production from Groningen because of the induced earthquakes, therefore a big capacity of the pipelines becomes available for the transportation of hydrogen. The huge potential for wind offshore is another important driver. Gasunie (the gas TSO) has a vision that the gas infrastructure can become the backbone of a new hydrogen system, transporting 100% hydrogen. North Sea wind energy how could be transported to the mainland and stored via hydrogen. New electrolysis projects are currently being explored (up to 250 MW), based on sophisticated business models for green hydrogen production, not only centred on curtailed electricity. Other projects on CCUS are also being developed. NL is putting in place a supporting national policy broadening the scope of subsidies schemes from renewables to decarbonisation, looking at gas regulation and at RED II transposition. A hydrogen strategy is being prepared, to give also a signal to investors. N. van Hulst concluded on the huge potential for Europe in the long-term. He insisted on the need to accelerate on the transformation of the natural gas grid to hydrogen, including the connection to Northern Africa and Middle East. He also advocated for an integrated hydrogen market at the EU level, based on the same definition, the same approach to market regulation and to guarantees of origin.

4. **Hydrogen in France**
Natacha Wnuk, France

N. Wnuk presented the French plan for the deployment of hydrogen launched in June 2018. The hydrogen plan focuses on three markets: production of hydrogen for industry, mobility, services to the electricity grid. The plan contains several recommendations to start the deployment of hydrogen in FR:

- Substitution of fossil hydrogen by hydrogen produced through electrolysis (preferably from RES) to scale up production and reduce costs (indicatively 10% of low-carbon hydrogen in industry by 2023 and from 20 to 40% by 2028).
- Mobility: investment aid for captive fleet, clarify regulatory framework for HRS, support research on heavy duty vehicles, consider the greening of the railway. Indicative targets are also defined in terms of number of vehicles and HRS.
- Flexibility in the electrical system (hydrogen for energy storage) and decarbonisation of the gas grid: study in progress to determine the conditions for hydrogen fed in the gas grids; scale-up power-to-gas demonstrators; pilot projects in French Overseas regions providing flexibility to the power grid.

In addition, other studies are being prepared and green deals are being elaborated with stakeholders to remove the bottlenecks to deployment. Calls for projects were launched on mobility, production of decarbonised hydrogen for industry and deployment of hydrogen in isolated zone.

N. Wnuk presented some concrete examples of hydrogen state of play in FR. In terms of infrastructure, FR has a target to build 100 HRS by 2023 and is well on track to reach it. It also has the first fleet of taxis, a FC bus line and a river shuttle. Hydrogen trains have been ordered by some French regions to replace diesel trains. Some prototypes of hydrogen mobility were also presented to the public (the Energy observer vessel and the LMPH2G racing car). On P2G, a first demonstrator was inaugurated in Dunkirk, to supply a new district with a blend of hydrogen and natural gas; a second one, Jupiter 1000, will be launched at the end of 2019 at Fos-sur-Mer.

5. Polish perspective on hydrogen
Daniel Musiał, Poland

D. Musiał highlighted that PL produces 14% of the hydrogen demand in Europe, based on a dependable demand from industrial applications. There is also a case for hydrogen injection (up to 10% of hydrogen in some cases). PL is involved in international initiatives (as an observer in the International Partnership for Hydrogen and Fuel Cells in the Economy (IPHE) and as a signatory to the Tokyo agreement). PL sees hydrogen as a way to reduce its dependence on coal. The Ministry of Energy set up a Working Team on Strategic Analysis of the Development of Hydrogen Economy in PL, to identify regulatory acts on hydrogen requiring changes (i.e. vehicle approval, distribution, refueling stations, safety regulations). It is supporting the implementation of hydrogen in the field of energy and transport and the construction of flagship installations based on SOFC technology to promote cogeneration systems powered by hydrogen.

In terms of R&I activities, D. Musiał highlighted a demo project on purification of hydrogen for the use in transport (co-financed by the CEF blending facility), a project on SOFC micro-CHP, the development of new materials and solutions for the production of SOFC, and a system for distributed hydrogen production from biogas. PL is also involved in a number of international projects (incl. projects financed by the FCH JU).

D. Musiał concluded highlighting the potential of hydrogen in heating and transport, but also as a raw material for export. This would offer opportunities to develop a new branch of the economy and to improve the quality of life in large urban agglomerations.

6. Tour de table

DG ENER

C. Kuehnhanss from the "Wholesale markets; electricity & gas" unit briefly presented the ongoing sector coupling study, which is looking specifically at the market and infrastructure linking between the electricity and the gas sectors. The study aims to identify regulatory barriers and gaps to the deployment of renewable and low carbon gases (not only hydrogen, but also biogas and biomethane), to propose measures to address them and to assess different options. The study has a qualitative approach and begins with a literature review, evaluating the possible role of gas in the energy transition. It builds a conceptual benchmark, looking at different regulatory frameworks and country-based research (incl. technical regulation, economic regulation, security of supply regulation and renewable and climate policy instruments available). It identifies five main categories of barriers (Immaturity of technologies, unlevel playing field, current focus of infrastructure regulation on natural gas, uncoupled and uncoordinated infrastructure planning, risks for interoperability between different markets and borders). Based on the barriers, the study tries to propose solutions to have a framework that does not exclude any of the relevant technologies or energy carriers.

G. Melica (on behalf of the colleagues from the "Renewables and CCS policy" unit) provided an update on the two Delegated Acts linked to REDII and related to hydrogen used as transport fuel. Work is ongoing to determine the GHG methodology for Renewable Fuels of Non Biological Origin (RFNBOs) and Recycled Carbon Fuels (RCFs) – as both defined in REDII - which producers of such fuels and voluntary schemes will have to follow to determine the GHG savings that such fuels achieve. The Delegated Act is expected to be delivered during the course of 2020. Work is also ongoing to develop the methodology to be applied by producers of RFNBOs wishing to claim 100% renewable electricity use for the production of their fuels. The Delegated Act for this is expected to be delivered during the course of 2021.

E. Lecomte from the "New energy technologies, innovation and clean coal Unit" briefly presented some projects from the SET-Plan Action on Energy Efficiency in industry. An important sector where hydrogen could be used is steel, not only for carbon direct avoidance (using electrolysis, as done in projects like H2FUTURE, HYBRIT, GrInHy), but also using steel mill plant gases (CO2, CO, H2) for producing chemicals, methanol and/or ammonia. This process is currently being experimented by the Carbon2Chem project. E. Lecomte also stressed that industrial plants will not only use surplus electricity, but that electrolysers will need to run for at least 5000-7000 hours per year to be cost-effective, therefore using considerable amounts of electricity. Converting a steel plant with electrolysers would require tens of TWh of electrical consumption (5 nuclear power plants around the steel plant would be needed just to power the electrolyser). To improve the business case for electrolysis, one possibility could be to valorize also the oxygen (e.g. in oxy-fuel combustion for cement production). E. Lecomte stressed that feasibility studies are showing cost increases for these processes, hence industry is calling to create a market for green products (e.g. labelling of green steel) so that customers would agree to pay the price premium. Global competition for the steel industry, international agreement and protection against imported steel that is not green should also be considered.

Member States were asked to suggest one priority topic to address in future meetings.

The following topics were mentioned by MSs in the final tour-de-table:

- RED II transposition (BE, DK, ES, HR, LV, CY)
- Clarification on the status of hydrogen in the gas package (BE, DE, ES, CY, LV)
- Regulatory questions (BE, DE, EE, CY, LV, AT, PT, UK)
- Internal market (NL, AT, SI)
- Definitions and hierarchy between green and blue hydrogen (BE, DE, FR, LV, LT, PT, SI)
- Mobility (CZ, FR, EL, ES, LV, RO – in particular financial instruments)
- Certification/GOs and cross-border trade (DK, LT, NL, AT, PT)
- Transport of hydrogen and international trade (DE, NL, PT)
- Technical and safety issues (FR, HU - especially on injection in the gas grid, PL)
- Best practices (BG - in particular on coordination at national level, HR, IE, PT)
- Industrial impact (DE, ES, CY)
- Other technologies beyond electrolysis, e.g. hydrogen from biomass (PT)

7. AOB

The next meeting of the HyENet is expected to be organised in November.