EUROPEAN TECHNOLOGY & INNOVATION PLATFORM ON WIND ENERGY

D.6.4 Report on dissemination/networking event 2018

Alexander Vandenberghe

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Authors

Name	Organisation	E-mail
Alexander Vandenberghe	WindEurope	Alexander.vandenberghe@windeurope.org

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1 Aim of the report

As part of the contract between the European Commission and WindEurope for the creation of a new and reformed technology platform on wind energy (ETIPWind), WindEurope has committed to organise a minimum of two dissemination events (D.6.1 and D.6.3) throughout the course of the contract.

The first dissemination event was held on June 20 in Brussels. The event focussed on informing the wind energy research community on the achievements of ETIPWind in supporting EU policy-making and on highlighting how the wind energy sector benefits from EU funds for research and innovation. It also offered the participants a forum to discuss the sector's priorities directly with policy-makers at European level. The results of this event are described in the report D.6.2.

The second dissemination event was originally planned for June 2018. However, due to prolonged illness of key personnel at WindEurope and the multitude of events organised on renewables in the month of June, the WindEurope secretariat asked permission to postpone the event to September 2018. This would allow the secretariat to attract a high quality audience and help link the ETIPWind activities with other important events for the wind energy sector, most notably the Global Wind Summit 2018 in Hamburg.

This report will outline the goals of the second dissemination event and contains the agenda, presentations and minutes of the discussions held on 13 September 2018 in Brussels during the second ETIPWind dissemination/networking event. The report also includes an overview on the wider stream of activities that were held at the Global Wind Summit in Hamburg. Some of which are closely linked to the items discussed during the September 2018 ETIPWind event.

2 Aim of the dissemination event

In the ETIPWind 2018 Strategic Research and Innovation Agenda (SRIA) the wind energy sector stipulated that "grid and system integration" is the sector's top research priority. The report highlighted that more and better interactions between power producers and end-users, between supply and demand are needed to facilitate the integration of renewable energy into the energy system. In addition, an accelerated electrification of the entire energy system will be needed in order to meet the Paris Agreement objectives. To achieve this Europe needs to put more effort on sector coupling and the electrification of energy-intensive industries, heating & cooling and transport.

Supporting the electrification of buildings, transport and industry is a top priority for the wind energy industry. As such, electrification was also one of the main themes of the 2018 Global Onshore & Offshore Conference organised in Hamburg by WindEurope. A new report, titled "Breaking new Ground", shows that in order to meet the Paris Agreement objectives up to 62% of the energy demand in 2050 needs to be met by electricity. With a 62% overall electrification rate (86% in industry, 64% in buildings and 51% in transport), the EU will reduce energy related emission with 90% (compared to 1990 levels) and reduce overall energy demand with 33%. Now only 24% of demand is met by electricity. So the electrification rate will need to accelerate quickly to help the EU decarbonise its economy.

For this event, the ETIPWind Steering Committee asked the secretariat to focus on the role that wind energy could play in helping other sectors decarbonise and electrify. So ETIPWind organised a roundtbale with representatives from various energy-intensive industries to present their decarbonisation strategies and discuss technological and other barriers to the electrification of industrial processes. A better understanding of the technological processes and innovation needs in other sector will be critical to support the broader discussions on electrification, sector coupling and decarbonisation policies and strategies.

2.1 Agenda

09:45	**Registration & welcome coffee**
10:00	**Introduction** Aidan Cronin (SGRE), Chair of the ETIPWind Steering Committee
10:15	**Wind energy – a power profile** Daniel Fraile, WindEurope
10:30	**Sector coupling – technology pathways for decarbonisation** Aidan Cronin (SGRE), Chair of the ETIPWind Steering Committee
10:45	**Direct Electrification - case studies from selected industries** ○ Steel, the Siderwin project by Herve Lavalaine de Maubeuge, Arcelor Mittal ○ Chemical and sustainable energy by Yvonne Van Delft, Voltachem ○ Roundtable discussion
12:15	**Lunch**
13:15	**Indirect Electrification - case studies from selected industries:** ○ Hydrogen in steel production, the Hybrit project by Mikael Nordlander, Vattenfall ○ Methanol production, the MefCo2 project by David Pardo, i-deals ○ Ammonia-based fuels by René Laursen, MAN Energy Solutions ○ Roundtable discussion
14:45	**Next steps: Global Wind Summit 2018** Lorenzo Morselli, WindEurope
14:55	**AOB**
15:00	**End of meeting**

3 Minutes of the roundtable discussion

3.1 Introduction

Aidan Cronin, chair of the ETIPWind Steering Committee, opened the roundtable with a short introduction to ETIPWind. He highlighted that ETIPWind is the only platform in the wind energy sector that connects academia, research institutes, industry and policymakers. He thanked the European Commission for its support to the platform and welcomed the decision to continue support for coordinating collaboration on research & innovation in the wind energy industry.

Mr. Cronin then gave a brief overview of the wind energy sector's priorities and challenges as outlined in the 2018 Strategic Research & Innovation Agenda. These priorities are, in order of importance, grid & system integration, operations & maintenance, next generation technologies, offshore balance of plant and floating wind. Particular attention was given to the action areas for grid & system integration and next generation technologies. There is an increasing need for electrification of industrial processes. So developing new strategies to optimise and synchronise electricty generation and demand becomes ever more important.

Sector coupling or connecting wind power plants directly with energy intensive industries is a top priority as it will help reduce the EU economy's dependence on fossil fuels, meet climate targets and provide flexibility beyond the power system. The latter is vital to facilitate the integration of variable renewable energy sources into the grid. Indirect electrification or power-to-x offers similar benefits. Large electrolysers will be able to generate hydrogen or ammonia using excess wind power. The hydrogen or ammonia produced can act as a storage solution for this clean energy, but can also be used directly as fuel or feedstock that directly reduces the emission of carbon and other pollutants.

However there are still many technical and non-technical challenges that impede electrification and the use of variable renewables in industrial processes. Mr. Cronin's wishes for this roundtable were to gain a better understanding of the state of art in other sectors, to identify common goals and objectives for all sectors and lay the groundwork for future collaborations.

3.2 Wind energy – a power profile

Daniel Fraile, head of market intelligence at WindEurope, held a presentation to introduce the wind energy sector to the representatives from the other sectors and industries. According to WindEurope, wind energy could provide up to 29.6% of power demand in the EU28 in 2030. In some countries, such as Denmark and Ireland, wind power could make up two thirds of the power mix. The International Energy Agency (IEA) estimates that around 2030 wind energy will become the biggest source of electricity in the EU, surpassing gas and nuclear. They estimate that by 2040 wind energy could produce 900 TWh annually.

So variable renewables are an important part of the energy mix today and will cover the majority of power generation in the future energy mix. This drives the need to develop more flexible energy systems, systems that cope better with variable power production. But what does variabality mean? And how variable is wind power generation?

Taking data from 1 particular day, 16 december 2017, Mr. Fraile showed that on a daily basis wind becomes more predictable as volumes increase. In countries with a small installed capacity, wind power production is highly variable. In larger countries with more volumes, clear wind power production trends come to light. And when taking an EU wide approach to wind power production the differences dissapear as strong winds sweep across Europe. So variability is a matter of perspective and scope.

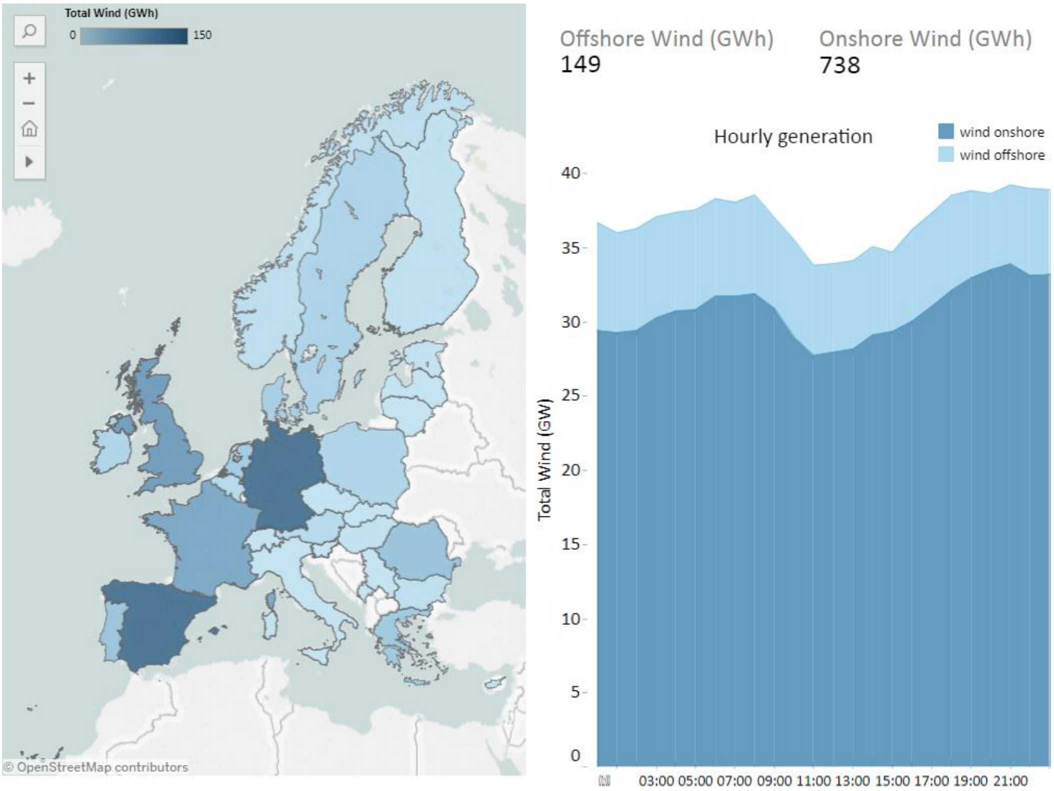

Figure 1. Overview of wind power production in Europe on 16 December 2017 (source: WindEurope).

But wind power production is also determined by seasonality. Winter and autumn are typically good, windy seasons, whereas summer is usually less favourable for generating wind power. Interestingly it is the other way round for solar PV. So wind and solar are very complementary. Coupling of solar power with wind power can create a baseload powered by renewables. In 2017 Spanish wind and solar power generators provided a combined minimum of 4 TWh each month. Andind and solar also match well on a daily basis. PV production peaks at noon, whereas wind turbines are able to generate power during the nights.

There are various ways and technologies to shift excess energy and cope with flexibility. Hydropower is the most well known solution, but is not an option for most countries. Intraday shifting could by done by synthethic gas and/or battery storage. Better demand side management, more electric vehicles and electrolysers and increased interconnection capacity between regions will also help secure system stability by ramping production up or down according to the power available. Power-to-x will be a vital long term storage solution needed to mitigate the seasonal variablity of wind power production and reduce curtailment. In all it is estimated that flexibility will be needed for about 25% of the load in a 85-90% renewables system.

3.3 Sector coupling – technology pathways for decarbonisation

Aidan Cronin, rounded up the introductionary part of the roundtable with a short presentation on the need for aligning green power supply and green power demand. Electrification is energy efficient, but has to be driven by renewables if the EU wants to keep the promises of the Paris Agreement. If the EU cannot integrate renewable power with overall demand, assets will be stranded and ultimately the energy transition will fail.

When it comes to integrating renewables, the winning technologies will not necessarily be the cheapest at any given time. Rather, technologies will be selected on “fit-for-purpose” criteria. This means that renewables will need to deliver the right amount of power, at the right price at any given time.

4 Direct electrification

4.1 SIDERWIN – the right formula for the steels of the future

Hervé Lavalaine of Arcelor Mittal Mazières Research, gave a presentation on SIDERWIN, an innovative project on decarbonising the steel production process via electrolysis. The SIDERWIN project is funded by Horizon 2020 and builds on the EU funded projects ULCOS and IERO. The aim of the project is to develop an engineering-scale prototype for the electrolysis technology (Technology Readiness Level 6).

Decarbonisation is a real priority and challenge for the steel sector. The steel sector has reached a plateau when it comes to fossil fuel driven steel production. Alternative energy sources will be needed to decabronise the existing processes. In 2016 over 1,600 million tonnes of steel (of which 75% primary steel) was produced worldwide, accounting for 6.7% of global greenhouse gas (GHG) emissions that year.

The European steel industry accounted for 10% of the global production and about 5.3% of the European GHG emissions. The European steel sector employs 320.000 employs, has a turnover of 170 billion Euro and accounts for 1.4% of the EU's gross domestic product (GDP). The EU steel sector is expected to grow as demand will continue to rise. By 2050 over 236 million tonnes of steel could be produced in Europe.

Today most of the steel is produced using blast furnaces. In this process cokes and oxygen are used to chemically break up the iron ore. The end products are pure iron and carbondioxide (CO2). The process creates about 2 tonnes of CO2 for each tonne of iron, as demonstrated by the formula below. The blast furnace process is very energy intensive (heat). The equivalent of almost 5.2 MWh is needed to produce 1 of steel.

$$\underset{1.5t}{Fe_2O_3} + \underset{0.5t}{C} + O_2 \rightarrow \underset{1.83t}{CO_2} + \underset{1.0t}{Fe}$$

Figure 2. Formula for blast furnace steel production.

The SIDERWIN project aims to develop a prototype of a new, more sustainable primary steel production process through low temperature electrolysis (110°C.). This technique offers several benefits. Firstly, it is more flexible due to the lower heat requirements. Secondly it is more energy effcient (a 31% reduction of direct energy use) compared to blast furnaces and lastly, it is less polluting (a 87% reduction of direct CO2 emission).

The main downside is that the technique is currently not cost competitive. Mr Lavalaine stated that high carbon prices (at least 120€/t CO2) will be needed to incentivise the steel sector to roll-out the low temparature electrolysis technique. In addition, the electrolysis technique is more resource intensive. To make 1.2 ton of iron one needs 2 ton of iron ore. With blast furnaces it takes just 1.5 ton of iron ore to make 1 ton of iron.

$$\tfrac{1}{2}Fe_2O_3 \rightarrow Fe + \tfrac{3}{4}O_2$$

Figure 3. Formula for steel production via the SIDERWIN electrolysis technique.

Decarbonising steel is also in the direct interest of the wind energy sector. Wind energy is a steel-intensive sector. For each onshore turbine some 250 tonnes of steel are used. Offshore this number increases to 1,500 tonnes for the earliest offshore turbines and even to 3000 tonnes and more for the newest 8 MW turbines. So helping to reduce CO2 emissions in steel production will reduce the overall ecological impact of wind energy.

4.2 Electrification of the chemical industry

Yvonne van Delft, Voltachem, presented the electrification strategies of the chemical sector. The presentation focused in particular on the chemicals sector in the Netherlands. She stated that government initiatives such as the decision to push for more offshore wind and the closure of the Groningen gas fields, urged the Dutch chemicals sector to explore the use of renewable energy sources in their production processes. Chemicals account for some 27% of the national energy demand in the Netherlands. Fertilizers and plactics are the most polluting industries emitting some 15 million tonnes of CO2 annually (2010 figures).

To reduce CO2 emissions electricity is seen as the preferred energy carrier. by 2050 the sector wants to be fully electrified, consuming up to 250 TWh per year. Yet, today only a fraction of the energy consumed by the sector is electric. The sector identified three pathways to achieve this strong electrifcation:

- Power to heat.
- Power to hydrogen.
- Power to chemicals.

Power to Heat is the best short term solution to electrify the chemicalsector. The most mature and cost effective technologies are electric heat pumps and mechanical vapour compressors. Electrification of heating offers flexibility to manufacturers that need it. Small electric heating appliances are a great solution when a quick repsonse is needed and the operating hours are on the low side. Electric heat pumps are a great solution as they heat up when electricity prices are low due to excess power and either dispatch heat directly or store it for later use. Larger and more capital intensive solutions such as mechanical vapour compressors are needed when the response time is less important and the equipment needs to run more and longer hours

Ms Van Delft then presented some business cases. Investments in large industrial heat pumps (10MW) used for upgrading steam for industrial processes, with a 96% operation mode, have a payback time of just 3 years. For power to chemicals (e.g. electrochemical reduction of CO2 to CO using a 0.7 MW electrolyser) the business case is less positive as the electrolysers avalaible today are too expensive. Electrolysers need to last at least 2 times longer and increase their current density (measured in amperes per square metre) in order to render a positive business case. A strong carbon price of 150€/t CO2 will be needed to warrant investments in industrial scale electrolysers.

During the questions and answers there was an extensive discussion on the issue of upscaling electrolysers. The outcome was that upscaling and technology improvements are needed, but that the size of electrolysers will plateau at one point. At one point a more modular aproach to electrolysers will become more beneficial. This modular approach would increase the flexibility, reduce copper demand and be more easily to industrialise.

Another topic discussed was the business case for electrolysis. The current business case see electrolysers being active when electricity prices are low, i.e. as as a way to use up excess renewbale power. But this is not very cost effective due to low return on investments. As the machines will not be operating a lot, capex increases. So electrolysers need to work more hours (even when electricity prices are not extremely low) to reduce capital costs. And by doing so, they can also benefit from providing system flexibility services to the grid by ramping production up or down in line with the available power. This will bring in additional revenues. Lastly, charging a premium for green chemicals could also be a way to boost the business case for chemical electrolysis.

4.3 Roundtable on direct electrification

After the presentation there was an open discussion on what is needed to drive the electrification of industrial processes forward. The main topics discussed were:

- Social awareness and support. Global warming is an invisible adversary. It is still hard to convince business leaders and policymakers of the long term impacts of CO2 pollution and climate change. Climate change mitigation needs urgent measures that have long term benefits, but bring significant short term effects. Politicians and large companies are usually adverse to taking unfavourable short term decisions. Large public support for the energy transition and the direct benefits of a GHG neutral society need to be better communicated.
- Coordinated international action. Fighting climate change is a global issue. The biggest polluters are outside of the EU. So decarbonising EU industry alone will not be enough to reach the Paris Agreement targets. Furthermore, if EU industry is forced to decarbonise whilst others are still allowed to pollute, industry will just move production away from Europe. Global standards and market access restrictions based on emissions could help set a level playing field.
- Heating is a prime area for decarbonisation. Electrification of heating is one important path, another is heat recovery. District heating and heat flows between industry and urban environments have tremendous benefits. In addition, social support is strong for district heating networks as they are by definition local.
- Electricity pricing. From the presentations we learned that carbon prices will be an important driver to enable the energy transition. However, electricity prices need to remain affordable too. Industry is in general fearful of high electricity prices. Currently 50€/MWh is the maximum industry is willing to pay.

5 Indirect electrification

5.1 Vattenfall and the Hybrit project

Mr. Mikael Nordlander of Vattenfall presented the HYBRIT project. HYBRIT is a joint venture by three Swedish entities that aims to produce fossil free steel.The partners are Vattenfall (energy), LKAB (mining) and SSAb (steel production). Vattenfall's joined as part of their wider corporate objective to go fossil-free in one generation. With 98% of green power generation, Sweden has a great starting position to deliver on this promise. However, electrification of industry and transport will need to accelerate. 64% of Sweden's 2016 GHG emissions came from transport and industry (both accounted for 32%). Iron & steel production alone accounted for 11.5% of Sweden's emissions.

In HYBRIT there is no need for melting the iron ore. Instead hydrogen is used to drive of the oxygen from the iron ore in a direct reduction process. The end products are water and «sponge iron». It is called «sponge» iron because the oxygen creates micro pores in the ore body after reacting with the hydrogen, resulting in a more porous substance. Sponge iron is more susceptible to rust and is therefore quickly melted down for steel production. The direct reduction process that the HYBRIT project will install emits 64 times less CO2 than traditional blast furnace techniques going from 1600 kg of CO2 to just 25 kg per tonne of crude steel.

Mr. Nordlander stated that the electrification of the steel industry in Sweden is a now or never issue. Most of the blast furnaces used in Sweden today come at the end of their designed life in the next 10 years. The industry needs to develop alternative processes and prove their economic viablity now. If not industry will reinvest in blast furnaces and we will be stuck with this old and polluting technology deep into 2040. By then it might well be too late to mitigate the adverse effects of climate change and air pollution.

The hydrogen based direct reduction technology is readily available, but the cost of fossil free steel using hydrogen is 20-30% higher than traditional steel production processes. This is mainly due to the low price of coking coal, which is used to extract the oxygen molecules from the iron ore and which creates CO2, and CO2 emission rights. Electricty prices also play a role as the HYBRIT technique will consume some 3,500 KWh of electricty for each tonne of steel produced. Nevertheless the project partners believe there is a market for fossil-free steel and that customers are willing to pay a premium price for green steel. Groundworks have started in2018 and the plant will be commissioned in 2020. For the first 4 years the plant will run test campaigns to optimise production processes. The plant is expected to consume 10-15TWh per year, which amounts to some 10% of Sweden's energy mix. The total cost of the project is 150 million Euro.

Hydrogen storage techniques are important aspect of the HYBRIT project. Vattenfall is working on developing Lined Rock Cavern (LRC) storage facilities suitable for hydrogen. Storing hydrogen is important as the iron production plant needs a continous hydrogen supply. Yet hydrogen production is dependent on the availablity of variable renewable energy sources such as wind and solar. Using excess wind power to create hydrogen and storing it for days or even weeks will be essential to ensure the economic viability of the HYBRIT project.

Supplying hydrogen and ensuring the plant is properly integrated into the grid is Vattenfall's main contribution to the project. Since hydrogen is highly reactive and diffuses quickly, more research is needed to develop and select the best liner materials for the LRC and to understand the mechanics of the surrounding rockbed during operations.

5.2 MefCO2 – Methanol fuel from CO2

David Pardo of i-deals presented the MefCO2 project. The aim of this Horizon 2020 project is to demonstrate the economic viability of producing methanol fuels using a combination of carbon capture technology and renewable energy. The project captures and uses carbon dioxide emitted post combustion by a lignite power plant and combines it with hydrogen to create methanol. The hydrogen electrolysers are powered by excess renewable energy, mostly wind and solar power. The MefCO2 project can at this point create 1 tonne of methanol out of 1,5 tonne of CO2.

The project consortium highlighted that methanol is an attractive and versatile energy carrier. Just like hydrogen, methanol production can help reduce curtailment of variable renewable energy by ramping up production when there is an excess of renewable power available. Methanol is denser than hydrogen and can therefore also be stored longer and easier. But it is not an ideal long term storage solution for variable renewable energy.

Methanol is however a prime resource for decarbonising transport. Mostly marine shipping. By injecting green methanol into marine fuels the carbon footprint of the transport industry could reduce significantly. The marine sector is increasingly looking to decarbonise and methanol fuels are seen as one of the key technologies to do so. Especially in China, methanol fuels are expected to break into the market in the next 5-10 years. In addition methanol could be used as live feedstock.

At this moment in time, the MefCO2 project is not economically viable. Carbon prices are too low to justify the investments in carbon capture technology, which in itselfs also needs to be made more efficient. With the current technology just 1% to 3% of all CO2 emitted is captured. In addition, hydrogen electrolysers are too costly and the electricity prices too volatile to allow for permanent production. The sector is looking for PPAs to enhance the business case. The categorisation of methanol fuels also impacts the potential business case, as the label « renewable » or « advanced » fuel would allow producers to charge premium prices.

The MefCO2 project demonstrates a number of important aspects :

- The process can be applied in a wide range of CO2 emitting sectors. For instance, a new project combines the steel industry (CO2 source) and green hydrogen producers to create methanol.
- Methanol production with CCS can drive the the hydrogen industry and renewable energy sector forward because it will increase demand for green hydrogen.
- It helps to decarbonise transport and shipping by creating low carbon fuels.
- It could help to electrify the chemical sector by creating feedstock through electrolysis.

5.3 Propulsion of ships towards the year 2050

René Laursen of MAN Energy Solutions spoke about the future of powering marine shipping. By 2050 marine transport needs to be 70% less carbon intensive and reduce GHG emissions with 50% compared to 2008 levels. This will require new transport fuels. Most shipping is still powered by fossil fuels, mostly diesel.

Dual fuel engines are therefore a more viable solution to help the sector reach the 2050 targets. Dual fuel engine development is driven by the need for reducing NOx and SOx emissions. Future developments will be driven to reduce other emissions(CO2). Ammonia could be an ideal fuel and it is in fact already used in the sector to help reduce nitrogen oxide (NOx) emissions through a Selective Catalytic Reduction (SCR) process.

Ammonia is perfectly suited to couple the marine shipping industry with the wind sector. Ammonia is generated through electrolysis, can be stored at high density (and so could help store large volumes of renewable energy for long period of time), is safer to store than hydrogen and is carbon free when combusted.

Ammonia driven dual fuel engines could be ready for market in just 3 years. The technology is ready, but the market signals to develop the engines are not there yet. Carbon prices need to be higher and the ammonia electrolysers need to become more performant. Then ammonia is an ideal solution to help decarbonise a sector that is very difficult to decarbonise. LNG (liquified natural gas) driven ships have not made a big impact in the sector as just 1% of freight ships are gas powered. Even with these historic low gas prices, gas powered ships are still 20-30% more expensive than diesel powered ships.

5.4 Roundtable on indirect electrification

After the presentation there was an open discussion on the challenges for indirect electrification, decarbonisation by replacing a pollutant energy carrier with a more renewable or greener energy carrier. The main topics discussed were:

- Energy carriers. Hydrogen and ammonia are highly preferred intermediate carriers as they have a wide range of use cases be it as fuels, feedstock or chemical agent. The group was clear that in general electrolysers need more development. Costs are too high and production capabilities too limited.
- Storage. Hydrogen, methanol and ammonia can also be developed as a long term or seasonal storage solution for wind energy and other variable renewables. However, storage techniques require more technical analysis.

6 Next steps on sector coupling & electrification

Lorenzo Morselli of WindEurope gave a short presentation on how sector coupling, electrification and decarbonisation will feature at the 2018 Global Wind Summit in Hamburg. At the summit there will be dedicated sessions on decarbonising industry, on transport and on heating and cooling in buildings. In addition, there will be multiple sessions and workshops on system integration, system flexibility and grid technologies.

The Global Wind Summit will be the biggest event on wind energy with over 2,000 participants to the conference and over 35,000 visitors for the exhibition during this 4 day event.

7 List of participants

1) Altmikus, Andree – WRD Gmbh (ENERCON)
2) Amorosi, Gilda – EURELECTRIC
3) Averous, Nurhan Rizqy – RWTH Aachen University
4) Bonet Braña, Gabriel – ArcelorMittal
5) Chapalain, Florian – ABB
6) Cronin, Aidan – ETIPWind (Siemens Gamesa Renewable Energy)
7) Cuesta, David – i-deals
8) De Vries, Eize – Rotation Consultancy
9) Dionisio, Mario – European Commission
10) Fraile, Daniel - WindEurope
11) Gonsolin, Flore – CEFIC
12) Gonzalez, Alejandro – European Commission
13) Hostert, David – Bloomberg New Energy Finance
14) Kraus, Nicolas – Hydrogen Europe
15) Lange, Bernhard – Fraunhofer IWES
16) Laursen, René – MAN Energy Solutions
17) Lavalaine, Hervé – ArcelorMittal Maizières Research
18) Mortensen, Henrik – Siemens Gamesa Renewable Energy
19) Nordlander, Mikael - Vattenfall
20) Orduña, Angels – SPIRE
21) Piel, Eloi – Euroheat & Power
22) Potestio, Sabina – WindEurope
23) Provaggi, Alessandro – Euroheat & power / DHC+ technology platform
24) Quental, Nuno – European Commission
25) Simonot, Emilien – InnoEnergu
26) Van Delft, Yvonne – Voltachem / ECN part of TNO
27) Vandenberghe, Alexander – ETIPWind (WindEurope)
28) Weiss, Robert – VTT
29) Wilmet, Sophie - CEFIC