WindEurope contribution on the strategy for smart sector integration

May 2020

Renewable-based electrification is the most cost-effective approach to reach climate neutrality by 2050. The direct use of this renewable electricity whenever is available and wherever is possible, across all sectors of the economy (especially in the easy-to-abate-sectors[1]), should be prioritised. Renewable electricity should be used to produce zero-carbon gases and fuels, only where necessary, in activities which cannot reduce CO_2 emissions otherwise (e.g. the hard-to-abate sectors[2]).

Sector coupling refers to the increased integration of energy supply-side sectors with all end-use energy consuming sectors.

It would be an important strategy to deliver decarbonisation and other important objectives pursued in energy policy such as security of supply and affordability. One of the major enablers of sector coupling is the conversion of power-to-gas.

WindEurope welcomes the opportunity to reply to the European Commission (EC) roadmap on Smart Sector Integration Strategy. This response is based on our position papers:

- Wind-to-X, October 2019; and
- Breaking New Ground, 2018

1. What would be the main features of a truly integrated energy system to enable a climate neutral future? Where do you see benefits or synergies? Where do you see the biggest energy efficiency and cost-efficiency potential through system integration?

- **Features**:

To reach net-zero emission by 2050, Europe will need a highly flexible energy system with very large shares of wind and solar energy foreseen by the EC 2050 Long Term Strategy[3]. It shows a five-fold increase from today's wind power capacity, from 192 GW to 1,200 GW by 2050.

This **flexibility** can stem from smart electrification of energy uses and sector coupling including for the hard-to-abate sectors. These would enable the demand response and storage required to match renewables generation profile across different timeframes. Electrification and sector coupling would also help to minimise curtailment of valuable renewable energy and would enable the power system to deal with strong and fast changes of residual load (total load – non dispatchable source).

A key feature of a truly integrated energy system to enable a climate neutral future is also energy **efficiency**. We would welcome opportunities to strengthen energy efficiency ambition through the value chain in all sectors. A renewables-based electrification would help to increase energy efficiency as the conversion losses decrease, capacity factors improve and electrical devices become smarter.

These energy systems will be based on key targets: 2030 greenhouse gas (GHG) emission reduction target, renewables targets and energy efficiency targets. WindEurope strongly supports the target of

[1] Power generation, light-duty vehicles, and most industrial processes.

[2] Heavy industry (cement, steel, and chemicals), heavy-duty road transport, aviation and shipping.

[3] European Commission, In-depth analysis in support of the Commission Communication COM(2018) 773, *A Clean Planet for all - A European long-term strategic vision for a prosperous, modern, competitive and climate neutral economy*, November 2018.

55% Greenhouse Gas (GHG) emission reduction by 2030. Pursuing this target is crucial to avoid backloading and postponing the bulk of efforts to the post-2030 period, which would create a risk of missing the 2050 climate neutrality objective. A first assessment shows that at least 40% renewable energy is needed in the final energy consumption of the EU-27 in 2030 to reach 55% GHG emissions reduction.

European legislation will have to be put in line with these climate objectives. For instance, a reform of the Emissions Trading System (ETS) in line with net-zero emissions in the EU by 2050 would also be needed to achieve the European decarbonisation objectives.

- **Benefits & synergies**:
  An energy system integration can improve the efficiency (more details below) and flexibility of the energy system as well as its reliability and adequacy so that decarbonisation can be achieved in a more cost-effective way:
  - The **electrolyser** could serve as large flexible load, especially in time of high renewable generation and low power demand;
  - **Renewable hydrogen as feedstock for the industry** can replace carbon-based feedstock in industrial processes, especially in the energy-intensive industry, such as steel, chemicals and refineries. Industrial processes can be decarbonised by substituting carbon-based feedstock with renewable hydrogen. Such applications can revolutionise industry processes and can significantly reduce the carbon footprint of these sectors; and
  - **Renewable hydrogen as transport fuel in fuel cells** for heavy, long-distance modes of transport that are not cost-competitive to electrify via the direct use of electricity as energy carrier can also play an important role (this includes road, maritime and aviation sectors).

- **Energy-efficiency & cost-efficiency potential:**
  Electrical devices are more efficient than fuel-based combustion, even when accounting for power transformation losses:
  - **Heating and cooling**: Heating, at least for low to mid temperatures, can be electrified with existing technologies (e.g. replacing a gas oven by an electric oven, using heat pumps for fluids, and infrared for drying processes). In buildings, the potential of hydrogen is low, it usually does not compete with direct electrification for costs and efficiency reasons. A very cost-efficient option is indeed to use renewable electricity in large heat pumps or power-to-heat installations and inject the heat into a district heating network as part of an integrated approach with CHP plants, heat buffers, excess heat integration and utilisation of originally renewable sources (e.g. geothermal or solar thermal), because large heat pumps with high coefficients of performance can provide up to 4 units of heat from 1 unit electricity compared to the 1:1 ratio of direct electricity heating which is primarily useful in large district heating integrated electric boilers connected to the high voltage grid. Also, in residential heating in rural areas, common heat pump technology can heat space and water with a high coefficient of performance (> 3) and therefore contribute to reaching the European decarbonisation target. In addition, heat pumps have further potential for efficiency gains as the technology advances, whereas traditional gas boilers would struggle to surpass their current efficiency rates of 40-80%[4].

  - **Electromobility**: Battery electric vehicles have a conversion efficiency of 80-90% from tank to wheel, compared to internal combustion engines with an average efficiency of 20-30%. This allows electric vehicles (EV) to drive 3 to 4 times the distance with the same amount of energy. Moreover,

[4] European Commission (2016), An EU strategy on heating and cooling.
https://ec.europa.eu/transparency/regdoc/rep/1/2016/EN/1- 2016-51-EN-F1-1.PDF

the integration of the energy and the zero emission transport sectors can bring substantial benefits for the decarbonisation of both sectors. It also provides flexibility to the grid via the vehicle-to-grid potential. Indeed, EVs are able to generate their own electricity and sell demand response services back to the power grid and fuel cell electric vehicle (FCEV) can also provide vehicle-to-grid services, in addition to be a source of energy storage with renewable hydrogen. The deployment of EVs would also increase the battery storage capacity in the power system if smart charging infrastructure is used. This battery storage could help addressing the challenges of stability and balancing in the hourly and daily timeframes.

2. **What are the main barriers to energy system integration that would require to be addressed in your view?**

   There are several **barriers to direct renewable-based electrification of industry, heating and transport sectors:**

   - Complicated and burdensome **licencing and authorisations** of renewable energy projects (also valid for renewable hydrogen projects).
   - **Taxes, levies and tariffs in the use of electricity**: we need a level playing field between electricity gas and fuels. Indeed, today, we encounter larger differences on the approach countries tax electricity, gas and fuels. And very often, electricity is exposed to higher taxes than other energy carriers. The revision of the Energy Taxation Directive (ETD) should consider the climate impact of different fuels and carriers. Moreover, undue taxes and levies from electricity tariffs should be avoided;
   - **Energy efficiency accounting methods** are penalising electricity vs fossil fuels. For instance, the Primary Energy Factor (PEF) for complying with the Energy Performance of Building Directive does not reflect the current power system and is not standardised among Member States (MS);
   - The **lack of incentives for widespread use of heat pumps** (e.g. in district heating, industry);
   - The **lack of incentives for integrating electricity into transport** (e.g. financial incentives for new EV purchase, charging infrastructure targets or bonus-malus depending on vehicles emissions);
   - The **lack of a specific sub-target for electricity** under the fuel suppliers obligations of the Renewable Energy Directive (as compared to biofuels);
   - The **framework for vehicle-to-grid services** is not clear yet. It is generally not possible to provide vehicle-to-grid services unless the vehicle user is recognised as an energy generator;
   - Ensure a **level playing field between electricity, gases and fuels** by applying the same principles and methods for determining grid tariffs of both sectors; and
   - Oil and gas are not exposed to **CO_2 pricing for transport** applications nor building heating as they both fall outside the ETS scope. Power is, putting it in an economic disadvantage.

   In addition to barriers to direct electrification, the **barriers to indirect electrification**, especially to renewable hydrogen, need to be tackled:

   - **Taxonomy:** a clear, consistent, and transparent European definition for renewable hydrogen, and the different sources and routes to produce renewable hydrogen and renewable hydrogen derivatives, is missing in the current legislations. We are calling for electrolysed renewable hydrogen powered by 100% zero-carbon renewable electricity to be the reference baseline. This definition is needed together with an appropriate transposition of the Renewable Electricity Directive II (RED II) provisions at Member States level as it relates to how hydrogen is accounted for in transport (Art.27);

- **Energy Taxation**: the European Commission should update and revise the definition of hydrogen in the revised taxation directive to tackle renewable hydrogen. Nowadays, electricity is taxed when released for consumption but there is currently not clarification whether electricity is released for consumption when supplied to storage facilities. This opens the possibility of double taxation of electricity that is stored and re-sold. Therefore, to avoid double taxation of storage, the revised directive should clearly state that electricity supplied to storage facilities electrolysers cannot be considered as end-consumption;
- **Scale and cost reduction for electrolysers:** Producing hydrogen with electrolysers costs roughly double than with fossil-fuels[5], which is mostly done with fossil gas in a process called steam-methane reforming (SMR). The use of electricity represents 65-80% of the operational costs of electrolysers (IEA). This implies that the barriers listed under "direct electrification", notably on taxes and levies on electricity, also apply to indirect electrification;
- Some **infrastructure developments** could be required depending on the end use of renewable hydrogen. Renewable hydrogen used as feedstock for industry is a high value gas that is needed in pure form. Today, most of it is compressed and transported by trucks or produced onsite at the industrial location. Infrastructure for transporting renewable hydrogen from locations with high wind concentration (and grid congestions) to industrial clusters is needed; and
- **Lack of hydrogen refuelling stations** across Europe both for heavy duty transport, public transport and passenger vehicles.

3. More specifically:

3.1 How could electricity drive increased decarbonisation in other sectors? In which other sectors do you see a key role for electricity use? What role should electrification play in the integrated energy system?

Renewable-based electrification is the most mature and cost-effective approach to reach climate neutrality and trigger immediate widespread investments that could help the European recovery from the current crisis already in the short term. It should thus be prioritised. Europe should pursue a direct electrification using renewable electricity wherever is available and whenever is possible in the easy-to-abate sectors:

- **Heating and cooling** could reach a 64% electrification rate by 2050[6]. Buildings would reduce their direct emissions 70% from today, mostly by replacing gas and oil by electricity.
- **Transport** could reach a 51% electrification rate by 2050. Indeed, if costs of EVs continue to decrease and are on a par with internal combustion engine vehicles by 2024 (light vehicles) and by 2027 (heavy vehicles), then half of all new sale vehicles will be EVs shortly after 2025 (for light vehicles) and shortly after 2030 (for heavy vehicles).[7]
- **Industrial processes** could reach an 86% electrification rate by 2050. Industry could reduce its CO_2 footprint by almost 90% from today[8], by a combination of electrification, energy efficiency improvements and, as a last resort, carbon capture and storage (CCS). Regarding fuel costs, the decreasing electricity prices driven by cost reductions in renewable technologies could make them more attractive provided a reform on taxes and levies.

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[5] 21 IEA, 2019. The Future of hydrogen. p.55
[6] WindEurope (2018), Breaking New Ground. https://windeurope.org/wp-content/uploads/files/about-wind/reports/WindEurope-breaking-new-ground.pdf
[6] Ibid
[7] Ibid
[8] Ibid

Where direct electrification is not cost-efficient, technically viable in the timeframe to 2050, or sustainable, other ways to help decarbonising and reaching carbon neutrality by 2050 are needed. Indirect electrification with renewables should be used only where necessary, like in the hard-to-abate sectors of the economy:

- **Heavy industrial processes**: Substituting the fossil gas-based hydrogen with renewable hydrogen from electrolysis could reduce CO_2 emissions significantly in industry (e.g. chemistry, fertilizers, and refineries). Renewable hydrogen could also reduce CO_2 emissions in the production of iron and steel.
- **Heavy-duty transport**: a significant part of heavy trucks could run on hydrogen by 2050.
- **Shipping and aviation**: Direct electrification would remain marginal with less than 5% for both sectors[9]. Shipping will see electrification of short-haul transport reducing its energy consumption by one quarter. Cruise segments will favour renewable hydrogen and electro-fuels. And air transport could see embryonic electricity propulsion by mid-century for the shortest haul flights.

The production of renewable hydrogen could also be a viable solution to locations with a high concentration of wind energy generation and an insufficient grid infrastructure. The northern part of Germany is a clear example. Offshore wind in the North Sea could also be constrained by a limitation of electricity landing points and could lead to further delaying and grid congestions.

Renewable hydrogen production can be a source of demand flexibility. It could help to smooth ramp rates and reduce intra-day variability of the wind supply. However, its cost structure will limit its deployment as demand flexibility can be enabled at a lower cost from other sources (e.g. industrial demand, stationary and mobile battery systems). It could be more interesting to provide a source of seasonal storage. However, as of today, the exact future system needs and the viability of alternatives (underground thermal heating) are uncertain and need to be further evaluated.

In any case, using electricity directly is more efficient than converting it into other energy carriers (e.g. hydrogen). Consequently, indirect electrification, besides being intrinsically more expensive, would require more renewable energy capacities than direct electrification. While renewable hydrogen is currently expensive and its costs structure highly depend on specific projects (size, location, price of electricity), technologies for direct electrification are already available and their deployment should be accelerated to significantly curve GHG emissions already by 2030.

3.2 What role should renewable gases play in the integrated energy system?

Renewable gases like biogas or biomethane will have a role to play to decarbonise the harder-to-abate sectors. The role of biogas and biomethane might be important in specific locations, but the extension of the gas infrastructure to accommodate and transport renewable hydrogen and these renewable gases, should be carefully assessed by the European Commission (cf. question 3.3).

Additionally, renewable hydrogen also has a role to play, as alluded to above, but its role should be assessed with an energy efficiency principle in mind (i.e. whatever can be directly electrified should choose that path to minimise energy conversions/losses). This, again, speaks for a cautious evaluation of the role of gas infrastructure in a net-zero economy.

3.3 What measures should be taken to promote decarbonised gases?

We will focus here on renewable gases. Policymakers should support the development for the commercialisation of zero-carbon renewables-based gases and fuels by:

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[9] Ibid

- **Ensuring a clear distinction between Guarantees of Origins (GO) for renewable energy** (renewable electricity and renewable hydrogen) and, where applicable GOs for non-renewable energies. GOs for renewable energy play an important role to stimulate final customer's demand for renewable energy. Renewable energy GOs should only be issued for energies that are 100% renewable-based;
- **Targeting the development and upscaling of electrolyser** technologies through industrial policies for securing technology leadership and reducing the cost of renewable hydrogen production;
- **Continuing R&I on system integration** and give incentives for research, test, and demonstration, of large-scale electrolysers and off-grid connected renewables;
- Treating electrolysers using 100% renewable electricity on a level-playing-field with power-to-heat technologies and storage solutions;
- **Mandating an EU-wide framework for permitting** requiring Member States to designate "one-stop shop" permitting authorities at national level and set time-limits on application processes for technologies using renewable electricity, like electrolysers, power-to-heat and storage; and
- Even if the role of gas will be reduced, some power-to-gas will be injected into the gas grid. Therefore, we need to **ensure grid tariffs are cost-reflective** for power-to-gas injected to the gas network, and for the input electricity when power-to-x infrastructure provides flexibility to the energy system.

Repurposing and re-using the existing gas infrastructure both for the transport of renewable hydrogen and other renewable gases (but also as a storage medium) could unlock a cost-efficient pathway towards the upgrading of renewable gases' role in the energy system. Specifically, for retrofitting three points should be taken into consideration:

1. There is no case for methane leakage reduction to become Project of Common Interest (PCI). This is a regulatory issue, not a financing one. According to the polluter pays principle, Transmission System Operators (TSOs) should be responsible to tackle the methane waste they produce;
2. The integration of biogas/biomethane must be limited only where this provides an alternative to an additional transmission project or helps retire transmission projects with declining utilisation; and
3. A mere blending of renewable hydrogen will not be sufficient to achieve climate neutrality and might end up in two investment cycles instead of a strategy for full conversion (including end use appliances). The potential for climate neutral supply of hydrogen should be analysed by independent experts – such as a hydrogen high-level expert group.

3.4 What role should hydrogen play and how its development and deployment could be supported by the EU?

As mentioned before, direct electrification should be prioritised. If direct electrification is not cost-efficient, technically viable or sustainable, indirect electrification, notably with renewable hydrogen, will be key to enable decarbonisation of hard-to-abate sectors. **Producing renewable hydrogen with offshore and onshore wind could provide these hard-to-abate sectors with a solution to their energy needs which cannot be electrified directly.** Offshore wind is ready to supply the electricity to produce renewable hydrogen, but without a clear regulation there is no business case.

A clear and unambiguous definition at the European level of hydrogen would facilitate a market uptake of renewable electricity-based hydrogen. WindEurope believes electrolysed renewable hydrogen powered by 100% zero-carbon renewable electricity should be the reference baseline.

Renewable hydrogen will play an important role in the decarbonisation of conventional fuels through its use in the refining process. Furthermore, hydrogen produced with 100% renewable electricity could replace fossil-based hydrogen, being used today as a feedstock. This include for example ammonia, of which the chemicals sector uses 65% of the global demand to produce fertilisers, polymers, resins and other chemicals (through the production of methanol).

Hydrogen would provide a good option for long-term seasonal storage that could be deployed in those long periods of low wind, low sun, and high demand (in the very long-term).

Regulatory support to renewable hydrogen should be focused on those places where renewable hydrogen can truly make a difference (e.g. feedstock substitution) rather than opportunistic subsidising across all sectors and applications. In addition to the supports mentioned in question 3.3 above, to help the development and deployment of renewable hydrogen, the EU should:

- Create a **Clean Hydrogen Alliance** supporting projects with 100% renewable hydrogen only; and
- Ensure **power-to-X remains a competitive activity**. It has to be developed by market operators, in order to avoid distortions and inefficient outcomes. TSOs and DSOs should not be involved in competitive activities like power-to-gas, as they will have a potential conflict of interest when planning, granting access and operating / dispatching infrastructures. Europe should focus on how to create the right market conditions and a regulatory framework that recognizes the value of the use of greenest solution in the sectors where it is most required as well as of other benefits brought about such as those from sector coupling, (e.g. flexibility provision to the power system such as long-term storage).

With regards to state aid, the inclusion of hydrogen projects on the IPCEI projects partly addresses the access of renewable hydrogen to state-aids, but it is only for some important projects involving several Member States. The Guidelines for Environmental Protection and Energy (EEAG) put non-renewable energy-based hydrogen – e.g. the hydrogen produced from natural gas and making use of CCS - in a more favourable position as compared to renewable hydrogen. National subsidies to CCS could put non-renewable energy-based hydrogen in an economical more favourable position than the production of renewable electricity-based hydrogen.

Moreover, undertakings investing into the production of renewable hydrogen (produced via electrolysis) are often faced by high OPEX, in particular environmental taxes such as national surcharges and levies. This is for instance the case in Germany, where producers of renewable hydrogen are subject to EEG-surcharges.

One of the main cost component of producing 100% renewable-electricity based hydrogen is the electricity price. Exposure to high network charges and high electricity levies makes the production of this renewable hydrogen rather unattractive and thus also hinders the scaling-up of renewable hydrogen to a commercial level. To reflect upon the role that power-to-gas installations and renewable hydrogen can play in the energy transition, state aid policies should factor in the main cost drivers of producing and distributing renewable hydrogen. These include electricity taxes and levies for which exemptions should be considered.

3.5 How could circular economy and the use of waste heat and other waste resources play a greater role in the integrated energy system? What concrete actions would you suggest to achieve this?

District heating accounts for just 9% of space and hot water heating in the European Union. District heating in general (including with waste) is highly efficient and It is a source of flexibility for the energy system.

We can use renewable electricity in large heat pumps or power-to-heat installations and inject the heat into a district heating network as part of an integrated approach with CHP plants, heat buffers, excess heat integration and utilisation of originally renewable sources (e.g. geothermal or solar thermal). Such complementary district heating systems provide flexibility and stability for the variability of renewable electricity generation.

Below are some interesting projects of district heating systems showing that concrete projects for an integrated energy system are already up and running:

Country/ City	Project	Size of the project
Germany/ Hamburg	The project "Karoline" uses oversupply of electricity from renewable energy plants It has a **45 MW p**ower boiler, integrated in District heating Hamburg – operational since autumn 2018. It provides **13,500 households** with heat.	/
Finland/ Oulu	District heating, carbon capture & storage & energy sector coupling related investment projects.	Total size: 445 M€ (Ongoing projects: 245 M€, outlined investments additionally 200 M€)
Finland/ Espoo, Kauniainen and Kirkkonummi	Fortum's carbon neutral district heating & energy sector coupling related investment program rely on waste heat of data centres, wastewater and industry to electric heat pumps, geothermal, smart demand response solutions, & bioenergy. There is an 2025 intermediate target of discontinue coal in the district heating.	Total size: 200M€ (program ongoing)
Finland/ Kilpilahti	Neste Kilpilahti waste heat recovery project to be connected to heating of Helsinki region.	Current estimates (pre-feasibility at this point) 700-1000 M€
Belgium/ Ghent	It is a battery for district heating. The Combined Heat and Power engines at the Ham power station in Ghent operate at full capacity during the day to deliver electricity, while also heating the 4.5 million litres of water, stored in the former storage tank, to 90°C. The overall efficiency of the installation has led to a 34% CO_2 emission reduction. The stored water is used to feed Ghent's district heating network at night.	The costs of the project are limited thanks to the reuse of an existing insulated storage tank and of some pre-existing process installations on site. The investment for the storage unit could be limited to about €400,000.
France/ Chambery	Energy efficiency DH investment is mainly related to R&D, technical development	Size: €150,000.

	and testing in a partnership with a customer as a beta site.	
France/ Grenoble	To get an operating status overview of equipment into the substations.	200 K€.

3.6 How can energy markets contribute to a more integrated energy system?

The European Commission should **adapt the market design and regulatory frameworks adopted with the Clean Energy Package** for electricity to the gas sector by aligning the rules in this latter towards a net-zero emissions pathway.

Energy markets will provide **flexibility** and help a more integrated energy system. Energy efficiency measures at demand side (e.g. in buildings) will reduce electricity consumption and thus electrical stress on the grid, requiring less flexibility. The most significant element of system flexibility will come from new electric loads such as heat pumps and power-to-heat installations, electrolysers, smart charging infrastructure and storage solutions. An improved market design can also provide flexibility and therefore help sector integration (such as integration of EVs).

Intraday trading is a clear example of how to adapt the market to the new realities, significantly reducing balancing and reserves costs.

Bringing the gate closure time in these markets near to real-time can also reduce the system dependency on balancing reserves. Other examples include the possibility of aggregating generation at larger geographical areas and/or aggregating different technologies when bidding in the market.

3.7 How can cost-efficient use and development of energy infrastructure and digitalisation enable an integration of the energy system?

- **Electricity Infrastructure**

  As increasing the electricity share in Europe's energy mix would require larger and stronger grids, optimising the existing power grid infrastructure should be the priority together with further development of this grid. In that regard, TSOs should have greater incentives to save on OPEX by applying optimisation technologies.

  The upcoming Trans-European Networks for Energy (TEN-E) Regulation revision in 2020 should also be aligned towards a renewables-based electrification and prioritise electricity infrastructure, such as an interconnected offshore grid.

- **Gas Infrastructure**

  According to various stakeholders[10], gas demand has been systematically overestimated. So, the extension of the gas infrastructure to accommodate and transport renewable gases and renewable hydrogen should be carefully assessed by the European Commission. In some cases, it might not even be necessary to connect power-to-gas facilities to the grid. This is the case for on-site production of renewable hydrogen. It could be consumed locally on the territory of an industrial customer and thus a grid connection becomes obsolete.

  Blending hydrogen with natural gas into the gas network should be approached with caution, making sure that hydrogen does not end up feeding final uses for which other more effective and efficient decarbonisation options already exist and avoiding a lock-in into technologies using gaseous fuels with limited decarbonisation potential. This would be the case for example of the heating sector, where

[10] http://www.caneurope.org/docman/climate-energy-targets/3580-2020-can-gas-pp/file
https://www.e3g.org/docs/E3G_Trends_EU_Gas_Demand_June2015_Final_110615.pdf
http://www.foeeurope.org/sites/default/files/extractive_industries/2017/entso-g_fossil_free_europe_report_vfinal.pdf

buildings insulation and the substitution of gas-based heating appliances with more efficient electric heat pumps have higher CO_2 emissions reduction potential at a lower abatement cost.

Furthermore, Europe should discourage an extensive retrofitting of the existing gas infrastructure. A large demand for renewable hydrogen is still uncertain as are locations where it will be produced and used. There is no need of such an infrastructure today. The first deployment of renewable hydrogen projects should start from solutions that see generation as close as possible to the consumption point.

- **Digitalisation**

  Digitalisation will lower costs of monitoring and control of energy generation. Smart grids for instance are improving the safety, productivity, accessibility and sustainability of power systems (lower the level of losses and efficiency gains), allowing utilities to deliver energy at the right time, in the right place and at the lowest cost. It will help for instance the integration of electric vehicles into the electricity grids. As regards to smart technologies (e.g. charging points, smart meters), they will foster flexibility (including demand side flexibility) and therefore foster sector integration.

  WindEurope supports **joint ENTSOs infrastructure planning** to avoid stranded assets and to take decisions on new infrastructure – either gas/hydrogen or electricity – from a cost-efficient perspective. Yet, we are concerned regarding the joint ENTSOs' Ten-Year Network Development Plan draft scenario report for 2020 (TYNDP 2020) on the preliminary results as:

  - there are discrepancies between the EC scenarios of the Long-term strategy (1.5 Life and 1.5 Tech) ambition levels of electrification with the ENTSOs preliminary results (not above 49%);
  - there is a strong uptake of biomethane, synthetic methane, hydrogen and other so-called decarbonised gases;
  - assumptions on renewable energy growth rates, energy efficiency and demand response are modest; and
  - benefits of sector integration are barely explored.

4. **Are there any best practices or concrete projects for an integrated energy system you would like to highlight?**

   On top of the examples mentioned in the question 3.5 on district heating, the following best practices and concrete projects are worth mentioning:

   - **<u>Charging stations and vehicle-to-grid (V2G)</u>**

TEN-T CORE corridors safe and secure trucks parking areas with charging points

The Trans-European Transport Network (TEN-T) lacks overall electric charging infrastructure and stations for vehicles, but even more so for heavy duty vehicles. As the European Commission plans to provide safe and secure parking areas for trucks (with access to electricity), WindEurope supports the roll-out of these safe parking areas with access to electric charging infrastructure for vehicles along the TEN-T corridors, especially for heavy duty transport. In order to ensure 100% renewable electricity at these stations and as electricity demand at these stops will be significant, we suggest, as part of the EU Recovery Plan, the development of a methodology to ensure that only renewable power is used, through direct links (e.g. with onshore windfarms on site) or via PPAs (e.g. with offshore windfarms).

Vehicle-to-grid in Italy

Enel X, Nissan and RSE have launched Italy's first test of vehicle-to-grid technology applied to innovative services. A centre for testing V2G technology, equipped with Nissan LEAF cars and charging infrastructure developed by Enel X, has been established at the RSE facilities in Milan. Through V2G, electric vehicles can exchange electricity with public and domestic grids with numerous benefits for the community, energy operators and customers.

Amsterdam ArenA

There are 15 bidirectional charging stations with the 3-megawatt battery storage, consisting of 148 Nissan Leaf batteries, and the 1 megawatt PV on the roof. The stadium can provide the 3 MW to sell on the Frequency Containment Reserve (FCR market) outside event days while go off the grid fully during football matches. The intelligent software control enables electric cars of stadium visitors not only to receive power from the charging station, but also to feed electricity back into the stadium's electrical infrastructure.

Amsterdam Flexpower
Vattenfall and the City of Amsterdam, together with grid owner Liander, the infrastructure competence centre Elaad, and the Amsterdam University of Applied Sciences, launched Flexpower in May 2019. A total of 456 charging stations with 912 charging points or a 1/3 of all charging stations in the city. Charging stations provide less electricity between 18.00 to 21.00, and charge more at night when consumption is low or during the day when a lot of local solar power is being produced. As most electric cars are charged outside peak hours, electric car drivers benefit from quicker charging.

- **Indirect electrification: industrial processes & transport**

HYBRIT - Zero-carbon steel production by 2026
In 2016, the Swedish companies SSAB, LKAB and Vattenfall joined forces to create the HYBRIT Initiative to achieve a fossil free energy-mining-iron-steel value chain, including the development of large-scale hydrogen generation and storage. HYBRIT will transform the conventional production of steel from blast furnace to electric arc furnace thereby replacing coal, traditionally needed for ore-based steel making, with fossil free electricity and renewable hydrogen. A pilot phase is on-going until 2024. A demonstration plant is planned for 2025, giving the possibility to produce iron ore-based, fossil-free steel for commercial use in 2026. HYBRIT has the potential to decrease the Sweden's greenhouse gas emission by 10% and Finland's by 7%.

Don Quichote Project
The Don Quichote demonstration plant was implemented at a logistic centre of Colruyt Group in Halle in Belgium from 2012 to 2018. The plant is interconnected to an existing hydrogen refuelling facility that supplies hydrogen to a vehicle fleet. It receives energy from renewable energy sources: wind and solar power. It stored excess renewable electricity from wind and solar parks in the form of hydrogen.

HyBalance project
The project is a partnership between Air Liquide, CHN, Hydrogenics, LBST, Neas Energy and Hydrogen Valley. It is a power-to-hydrogen demonstration plant in Denmark that should provide both grid balancing services and hydrogen for industry and as a fuel for transport in the community of Hobro in the Danish province of Nordjylland. The electrolyser, with a capacity of 1.2 MW, enables the production of around 500 kg of hydrogen a day without releasing CO_2. The project should run from October 2015 to end of September 2020.

- **Demand response**

Finland's sustainable distribution centre
Schneider Electric has partnered with Lidl to build Finland's most sustainable distribution centre which benefits from an integrated Schneider Electric EcoStruxure™ Microgrid and EcoStruxure Building Operation solution that delivers high level of energy efficiency and runs on 100% renewable energy. It targets more than 50% energy cost savings, has 40% less CO2 emissions and is 30% more energy efficient than 2 other warehouses. The heat recovered from refrigeration systems is used for building's energy needs and supplied to Järvenpää's residents, heating water for approximately 40 private homes, and producing about 700 MWh/y of heat.

- **Hydrogen hub**

The NorthH2 renewable hydrogen project
The goal is to produce hydrogen from offshore wind to help decarbonise the industrial cluster of Groningen/Delfzijl/Eemshaven, which will lose its traditional source of energy when the Groningen

gas field closes in 2023. The plan is to start operation by 2025, reach 3-4 GW of renewable hydrogen by 2030 and 10 GW by 2040. Feasibility studies are due to start later this year.

- **<u>Electrifying ports</u>**

Port of Esbjerg, Denmark
A new test centre for 15 MW offshore wind turbines will be put in place together with charging infrastructure for electric vessels. The wind industry plans to electrify much of our fleet of vessels that we use for installation and maintenance.

5. **What policy actions and legislative measures could the Commission take to foster an integration of the energy system?**
In general, the EC should aim at aligning the fossil gas sector towards net-zero emissions and ensure a level playing field and effective competition among future energy carriers (renewable electricity, renewable gases, renewable hydrogen and hydrogen-based fuels from renewable electricity).

The EC should take new initiatives and **revise the following legislations with a swift implementation and monitoring:**

- **Energy Taxation Directive**: to be aligned with the European climate and energy goals, to provide a level playing field for renewable electricity, and to factor in new technologies such as storage and renewable hydrogen (cf. our response to EC consultation);
- **Trans-European Network for Energy Regulation**: the revision should focus on a renewables-based electrification and gives sustainability criteria for the selection of PCIs a more important weighting and include offshore hybrid projects as PCIs;
- **Alternative Fuels Infrastructure Directive**: to promote smart charging infrastructure and smart grids to provide demand-side flexibility (e.g. vehicle-to-grid, grid-to-vehicle) and strengthen the requirements for charging infrastructure (cf. our response to EC roadmap);
- **Building Renovation Wave**: technology roadmap to support the deployment of distributed energy resources at demand side (e.g. electric heat pumps, EV charging stations);
- **TEN-E:** New and updated infrastructure categories to enable the clean energy transition will be needed. An example is the transport of renewable hydrogen. Nevertheless, a mere blending of renewable hydrogen will not be sufficient to achieve climate neutrality and might end up in two investment cycles instead of a strategy for full conversion (including end use appliances). The potential for climate neutral supply of hydrogen should be analysed by independent experts – such as a hydrogen high-level expert group; and
- **Pending delegated acts from RED II:** the directive defines what renewable energy or renewable sources are but is not clear whether other energy carriers produced with such renewable energy or sources can be referred to as renewables when used in other sectors (e.g. when electrolysers are connected to a power grid with a varied energy mix and co-located with other sources of power generation to produce hydrogen). The only case foreseen is for the transport sector. Specifically, the definition of hydrogen will determine how the calculation of the fuel supplier obligation in Article 25 of the Renewable Energy Directive should be done. The EU should complete the pending delegated acts for accounting renewable electricity for electrolysers connected to the grid, provide a clear definition of renewable hydrogen and clarify the methodologies for compliance of the renewables fuel obligation (Articles 25-27) as soon as possible.

On indirect electrification, and to foster renewable hydrogen, the priority areas should be:

- The **taxonomy** to classify the different routes to produce hydrogen, particularly when produced via electrolysis with renewable electricity;

- A prompt resolution of the pending delegated act under Article 27 of the Renewable Energy Directive is critical to provide clarity to investors (‘how renewable is my hydrogen?’) and to prevent conflicting definitions across schemes;
- The **traceability of the renewable electricity** used for hydrogen production in a system with a mix of power generating technologies;
- The **roles and responsibilities of market and regulated playe**rs in the production of hydrogen, crucially who can own, operate and offer sector coupling and cross-vector integration services to the market; and
- The **level of infrastructure** needed for smart sector integration.

Finally, consumers acceptance, transparency and incentives are crucial to foster an integration of the energy system. The EC should give incentives to renovate buildings/energy efficiency labelling (e.g. heat pumps development incentives), to increase the electric vehicles sales, etc.

For instance, consumers face problematic conditions for using charging infrastructure. This is due to two phenomena: a) There is no universal “instruction manual” for each type of alternative fuels infrastructure (charging stations are not harmonised and are all working differently); and b) There is a lack of information and transparency. Electric mobility is a key example. There is a lack of information on the availability, and accessibility of charging stations. For consumers to be willing to use alternative fuels infrastructures, adequate and transparent information is needed (including on the location of charging infrastructure, accessibility and visibility of the fuel price).

A more reflective Primary Energy Factor for eco-design products and Energy Performance of Building Directive (EPBD) reporting would also be welcome.

For the hard-to-abate sectors, costs for basic materials can increase (significantly), on percentage, using fossil free compared to conventional technologies. This may be especially true at the beginning of this process, when new technologies are still in development, leading to higher costs. Certificates for green products could be introduced as a means for customer to proof that the final product has been produced by (raw) material, using renewable energy sources and thereby reflecting upon the “higher value” of the final product.