ETIP Wind

EUROPEAN TECHNOLOGY & INNOVATION PLATFORM ON **WIND ENERGY**

ETIPWind workshop

Making Europe's power grid fit for climate-neutrality

28 September 2021

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Table of contents

1 Context

1.1 Background

As part of its contract with the European Commission, the ETIPWind secretariat will organise meetings and workshops to strengthen synergies and alliances with other European Technology & Innovation Platforms and stakeholder associations with an invested interest in advancing wind energy power production.

1.2 Scope

On 28 September the European Technology and Innovation Platform on Wind Energy (ETIPWind) held an online workshop entitled: “Making Europe’s power grid fit for climate neutrality”.

The aim of the workshop was on the one hand to open the debate on how to deliver on the EU’s new energy and climate targets and on the other hand to disseminate the findings of the ETIPWind report: “Getting fit-for-55 and set for 2050”. The objective of the discussion was to compare and align the positions of all stakeholders and to identify what technology and policy innovations are needed to ensure delivery on aforementioned targets.

The target audience included on the one hand technical experts from wind and other renewable energy sectors, system operators, technology providers, as well as policymakers and regulators national and European institutions.

2 Agenda

Time	Item
10:00 – 10:05	**Introduction** **Adrian Timbus**, ETIPWind Executive Committee Chair/ Head of Portfolio and Strategic Marketing, Hitachi ABB Power Grids
10:05 – 10:15	**Keynote presentation** **Joachim Balke**, Head of Unit, Infrastructure and Regional Cooperation, European Commission, DG ENER
10:15 – 11:00	**Session 1: Fit-for-55 Package: policies and investments** **Moderator: Adrian Timbus**, ETIPWind Executive Committee Chair/ Head of Portfolio and Strategic Marketing, Hitachi ABB Power Grids **Speakers:** • **Brent Wanner**, Head of Power Sector Unit, World Energy Outlook, IEA • **Daniel Fraile**, Director of Market Intelligence, WindEurope
11:00 – 11:10	**Coffee Break**
11:10 – 12:00	**Session 2: Enabling technologies to deliver climate neutrality** **Moderator: Vasiliki Klonari**, Senior Analyst, Digitalisation and System Integration, WindEurope **Speakers:** • **Susanne Nies**, Board Chair, currENT • **Eoin Hodge**, Chief Public Technology Officer, SuperNode Ltd • **Wilhelm Winter**, Lead Electrical System Design, Tennet TSO GmbH • **Nicolaos Antonio Cutululis**, Professor, DTU Wind Energy • **Frank Martin**, Advisory Engineer, Siemens Gamesa
12:00-12:10	**Coffee Break**
12:10-12:50	**Session 3: 'How to deploy the grid technologies Europe needs for a net-zero economy'** **Moderator: Daniel Fraile**, Director of Market Intelligence, WindEurope **Speakers:** • **Jochen Kreusel**, Global Head of Market Innovation, Hitachi ABB Power Grids • **Jan Kostevc**, Infrastructure Regulation Officer, Team leader at Agency for the Cooperation of Energy Regulator, ACER • **Norela Constaninescu**, Head of Section, Innovation, ENTSO-E
12:50 – 13:00	**Closing remarks and next steps** **Adrian Timbus**, ETIPWind Executive Committee Chair / Head of Portfolio and Strategic Marketing, Hitachi ABB Power Grids

3 Minutes of the workshop

3.1 Introduction

Adrian Timbus, Chair of the ETIPWind Executive Committee, opened the workshop. He welcomed all the participants and explained the house rules of the workshop. As the workshop was held virtually participants could send their questions and feedback via the chat function. Some questions were answered during the panel discussions, others were answered by the panellists directly in the chat. See Annex 1.

3.2 Keynote presentation: Raw materials and circularity for wind energy

Joachim Balke, Head of Unit, Infrastructure and Regional Cooperation, European Commission (DG ENER), presented the European Commission's proposals on how to deliver 55% GHG reduction by 2030 and climate neutrality by 2050. And the importance of energy infrastructure investments and policies to deliver on these ambitious goals.

The energy transformation is centred on three pillars.

- Increasing smarter and efficient use of energy;
- A deep renewables-based electrification of energy demand in all sectors; and
- The use of renewable and e-fuels where direct electrification is not economically or technically viable.

Making the energy transition happen will require a huge and rapid increase in deployment of wind and solar energy. To deliver all this renewable electricity to where it is needed the European energy infrastructure needs to grow and transform too. The Commission has therefore put forth a revised plan for the Trans-European Networks – Energy (TEN-E) regulation.

The proposed revision of the TEN-E includes an increased focus on:

- Offshore power grids building on regional cooperation strengths to deliver 300 GW of offshore renewable energy by in 2050 (cfr. the EU Strategy for Offshore Renewable Energy);
- The deployment of smart electricity networks; and
- Hydrogen infrastructure.

Coordination and long-term planning will be key so the proposal also calls for a strengthened role of the Agency for the Cooperation of Energy Regulators (ACER) and closer involvement of the European Commission in the 10-year network development plan (TYNDP) of the European TSO community (ENTSO-E). In addition, new provisions aim to make permitting procedures easier and faster.

The council of the EU and the European Parliament will formulate their respective positions on the Commission's proposal shortly and interinstitutional negotiations (trialogues) are expected to start before the end of the year. In 2022 the new regulation should be approved.

3.3 Session 1: Fit-for-55 Package: policies and investments

In the first session participants received a high-level overview on the technology and policy trends that will deliver a climate-neutral or net-zero society.

Brent Wanner of the International Energy Agency (IEA) presented the IEA's view on how to achieve a Net-Zero global economy by 2050.

The IEA believes renewables, hydrogen and energy efficiency are the key tools to deliver this. Wind capacity would need to grow 11 times and solar PV 20 times by 2050. This would lead to global installed capacities of 8 TW and 14 TW respectively. Annual grid investments would also need to almost triple over the next 30 years.

The power sector would need to decarbonise 100% in advanced economies by 2035 and in all economies by 2040. After that emission reductions will need to come from heavy industry and heavy-duty transport (e.g. maritime shipping and aviation).

Crucially the IEA notes that the majority technologies for achieving the necessary deep cuts in global emissions by 2030 are known already today. But that the path to net zero is narrow and requires their immediate and massive deployment. 50% of the technologies are already market ready, but $90bn investments in R&D is needed to improve the rest by 2030.

Daniel Fraile, Director for Market Intelligence at WindEurope, presented the Getting fit for 55 and set for 2050 report from ETIPWind and WindEurope.

The report shows that delivering a climate neutral European economy is possible. Electricity will provide for 75% of Europe's energy demand. 57% will be through direct use of electricity, the rest will be indirectly (e.g. electrolysis). Wind energy will provide 50% of Europe's electricity according to the European Commission's scenarios.

The energy costs associated with transition towards climate neutrality will cost no more as a share of GDP than today. Energy's external costs that are not accounted for today, notably air pollution, will reduce drastically due to the exponential deployment of renewables such as wind and solar PV. Grid investments will need to double and there must be special attention to the offshore sector. Here Europe needs an integrated approach to grid planning and allow for smart efficient solutions such as hybrid offshore projects.

The costs of wind energy will continue to decline significantly over the next 30 years. But only if the EU continues to invest in research to unlock five mega trends. Scaling up offshore wind, industrialising floating offshore wind, further improving the happy co-existence of wind energy and society, repowering onshore wind farms, and achieving full circularity of wind turbines.

3.4 Session 2: Enabling technologies to deliver climate neutrality

In the second session participants received more in-depth presentations on some of the innovative technological solutions that are ready for large-scale deployment in Europe.

Susannie Nies, Chair of the board of CurrENT (industry association representing innovative grid technology companies operating in Europe) gave an overview of how new and innovative grid solutions are essential to deliver on Europe's climate and energy ambitions.

One key obstacle to deployment of these technologies is the current regulatory framework which incentivises grid build-out over grid optimisation. But both are equally needed to deliver climate neutrality. Regulatory changes should promote near-term investments and adopt an output-oriented approach.

Eoin Hodge, Chief Technology Officer at SuperNode ltd presented how superconducting technology could make long distance transmission of bulk renewable electricity more cost effective.

Superconductors would be better suited to transmit bulk renewable power from Europe's periphery (where the best energy resources are) to the demand centres. Even if cable costs are higher, superconducting technology

would be more cost-effective than traditional HVDC technology. This mostly due to the significantly lower cost of the substations.

Wilhelm Winter, Lead Electrical System Design at Tennet presented how to integrate and connect Europe's AC and DC networks to unlock the full potential of offshore wind energy.

The future power system will include more HVDC systems and power electronics. They are essential to integrate large shares of variable renewable energy, especially offshore. But renewables are unevenly distributed and have low inertia, which under specific conditions could lead to a system split. To counter this Europe needs to invest in R&D to increase the interoperability and interconnectivity of traditional high voltage AC systems and the new DC systems.

Nicolaos Antonio Cutululis, Professor at DTU Wind Energy presented how the role and responsibilities of wind farms in the power system have and will continue to increase as installed capacity increases too.

As of the early 2000's wind farms were asked to contribute to an increasing amount of systems service. From voltage control, through frequency control and system balancing. Wind turbines have a high degree of controllability but today still need to be embedded in a strong energy system to function properly. With innovation in smarter controls and new hardware and software wind turbines could easily develop grid-forming capabilities and become the true backbone of the European energy system.

Frank Martin, Advisory Engineer at Siemens Gamesa gave an outlook on how power-to-x solutions could help mitigate grid infrastructure bottlenecks and help decarbonise sectors where direct electrification is not economically or technically viable.

Europe needs to decarbonise fast. And electrification is the best way to do so. But grid infrastructure works take closet to a decade to complete and securing grid connection is a major obstacle for the development of new wind farms. Directly coupling wind turbines with electrolysers to produce renewable hydrogen could be a way to mitigate grid build-out restrictions without compromising the wind energy market. In the long term Europe will need both more grids and more power-to-x solutions to decarbonise all the economic sectors.

3.5 Session 3: 'How to deploy the grid technologies Europe needs for a net-zero economy'

The third session saw a panel discussion on how regulatory frameworks need to evolve in order to accelerate grid build-out and deployment of new innovative technologies. The panellists included Jochen Kreusel, Hitachi ABB Power Grids, Jan Kostevc, Agency for the Cooperation of Energy Regulator, and Norela Constaninescu, ENTSO-E.

The panellists noted that all stakeholders agree that investments in grids need to accelerate. More ambitious plans are being made, but the investments to implement the plans are lagging behind. Europe needs a holistic approach to deliver on its energy and climate targets. The holistic approach entails three distinct trends.

1) Close coordination at European level. Grid planning exercises are robust at national level, but these lack the helicopter view needed to ensure a cost-effective transition.
2) Connecting the onshore and offshore grids. The onshore grid is characterised by AC lines in the transmission system and lower voltage levels in the distribution system. Offshore grids will be mostly High Voltage and DC connection.
3) Coordinate across energy carriers. Renewable hydrogen will be a key element to help decarbonise sectors where direct electrification is not a viable option. To unlock its full potential Europe needs an integrated approach to find the optimal distribution between investments in (retrofitting) gas and electricity grids.

The panellists also identified several barriers to deployment of the needed technology and infrastructure.

- Permitting is a key bottleneck to the build-out of new grid infrastructure. Increased and improved citizen engagement is essential to gather support for large infrastructure works.
- Investment bias. The current regulatory framework for investments incentivises large CAPEX investments over small-scale investments. This CAPEX bias explains in part why investments in grid optimisation technologies in particular are low. The absolute return on investment of those investments is much smaller compared to building new infrastructure. One solution is to not only measure costs, but also the benefits associated with investments.
- Stakeholder complexity. With a more holistic approach more and more stakeholders are involved in the decision-making process. Whereas coordination is absolutely essential, it proves to be much harder to reach consensus on the way forward and indecisiveness is a real risk.
- Interoperability. With more variable and distributed renewable energy sources connected to the grid the system must become more flexible. This requires interoperability between all network elements, connected devices and market players. Improvements and standardising in data exchanges is a first but essential step towards true interoperability.

Annex 1: Questions and Answers

During the workshop not all questions could be answered during the panel discussions. Speakers were invited to reply to questions in the chat. The questions below have been corrected for clarity and spelling.

3.6 Question 1

To Joachim Balke: When you mention integrated offshore development plans, do you refer to integrated as in integration of various national plans or as integration of combining the electricity and gas/hydrogen infrastructure?

3.7 Question 2

To Joachim Balke: How many times more would you assume the electrical grid infrastructure needs to grow to accommodate the growing electrification in Europe? Two times, five times or ten times?

3.8 Question 3

To Brent Wanner: 50% of new electric heavy trucks sales electric by 2035 seems very optimistic. Doesn't the fuel transition in this sector seem to lean rather towards H2/synthetic fuels than electrification?

3.9 Question 4

To Brent Wanner: There is backing from WWF and many NGOs (and us, EUREC) for IEA's "no new fossil fuel boilers after 2025" report: https://www.wwfmmi.org/?4589441/No-gas-in-green-Taxonomy---150-NGOs-urge-EU-Commission

3.10 Question 5

To Brent Wanner: Can you tell more about how you see the relation between decarbonisation of electricity by 2035 in developed countries with electrification of industry?

3.11 Question 6

To Brent Wanner: How should I interprete the 60% installed capacity (MW) and 90% energy delivery from renewables (MWh) and their contribution to carbon neutrality (IEA presentation)?

- By 2050 in the IEA Net Zero by 2050 Scenario, renewables account for 80% of global installed capacity and almost 90% of electricity generation, as other technologies are focused less on bulk power and more on flexibility. see the full report at https://www.iea.org/reports/net-zero-by-2050

3.12 Question 7

To Brent Wanner: In flexibility provision, I assume that other renewables include wind and solar. How would you explain that these contribute less to flexibility in advanced economies compared to emerging markets (in 2050)?

3.13 Question 8

To Brent Wanner: And speaking about flexibility; how to assure/ design tariffs so that flexibility is used to drive deployment of RES/variable energy production (volatile load), and not to drive "efficient use of grid infrastructure" (flat load)?

- Quadrupling the provision of power system flexibility globally by 2050 (measured here in terms of upward ramping) does call for markets to appropriately value all the services provided to the grid. Digitalisation of systems are critical to enable accurate reflection of these values to the system and to asset owners. see the full report at https://www.iea.org/reports/net-zero-by-2050

3.14 Question 9

To Brent Wanner: What we need to do differently in energy efficiency to accelerate the reduction of CO2 emissions associated with it?

- Many areas can be accelerated, I would highlight in particular raising minimum performance standards and making sure price signals are there and clear to encourage energy efficiency. see the full report at https://www.iea.org/reports/net-zero-by-2050

3.15 Question 10

To Brent Wanner: I see nuclear part of the net zero future. Can you comment on it?

- Nuclear power doubles to 2050 in the Net Zero by 2050 Scenario, with lifetime extensions in advanced economies, where acceptable, and scaling up new builds in those countries already increasing the use of nuclear power (for example 19 countries have reactors under construction today). This would also call for advanced technologies, including small modular reactors, and opportunities to produce electricity, heat, and hydrogen. see the full report at https://www.iea.org/reports/net-zero-by-2050

3.16 Question 11

Many of the HVDC components are at TRL 7+ , but need industrial testing - who is going to move first?

3.17 Question 12

Getting from TRL6/7 to market is such an issue for the power sector and needs to be addressed if we are to achieve decarbonisation in a timely manner?

3.18 Question 13

To Susanne Nies: You mentioned Technopedia in one of your slides? How can this be used to enable grid optimisation. And more generally we know the benefits from various studies, why isn't this happening widely?

3.19 Question 14

To Nicolaos Antonio Cutululis: Wind power plant system-friendly capabilities have been studied for several years in research actions, but most of them not exploited in the market? Why is this? Is it a matter of maturity, costs, market design, legislation?

3.20 Question 15

To Eoin Hodge: A clarifying question. How far can superconducting cables transmit? Are there deployed projects out of Europe?

- Thanks again for the opportunity to present today. DC Superconducting cables don't have a limitation on transmission length in themselves, we have cooling and pumping infrastructure that we incorporate at intermediate points along the transmission distance, to extend the transmission distance. One of the projects I presented was sponsored by KEPCO in Korea and is installed at a substation in Seoul.

3.21 Question 16

To Frank Martin: How do you see the relationship between TSO, wind technology OEM and wind farm developer developing in the future? which elements will be changing this?

3.22 Question 17

To Norela Constantinescu: Who should be responsible for coordinating a European grid as Europe moves on from national radial connections to international and regional projects (MPIs, Meshed Grid, etc)?