Greening the Grid in Europe: Accelerating Access to Green Electricity for the Industrial Centers

Executive Roundtable Summary (Frankfurt –May 10-11, 2022)

Background

During discussions at COP26 and in the aftermath, the business community made clear that companies want to become carbon neutral at least by 2050 or earlier. Many companies have set ambitious carbon abatement goals by 2030 that rely on access to energy and power from renewable sources. However, with the vast quantities of renewables being produced in large windfarms far away from the industrial centers, these companies rely on an adequate transmission infrastructure to bring the renewable power to their sites.

This Executive Roundtable has been developed to assist decision-makers in understanding at what time and to what extent zero-carbon electricity may be fully accessible for their company's use – and how reliable it will be. The energy system of the future depends on a strong transmission backbone, distributed generation, smart demand management and storage opportunities across the continent. At the same time, processes to build the green grid are often held up by political disagreements, civil society campaigns, and unreliable value chains. Practical solutions must be found.

The Roundtable brought together 29 senior sustainability and grid-infrastructure experts from 7 countries – with 83% from large companies of various industries and 17% from academia/NGO/associations.

Participants

Host Jacobs

Zoe Haseman, Vice President Sustainability, Jacobs

Moderators

- **bp**: Andrea Galieti
- **ERM:** Rob van der Hage
- **Jacobs:** Zoe Haseman and Wolfgang Klaer
- **Merck:** Maria Schaad
- **Schneider Electric:** Andreas Sachs
- **World Environment Center:** Glenn Prickett

Speakers

- **Boehringer Ingelheim:** Ingo Weiss
- **Dena (German Energy Agency):** Philipp Litz
- **E.DSO:** Roberto Zangrandi
- **ERM:** Rob van der Hage
- **IBM Consulting:** Trygve Skjotskift
- **Jacobs:** Pete Adams and Mark Bello
- **Next Kraftwerke**: Leonard Hirsch
- **Renewable Grid Initiative:** Andrzej Ceglarz
- **Roche**: Thomas Wolf
- **Schneider Electric:** Gregor Meyer Landrut
- **Siemens Energy:** Erik Zindel
- **TenneT:** Tim Meyerjuergens
- **The Mobility House:** Robert Seiler
- **TransnetBW:** Werner Goetz
- **Wind Europe**: Giles Dickson

Key Points

(1) AMBITION:

Business and governments have well understood the need to develop the European electricity grid and make it fit to carry and transmit the rapidly increasing amounts of wind and solar power capacity that are already available and quickly being expanded, according to Roundtable participants. Offshore North Sea wind energy production with a capacity of 51 GW* alone in Germany and the Netherlands, in addition to onshore wind energy of 374 GW** planned in Europe by 2030 is waiting to be delivered to the industrial centres via large transmission lines currently being constructed, while distribution system operators (DSO's)

scattered over Europe are also adding increasing amounts of intermittent green electricity (mainly photo-voltaic power) to the grid. At the same time, several European cities such as Copenhagen are experimenting with smart technologies to sharply reduce demand and raise the share of renewable energy that they use.

It is undisputed that Europe is in the midst of a massive transformation of its electricity infrastructure, with a political will in many countries to heavily expand the supply of renewables. At the same time, cities and companies are demanding clean electricity at an even larger scale. The answer to their net-zero ambitions lies very much in the ability to expand the green grid and accelerate infrastructure development – while continuously improving energy efficiencies. At the same time, power purchase agreements (PPAs) and co-ownership models in infrastructure projects are expected to be heavily expanded, while cities are using flexible demand management solutions for electricity with smart technologies. Storage systems such as e.g. the batteries of electric vehicles for day-to-day storage as well as the use of hydrogen to store green power during longer periods of dark and lull (especially during the winter months) are expected to become key factors to guarantee a stabile electricity supply with green electricity.

(2) PAIN:

The current grid isn't designed for the increasing rates of frequency changes, voltage drops with increasing line length, and other technical challenges. A direct consequence is the fact that electricity cost in the South is generally higher than in the North, and on windy days even twice as high. More powerful transmission lines are needed. European electricity generation is now facing a changing geography as countries such as Denmark, Germany, the Netherlands and others are building large offshore and onshore windfarms in the northern coastlines while electricity consumption is largely taking place in the industrial centres further south.

However, building the electrical infrastructure network for electricity transmission faces several challenges: (1) community resistance (especially those rural communities that are just being crossed), (2) lengthy permitting periods, and (3) cost challenges. Some Roundtable participants identified (4) the lack of a trained workforce to build the infrastructure even as the most critical factor to success – and thus to be the greatest risk. At a time of low availability of engineers and electricians everywhere in the European economies, Roundtable participants estimated that the huge demand during the next decade for exactly this workforce is going to slow down construction like no other factor.

Experiences with building Europe's most ambitious transmission line, Suedlink, identified potential for more will and creativity in finding viable solutions for acceptance and collaboration. While stakeholder dialogues have been offered early and continuously, they have not resulted in satisfactory compensation for communities or innovative participation models. Instead, the government decided to build an underground transmission cable, which, according to Roundtable participants, didn't bring about general stakeholder acceptance but rather shifted the tensions with communities and NGOs towards tensions with farmers. At the same time, it led to higher costs for taxpayers as well as delayed construction. Future infrastructure developers are advised to draw from these valuable experiences.

(3) The transformation towards delivering green electricity to the cities and industrial centres in Europe is slowed down by a combination of lack of staff in the regulatory administrations of most European countries (thus directly resulting in slow permitting procedures), sometimes "ridiculous" rules that insist on installing out-dated technology, prohibition of joint financial value creation with communities, approval procedures that are organized step-by-step, and a lack of knowledge among young protesters how the system is designed. In order to accelerate speed, **participants advised (a)** that Transmission System Operators (TSOs) engage with local communities very early, be completely transparent, and permanently available (e.g. build a café), **(b)** that companies constantly remind governments to hire more skilled staff for their permitting authorities, **(c)** that administrative bodies work on several steps of the necessary approvals in parallel, **(d)** that govern-

ments allow rural communities which are crossed by transmission lines to benefit financially, **(e)** that legislators eliminate counterproductive provisions in their regulations that discourage the use of modern technology, **(f)** that "positive silence" is applied (when a reviewer doesn't comment by a deadline, they are deemed to support the permit, and **(f)** finally: that infrastructure developers help skilled but discouraged technicians of the old industries to get trained and employed in the newly developing opportunities.

An important step to expand electricity generation and integration of distributed energy resources would be a regulatory framework that reduces risk for DSOs as well as for customers. Most of Europe lags behind the technological possibilities and thus discourages investments. One example are vehicle-to-grid technologies; in business relationships with owners of electric vehicles, DSOs in many countries are prevented from maintaining and operating storage systems as there is a lack of regulation clarifying to whom the stored electricity belongs. Does the vehicle owner always have full command over the electricity stored in his vehicle or does the DSO have the right to source from it (independently at certain times, always, never)?

(4) PROMISE:

Distributed energy resources from photovoltaic fields, rooftop solar, small windfarms, biomass-energy and other sources across the country and the continent, often highly intermittent, can be made available and be distributed to customers by using Virtual Power Plants (VPPs). VPPs also actively stabilize electricity availability in the grid as they manage demand by trading and delivering energy according to market prices on a day-ahead and intra-day price basis. They do this by using live information from thousands of electricity sources (assets), weather stations, and the many European power exchanges, to make forecasts and predict precise schedules supported by specially developed algorithms. Finally, they act by automatic steering of all assets as a cluster for generating the best revenue for their clients (and through demand management stabilize the grid). Access to these services and the international power markets can be obtained through the VPP's trading platforms, which state they are able guarantee that the electricity delivered originates from the VPP's assets (thus renewable sources).

In the future and even now **there is an explicit ask for all consumers to provide and activate their flexibility** to help balance the increasing amount of fluctuating renewable production and the limitations of the power grid. Thus, cities such as Copenhagen, Rotterdam, and others have advanced in intelligent instrumentation of assets and in motivating electricity consumers to participate in the flexibility and energy storage markets (and to earn revenue from their energy assets). Typical asset types are HVAC systems (Heating, Ventilation, and Air Conditioning), heat pumps, batteries, electric vehicle (EV) chargers, cooling, compressors, electrical motors and industrial equipment, each of them with their own flexibility profile. While customers govern their profile (by providing information about their asset's total load, length, and frequency of activity) service providers optimize the portfolio for the city quarter or the city. As vast pools of unlocked flexibility reside in our cities, buildings, factories, electrical vehicles, and infrastructures, their smart activation seems to be the fastest and cheapest way of balancing our energy systems. It was mentioned that the value for the city of Copenhagen, which operates 3,600 public buildings and associated ventilation systems, heat pumps and EV charging stations is saving more than 1 million Euros annually for provisioning 10 MW flexibility from its buildings and assets.

Roundtable discussions identified technological solutions that are quickly taking place under the current regulatory framework and in leading communities. However, a lack of courage to modernize regulation was also identified. To leverage the full potential of smart solutions for energy supply and demand management policy makers are advised to look into inventing the regulatory system of tomorrow.

(5) As technology advances electric vehicles and their batteries have the potential to become an important factor to stabilize the grid. Bidirectional charging is now quickly becoming available and potentially the norm,

meaning that electric vehicle fleets may be able to help reduce peaks of electricity demand by serving as a source of power. An interesting example is the Amsterdam arena's bidirectional charging project. It incentivizes the owners of electric vehicles to provide power from their batteries during times of high electricity demand at games by offering discounted tickets to the games. Similar applications can be company parking lots where EVs may play an important role to reduce peaks of electricity use or serve to reduce risk in case of short power cut-offs. EVs charged with photovoltaic power generated on company sites while the car is parked during the day may also provide electricity to their owners' homes at night. While experiences are currently being made more data needs to be gathered to verify developers' claims that the vehicle batteries do not suffer. As some roundtable participants were sceptical, it is estimated that large parts of society may have similar reservations. On the other hand, developers provided data showing that vehicle owners can almost double their contribution to CO2 reduction if participating in vehicle-to-grid integration schemes while at the same time generating an annual operating profit of over 700 Euros e.g. in Germany as of 2025. As these projects expand, they may quickly become interesting for company car fleets and private owners.

(6) Remarkable achievements have been made by leading industrial global companies to reduce absolute scope 1&2 CO2-emissions while their companies have still grown. In some cases, absolute reductions have been 60% in the past 18 years (relative reductions >70%) and are further decreasing towards zero-emissions by 2025. Although energy efficiency plays an important part, the remaining electricity use has to come from 100% renewable sources. Challenges include leased spaces with no dedicated landlord management, absence of green tariff schemes at some affiliates, cost premiums, uncertainties in the energy marketplace and renewable energy project supply chains globally, as well as fierce competition as demand for (virtual) Power Purchase Agreements (PPAs) is increasing compared to supply. Producing renewable energy on companies' own land is limited as there is neither enough space nor sufficient internal knowledge in most companies. In this environment companies depend on specialized consultants helping them to invest in PPAs.

Consulting services available e.g. for the pharmaceutical industry help smaller companies to increase their attractiveness for PPA developers by coordinating their requests for renewable electricity with those of other companies. As the demand is currently far bigger than the offer, projects must be developed. The bargaining power of small companies can be increased in such arrangements (thereby controlling costs) while at the same time the larger PPAs with a lifespan of 10-20 years can only be arranged with large demands. Especially companies in Spain, Sweden, Norway, Germany, the UK, Finland, and the Netherlands recently used PPAs.

Companies are on a journey: to control costs, they try to have long term contracts. At the same time technological progress enables new solutions while the policy framework also develops further. Companies are advised to collaborate, stay informed, and be flexible as opportunities evolve.

(7) Green hydrogen is a key component in Europe's future green electricity network. Although all Roundtable participants agreed that electricity conversion to hydrogen and then once again to electricity is the least efficient way of use of the valuable green electricity produced, hydrogen is the key storage system for large volumes of electricity and for longer periods of times. Therefore, hydrogen plays a vital role in periods of dark and lull, besides its role as a future energy source for several industries including (petro-) chemicals, steel, fertilizers, and parts of the transportation sector. Investments in a (green) hydrogen infrastructure must therefore be made with the same ambitions as any other part of the energy transformation.

**ERM (2022), compiling data of TenneT*
***Wind Europe (2022)*

Further reading: European platform for corporate renewable energy sourcing: https://resource-platform.eu/?ref=WindEurope

Note: WEC Executive Roundtables are conducted under the Chatham House Rule.