TECHNOLOGY

# Innovation and market disruption


**The three-day E.ON Innovation conference offered copious comment and strategies for transforming the energy market, from distributed power and renewables to new market design and digitalisation. *Brian Davis* reports.**

Every aspect of the energy spectrum is changing in the drive for a more sustainable future. The energy market is being transformed, with the move to distributed power, new sources of energy like blue and green hydrogen, decarbonisation and digitalisation. Innovation is key.

So, it was with eager anticipation that I attended the E.ON Innovation conference in early October, in the guise of a robot avatar at a three-day virtual event, rather than winging my way to Dortmund, Germany. Given there were 83 speakers and 1,250 minutes of live streaming of Europe's largest virtual energy event, this report focuses on some of the key themes, although there was food for thought in nearly every session.

Leonhard Birnbaum, CEO of E.ON set the picture. 'The biggest challenge today is the energy transition. There are big and small innovations in every area, which by definition require small steps every day. Innovation also leads to more $CO_2$ reduction and the key area of innovation will be to digitise our full ecosystems.'

The virtual world of the E.ON Innovation event was a gateway to discussions on every aspect of energy market transformation

*Photo: E.ON Innovation*

He emphasised that 'sustainability means electrification, and particularly renewable electrification with hydrogen development from renewable sources at scale.' However: 'building this ecosystem will require significant finance and demographics, which is a major challenge to reach E.ON's target of net zero by 2045 or sooner,' noted Birnbaum.

## Interconnection is about sustainability

'E.ON has completely transformed its business to prepare for a carbon neutral world,' explained Thomas König, Chief Operating Officer for Networks at E.ON.

But how are connectivity and sustainability linked?

Konig drew attention to the extreme heat and floods that hit many countries across the globe this summer and reflected: 'There's no doubt these disasters are man-made. It has become more critical than ever to drastically reduce our $CO_2$ emissions and live sustainably. At the same time, the flood disaster in Germany showed the importance of connectivity, as 200,000 people were temporarily without power. Fortunately, customers were reconnected in record time, due to collaboration, creating new solutions and support from other countries.'

Konig sees networks as the common denominator today. 'Every new connection of renewable energy sources replacing fossil fuel brings us closer to the Paris Agreement goals,' he commented.

The traditional relationship between energy suppliers and users is changing. With more and more people producing their own green electricity, using solar panels and onsite storage, E.ON has coined the name for these flexible consumers as 'flexsumers'.

Orchestrating interconnection of flexsumers with the grid requires a high degree of coordination and automation. The number of connected devices is forecast to increase to 500bn by 2030. 'Digitalisation is key to our future – optimising the capacity of distribution systems to ensure energy supply security and make power distribution observable and steerable across all voltage levels,' he said.

Numerous opportunities are offered by digitalisation throughout the entire value chain, from intelligent network planning and efficient operation of energy networks to new digital solutions for customers. Indeed, E.ON is focused on building a single digital platform for its entire network business across Europe, linking all its efforts and bundling solutions for customers and network businesses.

'You can no longer talk about the distributed grid without talking about renewable energy systems and all the regulations coming,' remarked Benjamin Jambor, Director of Regional Grids at Westnetz and CEO/Founder of grid solution provider Digikoo. 'The grid is no longer linear but raises increasing questions about the connection of PV [photovoltaics], wind turbines, etc. It's about balancing and looking towards sustainability goals.'

'This is the era of electrification, with a significant increase of customers wanting to connect to the grid,' added Johan Mörnstam, Senior Vice President of E.ON Energy Networks in Europe. Industries also want to electrify and decarbonise, with new customers coming like datacentres and battery factories consuming a vast amount of electricity, along with electrification of transport.' He mentioned that Volvo and other truck manufacturers predict that 50% of new truck sales globally will be EVs by 2030.

'Everything is about innovation,' continued Mörnstam. Examples of new E.ON innovation include a

large-scale battery solution in Hungary; the introduction of a new digital trading platform in Sweden, to increase the grid utilisation factor; and use of drones to survey the grid more efficiently. E.ON is also seeking to use a mountain of data with artificial intelligence (AI) to create self-healing grids.

So, what's the scale of the challenge? E.ON has over 50mn customers and operates a 1.4mn km electricity grid with over 800,000 distributed energy producing assets connected to this grid. 'Billions more assets will be joining the grid,' explained Sebastian Weber, Chief Technology Officer, E.ON. 'Managing this complexity is where innovation will happen. Quantum computing, for example, will be utilised in the future, given the number of parameters. But it's just the beginning of the journey.'

There is a fundamental drive towards harmonisation on the application landscape, with a move to put all datacentres on the cloud by 2023, to drive flexibility and scalability as well as reducing $CO_2$ emissions. Smart meters are also being rolled out across Europe. And E.ON recently invested in a majority stake in gridX, an AI-based energy load management start-up focused on the micro-grid level.

Interconnection panel (left to right): Johan Mörnstam, Senior Vice President, E.ON Energy Networks in Europe; Sebastian Weber, Chief Technology Officer, E.ON; Benjamin Jambor, CEO, Founder Digikoo; and moderator Christoph Burkhardt, journalist

*Photo: Sven Adrian/E.ON Innovation*

## The end of centralised markets?

A cross-sector panel discussed the future of electricity markets.

Alana Kühne, Head of PPAs (power purchase agreements) and Merchant Products at Ørsted has developed the first 'merchant windfarm' in Germany. 'This presented a new challenge, as in the past a lot of development relied on subsidies of long-term investment plans. We are now open to the actual power markets and have to look for alternative routes to get the long-term certainty we need as investors in renewable energy generation, and to deal with the volatility in power markets.'

Kühne admitted: 'We can't get that [certainty] alone from the central energy markets. One of the routes we've been pursuing is to sign long-term corporate PPAs that provide us with a foundation on some of the revenues coming over the years, before we invest in very large projects... There will be different risk mitigation options for offshore wind and solar [projects] in the European markets as we move forward,' she remarked.

Are we looking at the end of central energy markets?

'That's not how I see it!' declared Tobias Paulun, Chief Strategy Officer of the European Energy Exchange, Leipzig. 'We are heading into a new era of power trading. In past years, the power markets have never been stable, constant or static. They have always undergone dynamic transformation and innovation. In the long-term derivatives market, there has been a lot of product innovation, with a steady increase of trading activity on the intra-day markets. I do not see an end to this trend.'

Paulun reckons the power markets in Europe have reached the next level of maturity, which should stimulate new players, like global commodity traders, providing additional liquidity and competition to existing players.

Given the expected doubling of renewables capacity in Germany, for example, in the next 10 years and possible tripling within 15 years, Axel Gerhardy MD of E.ON Energy Markets, asked if there would be 'cannibalisation of renewables' if all the projects run in parallel.

Ørsted's Kühne considered there was little need for concern. 'Most major renewables companies are looking at system integration going forward.' However, she recognises the increasing complexity of handling intermittent renewables: 'That's where balancing comes into play as we look at the business cases for new projects and decentralised operations in the future ... working towards our goal of 100% renewable generation.'

In the last few years, decentralised grid markets have come to account for 20% of trading volumes. Ewald Hesse, Co-Founder and CEO of Grid Singularity described development of a simulation platform where 1,000 players (mostly energy cooperatives) can test decentralised markets. He emphasised the importance of 'Open Source' technologies, which play a key role to drive competition in the new market.

## Decarbonisation – are we on track?

'Decarbonising energy is at the core of fighting climate change,' noted Dirk Swider, VP of Group Strategy at E.ON. 'Three quarters of global greenhouse gas emissions come from one [hydrocarbon-based] energy or the other. But reducing that is not an easy task and will require substantial changes in how energy is produced, transported and consumed.' The European Union estimates that additional annual investment of €200bn/y will be required in coming years. 'That is a massive challenge and great opportunity, but most of that money needs to come from private hands,' continued Swider.

Patrick Grachan, Director of climate policy thinktank Agora Energiewende, feels the energy industry is 'on track' when it comes to direction of moving towards climate neutrality and renewables. However, when it comes to scale and speed: 'we're not on track to reaching greenhouse gas neutrality by 2045,' he stated. 'This requires a lot more renewables to meet increasing demand and is a matter of [government] policy and companies speeding up.'

'We totally lack consciousness of time and ambition,' remarked Susanne Nies, General Manager of grid optimisation company Smart Wires. 'Although we have all the ingredients with leading technology innovation, the mindset of some people lacks speed and commitment.'

'The speed of transition is actually lowering when we look at permitting to get new renewables on the grid,' complained Clemens Hecker, Managing Director of AFRY Management Consulting.

Jöng Bergmann of transmission operator Open Grid Europe (OGE) pointed out that 80% of our energy system currently consists of molecules, but there will be significant adjustment over time as we decarbonise. He sees hydrogen as one of the potentially cost efficient solutions to meet climate goals, supporting security of supply and resilience of the energy system. He also mentioned recent discussions in the Hydrogen Council and the German government's hydrogen strategy that suggest the best sectors in which to deploy hydrogen would be industry and heavy-duty transport.

However, he recognised that the most challenging issue would be dealing with the heating sector. OGE is currently working on making its network hydrogen ready.

H2Global also has initiatives to support ramp-up of the market for green hydrogen and its products, explained CEO Markus Exenberger. 'The core problem is the price difference between product costs of

clean hydrogen and its derivatives, such as ammonia, e-kerosene and methanol. Currently, these derivatives can't be produced economically by this route, so state support is needed to address demand for very large projects.'

The German government has provided €90mn to H2Global in the first round of funding. 'Although we have very ambitious targets and the technology is well known, what is missing is the legal and regulatory frameworks,' he remarked.

'Speed is of the essence', said Valborg Lundegaard, CEO of Aker Carbon Capture, which has been awarded a major carbon capture and storage (CCS) contract for Heidelberg Cement, as part of the Norwegian full-value-chain Longship CCS project, for operation in 2024. Valborg noted that Aker has been approached for CCS projects worldwide but is currently focused on Northern Europe. Four segments have been prioritised, including cement, where emissions are hard to abate; gas-to-power; bioenergy and blue hydrogen.

Aker is using the Haldor Topsoe process in partnership with a research institute and the LINCCS (linking carbon capture and storage) consortium to make mega-scale hydrogen plants more efficient and has tested carbon capture at a hydrogen plant run by Preem in Sweden.

> ***'We are living in the age of zero – an era of exponential development, disruption and new interconnections, where we need to think differently about people, power and platforms'***
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> **Kristian Ruby, Secretary General, Eurelectric**

## People, power and platforms

'We are living in the Age of Zero,' said Kristian Ruby, Secretary General, Eurelectric, the Federation of the European Electricity Industry. 'It is an era of exponential development, disruption and new interconnections, where we need to think differently about people, power and platforms.'

The numbers speak for themselves. 'The age of zero is an era of exponential development, with need for 500 GW of renewables, 30mn heat pumps and 40mn EVs... We face an unprecedented scaling of our sector, with €400bn to be invested in grids in Europe over the next 10 years.'

'We call 18 to 20-year-olds Generation Z, which stands for zero. They've grown up in an era since 2000 where nearly every year was a heat record and an emission record. No wonder they care about their carbon footprint. All they have seen is political failure and failure to align with the science... We will see Boomers go out and Generation Z gradually take over with different expectations for utilities,' said Ruby.

And continued: '40 GW of self-consumption means that PV panels will be as common as a fridge was in the 1960s. We need to think how to integrate all that new electricity and new consumers in the system. And 40mn EVs means a complete revamp of the transport segment. Maritime is the new kid on the block and will be included in the ETS [European Emissions Trading System] by 2023. By 2030, all major ships docking in Europe will be required to source their energy from clean shore power, and radically reduce GHG intensities by 2050.'

'In the age of zero, electricity is the lifeblood not only of households but also the broad economy. We need to go from silo thinking to sector integration and think differently about platforms... The hardware is getting stronger, the software smarter, and the networks better.'