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AURORA Spring Forum

OXFORD 2024

NAVIGATING RISING GEOPOLITICAL INSTABILITY: ENABLING THE NEXT WAVE OF DECARBONISATION

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Author Alex Blackburne
Theme Energy

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National Grid boss proposes future ultra high voltage grid

John Pettigrew, CEO of National Grid, has unveiled plans for an ultra high voltage onshore transmission network at the Aurora Spring Forum

Dimitris Mavrokefalidis
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Image: National Grid

John Pettigrew, the Chief Executive of National Grid, has discussed plans for an ultra high voltage onshore transmission network at the Aurora Spring Forum, aiming to support Britain's economic goals beyond 2050.

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UK undecided on zonal pricing switch – minister

(Montel) The UK government is still deliberating on whether to implement a zonal power pricing system, a minister said on Tuesday.

Reporting by: Gabriel Power
26 Mar 2024 | 11:58

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"We have ruled out nodal pricing, having hundreds and hundreds of price points across the country, because of complexity and uncertainty for investors," Graham Stuart, minister for energy security and net zero, told the Aurora Spring Forum in Oxford.

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The National Grid has over 300 substations spread across England and Wales

Data center power usage to go up sixfold in 10-yrs

By Pradnesh Naik • Mar 27, 2024 • 12:12 pm

BBC NEWS

UtilityWeek

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Bloomberg UK

Martijn van Gemert • 2nd
Strategy Director | Leader in the Energy Transition | Regulatory Economi...
1w •

Looking back at an inspiring Aurora Spring Forum in Oxford with a great line up of speakers including UK Minister dor Energy Security and Net Zero. The key topic of the day: "Navigating rising geopolitical instability: enabling the next wave of decarbonisation. Little has not been discussed: Grid challenges in Europe's pursuit of Net Zero, policy reforms & risks for storage projects, the route to bankability of Hydrogen projects and of course discussing opportunities for the Offshore Wind market together with our VP Strategic Development Andreas Regnell. Thank you Aurora Energy Research John Feddersen and the staff for a brilliantly organized Spring Forum

Helen Raynsford • 2nd
Legal Director (Energy) at Osborne Clarke
1w •

Thank you Aurora Energy Research for the brilliant, thought provoking Spring Forum today. Far too many to list them all, so here are just three key take aways:

💡 In spite of the arguments in favour in #REMA, there remains limited support for zonal pricing. Is it unfair to characterise support for zonal as coming only from economists? Dissenting voices, please get in touch!
🍖 Demand and consumption will play an integral part in getting to net zero, but are being sidelined in market design. Why not treat electrons like we treat bacon, and buy one get one free, instead of curtailing in periods of oversupply.
🤦 To meet the demands of electrification, we will need to produce as much copper in the next 20 years as we have produced in history to date. Copper in the garden anyone?

#EnergyTransition #AuroraSpringForum #NetZero #Decarbonisation

Axel Thiemann • 2nd
CEO at Sonnedix
1w •

What's the biggest barrier to the delivery of European targets for renewables?

According to industry experts at the 2024 Aurora Spring Forum, it's grid connections and curtailment.

This was a timely poll from Richard Howard ahead of my panel discussion on resolving Europe's grid congestion challenge.

A big thanks to my fellow panellists Nick Winser CBE FREng, Emeline Spire, Fintan Slye and our moderator, Kora Stycz, for bringing different perspectives and approaches – the UK is making great strides.

We were all aligned on the urgent need to invest in infrastructure to ensure the grid is ready for the huge increase in renewables. This needs to be done speedily, sustainably, and considering all stakeholders. One issue we debated was around demand management and flexibility, and how much of this is a behavioural challenge, as opposed to technical?

Thank you to Aurora Energy Research for another great event, and for the opportunity to be part of this important discussion!

#Grids #RenewableEnergy #SolarPV #Storage

Francesco Starace • 3rd+
Partner at EQT Group, Chair SEforALL, Chair SBTi
2w •
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Why do we need Energy? Because we use it to work, to live . We generate and supply energy because there is a Demand for it. So : what happens now to the #EnergyTransition , after the past decade ? An exciting journey to the #Electrification of our energy uses: an amazing investment opportunity. more complex ? Or simply different?

> **Aurora Energy Research**
> 41,928 followers
> 2w •
>
> Looking back on the last decade of the #EnergyTransition and looking forward to the next decade framed the discussion between Francesco Starace, Partner, EQT Group and John Feddersen.
>
> Francesco highlighted the importance of digitalisation and materials science in the past decade. The led onto the open question of the impact of these these two forces going forward and the potential disruptive implications of new emerging technologies.

Hamish Yates (He/Him) • 2nd
Founder & CEO at Neptune Infrastructure Associates
1w •

Fascinating day at the Aurora Energy Research #springforum, University of Oxford .

Among countless insights from the day, one stood out: 360GW of renewable energy capacity is currently in the queue for a grid connection in the UK 😱

Fantastic momentum building in the energy transition but a long way to go in delivery.

A real highlight was having a good chat with Robert Llewellyn on all things EVs and scrap heap challenge!

Neptune Infrastructure Associates

Charlotte Johnson • 2nd
Global Head of Markets at Kraken
1d • Edited •

Last year the Aurora spring forum largely focused on navigating crises. But this year it was all about the action required to move forward.

🌡️ John Feddersen presented the stark reality of climate change, every month from May 2023 saw average temps higher than ever before.

📣 Fortunately, the LCOE of renewables and BESS has fallen significantly (solar and BESS are ~80% cheaper than 10 yrs ago), but, there are still barriers to decarbonising our gen mix and regulation is key.

1️⃣ Grid side
Connection queues are a global issue for renewables, BESS & demand.
Everyday ~1GW is added to the GB queue. Colocation makes a lot of sense and it's not a new concept. But there are barriers to overcome first.

2️⃣ Market reform side
⏱️ Shorter SPs could drive value close to real time as renewables come online.
📍 Locational pricing would send a signal that is reflective of value.
💛 Gov support distorts the market, so this needs to be done in a way that is the most helpful and least disruptive. Currently ~25GW of renewables on subsidies aren't incentivised to generate efficiently.

🚗 Decarbonising our gen mix is key, but the demand side needs attention too.

👀 And it has the potential to scale fast. 4GW of BESS in GB are ~1hr in duration (4GWh), but, 2GW of EVs could provide double that energy.

Thank you Aurora Energy Research for organising an insightful spring forum.

Ana Paula Marques • 2nd
Executive Board Member EDP | CEO-EDP España | CEO-EDP Produção
6d •

Reflecting on the 10th Aurora Spring Forum

Miguel Stilwell d'Andrade, EDP's CEO, covered 'The Architecture of a Decarbonized Power Sector,' emphasizing that 'Renewables are the solution to the much-needed clean energy era – they offer environmental sustainability, energy security, affordability, and economic opportunities.'

I had the opportunity to participate in a thought-provoking panel discussion centered on 'Towards 2030: Next Steps on the Energy Transition in GB and Europe'. Moderated by Richard Howard, our panel, with colleagues from Eneco, ScottishPower, and Ørsted - As Tempelman, Keith Anderson, and Olivia Breese - sparked an engaging debate.

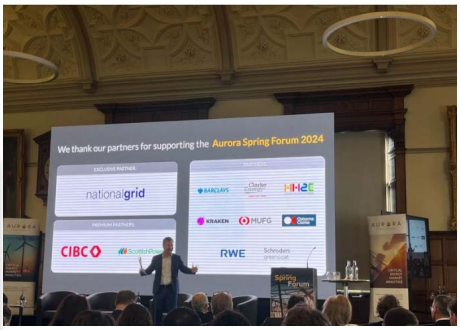
➡️ Got Grid?
- The speed of the energy transition is directly tied to the development of grid infrastructure. Without modern, efficient grids, we cannot fully harness the power of renewable energy sources. Around 40% of Europe's distribution grids are over 40 years old and need modernization.

➡️ If you could make one policy change to accelerate decarbonization in Europe, what would it be?
- Activate the green switch! Fast-track regulatory and legislative packages to drive immediate and impactful decarbonization across all sectors of the European economy. We need focus, action and speed.

Thank you, Aurora Energy Research, for the invitation.

James Samworth • 2nd
Partner @ Schroders Greencoat LLP | Renewable Infrastructure, Private E...
1w •

Great to be back in Oxford for the Aurora Energy Research Spring Forum sponsored once again by Schroders Greencoat LLP. Thank you John Feddersen for the reminder of our legendary but now sadly off brand green drinks...
Great speakers and discussion already and it's not even coffee time.



Darren Davidson • 2nd
Vice President Siemens Energy UK&I and Siemens Gamesa UK
25m •

Yesterday, our Head of Market & Government Affairs, Matthew Knight and I had the pleasure of attending the 10th Aurora Energy Research Spring Forum.

From grid expansion to offshore wind, green hydrogen to delivering our net zero targets, there were so many interesting and valuable discussions that team Siemens Energy participated in alongside the great and good of the energy sector. ⚡

Held in a fitting venue - the historic Oxford University, our day centred around the toll of a bell as we moved from session to session! 🔔

The energy transition is the greatest opportunity of our lifetimes. The focus and passion of the sector to deliver against our #netzero targets is palpable, what we need now is the long-term policy to support implementation to a timeline which gets us to 2050.

We should be very proud of the progress we've already made, but we need to move faster to achieve our overarching goals.

I'm leaving Oxford feeling inspired by our sector, in particular the Siemens Energy and Siemens Gamesa colleagues on the ground, helping to deliver our UK&I #energytransition.

Aurora Energy Research

John Pettigrew • 3rd+
Group CEO at National Grid
2w •
+ Follow

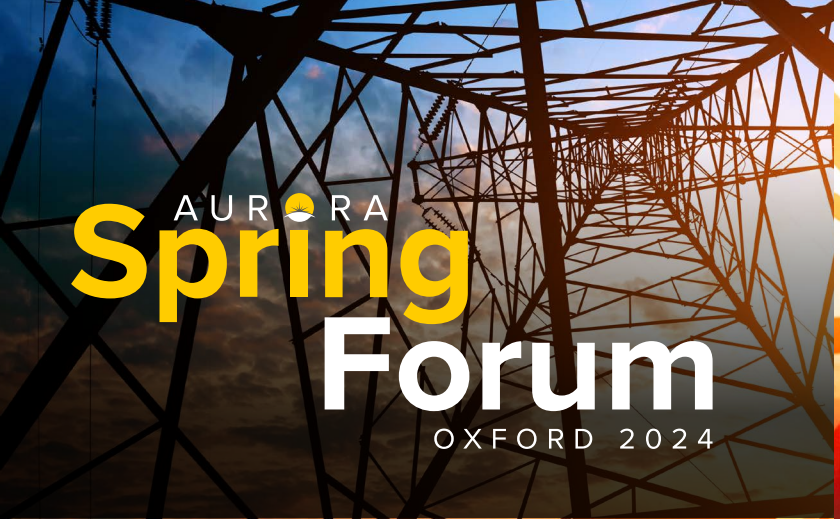
It was a privilege to be invited to speak at the annual Aurora Spring Forum in Oxford today, known for assembling the brightest and most creative minds in the UK's energy industry. I was hugely encouraged by the knowledge that all attendees were united behind a common vision - to decarbonise our energy system, while decreasing our bills and bolstering energy security.

I shared my reflections on how the supergrid designed by our talented predecessor engineers in the 1950s transformed electricity transmission in Britain, and how, just like in the 1950s, we now find ourselves with a network that is constrained, which is why we're exploring the construction of ultra-high voltage transmission lines of 800kV - double the current onshore high voltage lines. This new grid, when coupled with ultra-large-capacity 'hub' substations, would enable bulk power transfers around the country.

You can read my full speech below.

Aurora Energy Research

#Energy #Electricity #ElectricityTransmission #AuroraSpringForum #Decarbonisation #CleanEnergy



Dear friends & colleagues,

It was my great pleasure to have hosted you in Oxford for the 10th Aurora Spring Forum. What a fantastic day!

Many delegates have since shared with me their belief that the 2024 edition helped to push forward some of the most important current debates in our industry.

Perhaps the central theme of the day concerned the respective—and often complementary—roles of planning and markets.

John Pettigrew's inspiring call to action in building a UK super grid made a strong case for planning the grid.

Minister Stuart and Greg Jackson articulated the need for more markets in their morning plenary sessions. The day was peppered with examples of new technologies and business models that could be unlocked if their social value was appropriately reflected by markets.

I won't attempt to summarise the various sessions here, however in this pack we've aimed to compile the Aurora team's main learnings and punchlines from the day. It is obviously impossible to do justice to the experience of being there, but we hope this is a useful summary to take away, especially of those parallel sessions that you may not have been able to attend.

Many people deserve thanks for the critical role that they played in bringing the 2024 Spring Forum into existence.

Our speakers were excellent, including our distinguished keynote speakers **Graham Stuart**, UK Minister for Energy Security and Net Zero; **John Pettigrew**, CEO, National Grid; and **Francesco Starace**, Former CEO, Enel & Partner, EQT Infrastructure. I'm also extremely grateful to our plenary panellists, **Bruno Bensasson**, Chairman and CEO, EDF Renewables; **Dorothy Thompson**, Chair, Statera Energy; **Greg Jackson**, Founder & CEO, Octopus Energy; **Hunter Hunt**, Chairman & CEO, Hunt Energy; **Jonathan Brearly**, CEO, Ofgem; **Judith Hartmann**, Operating Partner, Sandbrook Capital; **Miguel Stilwell d'Andrade**, CEO, EDP; and **Sam Laidlaw**, Chairman, Neptune Energy.

Our generous sponsors are due special appreciation. The partnerships with **National Grid, CIBC Capital Markets, ScottishPower, Barclays, Clarke Energy, HH2E, Kraken, MUFG, Osborne Clarke, RWE**, and **Schroders Greencoat** are built on many years of fruitful cooperation, and we would like to thank them for supporting the Aurora Spring Forum 2024.

Finally, thank you to my own team at Aurora, especially the Events and Marketing teams, for their diligence, commitment, and adaptability in staging the Aurora Spring Forum 2024.

We look forward to welcoming you again next year to continue the discussion!

John Feddersen, Founder & CEO, Aurora

Click HERE to view the presentation

DISTINGUISHED OPENING KEYNOTE ADDRESS & INTERVIEWS

Chair: **John Feddersen,** Founder & CEO, Aurora

Speaker: **Graham Stuart,** UK Minister for Energy Security and Net Zero

Interview & Q&A summary:

What has the impact of the energy crisis had on the transition?

Undoubtedly, there was a squeeze resulting from the energy crisis of 2022. This was a consequence of the structural challenge of transitioning away from coal while lacking sufficient renewable generation, leading to heavy reliance on natural gas. However, these challenges should be viewed in the context of the significant progress that has been made: the UK was the first major economy to halve emissions, with renewables penetration increasing from 11% in 2012 to almost 50% today. Nevertheless, geopolitical tensions have complicated decarbonisation efforts.

How do you reconcile building new gas capacity with the 2035 Net Zero target?

As renewables penetration increases, balancing the system becomes more challenging. While interconnectors, flexible demand, and storage have great potential, some thermal generation is still necessary as a backup. Unabated gas is expected to make up only 2% of total annual power generation, but to ensure a Net Zero system, emissions will need to be offset. New capacity must be procured through the Capacity Market, as over half of the current gas fleet is expected to retire by 2035.

Can we afford the energy transition?

The science is clear: the consequences of climate change will be drastic and costly, making it imperative to align economic policies with our decarbonisation goals. Although transitioning comes with significant upfront costs, renewable prices are decreasing rapidly; the price of offshore wind dropped from £120/MWh in the first CfD auction to £39.5/MWh two auctions later. Furthermore, the price of energy will decrease as we move to a high-renewable energy system, so despite the transition having high up-front costs, it will make power more affordable in the long-run.

DISTINGUISHED OPENING KEYNOTE ADDRESS & INTERVIEWS

Speaker: **John Pettigrew,** CEO, National Grid

Keynote Address summary:

Investment in the National Grid today is unparalleled, with the Great Grid Upgrade promising to deliver 17 projects concurrently, facilitating the expansion of offshore wind. However, looking to 2050 and beyond, can an incremental approach to network expansion deliver change at the scale and pace required? Do we need to think about fundamentally different approaches?

The national grid faced similar questions back in the 1950s. Demand had increased nine-fold since its inception in the late 1920s and a major expansion was needed to transmit power from new coal power stations in the East Midlands and Yorkshire to demand centres. Cue: the super grid—a new high-voltage system built over the top of existing low voltage infrastructure. This step change in grid capacity allowed new technologies and sectors to develop and allows us to connect new renewable generators to the present day.

Today, with the rise of intermittent renewable generation and increasing demand from data centres, electric vehicles, and heat pumps, we now stand at a similar crossroads: we have reached the limit of what an incremental approach can deliver, and bold action is required. Cue: the super super grid – an ultra-high voltage (800,000V) network superimposed on the super grid, with strategically located ultra-high capacity sub-stations near big demand centres, spare connection points for future generators, constructed with coordinated investment and in collaboration with partners in the sector.

This vision doesn't remove the need for expansion projects already under way or reforms to the connection process, which remain critical. But thinking longer term, only a new, capacity rich network designed for growth can deliver Britain's Net Zero ambition.

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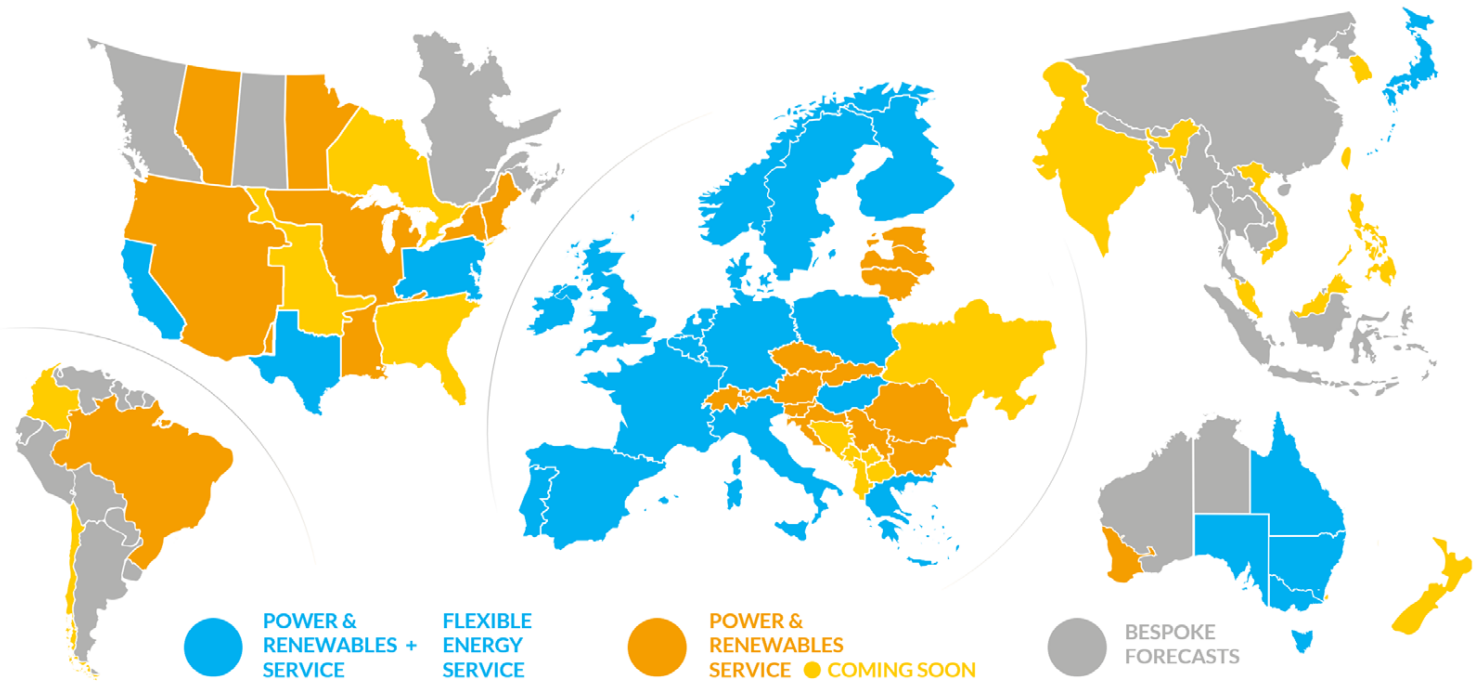

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DISTINGUISHED OPENING KEYNOTE ADDRESS & INTERVIEWS

Chair: **John Feddersen,** Founder & CEO, Aurora

Speaker: **Francesco Starace,** Former CEO, Enel & Partner, EQT Infrastructure

Interview summary:

What changes in the energy transition do you expect in the next decade?

The spark for the transition in the past decade was the fact that renewables became competitive, which was enabled by two major forces: digitisation and material science. While digitisation allowed the sector to operate more efficiently, material science made it possible to manufacture and recycle wind turbines and solar panels much more cheaply. These forces will continue to decarbonise supply in the next decade. However, the discourse is shifting from supply to demand, smart consumption, and electrification; the next decade will be about transforming the demand-side.

In many places, demand is heavily regulated—what changes are fundamental to unlock the demand-side transformation?

New technologies require three attributes to be adopted: they must be safe, cheap to produce, and easy to adopt (i.e. not require big changes in infrastructure). It is the role of the regulator to help facilitate these conditions, but big challenges lie ahead. What will be the demand from millions of electric vehicles compared to thousands? How will 50%, 60%, 70% penetration of heat pumps affect the system? Undoubtedly, the grid will have a large part to play in unlocking this change.

Given the flight of public markets to private infrastructure funds, where will the capital required for the energy transition come from in the future?

Annual investments in the global energy transition range between $3–4 trillion, contrasted with the $8 trillion annually spent on burning fossil fuels. Clearly, we must move from burning to building renewables, and the returns are there if the three above conditional attributes are met. Hence, private capital is now available, with abundant opportunities for safe renewables investments. As the returns on renewables turn from stellar to safe, capital will begin to flow into emerging high-return areas, such as electrification, batteries, hydrogen, and other technologies.

PLENARY SESSION

TRANSATLANTIC ENERGY SECURITY: HAVE WE REACHED A SETTLED NEW PARADIGM?

Chair: **Dan Monzani,** Managing Director, UK & Ireland, & European Hydrogen, Aurora

Speakers: **Sam Laidlaw,** Chairman, Neptune Energy
Hunter Hunt, Chairman & CEO, Hunt Energy
Jonathan Brearley, CEO, Ofgem
Judith Hartmann, Operating Partner, Sandbrook Capital

Having successfully navigated the challenge of replacing Russian gas with alternative EU, US, and Qatari imports, alongside reducing domestic demand, our panellists discussed the evolving landscape shaping the definition of "energy security".

In 2024, dynamics of an election year could test the resilience of current gas supply chains. Despite uncertainties surrounding the reliability of US gas exports due to the election, Hunter Hunt suggested the US, with 82 MMt of liquefied natural gas (LNG) under construction, could compete with Qatari producers. Judith Hartmann noted the importance of "greening gas" to support intermittent renewables, highlighting the potential for repurposing gas infrastructure for low-carbon alternatives economically.

Beyond gas, critical metal supply chains and labour skills were discussed as key considerations for energy security. Hunt referenced the US's Inflation Reduction Act (IRA) as a protective measure used to incentivise spending in the US, stating, "the world is going to be at war if there is not going to be diversity of processing of minerals required for these materials." Sam Laidlaw added, "in an electrified world, we will need as much copper in the next 20 years as the world has consumed in the history of humanity".

Hartmann highlighted the future use of AI and the growing demand for electricity from data centres. Large energy users have voiced concern about AI's growth being hampered by electricity generation limitations. Outside of consumption, AI was mentioned as a key component of optimising plant operations and potentially helping reduce reliance on certain critical metals through potential advancements in material sciences.

Finally, the importance of engaging with retail customers was emphasised, given that the cost of grid improvements, government-backed subsidies etc., will be funded by the consumer.

"Unless we start thinking about consumer-orientated industry, we won't be successful in translating what we do in the backend, to that of the frontend."—Jonathan Brearley

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AURORA GLOBAL KEYNOTE

RENEWABLES INVESTMENTS: HOW MUCH CARBON ARE YOU ACTUALLY SAVING?

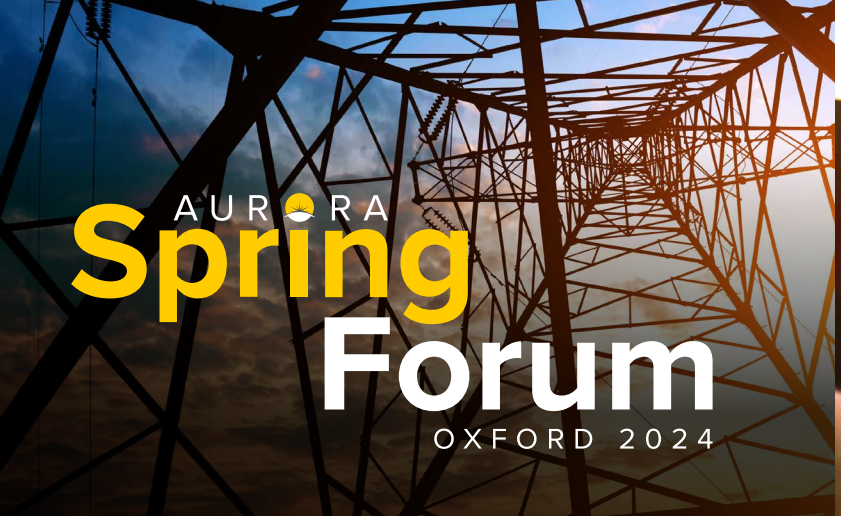
Speaker: **Richard Howard**, Global Research Director, Aurora

With investors looking increasingly at the carbon their renewable projects can abate, Richard Howard, Aurora's Global Research Director, presented a new methodology to quantify these potential emissions in his keynote address.
The analysis focussed on the formulation of a project's Marginal Avoided Carbon (MAC), a metric representing the amount of carbon that could be avoided with the addition of a megawatt of low carbon capacity to a given power system.

Using Great Britain as a case study:

- Solar, with a MAC of 285 gCO2/MW in 2025, delivers higher carbon savings than onshore and offshore wind as its generation is correlated with periods of high marginal carbon intensity in GB.
- Assets which are less correlated with the rest of the fleet can secure a premium in both capture prices and carbon savings. Offshore assets in northern Scotland secure a 30 gCO2/MW premium over those in eastern England.
- Despite significant grid curtailment, decreasing the MAC for Scottish onshore wind farms, they still outperform those in eastern England by 5% in the same metric, resulting in a lifetime MAC of 9500 tCO2/MW for the former.

Click HERE to view the presentation



PLENARY SESSION
THE ARCHITECTURE OF A DECARBONISED POWER SECTOR

Chair: **Laurie Fitch**, PJT Partners

Speakers: **Bruno Bensasson,** Chairman & CEO, EDF Renewables
Dorothy Thompson, Chair, Statera Energy
Greg Jackson, Founder & CEO, Octopus Energy
Miguel Stilwell d'Andrade, CEO, EDP

"If a bear is chasing you and you reach a road, which do you fear more?"

The panel discussion explored the multifaceted journey towards a decarbonised power sector, tackling pivotal issues such as investiability, regulatory hurdles, public perception, technological innovations, and international collaboration. Panellists emphasised the urgency of creating an investible environment to drive renewable energy adoption. However, they also acknowledged significant challenges, particularly regulatory complexities hindering timely project deployment. Simplifying regulatory processes was deemed essential for a swift transition to a decarbonised power system. Looking forward, collaborative efforts, streamlined regulations, technological advancements, and international cooperation were endorsed as essential strategies to accelerate progress towards a sustainable energy future.

Key takeaways include:

- Highlighting the imperativeness of establishing an investible environment, with clear regulatory frameworks and attractive returns cited as crucial factors
- Discussing technological innovations such as long-duration energy storage, hydrogen, and demand response mechanisms to address intermittency challenges associated with renewable energy sources, placing emphasis on prioritising the deployment of existing technologies while investing in research for future advancements
- Addressing supply chain constraints and grid reinforcement needs to support the renewable energy transition, identifying issues like lead times for critical equipment and grid modernisation as vital for accommodating the growing penetration of renewable energy sources and ensuring grid reliability

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AURORA KEYNOTE

CHARGING AHEAD: THE GRID CHALLENGE IN EUROPE'S PURSUIT OF NET ZERO

Speaker: **Ana Barillas,** Managing Director, Iberia & LATAM, Aurora

This session scrutinised Europe's ambitious renewable energy targets for 2030, underlining the enormity of the challenge for the grid to bring these assets online. In particular, the session delved into the grid operability and grid connection obstacles that exist with 751 GW of renewables required to meet Europe's Net Zero energy goals but 893 GW waiting in the grid connection queue and an estimated 1.54 trillion € in grid investment required by 2040.

When considering both the challenges and solutions facing the grid, the session highlighted the following:

- Grid operability: There is great need for data transparency on grid operations, with limited access hindering informed decision-making and efficient grid management. Transmission System Operators increasingly resort to costly remedial actions to address congestion issues, reflecting the growing imbalance between renewable energy generation and grid capacity. Grid curtailment, particularly pronounced in regions like GB and certain areas of Spain and Italy, underscores the urgency of upgrading grid infrastructure to accommodate expanding renewable energy sources.

- Grid connections: Likewise, the large backlog of grid connection requests highlights the pressing need to address grid connection challenges, with disparities existing across European countries. For instance, Poland rejected 51 GW of capacity in 2022 due to grid congestion. This emphasises the need for tailored solutions to alleviate congestion and facilitate renewable energy integration. However, delays persist in implementing initiatives such as grid auctions in Spain facing an 18-month delay, reflecting the complexities involved in upgrading grid infrastructure.

- To solve these issues, the EU has outlined a series of recommendations including a holistic assessment of the system's needs, anticipatory investments (recognising the limitations of reactive approaches), better data availability on grid curtailment operations and connection requests, non-firm connection frameworks where grid development isn't a viable long-term solution, and alignment of product designs and grid connection requirements.

Click HERE to view the presentation

PLENARY SESSION
TOWARDS 2030: NEXT STEPS ON THE ENERGY TRANSITION IN GB & EUROPE

Chair: **Richard Howard,** Global Research Director, Aurora

Speakers: **Ana Paula Marques,** CEO, EDP Spain
As Tempelman, CEO, Eneco
Keith Anderson, CEO, ScottishPower
Olivia Breese, Senior Vice President, CEO Region Europe & Power2X, Ørsted

This plenary session started by highlighting grid connection infrastructure as a major barrier to the delivery of EU renewable energy targets for 2030. The speakers and the audience noted grid congestion as the key challenge, with the need for increased investment and collaboration between companies to share grid connections and optimise storage capacity. "Around 40% of Europe's distribution grids are over 40 years old and need modernisation," Ana Paula Marques stated. The transition towards a more efficient, digitalised grid was discussed as essential, with a focus on modernising and planning the grid infrastructure to keep pace with the rapid growth of renewable energy sources.

The session then moved onto the topic of wind energy, underscoring the ambitious wind and solar targets set for 2030 and the obstacles in achieving them, such as grid congestion and underinvestment in projects. There was a consensus on the necessity of clear auction schedules, larger auctions, and a more defined path for investments. The importance of offshore wind development in the North Sea was emphasised, with speakers advocating for greater investment and regulatory support to ensure the successful expansion of wind energy projects in an environmentally friendly manner.

The hydrogen market was another focal point, discussed as a crucial element in creating a new value chain and accelerating the energy transition. However, regulatory uncertainty, technological challenges, and financial constraints were identified as key hurdles. Speakers highlighted the need for a combination of support mechanisms to bridge the cost gap and ensure the scalability of hydrogen projects.

The session concluded with an emphasis on the urgency of implementing efficient regulatory frameworks and support mechanisms to facilitate the development of the hydrogen market and other low-carbon technologies in the broader energy transition strategy.

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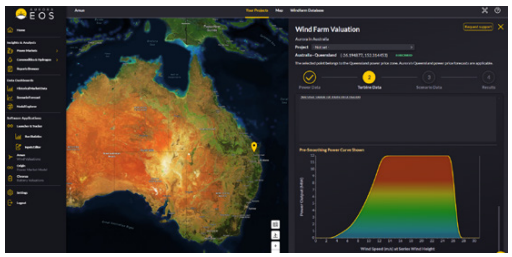

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BREAKOUT SESSION

HOW DO WE RESOLVE EUROPE'S GRID CONGESTION CHALLENGE?

Chair: **Kora Stycz,** Research Lead, Aurora

Panellists: **Fintan Slye,** Executive Director, National Grid ESO
Axel Thiemann, CEO, Sonnedix
Émeline Spire, Director Power System Transformation, Agora Energiewende
Nick Winser, Chair, Energy Systems Catapult

In this breakout session, a panel of experts highlighted the importance of long-term grid planning and management as a key pillar of any Net Zero power system. Fintan Slye and Nick Winser emphasised that the reactive approach to grid development in GB thus far produces suboptimal results. They highlighted the necessity for anticipatory spending on the grid and proactive grid development, advocating for a strategic spatial plan. Additionally, they stressed the need for community engagement in this process.

Émeline Spire pointed out the cruciality of coordination across sectors and member countries to formulate an integrated, forward-looking grid plan for the EU. The key challenge lies in determining responsibility for design and governance, and how this will impact on-ground decisions such as community-level heating.

Axel Thiemann highlighted common factors across grids in different countries, including an increase in curtailment, and reluctance of developers to make long-term investments due to the uncertainty surrounding policy and government strategy.

The key takeaways from the session include the following:

- There is a need for integrated long term grid planning both in GB and the EU. While liberalised markets are typically averse to anticipatory spending, this would help optimise grid development and match grid connection times to project development timelines.

- Community engagement is crucial for achieving Net Zero. Communities should be involved by providing them with the context of how they fit into the country's long-term grid development strategy and offering tangible community benefits.

"We need an integrated spatial plan for the grid. This plan should be endorsed by ministers and put into the public domain so communities can see the full context of why projects need to go in their backyard".

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BREAKOUT SESSION
GRID SCALE BATTERIES: HOT MARKETS, POLICY REFORMS & RISKS FOR STORAGE PROJECTS

Chair: **Evangelos Gazis,** Head of Southeastern Europe, Aurora

Panellists: **Charlotte Johnson,** Global Head of Markets, Kraken
Christoph Torwegge, Partner, International Sector Leader - Energy & Utilities, Osborne Clarke
Pat Wood, III, CEO, Hunt Energy Network
Sandra Grauers Nilsson, CEO, Eku Energy

In the absence of regulatory frameworks, grid-scale batteries thrive in problematic power markets, often with isolated power system islands, constraint bottlenecks, high decarbonisation ambition, and investment in renewables. A perfect market for batteries would have short settlement periods, leading to higher price volatility; locational pricing, incentivising the geographic placement and temporal generation of assets; and subsidy schemes beneficial to storage. Alongside the UK prior to 2023, other hot markets for grid-scale batteries include Spain, Germany, the Netherlands, France, and Italy.

The panel also discussed opportunities relating to co-location with renewable assets. Adding a grid-scale battery project to a repowering wind farm can significantly de-risk grid-scale battery projects and increase investor confidence due to a relatively small CAPEX increase and the opening of new revenue streams. For instance, co-located projects in Germany may receive an additional innovation subsidy to supplement energy trading revenues.

However, a key challenge in GB, according to the panel, arises from regulations that restrict trading such co-located assets in certain markets such as the Balancing Mechanism. This highlights a need for a Grid Code review to maximise the potential for co-located assets, whereas this issue is not as significant in other countries.

Despite this, financial institutions have still been very willing to finance grid-scale battery projects. In addition to merchant revenues, batteries have exposure to capturing upsides from market volatility and regulatory support from co-location. Such projects are often complementary to a risk-return portfolio, particularly in well-established markets.

Amongst other storage technologies such as pumped hydro and compressed air, batteries stand out for their geographic versatility and instantaneous reactions, which have pushed them to the forefront. Overall, the panel stressed the importance of anticipating what these batteries need to do in the future, as everything will not be the same as it was last year.

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BREAKOUT SESSION
FINANCING THE ENERGY TRANSITION IN A HIGHER RATES WORLD

Chair: **Brian Potskowski,** Head of UK & Ireland Advisory, Aurora

Panellists: **Ingmar Wilhelm,** CEO, Galileo
Karin Kaiser, Head of Private Markets Europe, Schroders Greencoat
Rosheen McGuckian, CEO, NTR
Simon Maine, Managing Director, Brookfield

During the session, which focused on navigating the world of financing the energy transition, considerable attention was dedicated to examining the ramifications of elevated interest rates on investment prospects and the consequent adjustments in investors' strategies. In his opening statement, Brian Potskowski presented the viewpoint that while interest rates might have reached their apex within the current economic cycle, a return to historically unprecedented low rates is not to be expected. Potskowski's insight prompts a nuanced consideration of the evolving financial landscape, where asset allocators have more alternatives for accessing yield than in the ultra-low rate environment.

The discussion with the panellists covered the topic of capital allocation in the current economic climate. The irreversible shift in financial dynamics was emphasised, noting that return expectations are increasing, given the rise in risk-free rates. Building on this observation, the need to explore avenues for unlocking the untapped potential within the energy sector was also addressed.

Panellists agreed on the critical importance of incorporating value-added strategies to meet higher return requirements. This acknowledgment reflects a collective commitment to not only achieving financial returns but also fostering positive environmental and societal impacts through the role of transition investing. One of the panellists highlighted the potential impact on national emissions that could result from investing in a coal portfolio and transitioning the business towards renewables.

On an ending note, the following quote was stated, indicating a light at the end of the tunnel for the future financing of the energy transition:

"Have faith everybody, it was a tough year, but the fundamentals are still there".

BREAKOUT SESSION
LONG DURATION ENERGY STORAGE: GETTING TO SCALE

Chair: **Marc Hedin,** Head of Research, UK & Ireland, Aurora

Panellists: **Jon Norman,** President, Hydrostor
Ramya Swaminathan, CEO, Malta
Richard Butland, CEO, Highview Power
Robert Todd, Managing Director, CIBC Capital Markets

"No one wants to build merchant".

In this breakout session on long-duration energy storage, the main themes revolved around managing the inherent risk of an unsolved problem in transitioning power systems. Both risk appetite for developers to drive forward such projects and investors' willingness to finance them, need to be managed. Therefore, the role of robust subsidy schemes, specialised markets, and innovative funding regimes are all pivotal in the roll-out of Long Duration Energy Storage (LDES), mirroring the early era of renewables.

When discussing cap and floor mechanisms, the panel overwhelmingly focussed on the floor price rather than the cap, stating that the purpose of the scheme was to de-risk unproven CAPEX for investors rather than to constrain runaway profits at the cap price for consumers. They noted that *"a floor where equity can lose money is not a real floor".*

The speakers were keen to break down what can be an amorphous categorisation, noting that intraday and inter-day storage exist in a more mature market environment that values arbitrage on that timescale. However, longer storage durations over weeks or seasons still lack remuneration mechanisms for arbitrage. Instead providing grid reliability (balancing short-term frequency deviations and providing inertia) over grid firming (moving volumes of energy to enable renewables) appears to be the business model of credibility in most nascent country markets.

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BREAKOUT SESSION
HYDROGEN PROJECTS: THE ROUTE TO BANKABILITY

Chair: **Emma Woodward,** European Hydrogen Market Lead, Aurora

Panellists: **Alexander Voigt,** Co-Founder & Board Member, HH2E
Andrew Doyle, Executive Director, MUFG
Sopna Sury, Chief Operating Officer Hydrogen, RWE Generation SE
Tony Cocker, Senior Independent Director, SSE & Chair, Infinis Energy Management

In this session, the panel of hydrogen experts highlighted the need for large-scale and long-term hydrogen offtake contracts to help socialise costs and allow smaller buyers to participate in the market. As the hydrogen sector develops, there is a need for higher returns to first-of-a-kind projects, rather than trying push them to minimise their costs.

Policy support is also a major driver for hydrogen uptake in GB and in Europe more generally. Green hydrogen quotas are a good way of driving hydrogen uptake, especially for the smaller volumes that are expected to be produced in the next few years. Certainty in terms of policy support will be key to bankability and driving investments.

The key takeaways from the session include the following:

- Existing users of grey hydrogen such as refineries and steel plants are expected to be the first users of low carbon hydrogen, as they have most of the required infrastructure in place. This will be followed by the chemicals sector (ammonia and fertilisers) and then heavy-duty transport.

- The green hydrogen industry in Europe is progressing rapidly. Large trading companies buying long term fixed offtake can support the bankability of new projects, which leaves room for small consumers to participate by buying smaller volumes at a premium.

- A low carbon hydrogen standard that defines a maximum allowable carbon content for hydrogen production may be a more pragmatic approach to policy support than having precise definitions for different 'colour' categories of hydrogen.

"For large-scale production and uptake of hydrogen, we need to have an infrastructure, a system in place. Just producers and offtakers alone are not sufficient."

BREAKOUT SESSION
NAVIGATING DISRUPTION: MARKET DISTORTION, DIVERSIFICATION, & FRIEND-SHORING OF SUPPLY CHAINS

Chair: **Alexander Esser,** Head of Nordics & Baltics, Aurora

Panellists: **Adam Podgórski,** CEO & Founder, Green14
Gayatri Desai, Managing Director, CIBC Capital Markets
Özer Ergül, Group Head of Procurement | CPO, Aquila Capital

The panel discussion on managing disruptions in supply chains and renewable energy addressed various challenges, including market distortion affecting solar panels and wind turbines, limited diversification in renewable energy technology production, and the tendency to rely too heavily on certain suppliers. Led by Alexander Esser, the conversation among experts highlighted significant cost disparities between renewable energy technologies produced in China and Europe, particularly in PV modules and wind turbines.

One notable viewpoint expressed optimism about the future of polysilicon manufacturing in Europe, despite the higher costs associated with producing solar cells here. Additionally, the discussion shed light on the complexity of supply chains for complex systems, making it difficult to accurately assess the sustainability of production processes.

Furthermore, there was acknowledgment of shifting consumer attitudes, with a growing willingness to pay a premium for products from suppliers with strong environmental and social credentials. The importance of building trust within the supply chain, particularly in battery production, was also emphasised.

Overall, the discussion underscored the importance of thoughtful sourcing, manufacturing, and sustainability practices within supply chains to effectively manage disruptions and support the ongoing transition to renewable energy.

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BREAKOUT SESSION

RIDING THE STORM: OPPORTUNITIES & RISKS FOR OFFSHORE WIND

Chair: **Rebecca McManus,** Senior Associate, Aurora

Panellists: **Alice Delahunty,** President, National Grid Electricity Transmission

Andreas Regnell, Senior Vice President, Head of Strategic Development, Vattenfall

Duncan Clark, Managing Director, Offshore & Country Chair, UK & Ireland, Ørsted

Theodora Forbes, Vice President, CIP

"There's no question that it's massively challenging, but we've made enormous progress".

This panel discussed the 'triple whammy' of challenges faced by offshore wind projects in the present and near future. In light of prevalent project development delays amidst a backdrop of ambitious targets set by the government, offshore wind faces a slew of roadblocks arising from supply chain costs, grid connection challenges, and subsidy support. However, the panel emphasised a strong sentiment to remain optimistic about the implementation of offshore wind as the cornerstone of a future, fossil-free energy system.

Key points from the session include the following:

- An accumulation of speculative projects in grid connection queues poses risks of extending offshore wind project development time-lines by 5–10 years. There is currently over 700 GW of projects in the GB grid connection queue, comprising over 10 times the current installed capacity and 5–6 times the capacity needed for decarbonisation. These excess projects necessitate new transmis-sion lines, which may not be strictly required, thus adding delays to projects that are actually crucial to the system. National Grid's five-point plan for grid connections aims to mitigate such effects.

- The need for regulatory and subsidy support for offshore wind is a significant factor considering the technology's significant missing-money problem. A weak subsidy scheme could have the ripple effect of creating uncertainty in the market, and any market solution needs to be geared towards future system needs, not current.

- Supply chain issues have recently led to about 40–50% price increases due to inflation, interest rates, and supply congestion, making project investment much riskier than before. CAPEX distributions have changed, and project lead times have increased, leading to a shift in the landscape of what investors need to know.

FIRESIDE CHAT

THE FUTURE OF ENERGY: MANAGING UNCERTAINTY IN THE VERY LONG TERM

Chair: **Pierre Dennery,** Head of France, Aurora

Panellists: **Giorgia Carchitto,** SVP Low Carbon Commercial Assets & Portfolio Analysis, bp

Guy Newey, CEO, Energy Systems Catapult

"Forecasts and scenarios are there to understand the key assumptions behind a narrative, to consider whether those assumptions are non-contradictory and present a plausible pathway".

This fireside chat delved into the complex and multifaceted challenges facing the energy sector as it navigates through an uncertain future. Speakers explored various factors contributing to this uncertainty, including technological advancements, geopolitical shifts, climate change, and societal demands.

Policy regulation and its driver, politics, were considered the greatest source of uncertainty. The panel agreed that long-term policy, whilst difficult to agree on, must be consistent even if not perfectly designed. Additionally, the behaviour of demand was also a source of uncertainty, as policy levers that impact demand tend to be less straightforward.

Speakers stressed the need for policies that not only facilitate the adoption of clean energy technologies but also address broader concerns such as energy security and affordability. A balanced approach to regulation was deemed essential in navigating the complexities of the energy transition.

Geopolitical dynamics were also brought into focus, with discussions revolving around how global shifts and tensions impact energy markets and investment decisions. Participants stressed the importance of strategic foresight and international cooperation in navigating geopolitical uncertainties.

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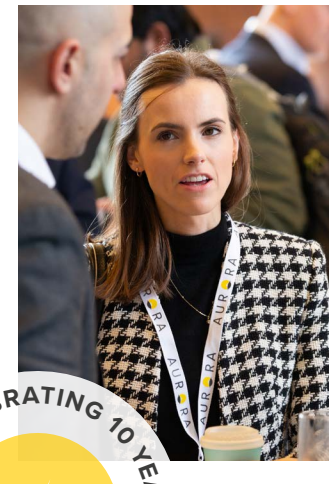

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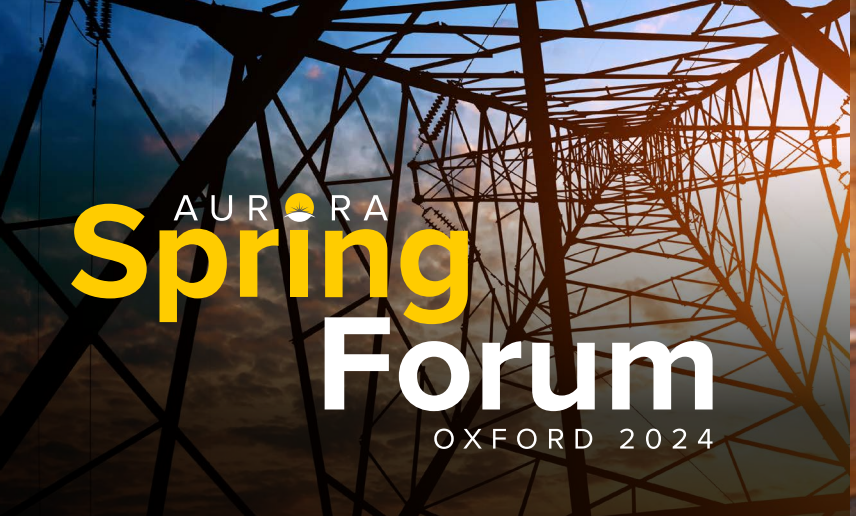

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