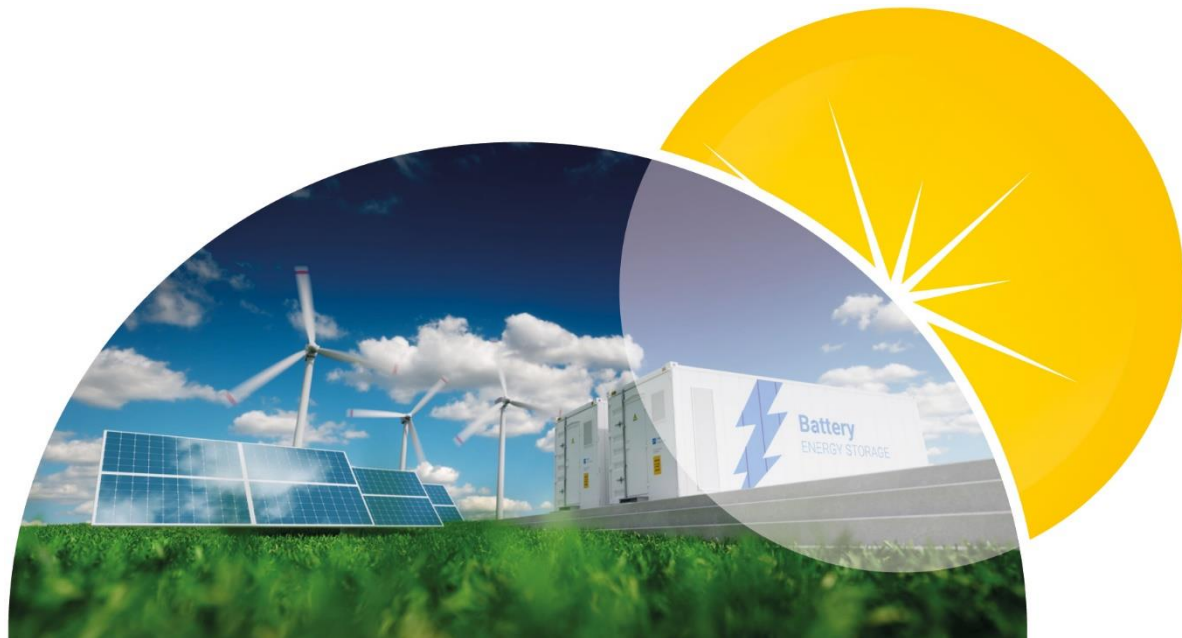


Aurora Battery Storage and Flexibility Conference 2019

Highlights Pack



Aurora Battery Storage and Flexibility Conference

It was my great pleasure to welcome you to Aurora's Battery Storage and Flexibility Conference 2019. This was our fourth annual event dedicated to flexible energy, batteries and energy storage. These topics are very much top of the political and business agenda, as we move towards a decarbonised, decentralised and digitalised energy system.

Joined by distinguished speakers and panellists, in particular Alan Whitehead MP, Shadow Energy and Climate Change Minister, and informed by Aurora's unique analysis, the conference brought together the insights and perspectives of the organisations and people who will shape the future system.

Aurora's latest analysis on flexibility requirements moving towards Net Zero and on the economics of merchant solar co-location with battery storage helped frame the debate on the day, as well as the 9 August power outages. From a personal perspective, one of the main highlights for me was to host Fintan Slye, UK Systems Operator at the National Grid SO, whose responsibility it is to keep the country's lights on. We discussed the outages, and National Grid's ambition to operate a zero-carbon system as early as 2025.

We heard business leaders, government, and experts discuss and debate the issues central to the low carbon energy transition, including the need for flexibility, the role of flexible assets in achieving Net Zero, and the associated key risks and financing challenges.

We are very grateful for the support of our speakers and sponsors: Anesco, Clarke Energy, Fluence, Freedom Group, Open Energi and Osborne Clarke.

John Feddersen

Co-Founder and CEO
Aurora Energy Research



Conference overview

Aurora's fourth Battery Storage and Flexibility Conference brought together leading industry figures, including Alan Whitehead MP, Shadow Energy and Climate Change Minister to debate and discuss the highly topical issues of flexible energy and battery storage.

New analysis presented at the conference suggests that delivering a 'net-zero' power system will require 100GW+ new wind and solar capacity by 2050, and up to 30GW of short-duration storage, as well as 20GW+ of firm backup capacity will be required to help balance renewables output.



Links



View the
[Conference
Press Release](#)



Watch the
[Highlights Video](#)



Listen to the Podcast
on [iTunes](#), [Soundcloud](#)
or [Spotify](#)



Presentation links are
on the following
pages >>>

Impressions from the day





The road to 2050: The need for flexibility in a high-renewables world

- What volume of storage is required to balance demand and supply in a high-renewables world?
- How much fast-ramping generation does a zero-emission power system need?
- How much dispatchable generation would you need to ensure we can keep the lights on when the wind stops blowing?



Flexibility 2.0: Evolution of the power market, system needs and emerging technologies

- What is flexibility, and how do we incentivise the right amount to meet system needs?
- How do we avoid a repeat of the August power outages?
- Do we have the right technologies today, and if not, is there a role for policy to support new ones?



Key risks and financing challenges for flexible assets

- Why are batteries generally perceived as a high-risk investment? How much of this is just perception vs reality?
- How much can we bank on price volatility?
- To what extent can different strategies make batteries investible?



The year in review

A look back on noteworthy energy
industry headlines in 2019

Part 1

Presentation

The road to 2050: The need for flexibility in a high-renewables world



Speaker

Ana Barillas, Aurora

View the [‘Road to 2050’ presentation](#)

Panel Discussion

Flexibility 2.0: Evolution of the power market, system needs and emerging technologies



Chair

Felix Chow-Kambitsch, Aurora

Panellists

Marek Kubik, Fluence

Robyn Lucas, Open Energi

Dan Monzani, BEIS

Carolina Tortora, National Grid SO

Interview

The role of flexible assets in achieving Net Zero



Chair

John Feddersen, Aurora

Speaker

Fintan Slye, National Grid SO

Presentation

Key risks and financing challenges for flexible assets



Speaker

Oliver Kerr, Aurora

View the ['Key risks and financing challenges' presentation](#)

Presentation

The economics of merchant solar co-located with battery storage systems



Speaker

Mike Ryan, Anesco

View the ['Economics of merchant solar and battery co-location' presentation](#)

Panel Discussion

Key risks and financing
challenges for financing assets



Chair

Oliver Kerr, Aurora

Panellists

Simon Hobday, Osborne Clarke

Gauri Kasbekar-Shah, NatWest

Mike Ryan, Anesco

Tom Williams, Downing

Sam Wither, Sembcorp Energy UK

Interview

Labour's plan for power sector
decarbonisation and flexibility



Chair

Richard Howard, Aurora

Speaker

Alan Whitehead MP, Shadow
Energy and Climate Change
Minister

Feedback

"Another excellent conference; thank you. Good networking and interesting content"

Andrew Buglass, Buglass Energy Advisory Ltd

"I really enjoyed it – thought it was a good balance of presenting Aurora's skillset as well as interesting and very relevant industry representation"

Hugh Brennan, Hive Energy

"The event was well thought-out, with a variety of opinions across industry, investment, debt and government"

Seung Yun Oxley, Lloyds Bank

"Keep producing high-calibre conferences like this one, please"

Rory Tait, Lux Nova Partners

"Great event – surprised by the number of people attending"

Steven Blase, Aurium

"Aurora speakers and Fintan Slye were outstanding"

Tadgh Cullen, Solarcentury



"Great conference and insights from Aurora as always! Material was on-point and panels were diverse enough to enable a good level of debate"

Lee Belfield, RBC Capital Markets

Your feedback

#BattConf19 highlights

Simon Evans @DrSimEvans · 14 Oct

Fintan Slye, in charge of running GB electricity grid, says we already have the tech we need to run the grid at zero carbon.

Not all yet deployed commercially, but nevertheless available, he says.

National Grid planning to be able up run at zero C by 2025.

Alan Whitehead @alanwhiteheadmp · 14 Oct

Good grilling from @UKEnergywonk at @AuroraER_Oxford's #BattConf19 on Labour energy policy.

No crystal ball for the future system - but I'm confident storage and flexibility will be a sizeable part of it!



Mark Meyrick @MarkMeyrick1 · 14 Oct

'Optimisation: you need to be very careful how you go about it' Profound stuff this from Open Energi. #BattConf19 @AuroraER_Oxford

RheEnergise Energy Storage @rheenergise · 14 Oct

#battconf19 @FintanSlye_eso really interesting debate. Comment "inertia will become much more important to the grid over time" An inertia market in the future?

KiWi Power @kiwipowered · 14 Oct

.@alanwhiteheadmp at @AuroraER_Oxford #BattConf19 throwing down the gauntlet to Tories on #netzero. Claims @UKLabour will get there sooner.

auroraer.com

Felix Chow-Kambitsch @FelixChowK · 14 Oct

Interview with @UKLabour's @alanwhiteheadmp at Aurora #BattConf19: #ExtinctionRebellion is "a tremendous weapon of conscience"... "we really are in a #ClimateEmergency" #ClimateChange @AuroraER_Oxford



Charles Wood EUK @euk_wood · 14 Oct

Really interesting to hear Alan Whitehead MP talking about the need to put in place by 2030 actions needed to ensure net zero is not achieved immediately but is in motion with absolute certainty #battconf19

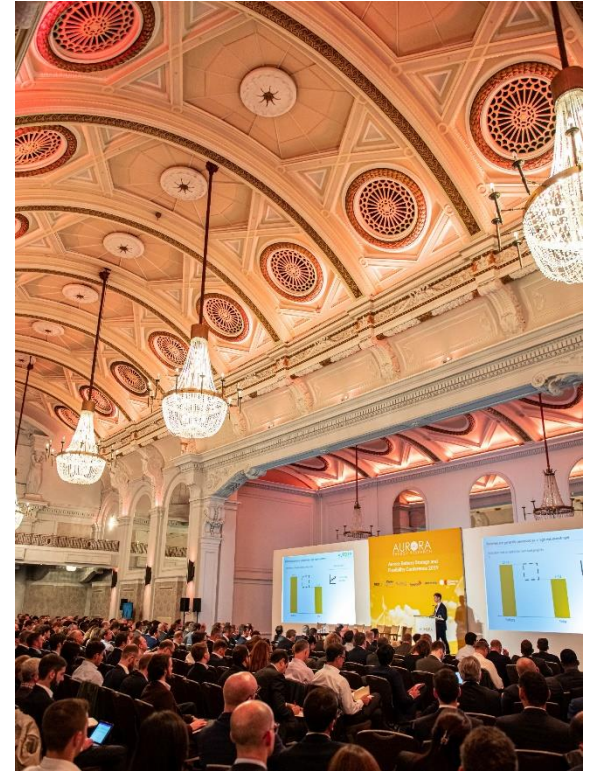
KiWi Power @kiwipowered · 14 Oct

Thanks @AuroraER_Oxford for a great event today. Looking forward to discussing insights over drinks with industry colleagues. #BattConf19 @Freedom_Group



#BattConf19

Impressions from the day





Asset managers must use their votes
to tackle climate change

S&P Global

Large market for energy storage in
UK's net-zero emissions system

reNEWS.BIZ

UK Net Zero 'needs 100GW' extra
green power

Envirotec
TECHNOLOGY IN THE ENVIRONMENT MAGAZINE

Getting to Net Zero: What happens
when the wind stops blowing? New
analysis presents possible answers

theenergyst

Fintan Slye: Inertia is "taken for granted";
it will become much more important

WINDPOWER
MONTHLY

Over 100GW needed for UK to reach
net-zero

 PVTECH

Report: UK needs 100GW more solar
& wind to hit 2050 target

BusinessGreen

Regulation, batteries, and overcoming
'short termism': Energy industry
sketches out Net Zero vision

Conference Partners 2019





We develop, construct, manage and operate renewable energy projects

A history of renewable innovation in the UK

- 1st subsidy free solar farm
- 1st batteries operating under FFR and BM
- 1st commercial battery (2014)
- 1st OFGEM accreditation for batteries on RO solar site

For more information please contact Nick Johnson at nick.johnson@anESCO.co.uk

ANESCO SOLUTIONS



Battery storage –
grid, commercial,
domestic



Solar – grid,
commercial, domestic



AnescoMeter –
O&M



Commercial and
Industrial



Domestic energy
efficiency: ECO



Peaking Power Plants

- 500MW of peaking plant installations in the UK
- High efficiency, low switch on price
- Increased electrical output
- Rapid start times
- Planning application assistance
- Electrical and gas connection assistance
- Emissions and noise data
- Optimal engine configuration assistance
- Hybrid options available



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Fluence is the global leader in grid connected energy storage


Joint Venture of Siemens & The AES Corporation delivers complete, proven storage systems

OUR TRACK RECORD

 **12+**
YEARS

 **95+**
PROJECTS

 **21**
COUNTRIES
AND TERRITORIES

 **1,500+**
TOTAL MW
DEPLOYED OR AWARDED

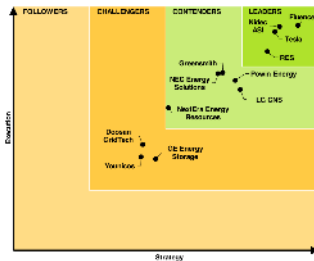
 **6,700+**
GW-HOURS OF DELIVERED
SERVICE GLOBALLY

INDUSTRY RECOGNITION

NAVIGANT

#1

ON NAVIGANT
ENERGY STORAGE
LEADERBOARD



FAST COMPANY

#3

IN ENERGY,
FAST COMPANY
MOST INNOVATIVE
COMPANY



OUR CUSTOMERS

SEABOARD
CORPORATION



SAN MIGUEL
CORPORATION

SIEMENS

Ingenuity for life

SWM

Stadtwerke München

SDGE

AES India

Sempra Energy utility*

NEXIF
ENERGY

ukpowerreserve
PART OF semcorp GROUP



TATA POWER-DDL

SPOTLESS

aps

AES

AusNet
services

Mitsubishi
Corporation

c-energy

e-on

AES Dominicana



NG Bailey



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Open Energi

Open Energi is an energy tech company specialising in demand-side management. Our artificial intelligence-powered platform, Dynamic Demand 2.0, optimises electricity use and unlocks demand flexibility from industrial processes, hydrogen electrolyzers, on-site generation, energy storage and electric vehicles to reduce costs and carbon.

Over the last seven years, we have connected over 3,500 assets at over 400 sites, reliably and safely helping leading UK businesses to take control of how, when and from where they consume electricity to create a more sustainable energy future.



Osborne Clarke

Osborne Clarke's international energy team is one of the most experienced in the legal industry. For over 20 years, we've helped clients deliver their energy projects. We advise utilities, sponsors, funders, commercial entrants and operators on integrated low carbon energy solutions, energy efficiency and smart grid applications, as well as decentralised power generation and management.

Through our expertise in the application of digital technology, applied alongside innovative business models to the trading, management, balancing, deployment and consumption of energy, we have become widely recognised as one of the leading law firms advising on the digital transformation of the Energy sector. We work with businesses at the cutting edge of energy innovation on their operational, intellectual property and contractual legal needs as well as the regulatory impact of the adoption of the latest technologies.

Aurora Services and Expertise





3 Offices

Oxford Berlin Sydney



120+
experts



250+
subscribers

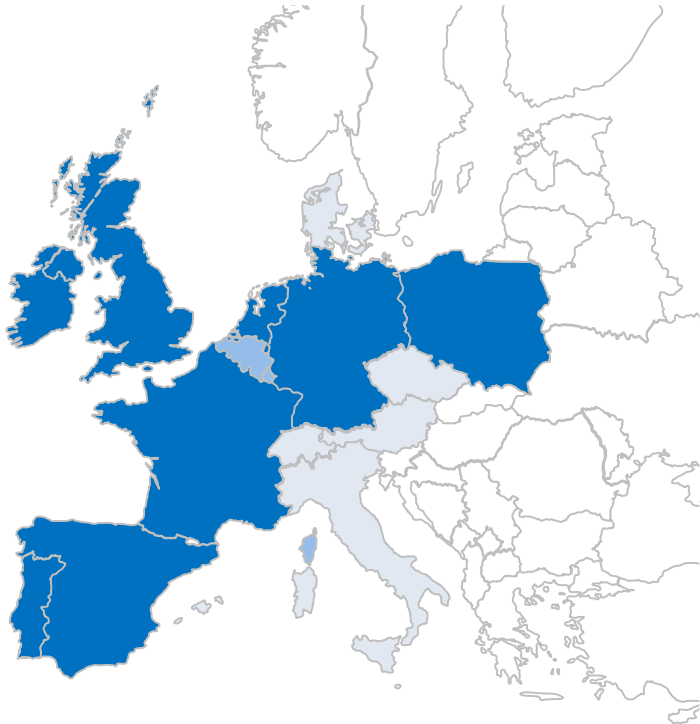


50+
transactions in 2019 YTD



Aurora covers key European markets & Australia

View our [Power Market Intelligence Services](#)



Comprehensive Power Market Services

- ✓ Power market forecast reports
- ✓ Forecast data in Excel
- ✓ Global energy market forecast reports
- ✓ Strategic insight reports
- ✓ Regular subscriber group meetings
- ✓ Bilateral workshops
- ✓ Analyst support

Power Market Forecast Reports

- ✓ Power market forecast reports
- ✓ Forecast data in Excel
- ✓ Analyst support

Bespoke Forecasts

For more information, please contact
Sebastian Just, Commercial Director



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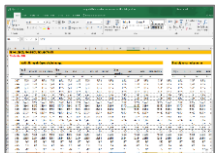
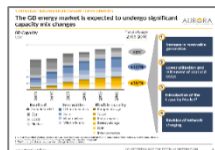


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Aurora's flexibility service offering



GB Distributed and Flexible Energy Service

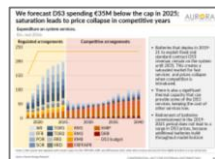


- ✓ Continuous regulatory and policy updates plus market developments
- ✓ Regular provision of up-to-date revenue stream forecasts for wholesale, BM, capacity market, ancillary services and applicable embedded benefits
- ✓ Investment case data for battery storage, gas peakers and DSR under various business models and market scenarios
- ✓ Plenty of interaction with the Aurora team to discuss our analysis

➔ Bankable forecasts used by more than 70 subscribers, who comprise >90% of CM contract issued to flexible technologies



Ireland Power Market and Flexibility Service



- ✓ Detailed forecasts of outcomes in wholesale, balancing, ancillary markets, and embedded benefits available to flexible technologies until 2040
- ✓ Investment case analysis for battery storage, peakers and DSR under the main business models, reflecting revenue-stacking opportunities
- ✓ In-depth review of policy and regulatory frameworks & relevant uncertainties

➔ All information you need for your business case and to successfully participate in the upcoming DS3 auctions

Aurora's flexibility service offering



Green Frog Power, support for £100m debt financing of a portfolio of gas peakers by Lloyds, HSBC and NIBC, including reliance



Gas peaker and battery storage portfolios, commercial sell-side advisory for UK Power Reserve that was successfully sold to Sembcorp



Forsa Energy, supported debt financing for a portfolio of gas peakers by Sequoia Capital



Gas peaker debt financing, supported a bank in building their lending case for gas engines. The bank now provides regular loans to gas engine projects



Battery storage projects, supported equity and debt raise ahead of DS3 auction



Battery storage portfolio fund raising, sell-side commercial advisory for an equity raise for a 2GW development portfolio. The process is still ongoing



Battery storage, commercial sell-side market advisory for a 90 MW operational battery storage portfolio mainly bidding into the FCR market



Battery storage, supported successful equity and debt raise, first battery storage debt financing in UK



Flow battery storage, provided secondary reserve forecasts and business case assessment for a flow battery to project developer and main investor



Battery storage, provided modelling of all major ancillary markets to inform DS3 bidding and optimal revenue stacking for a major Irish generator



Pumped hydro, buy-side valuations including forecasts of multiple ancillary services and operational optimisation analysis for First Hydro assets



Pumped hydro, assessment of the economic benefits of a hydro pumped storage project in the context of a permitting process and extension decision



CCGT, sell-side market advisory for Orsted's Enecogen plant, including forecasts for revenues from FCR and Dutch secondary reserve (FRR)



OCGT, provided a sell-side valuation and capacity market bidding strategy for two OCGT projects of a major utility. Both projects successfully sold



Heat storage, business case assessment for a reversible power-to-heat energy storage, valuing arbitrage opportunities for power, heat and steam

For more information, please contact

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Watch a demo



Free trial

Amun combines Aurora's market forecasts with granular wind data to obtain site- and project-specific capture price and revenue forecasts.

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Our upcoming events

Aurora Spring Forum



The Aurora Spring Forum is the leading private gathering of the energy industry in Europe. It brings together industry leaders in an exclusive setting at the University of Oxford to engage on key issues impacting GB, European, and global energy markets.

March 2020, Oxford

Aurora Summer Renewables Summit



Aurora's Summer Renewables Summit brings together leading industry figures to debate and discuss the policy and investment issues surrounding renewables and a subsidy-free future.

June 2020, London

Aurora Battery Storage and Flexibility Conference 2019

