



REMA Conference

**Review of Electricity Market Arrangements -
Where are we now and what are the next steps . . .**

Featuring REA's REMA white paper report launch

AT: BDB Pitmans, City of London - EC1

ON: Tuesday, 27th June 2023 | 9:30am - 4:30pm



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REA Review of Electricity
Market Arrangements

TUESDAY 27th JUNE 2023

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Session 1: EXPLORING REMA AND REA WHITE PAPER REPORT LAUNCH

| 10:20-11:00

- **Mark Sommerfeld** and **Jordan Dilworth**, REA
- **Dr. Chris Harris**, University of Bath
- **Alisha Ali**, Department for Energy Security and Net Zero

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Putting REMA into Context



- REMA needed to both respond to the energy crisis and deliver an energy system fit for the future.
- Has happened in parallel to more immediate market Interventions including Energy Bill Support Scheme, Energy Profits Levy and Electricity Generator Levy.
- Medium to long term focus on delivering an affordable, secure and decarbonised energy system.



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REA's REMA Involvement

- REMA has been a major REA work stream for the last twelve months.
- Have been engaged with Department for Energy Security and Net Zero REMA team since announcement.
- Established the REA Members Task and Finish REMA Working Group to help develop views.
- Have run several member engagement events over the last year during the first call for evidence.
- Submitted detailed response to the initial consultation.
- Also engaged in parallel consultations that impact REMA.
- Sit on the Government's REMA Market Participants Forum



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Purpose of the REMA Report

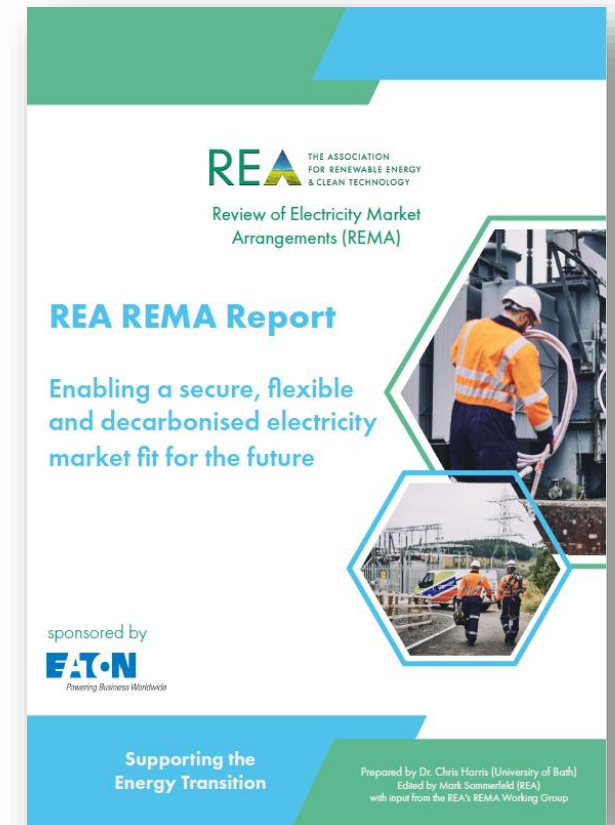
Government are reviewing a wide set of options for how the wholesale market could be developed.

Members have emphasised importance of ensuring:

- Existing asset business models are not undermined
- That UK remains an attractive investment market.
- An investment hiatus is avoided.

At same time, recognising that existing market arrangements will need to change to support a decentralised, decarbonised and secure energy system of the future.

Today's report sets out the case for an evolutionary, rather than revolutionary, approach in order to achieve REMA aims.



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Developing Our REMA Report

With very special thanks to our Report Author
Dr Chris Harris (University of Bath):



Kindly Supported by:



Powering Business Worldwide

With input from the REA Task and Finish REMA Working Group:

Isabel Boira-Segarra

Jon Crouch

Peter Dickson

Kit Dixon

Keith Gains

Stephen Hill

Mark Howitt

Richard Molloy

Marcus Newborough

Kamila Nugumanova

Dai Richards

Jonathan Scurlock

Christie Sims

Jerry Stokes,

Hilary Stone

Gregory Triantafyllidis

Duncan Valentine

Frances Warburton

Darren Williams

Future Earth Energy

Infinis

Glennmont Partners by Nuveen

Good Energy

Quinbrook Infrastructure Partners

Eversheds Sutherland

Storelectric

EATON

ITM Power

Drax

Hitachi Energy

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BSR

Gridserve

Imperial College

JBM Solar

Almax Partners

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Other Parallel Work Streams in the REA

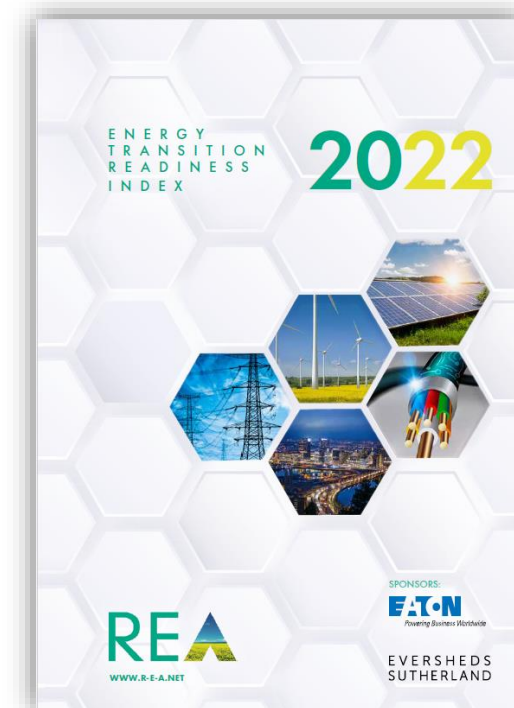
Grid Connection and Planning Reform

- Feeding into the design and implementation of National Grid ESO, Ofgems and ENA grid connection reform projects over Summer 23.
- *Developing a response to NG ESO connections reform consultation.*



Energy Transition Readiness Index 2023

This year's review is getting underway



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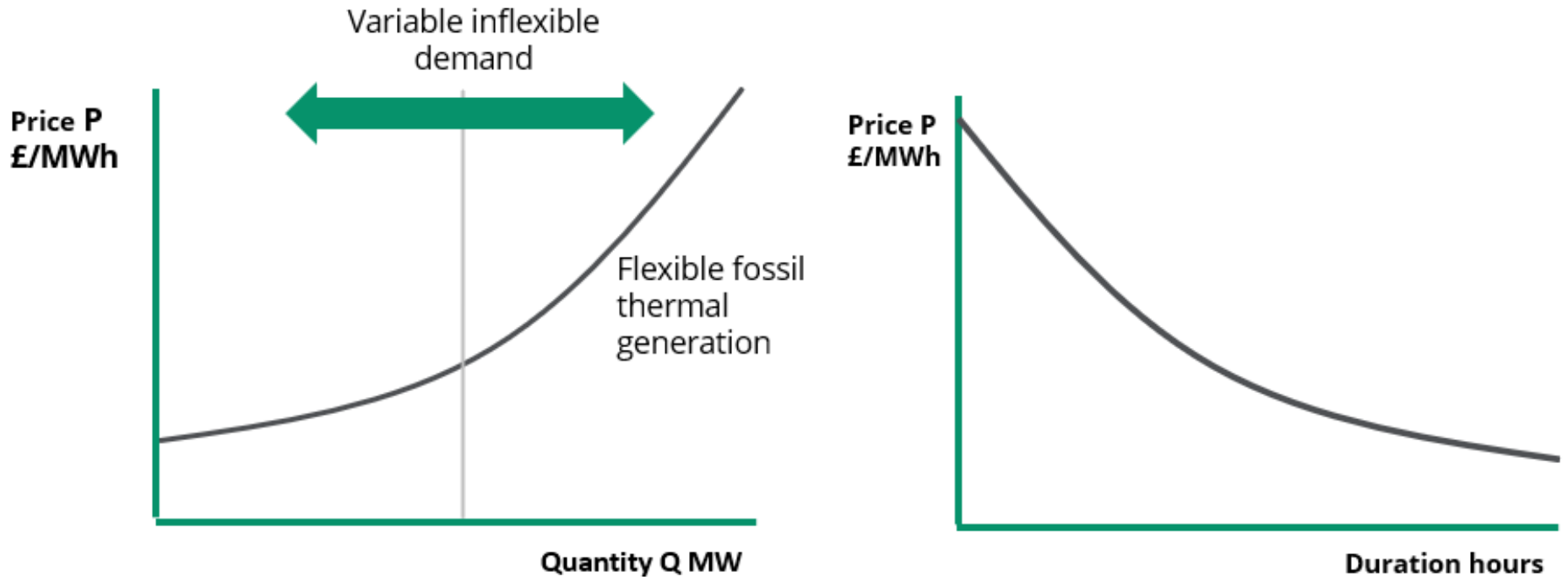
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Old paradigm (still the basis of all power systems)



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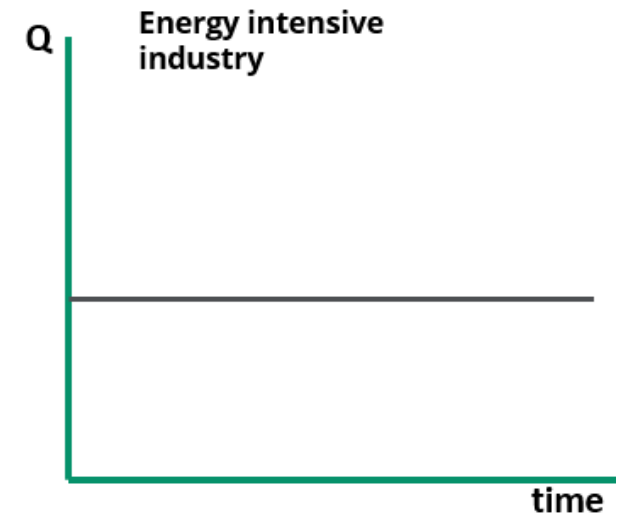
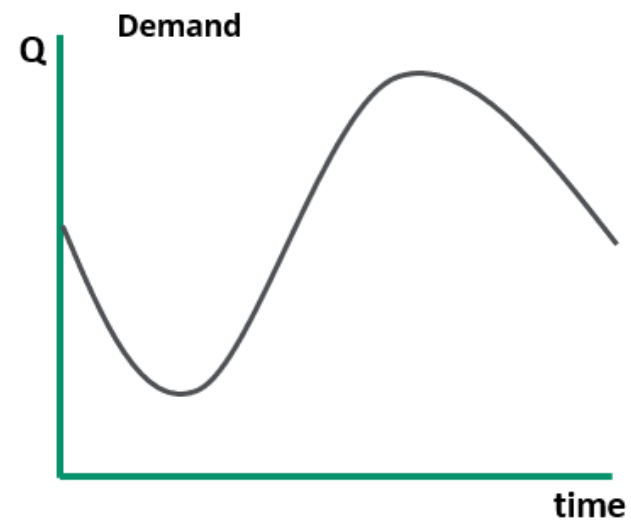
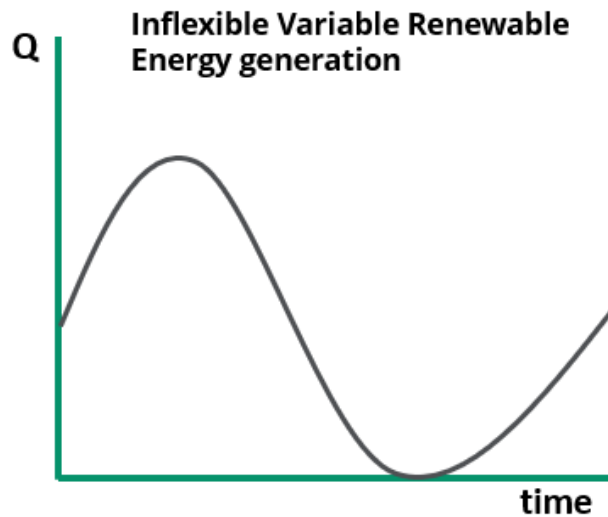
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Stylised new paradigm (firstly ignoring flexibility)



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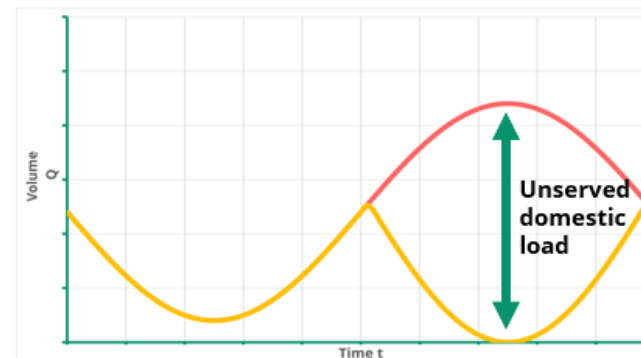
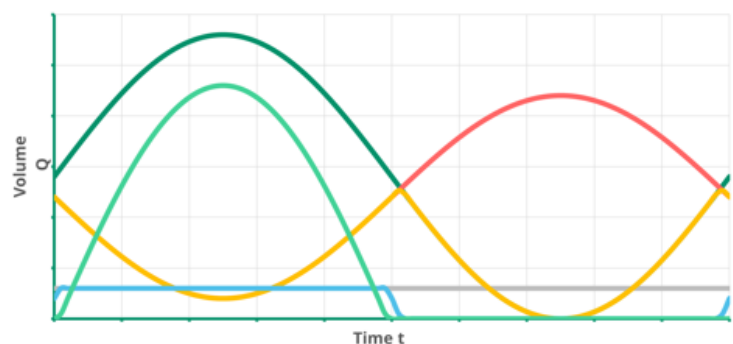
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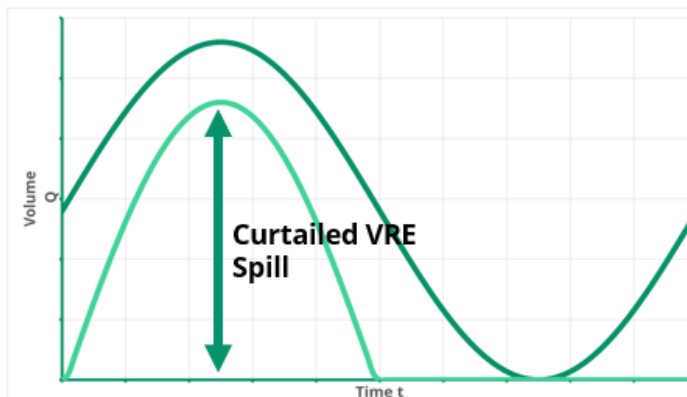
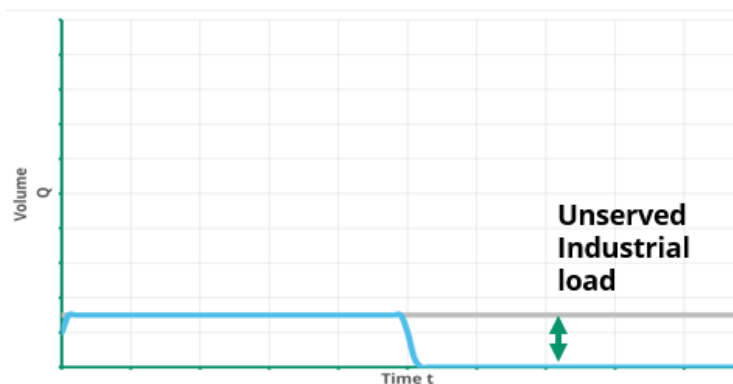
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Outcome with no flexibility



- VRE availability** (dark green line)
- Wasted spill** (light green line)
- Industrial demand** (grey line)
- Industrial demand served** (blue line)
- Residential demand** (red line)
- Residential demand served** (yellow line)



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Solutions to the variability problem

Retain unabated fossil gen

Don't electrify heating

Don't electrify transport

Interconnection

Massive VRE capacity

Retain abated fossil gen

More nuclear

Increase flexible renewable

Increase flex of heat demand

Increase flex of transport demand

Increase flexibility of renewable

Electrical storage

Industrial turn down

Fail Carbon Budget (CB)

Fail CB or heat with Zero Carbon (ZC) molecules

Fail CB or transport with ZC molecules

Import without Guarantee of Origin is high carbon. Scope 2 carbon leakage problem

Massive spill curtailment. High levelized cost

Very high levelized cost

Cost and timing challenge

Increase volume of water and thermal power

Likely volume is limited

Building stock, thermal comfort, behaviours

Smart EV charging

Electrification of EV fleet and charging infrastructure takes time

Need to explore all flex methods

Need storage in all time domains

Use this infrequently as security of supply support

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Carbon footprint of interconnector import

- CCC sixth carbon budget *“until the power systems in the rest of Europe become fully decarbonised, there is uncertainty about the carbon intensity of imported electricity”*
- Since carbon-light Guarantees of Origin will be retained or sold, then import with no GO is at the residual mix (not the grid mix), probably about 1tCO₂/MWh



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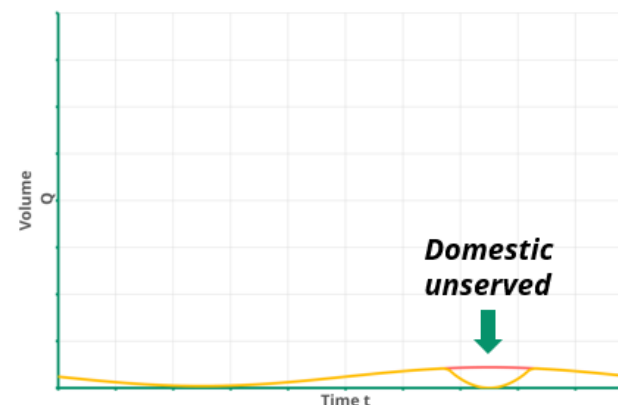
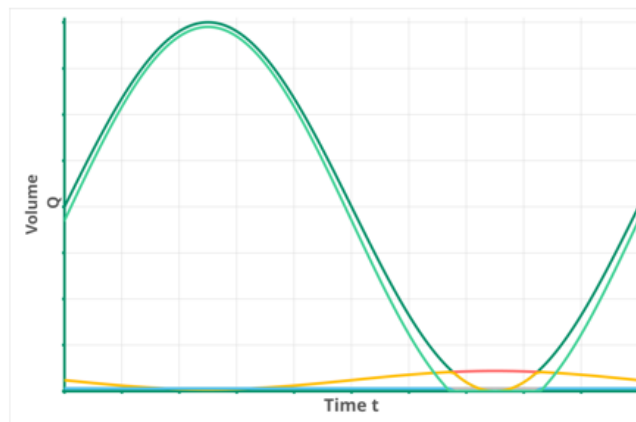
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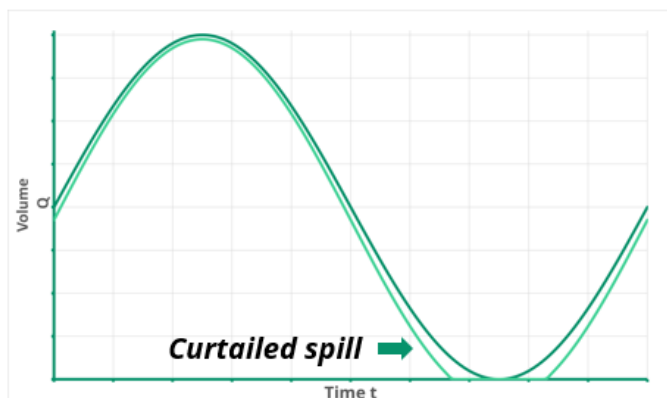
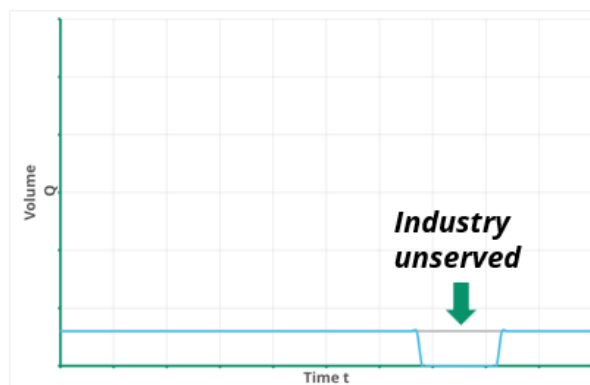
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Solution with massive VRE and no flex



Legend:
■ VRE availability ■ Industrial demand ■ Residential demand
■ Wasted spill ■ Industrial demand served ■ Residential demand served



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The Hydrogen Solution

- Possible with:
 - Massive offshore wind
 - Flexible hydrogen production
 - Storage
 - Some transport
 - Heating
 - Steelmaking
 - Very high capture CCS
- Not the focus of this presentation



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The Domestic Heating Solution

- Overhaul of the building stock and behavioural measures are truly the silver bullet
- However, in the face of decades of failure we cannot expect government to rely on this as the only solution
- Flexible heat demand is a form of storage and will reduce the amount of dedicated electrical storage needed
- Therefore, we wrap this solution with storage



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The Electric Vehicle Solution

- EVs have charging flexibility in space and time and there is no round turn cost
- EV stored volume is huge and can be V2X exported to some extent
- However, electrification of transport and flex charging will take time
- Therefore, we wrap this solution with storage



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Solutions to the variability problem

Increase flexible renewable

Increase flex of transport demand

Increase flex of heat demand

Energy storage

Increase flexibility of renewable

Industrial turn down

Increase volume of water and thermal power

Yes but our volume expectation is limited

Yes and today we will wrap this up with electricity storage

Yes and today we will wrap this up with electricity storage

Need storage in all time domains

Need to explore all flex methods

Use this infrequently as security of supply support

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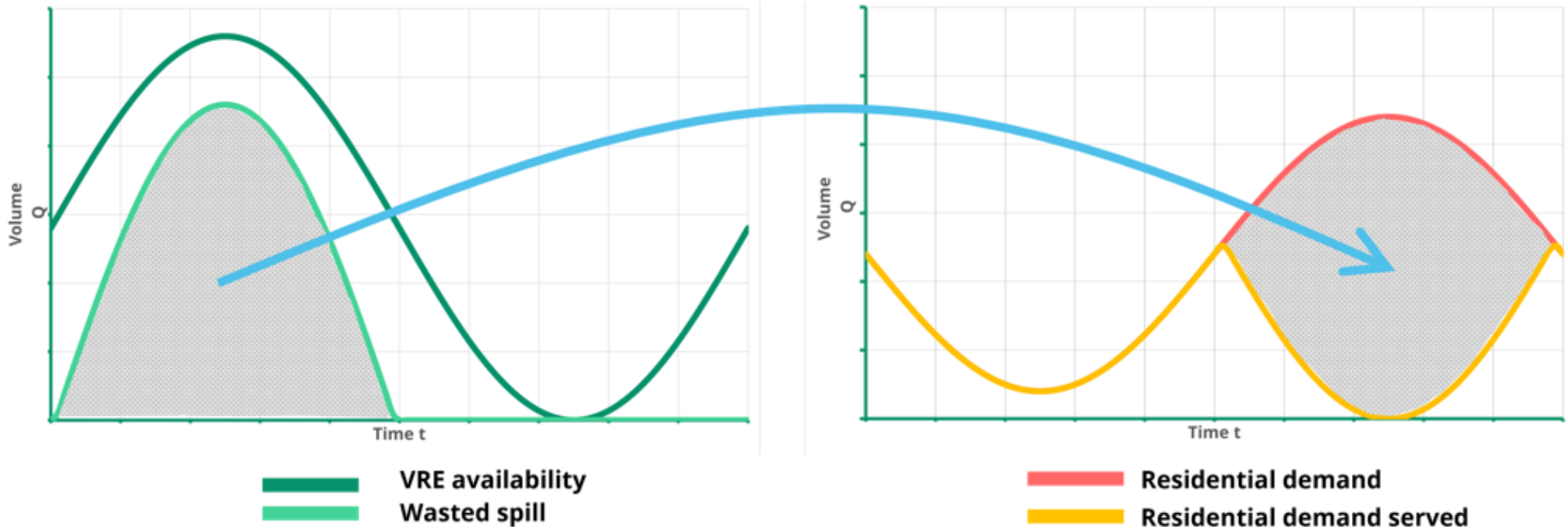
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Resolution of curtailed spill and lost load with stored energy (round turn, heating, EV)



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Flexibility

- Flexibility, including storage, is **essential**
- Flexibility with long notice is very much cheaper than standby flexibility
- Non-firm contracts delay the flexibility signal
- We need to:
 - Harness all forms of flexibility
 - Form timely volume signals over all time domains to decade
 - Form timely price signals from the volume signals
 - Enable harmonised transactions in all five markets



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Flexibility and the five markets

| | Challenge | Solution |
|-------------------------|---|---|
| Contract for Difference | Power is spilled to the system with limited notice. No penalty for variability. No reward for flexibility | Add option for firm CFD Mandate and reward forecasts |
| Capacity Mechanism | Only provides a backstop. Only partially firm | Add strike price Add firmness |
| Wholesale Market | Partly foreclosed. Reliant on gas to set price. Not integrated with CfD, CapMech or reserve | Enhance granular price discovery, especially in the 0-72 hour horizon |
| Reserve Markets | Not integrated with CapMech and Wholesale. Hard to revenue stack | Continue with ongoing harmonisation Add firmness |
| Balancing Mechanism | OK. But Balancing Services Use of System Charges (BSUoS) are large, increasing, and uncertain | Voluntary 5 minute balancing Maintain dual cashout option |

NB the Balancing Mechanism is the firmness enabler in the Wholesale Market



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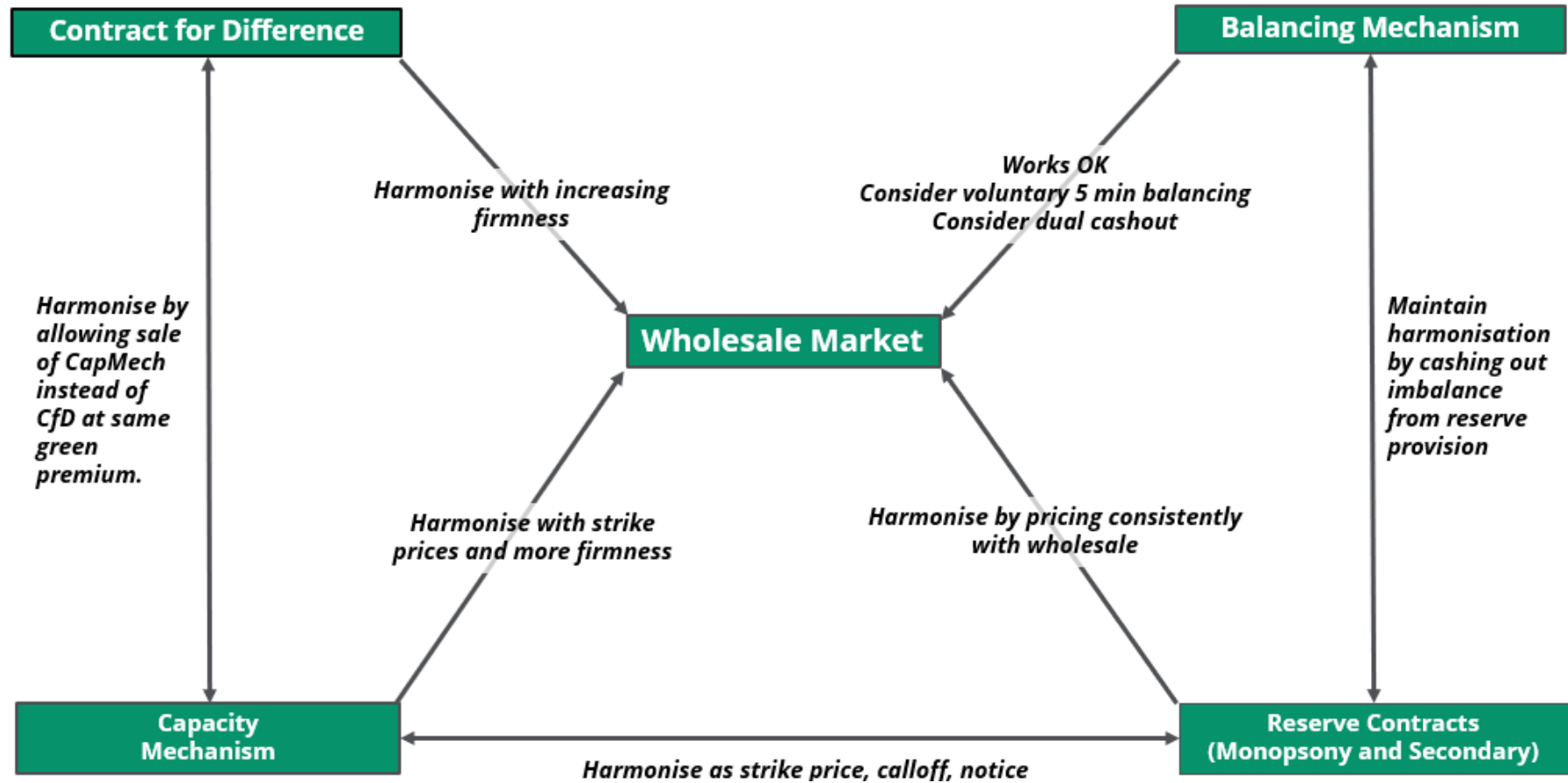
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Bringing the five markets together



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The four main price discovery requirements

Half hourly prices to 72
hours to enable
operational
optimisation with
installed kit

Annual price duration
curve to estimate load
factor and InfraMarginal
Rent

Annual baseload price for coarse
investment decisions for
generators

Periodic (diurnal, weekly,
seasonal) volume and price
signals to enable *structural*
decisions for type and
configuration of kit

0

72 hours

One year

Ten years



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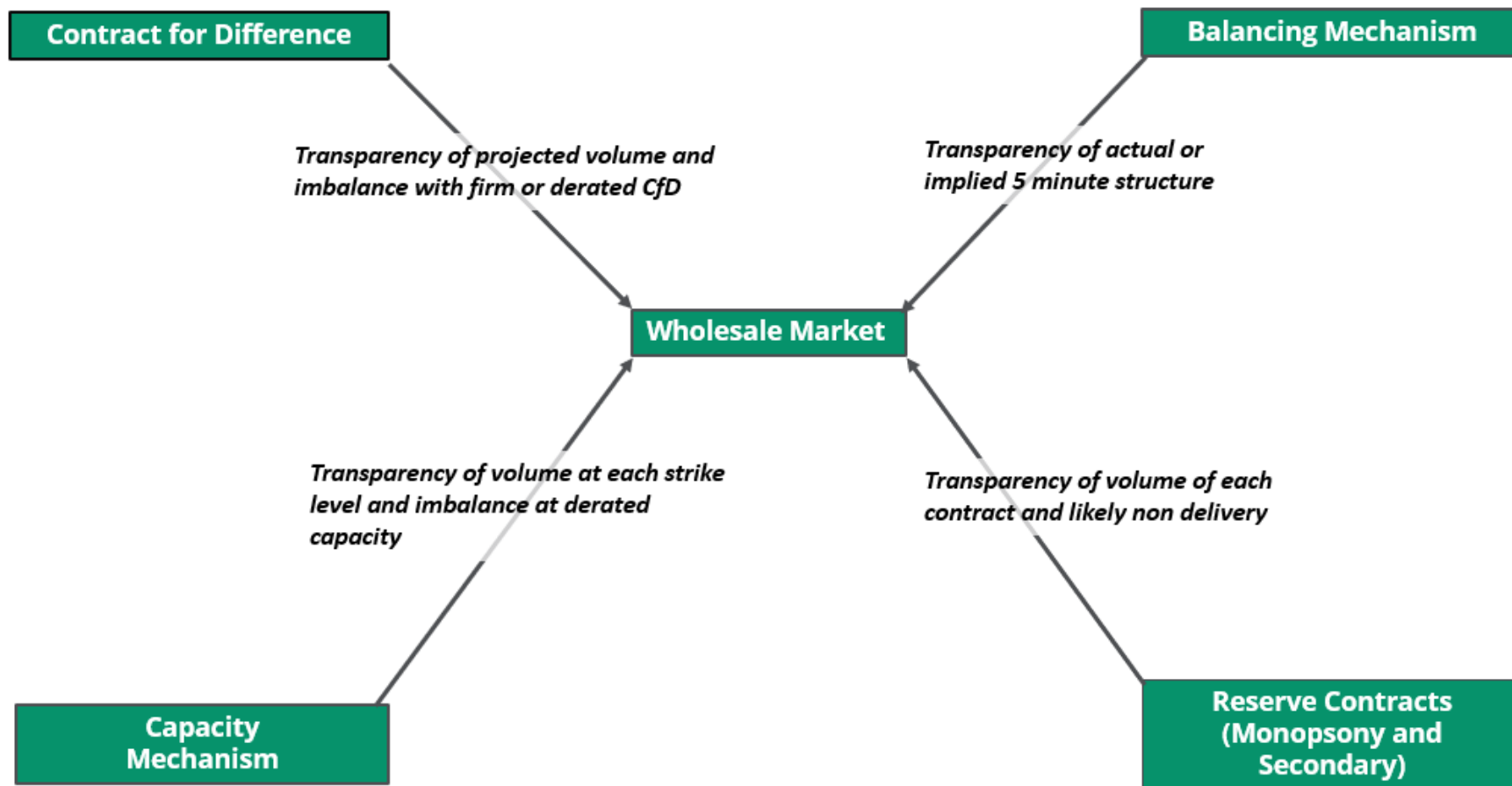
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Price formation, discovery and transaction



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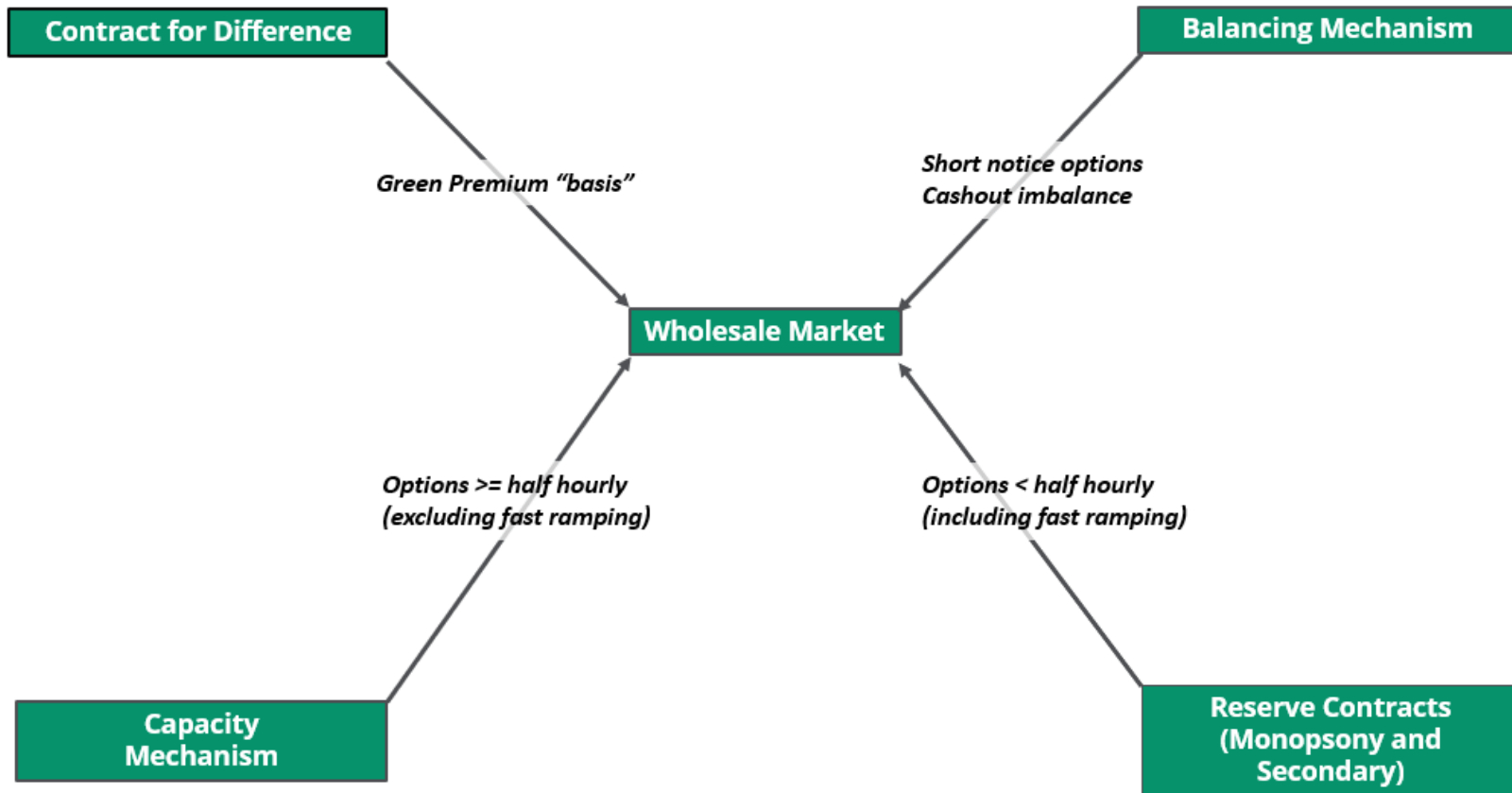
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All five markets are facets of one wholesale market so we can concentrate liquidity



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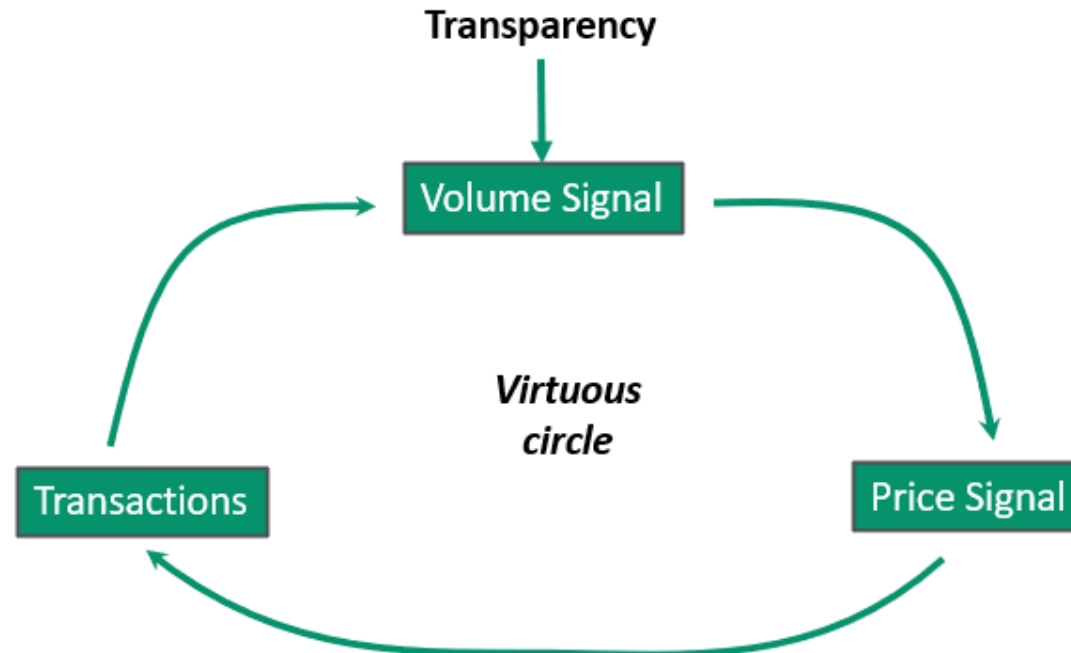
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System and Market Operator roles in conveying information

Firm CfD volumes, derated CfD volume profiles, CapMech volumes at each strike, open Wholesale volume, Reserve contracts procured, 5 min balancing profile history



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Links with recent government energy policy

- **March 2023** - Powering Up Britain – The Net Zero Growth Plan – re-affirmation
 - *“Fully decarbonise the power system by 2035”*
- **May 2023** - Strategy and Policy Statement – Flexibility is one of the three Strategic Priorities
 - *“Flexible and responsive markets”* ensure that the *“Energy System is Fit for the Future”*
 - *“Competitive, coordinated and effective flexibility markets which are open to technologies of all sizes”*
 - *“Unabated natural gas is phased out”.*



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Conclusion

- It's all about flexibility (including storage)
- Transparency enables volume and thence price signals
- Price signals improve liquidity which improves price signals
- Non-firmness is a challenge as it delays revelation about flexibility need and does not provide a price signal
- Bringing together the five harmonised markets improves transparency, liquidity, transactability and investability
- At the required system reliability level, this harnessing is massively cheaper than the alternative with no REMA change, and thereby enables the Just Transition



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Session 1 continued: EXPLORING REMA | 11:00-11:30

Update from Government and REMA Next Steps

- **Alisha Ali**, Department for Energy Security and Net Zero

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