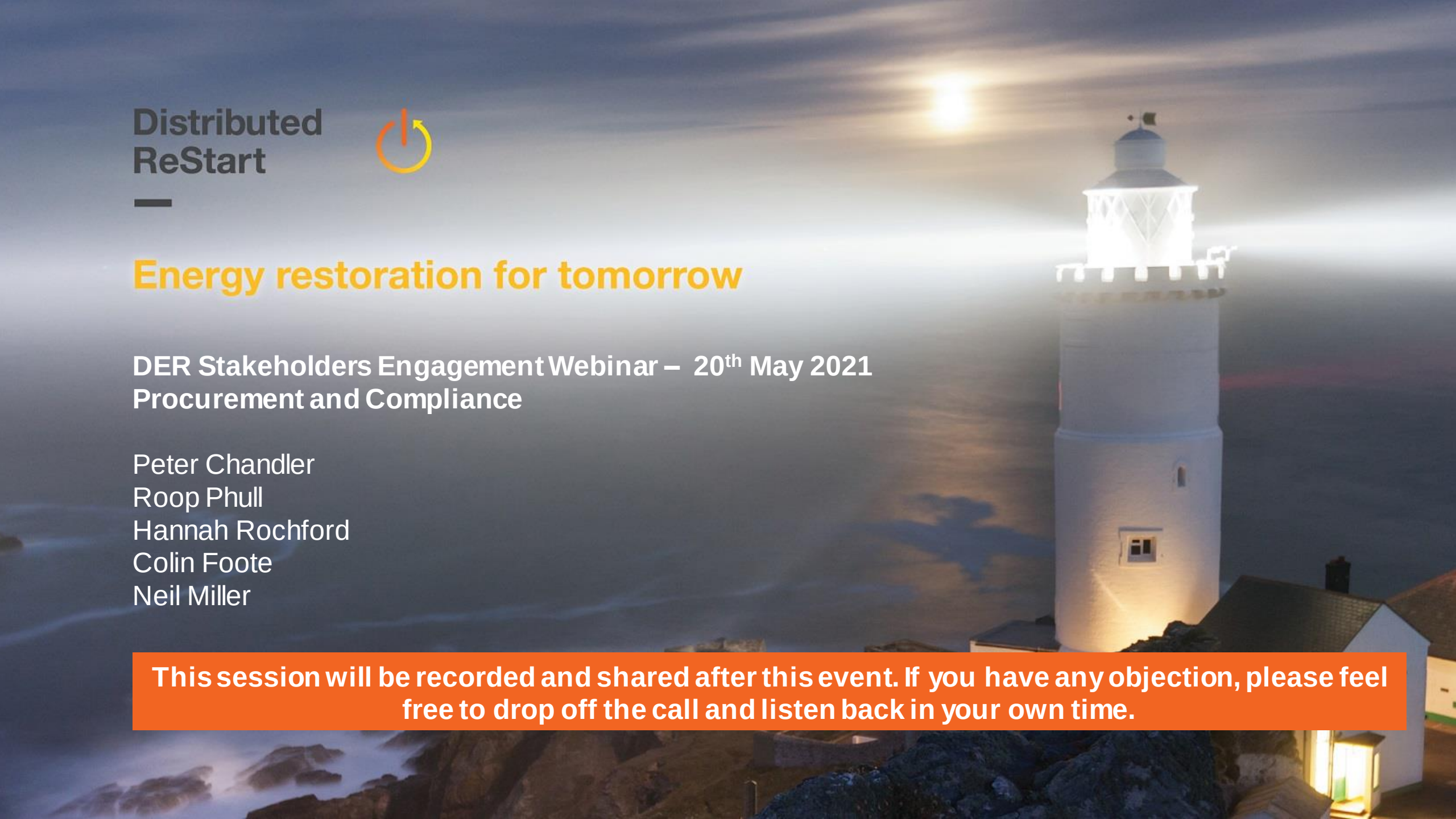

Distributed ReStart

Energy restoration for tomorrow

DER Stakeholders Engagement Webinar – 20th May 2021
Procurement and Compliance

Peter Chandler
Roop Phull
Hannah Rochford
Colin Foote
Neil Miller

This session will be recorded and shared after this event. If you have any objection, please feel free to drop off the call and listen back in your own time.

Distributed ReStart

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Agenda

- Welcome
- Purpose of this session (10 mins)
- Procurement process map (20 mins)
- Functional requirements (20 mins)
- Rules of play (10 mins)
- Compliance (5 mins)
- Q&A (20 mins)
- Next steps

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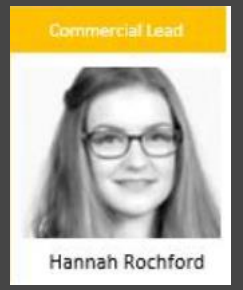
Presenters



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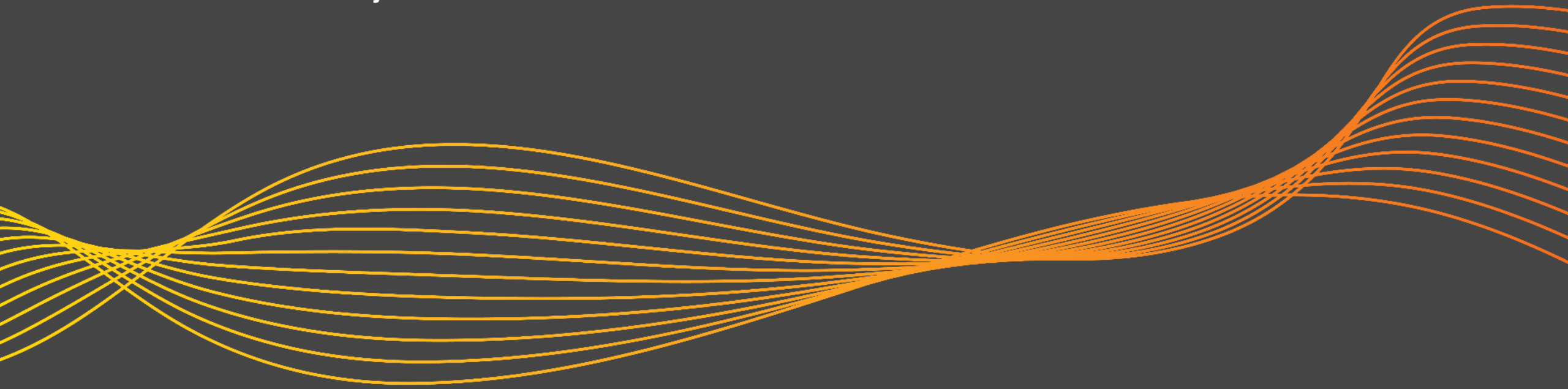
Purpose of this webinar and overall project update

Peter Chandler – ESO Project Lead



Purpose of this session and how you can help

We will share our initial proposals with you today

Give us your initial feedback

Review and challenge the detailed content

Come talk to us after this event to help co-create the final content

Your input today and in the bi-lateral meetings afterwards, is fundamental towards making this process work

Project progress

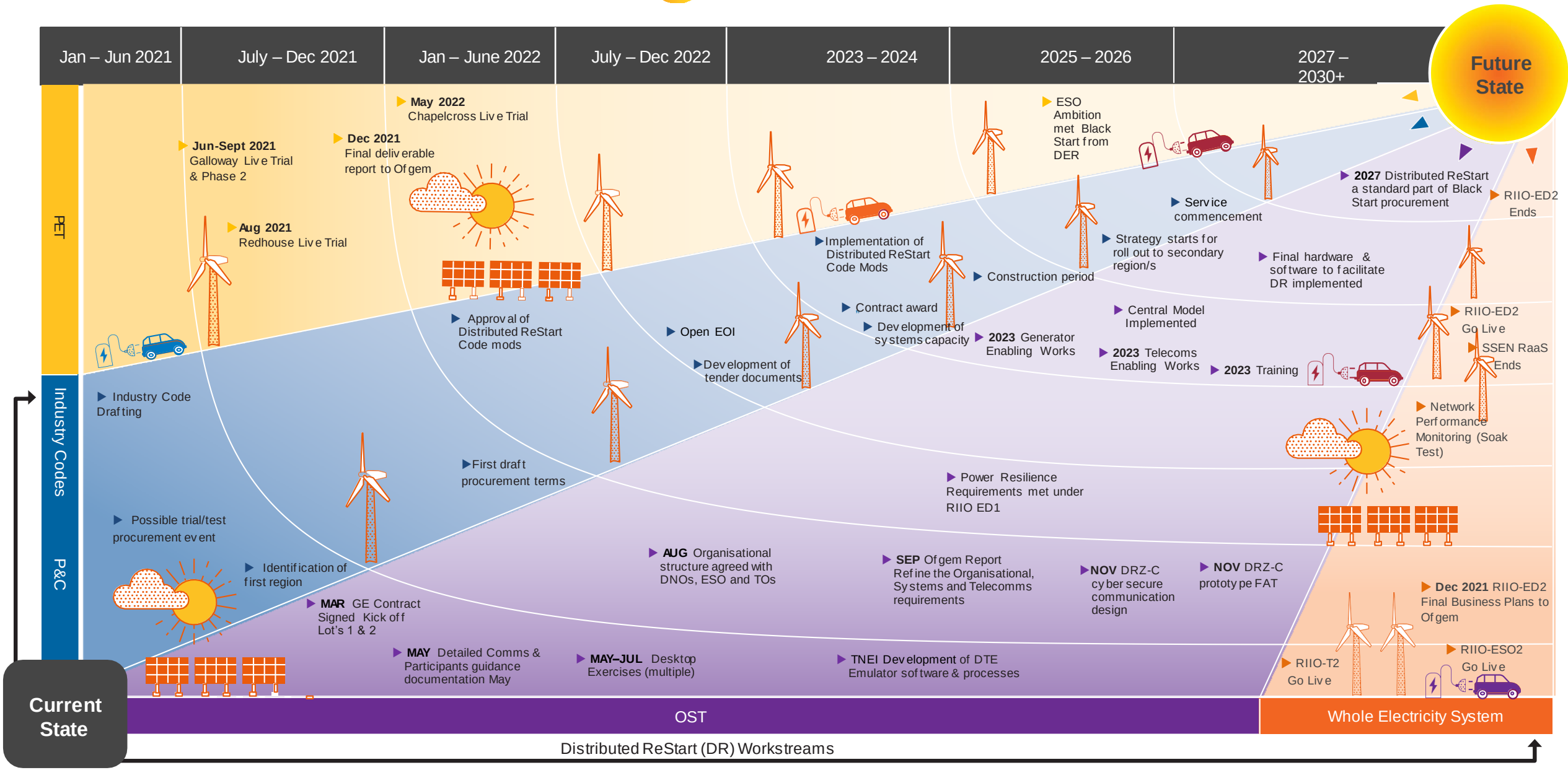
Project timeline for the remaining planned activities

Presenter: Peter Chandler

Slido #PCDER

Distributed ReStart Roadmap

KEY: PET – Power Engineering Trials workstream | P&C – Procurement and Compliance workstream | OST – Organisational, Systems and Telecommunications workstream | Whole Electricity System



Presenter: Peter Chandler Slido #PCDER

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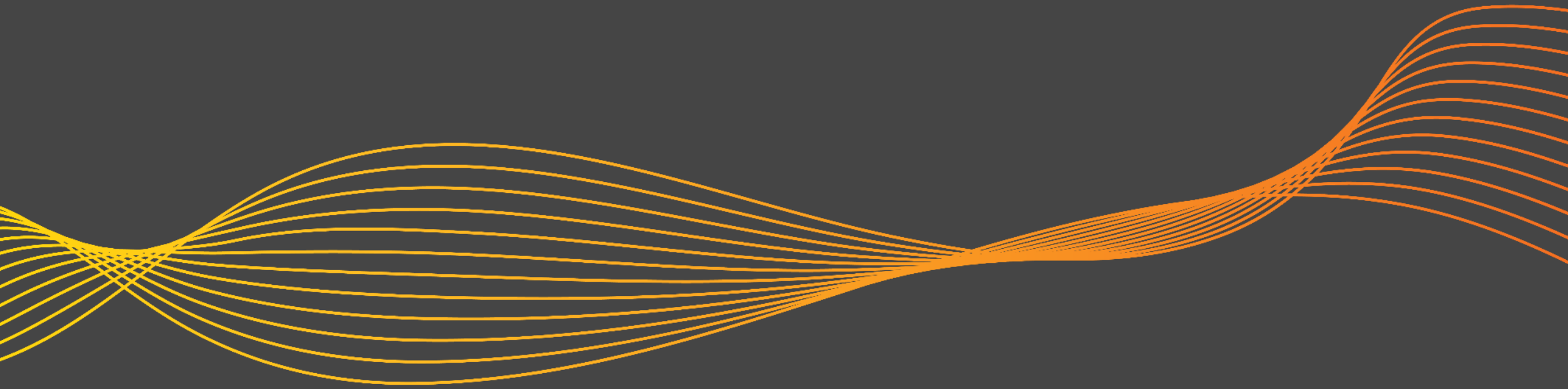
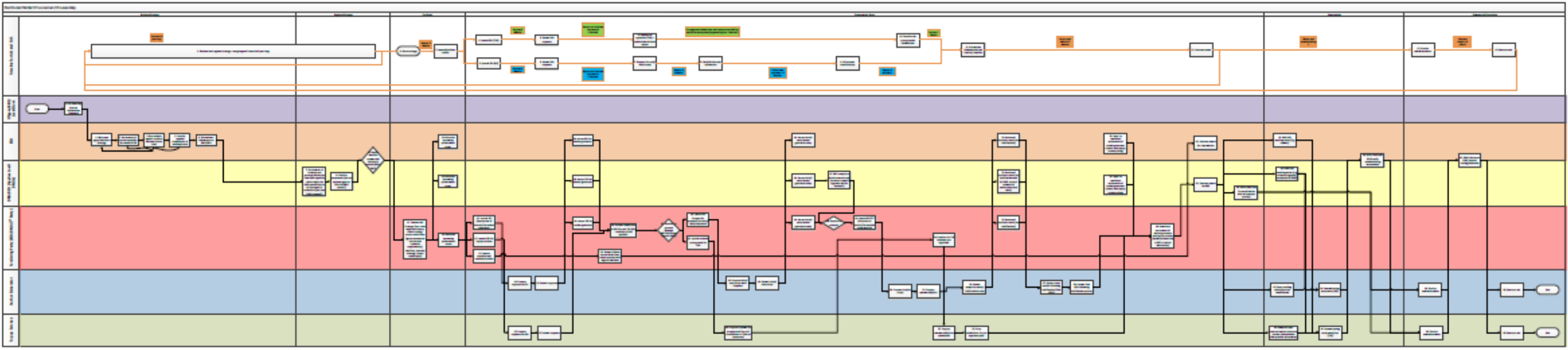
Procurement process

Hannah Rochford – Commercial Lead



Procurement End to End Process Map

View of our end to end process map:



Stages of the procurement process:

National Strategy → Regional Strategy → Pre-Event Commercial Strategy → Procurement Event (Submissions, studies & assessment) → Contract Award, Construction, Commissioning → Contract Delivery

Yearly

3 Months

Presenter: Hannah Rochford

Slido #PCDER

Procurement End to End Process Map

Anchor generator tender process

Top-up services tender process

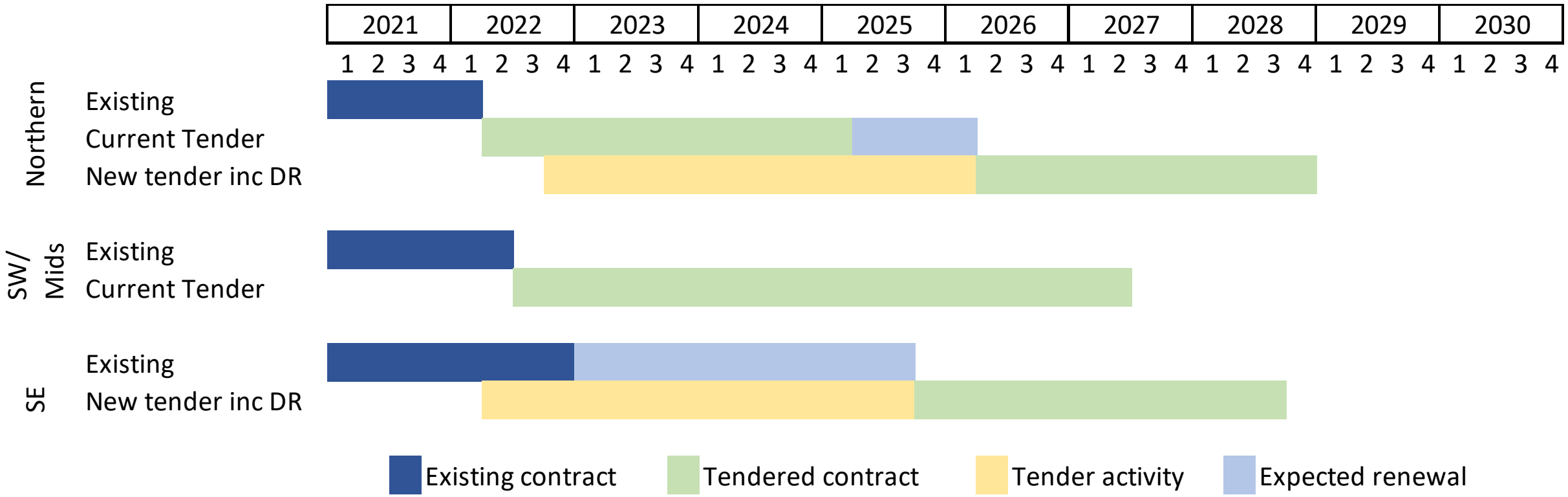
Presenter: Hannah Rochford Slido #PCDER

Procurement End to End Process Map

What we would like feedback on:

- Does the process make sense?
- Any issues for your businesses with what we've designed?
- Thoughts on proposed timelines?
- Thoughts on who the tendering party should be?
- Any questions on what we have designed?

Proposed initial roll-out of a black start from DER service



Presenter: Hannah Rochford

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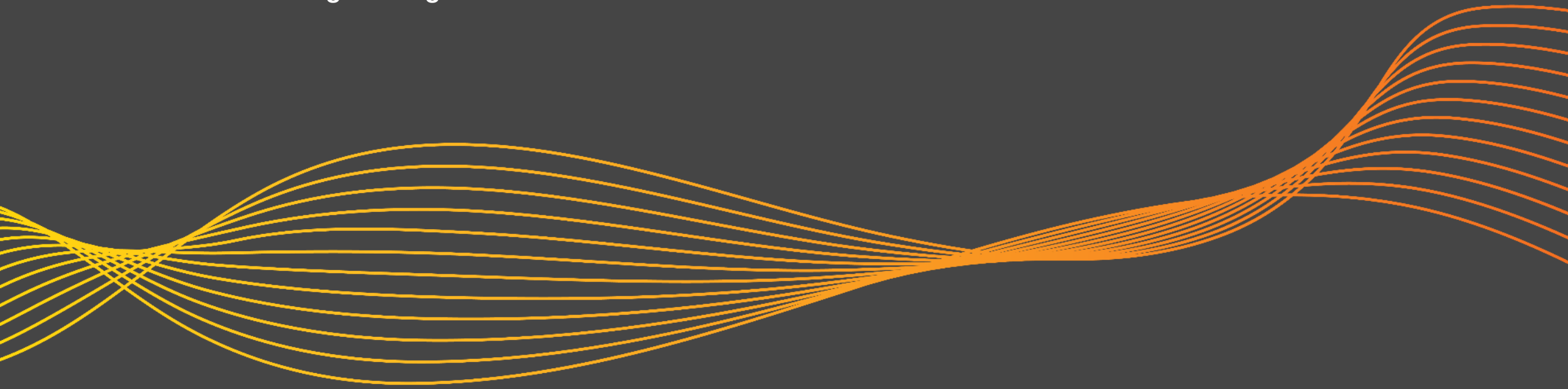
Functional Requirements

Neil Miller – Power Engineering Trials Workstream Lead

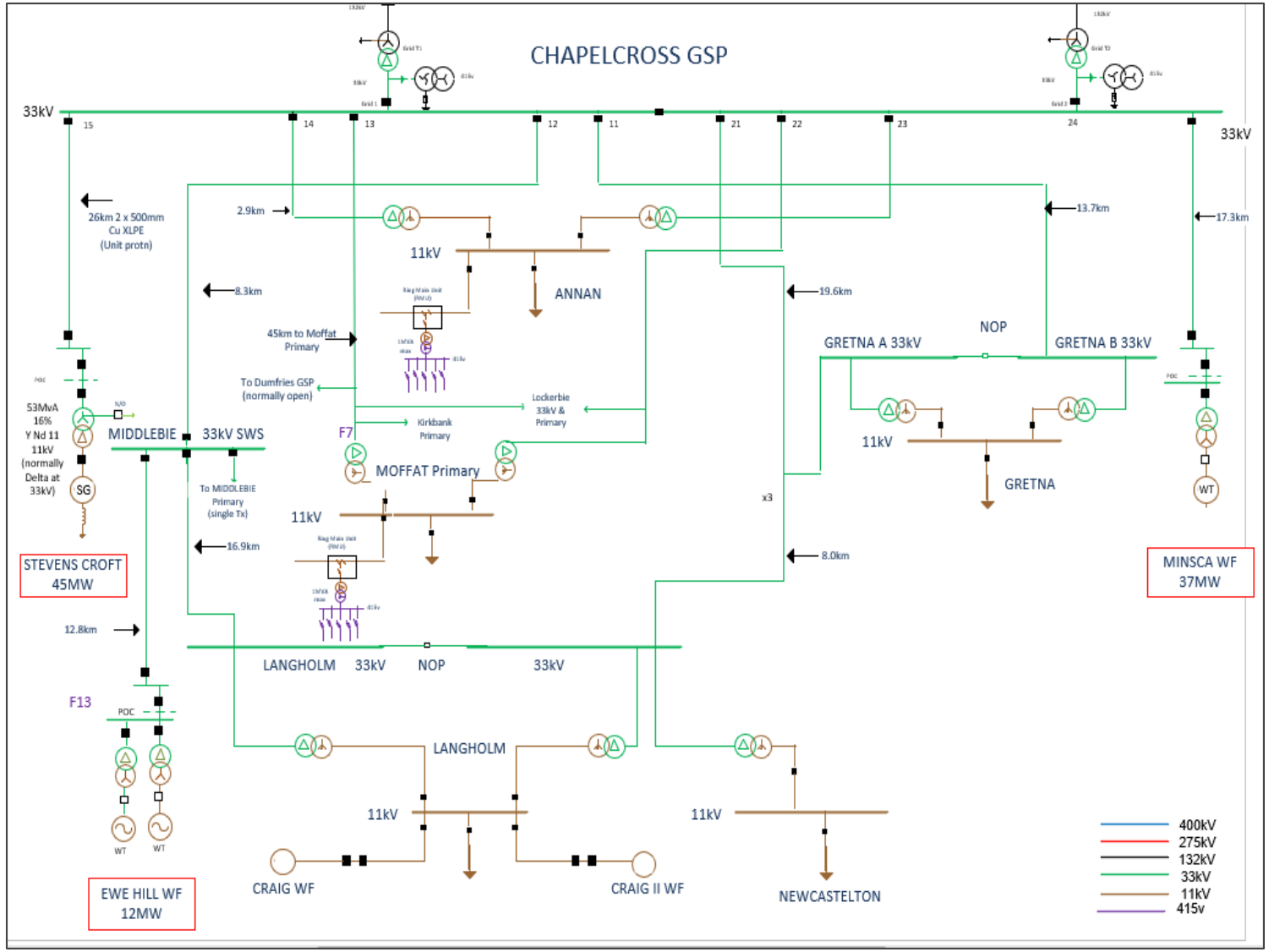


Distributed ReStart – Functional requirements

Distribution Restoration Zone (DRZ)

What do we want to do?

- ✓ Energise distribution network (primarily 33kV then below) independent of grid infeed.
- ✓ Block load demand pick up (while maintaining f>47.5Hz)
- ✓ Use all available DER (including intermittent) to 'grow' the power island.
- ✓ Control the f & V + stable network
- ✓ Ensure network faults are detected and cleared.
- ✓ Facilitate energising of higher voltage networks (132kV, 275kV & 400kV)



Presenter: Neil Miller Slido #PCDER

What services do we need from DER to achieve a DRZ

The total requirements for each DRZ will be site specific (depending on the scope of the DRZ and capability of DER within), but will consist of the following:

Service	Requirement	Description	Potential providers
Anchor generator (or power park)	Essential	Only one anchor generator is required per power island. Self-start and provide a controlled voltage source, able to energise the network to reach the next resource.	Synchronous generator, or other technology with required capability. A single point of connection is required with the DNO network.
Fast MW Control	Potential	May be required to supplement technical capability of anchor generator for example enhance block loading.	Battery, loadbank, flywheel, generator, others.
Inertia	Potential	Increase frequency stability of the DRZ and/or/ allow greater demand blocks to be picked up.	Synchronous generator, synchronous compensator (an inherent response is required without any measurement delays), others.
Frequency control	Potential	May be required to support the anchor generator to maintain frequency parameters during normal operation.	Synchronous generator, converter based sources with appropriate control, others.
Voltage control	Potential	May be required to enhance the MVAr capability of the DRZ to expand the island/energise to a higher voltage.	Wind farm, solar, battery, synchronous gen, Statcom, SVC, others.
Short circuit level	Potential	Increase the DRZ fault level. Facilitate protection operation at higher voltage levels or converter DER to connect	Synchronous generator, synchronous compensator, others.
Energy (MWh)	Potential	Enhance capability of the DRZ to restore demand above the capacity of the anchor generator. This could come from other any other gens on the island. (May be schedulable or intermittent.)	Schedulable MW - Synchronous generator (additional to the anchor), Intermittent resources (constrained and controlled by a set point),demand side management, others.

Requirements for an anchor generator (overview)

Technical:

- Time to connect
  - **≤8h**
- Voltage Control
  - **continuous with set point and slope**
- Frequency Control
  - **fast action proportional control**
- Block Loading Pickup
  - **≥ 2MW**
- Reactive Capability
  - **0.95 lead/lag pf minimum**
- Sequential Start-ups
  - **≥ 3**
- Short Circuit Level
  - **≥ 1xDER MVA rating**
- DRZC specific technical requirement
  - **tbc**

Resilience:

- Service availability
  - **≥ 90%**
- Resilience of Supply (service)
  - **≥ 72h up to 120h**
- Resilience of Supply (auxiliaries)
  - **120h**

Requirements for Top up services (technology neutral)

Technical:

- **Fast MW Control**
  - **≤200ms**
- **Inertia**
  - **inherent MW to f response (no measurement delays)**
- **Frequency Control**
  - **of active power (MWs)**
- **Voltage Control**
  - **slope or set point control**
- **Short Circuit Level**
  - **≥ 1xDER MVA rating**
- **Energy (MWh)**
  - Generate MWs within 10s of request

Resilience:

Resilience

- **Maintain control & comms up to 72h**
- **Service for minimum 72h duration**
- **Availability 90% of year**
- **Declare time to provide after black start (indicate if dependent upon length of time after the black out)**

Distributed ReStart – Functional requirements

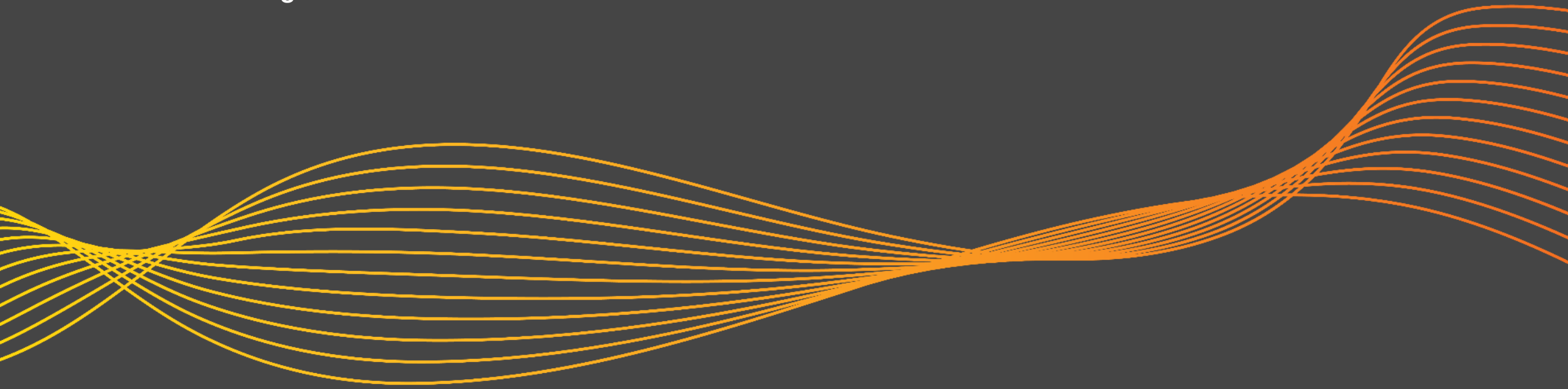
What we would like feedback on:

- Are the proposed services inclusive of legacy/existing technology?
- Are the proposed services cost effective to provide?
- Have we set the bar right? Is it too high or too low?
- Are there any technical services missing which could be provided to assist a DRZ?
- Are they technology agnostic/neutral?
- Other…..?

Distributed ReStart

Rules of Play

Colin Foote – Design Architect



Distributed ReStart – Rules of Play

- ✓ The requirements to be met by the combination of potential providers for a feasible Distribution Restoration Zone (DRZ).
- ✓ Supplement the technical requirements to be applied to Anchor Generators (AG) and Top-Up Service (TUS) providers individually.
- ✓ Specify what needs to be true with all participating Distributed Energy Resources (DER) in an area working together effectively.
- ✓ Will inform the assessment of potential DRZs and service providers in the early stages of the procurement process.
- ✓ The rules reflect the essential technical services and give a relatively simple set of key requirements.
- ✓ Might be assessed for all Grid Supply Points (GSPs) across Great Britain and the values published, possibly as part of the annual Long Term Development Statement (LTDS).

FOUR RULES

AVAILABLE > **REQUIRED**

Presenter: Colin Foote Slido #PCDER

Distributed ReStart – Rules of Play – 1. Power

Power Required = 60% * Maximum MW Demand in a DRZ

Power Available = Anchor MW * 90% + ∑ (TUS MW * Intermittency Factor)

The excess Power Available will inform an assessment of what the DRZ may be used for, i.e. whether it can go beyond restoring demand within its own boundary.

If the rule is not satisfied there may, in some circumstances, still be interest in development of a DRZ that focuses on transmission restoration or network resilience services only.

Distributed ReStart – Rules of Play – 2. Block Load Pick Up

BLPU Required = Largest Necessary MW Block Load in a DRZ

BLPU Available = ∑ (DER BLPU Capability)

If BLPU Available is notably high then it suggests that the DRZ may be useful in energising other DNO areas, transmission-connected demand, or providing start-up power to large power stations or other resources.

If the rule is not satisfied with the resources considered in the initial assessment, then a review might be conducted to identify opportunities for improvement, e.g. the addition of a controllable load bank may enhance the BLPU Available sufficiently.

Distributed ReStart – Rules of Play – 3. Reactive Power

Mvar Required = The total Mvar gain of circuits in the DRZ distribution network

Mvar Available = ∑ (DER Mvar Absorb Capability) * Mvar Range Reduction Factor

The excess Mvar Available will inform an assessment of what the DRZ may be used for, i.e. how far into the transmission network might be energised.

If the rule is not satisfied then the scope for providing additional Mvar capability might be considered, e.g. installation of reactive compensation.

Distributed ReStart – Rules of Play – 4. Fault Level

Fault Level Required = Minimum Acceptable Fault Level at GSP

Fault Level Available = ∑ (DER Fault Level Infeed) * Fault Level Reduction Factor

The excess Fault Level Available will inform an assessment of what the DRZ may be used for, i.e. how far beyond the DRZ boundary might be energised, and how much additional fault infeed may be necessary to support energisation up to 275/400 kV.

If the rule is not satisfied then the scope for providing additional Fault Level might be considered, or means of reducing the requirement might be considered, e.g. modifying network protection.

Distributed ReStart – Rules of Play – Areas for Feedback

- We're assuming that the Intermittency Factor for Top-Up Service providers will depend on the technology type. The factors used in the Capacity Market may be appropriate, e.g. 9% for wind, 1.5% for solar. Any thoughts?
- BLPU capability encompasses Fast MW Response, frequency control, and inertia, which are all related. Do you know the capability of your plant? For example, what increase in power is possible in 200 ms?
- How common is it for actual reactive range to be significantly greater than what is required by the Codes? Is reactive power available at zero MW?

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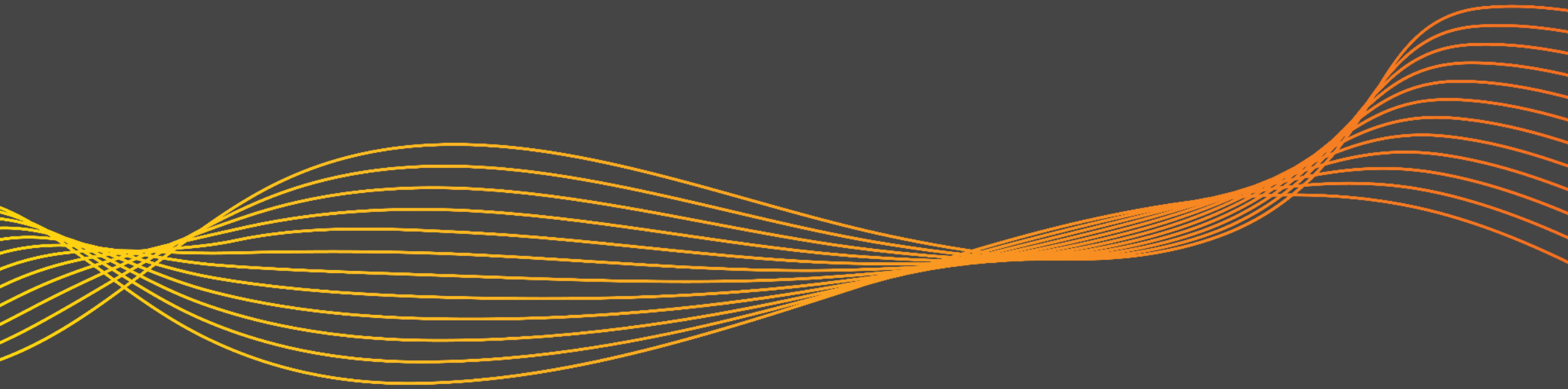
Compliance

Hannah Rochford – Commercial Lead



Industry Code Considerations

Industry Codes we're drafting changes to:

- Grid Code
- Distribution Code & G99
- CUSC & BSC
- DCUSA

We're furthest along with Grid Code and Distribution Code.

At present we have drafted changes with an assumption the Anchor Generators are CUSC parties which mean they have to adhere to the Grid Code requirements.

We want to understand your thoughts on this assumption.

We understand the benefits and drawbacks of acceding to the CUSC are as below:

Benefits

- Compliance with the Grid Code, where current black start requirements are held
- Accessible to the ESO Control Room

Drawbacks

- Smaller assets do not currently have to comply with the CUSC and Grid Code
- Extra requirements (cost, administrative, liabilities) to adhere to, on top of Distribution Code requirements

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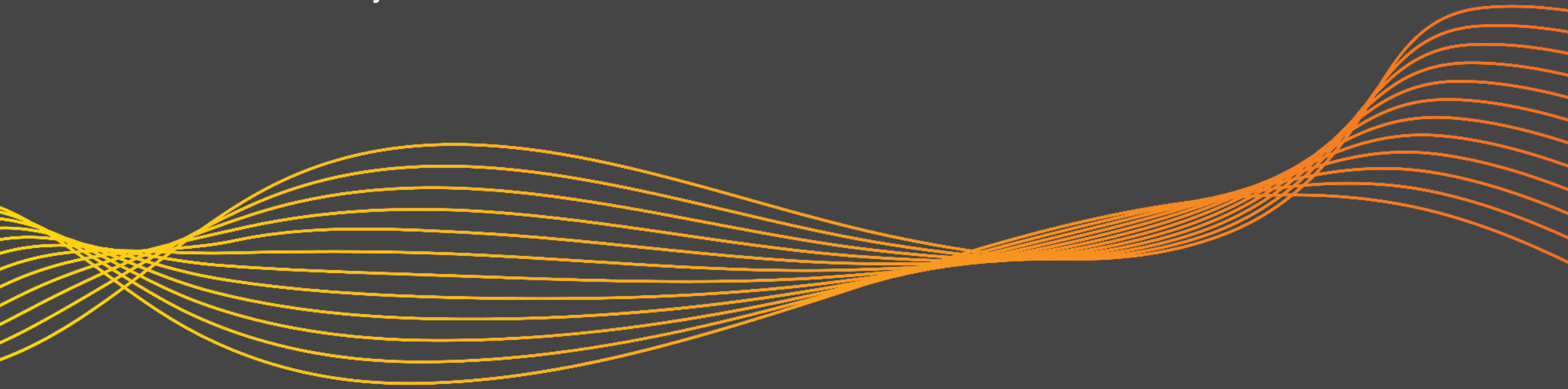
Q&A and Next steps

Peter Chandler – ESO Project Lead



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Questions

Please use Slido, Teams Chat or 'Raise your hand' in Teams for your queries and comments

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What happens next

The conversations will continue - register your interest for 1-2-1 meetings here

Slido poll open – tell us what areas you'd like to hear more about

Look out for more information about the test procurement event planned for summer this year

Thank you for your participation today

Any questions, please get in touch:
ReStart@nationalgrideso.com

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