

# Networks Customer Seminar Warwick



# House keeping

## **Fire Safety**

There is no planned fire alarm test today. Should the fire alarm sounds guests are asked to use the nearest fire exit and leave the building calmly

## **COVID**

No requirement to wear masks but please be mindful of space

## **Security**

In the event of a security alert, staff will direct us to a safe area

# House keeping

## **Facilities**

W.C's and restrooms located other side of the Network Lounge

## **Car Charging**

Park and Recharge App required

## **Break out space**

If you require a room, for any reason, please ask one of the team

## **Future Energy Scenario – Virtual Event**

Should you wish to view the virtual event a room can be provided

# Aims for today



Enable discussion



Networking



Share your questions and concerns



Share knowledge

# We will be using Sli.do today for audience participation

We want to ensure this session is as interactive as possible and there will be opportunities to ask questions throughout the day.

You can download the Sli.do app or access it on your device using the QR codes around the room. Please use code **#ncsjuly22** to access Q&A and polls.

**Please submit questions for the Ask the Panel session to Sli.do.**

# Agenda

Time	Item
9.30	Introduction and welcome
9.40	<ul style="list-style-type: none"><li>• Connections Heat Table and Transmission Connection Challenges</li><li>• Update on Construction Planning Assumptions Review</li></ul>
10.50	Refreshment break
11.05	<ul style="list-style-type: none"><li>• Connections overview: TEC Amnesty and Queue Management Update</li><li>• Whole Electricity System - Regional Development Programmes</li></ul>
12.30	Lunch – provided by Flying Cow Burgers
1.30	<p><u>Round Table 1</u> ESO Connections - Customer Portal <i>Introducing our new Customer Connections Portal and inviting suggestions for Phase 2 development</i></p> <p><u>Round Table 2</u> DER – Bilateral Connection Agreement Appendix G and Ways of Working <i>How the Appendix G process works, future changes and opportunities and inviting suggestions for improvement</i></p> <p><u>Pop Pods</u> <i>Our teams are here to talk to you, answer questions or just explain what they do and how it fits into the Connections Process</i></p>
3.00	Refreshment break
3.15	Ask the panel – representatives from OFGEM, BEIS, National Grid Electricity Transmission, NGENO
4.00	Close

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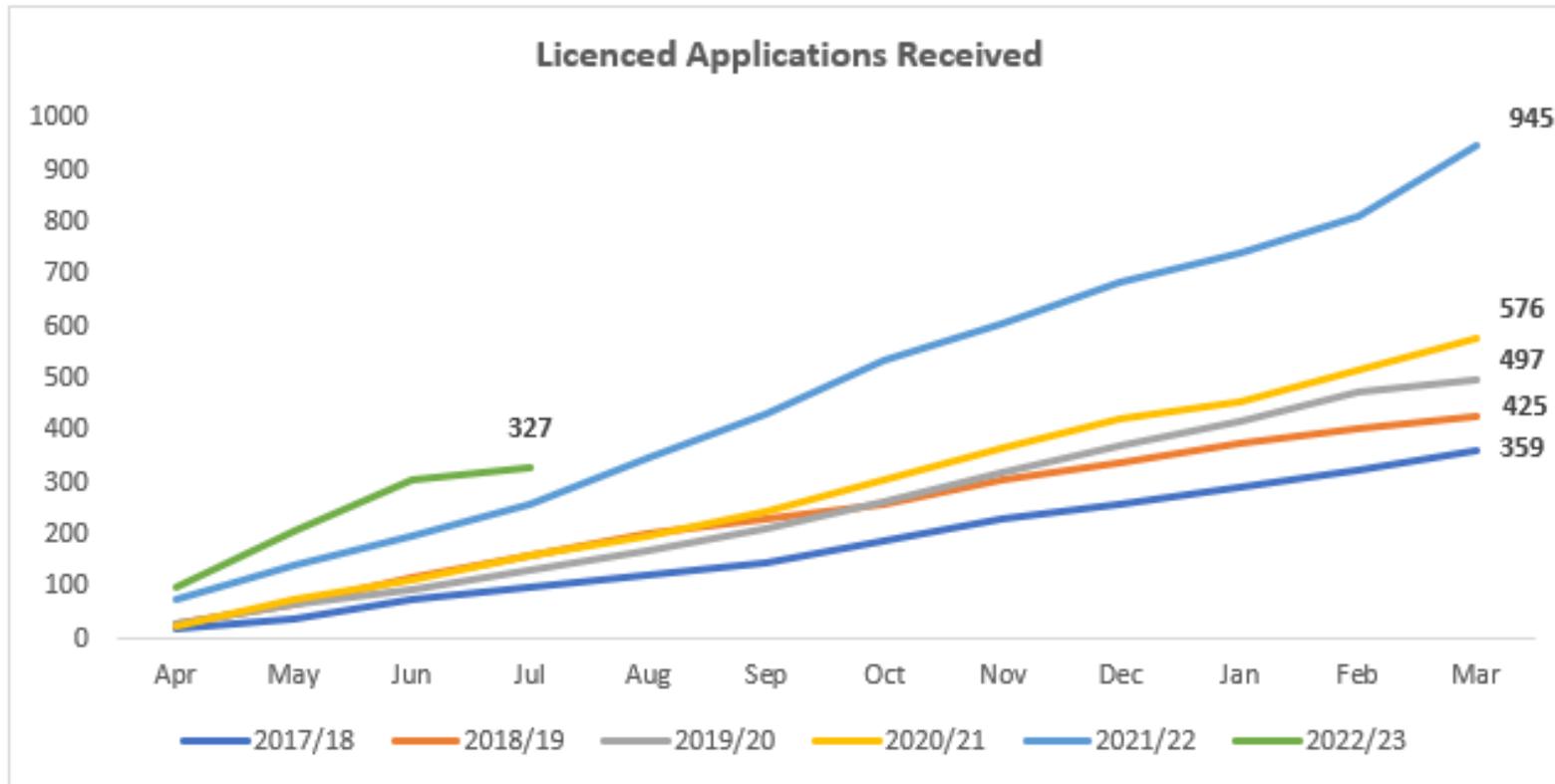


# Transmission connections challenges

Heat Map and Transmission & Distribution Queue

Transmission connections challenges

# What challenges are we experiencing?



The Transmission Contracted Connections background totals over **306GW** of generation and interconnectors

**Growth** of Licenced Transmissions Connection Applications

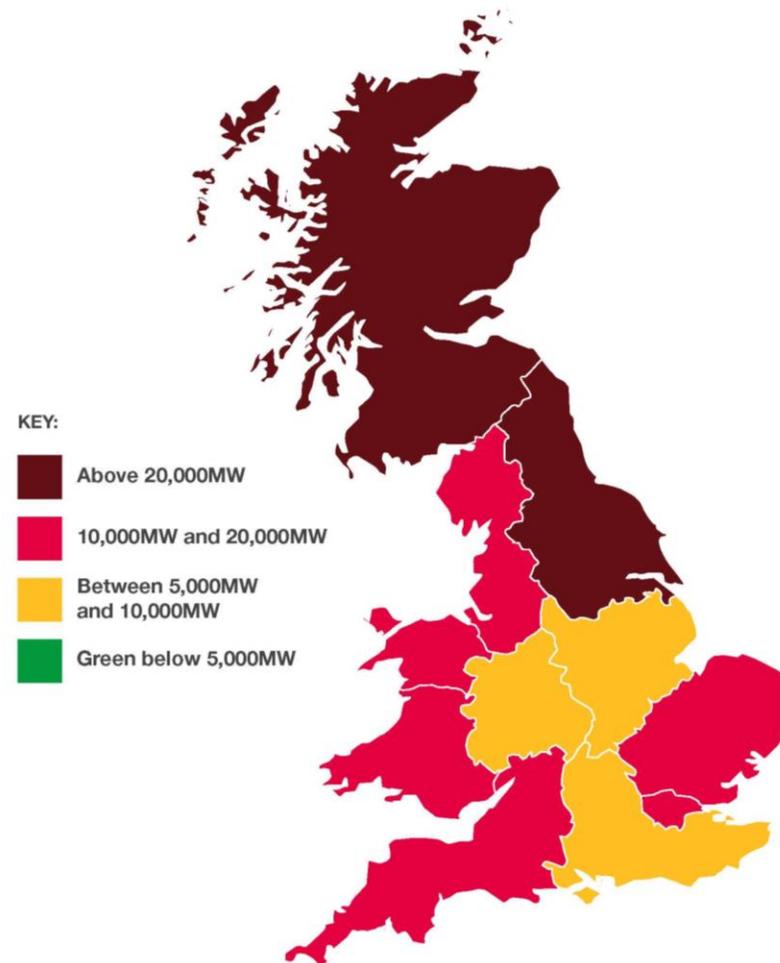
In FY23, 27% YTD

In FY22, overall 64%

## Transmission connections challenges

# Heat Map

A single plan view of the generation volume and type due to connect across GB by 2033



## Transmission connections challenges

# Heat Map



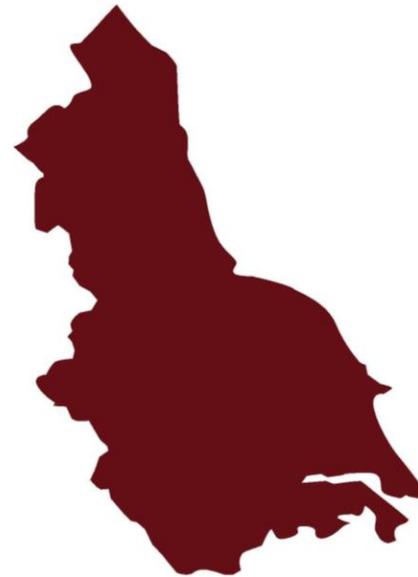
### SCOTLAND

	BESS	5,175
	BESS Non-Renewable	448
	BESS Renewable	1,080
	Pump storage	3,156
	Solar PV	89
	Sync Comp	61
	Thermal	40
	Tidal	247
	Wind Offshore	49,827
	Wind Onshore	10,717
	<b>Total</b>	<b>70,839</b>



## Transmission connections challenges

# Heat Map



### NORTH EAST

	BESS	2,622
	BESS Renewable	1,955
	CCGT	7,503
	Interconnector	1,000
	Nuclear	1,670
	OCGT	375
	Solar PV	560
	Tidal	247
	Wind Offshore	8,920
	Wind Onshore	985
	<b>Total</b>	<b>25,589</b>



## Transmission connections challenges

# Heat Map



### NORTH WEST AND North Wales

	BESS	649
	BESS Renewable	4,023
	Biomass	60
	CCGT	107
	OCGT	164
	Solar PV	114
	Thermal	50
	Tidal	390
	Wind Offshore	10,680
	Wind Onshore	348
	<b>Total</b>	<b>16,584</b>



Transmission connections challenges

# Heat Map



## EAST MIDLANDS

BESS	177
BESS Non-Renewable	4,737
Solar PV	2,117
Thermal	57
<b>Total</b>	<b>6,723</b>



## Transmission connections challenges

# Heat Map



### WEST MIDLANDS

	BESS	1,294
	BESS Renewable	4,737
	Solar PV	269
	<b>Total</b>	<b>6,300</b>



## Transmission connections challenges

# Heat Map



### SOUTH WEST AND SOUTH WALES

	BESS	1,439
	BESS Non-Renewable	12
	BESS Renewable	2,565
	Nuclear	3,340
	OCGT	516
	Solar PV	349
	Thermal	164
	Wind Offshore	7,991
	Wind Onshore	1,594
	<b>Total</b>	<b>17,971</b>



# Transmission connections challenges

## Heat Map



### SOUTH EAST

	BESS	569
	BESS Non-Renewable	750
	BESS Renewable	621
	CCGT	1,800
	OCGT	100
	Pump storage	3,156
	Solar PV	57
	Wind Offshore	1,200
	<b>Total</b>	<b>5,097</b>



## Transmission connections challenges

# Heat Map



### LONDON & EAST ANGLIA

	BESS	518
	BESS Renewable	3,389
	CCGT	2,799
	Nuclear	1,670
	OCGT	655
	Solar PV	600
	Wind Offshore	9,344
	Wind Onshore	67
	<b>Total</b>	<b>19,042</b>

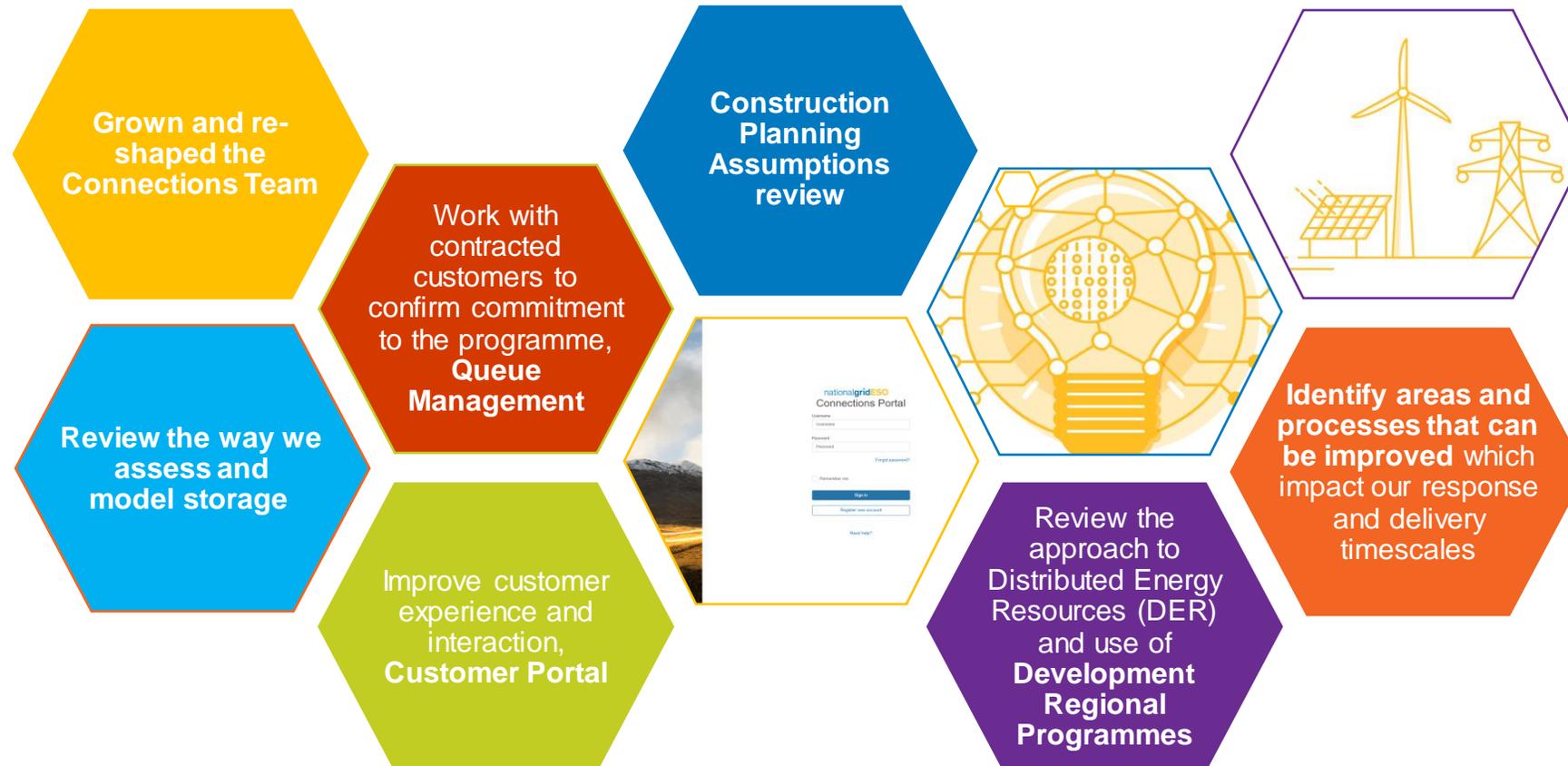


## Sli.do Poll

Do you think we have been able to capture key challenges to Transmission Connections?

Transmission connections challenges

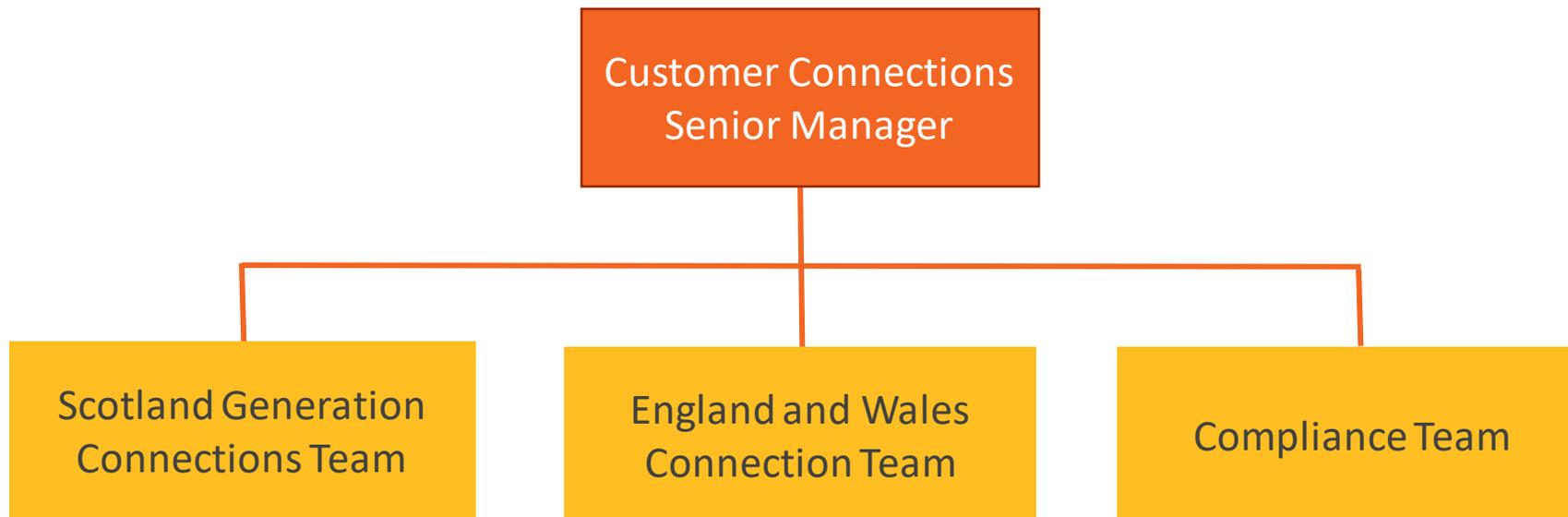
# How has the ESO reacted to these challenges?



Transmission connections challenges

# How has the ESO reacted to these challenges?

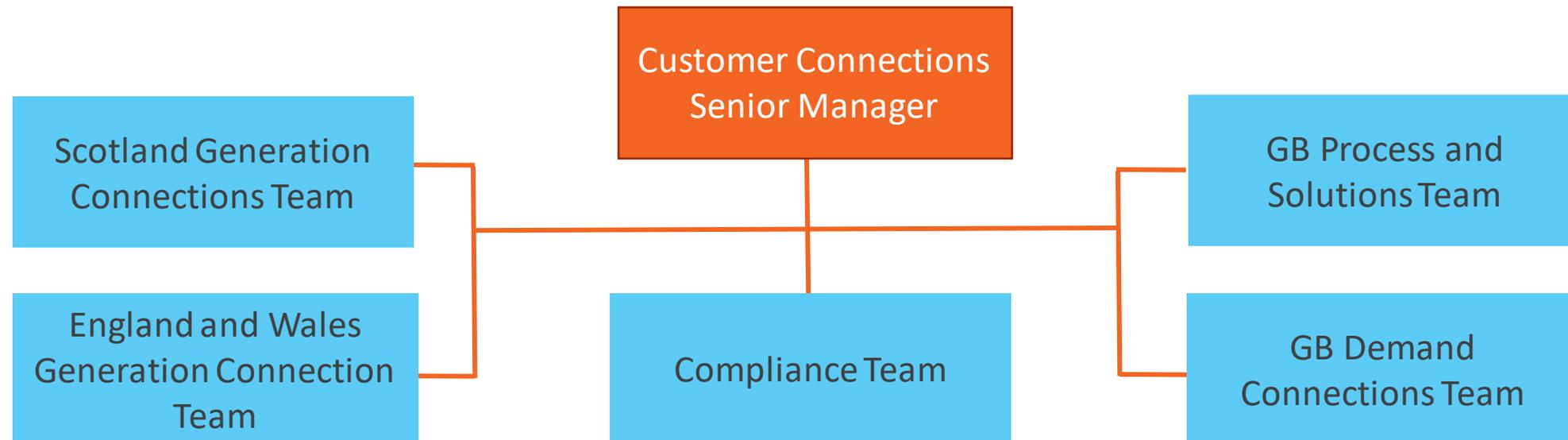
2019 – Smaller Team and simplified structure



Transmission connections challenges

# How has the ESO reacted to these challenges?

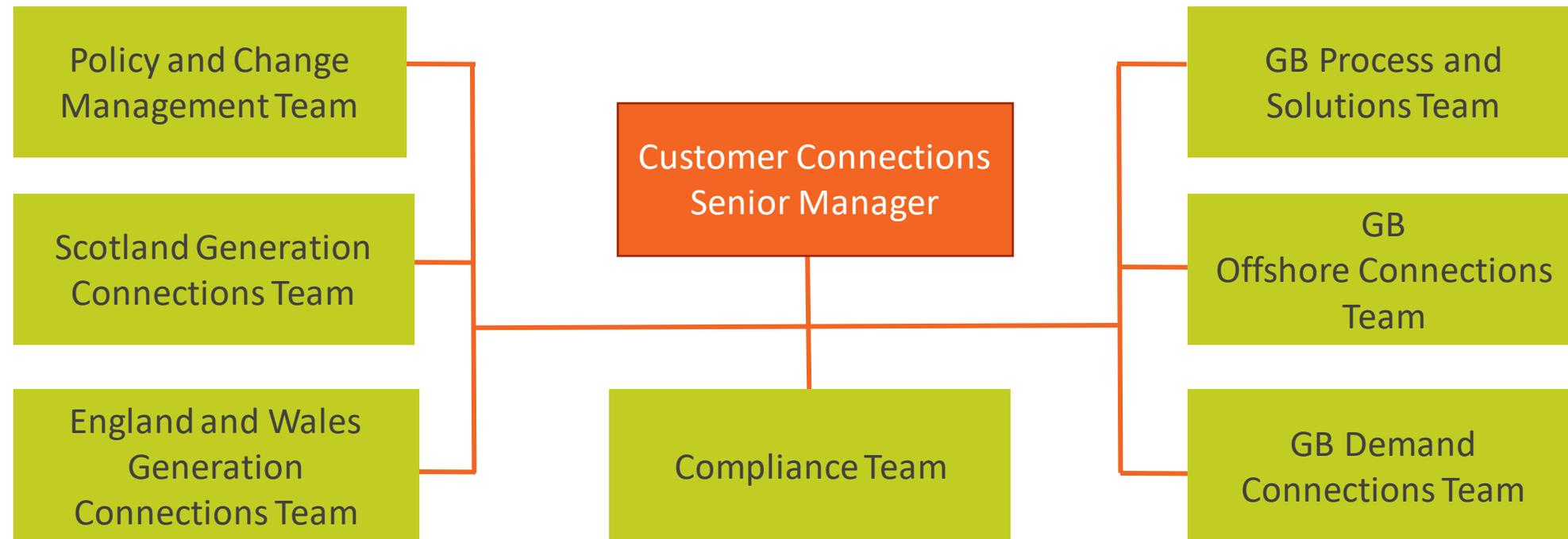
2021 – Structure changes and team starts to grow, creation of dedicated team for DNO and Demand Connections



Transmission connections challenges

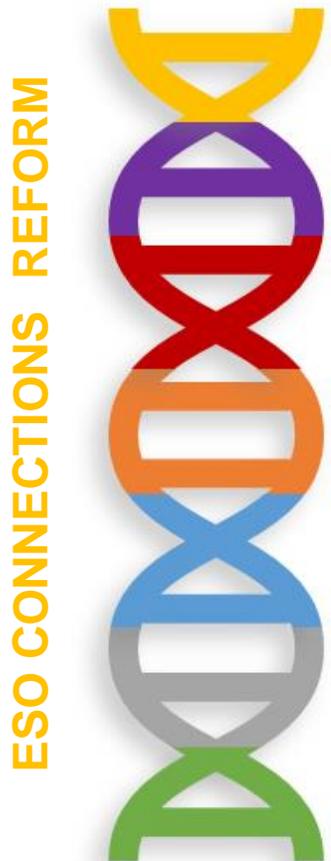
# How has the ESO reacted to these challenges?

2022 – Structure changes to ensure alignment with other strategies, enable focus on strategy and change, and team continues to grow



# How has the ESO reacted to these challenges?

## Long term strategy



- ▶ Whole System Approach to Transmission Connections
- ▶ Improvement to Customer Experience & Engagement
- ▶ Alignment with GB Energy Strategy and delivery of value to end consumers
- ▶ Supports the delivery of NetZero
- ▶ Enable a process that advances the projects that are ready to connect
- ▶ Process that embraces diversity and complexity of Connections within a evolving Energy System
- ▶ Future proof process [new framework for periodic reviews & simplify change]

Sli.do Poll

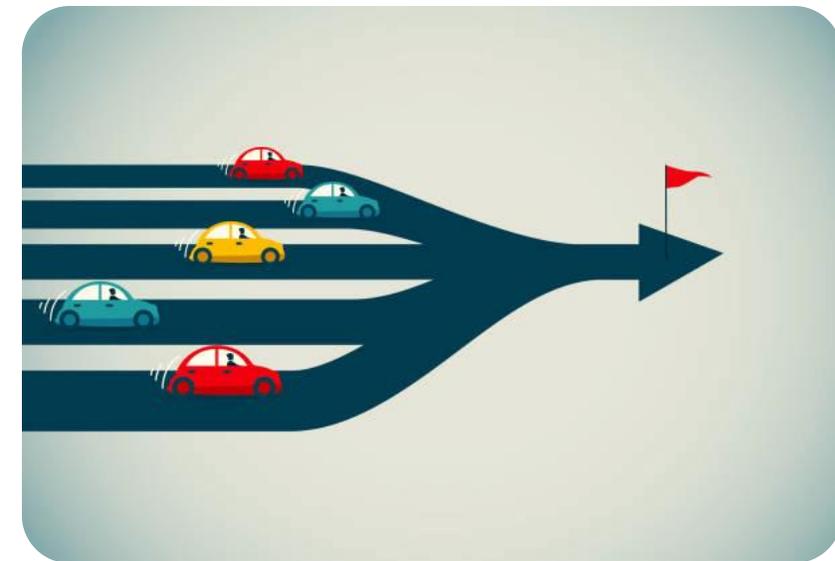
Do you support the Connections Reform proposal?

## Transmission connections challenges

# Transmission & Distribution Queue Challenges

Transmission and Distribution Queues are not integrated in a single platform and connection processes are not aligned, thus enabling:

- Distribution connections subject to Statement of Works experience two different queue positions
- Lag between application to Distribution and Transmission System Operator
- Distribution Customers face ambiguity regarding opportunity and viability for development of a future connection project
- Unavailability of one central database with consistent information on generation connected, to be connected and offered
- An attempt to produce a T&D queue would consist of a manual exercise to combine different sets of data which would become obsolete when released due to pace of change



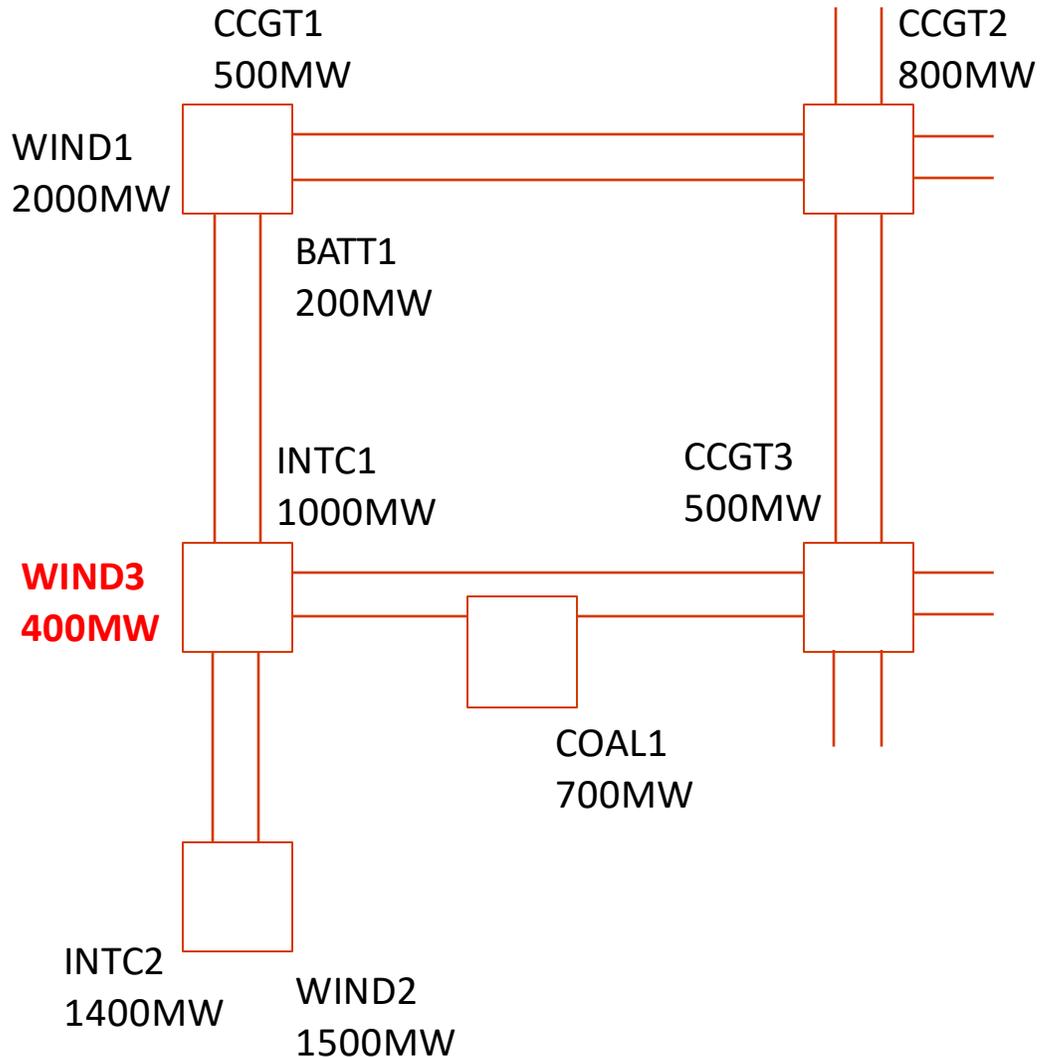
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Q&A



# Construction Planning Assumptions Review & Battery Modelling

# What is a Construction Planning Assumption?



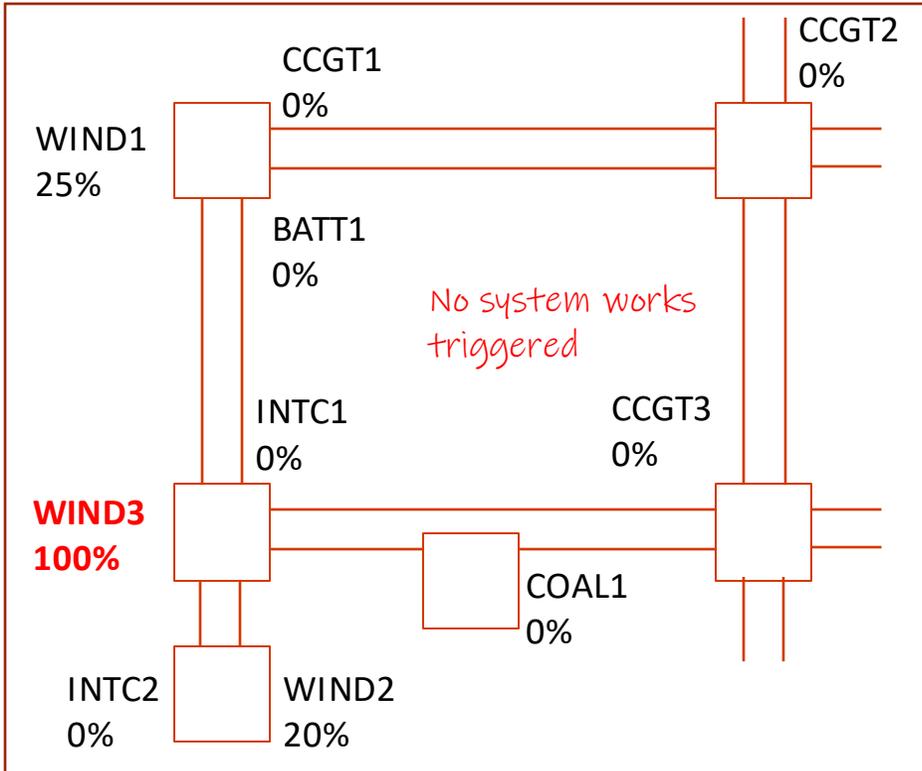
- A Construction Planning Assumption is the generation background which the ESO believes to be credible and reasonable for a connection study
- CPAs are provided to the TOs by the ESO as part of the connections process for a specific region of interest
- CPAs aim to achieve optimum balance between the risk of system constraints and excessive network reinforcements



# Impact on Connections

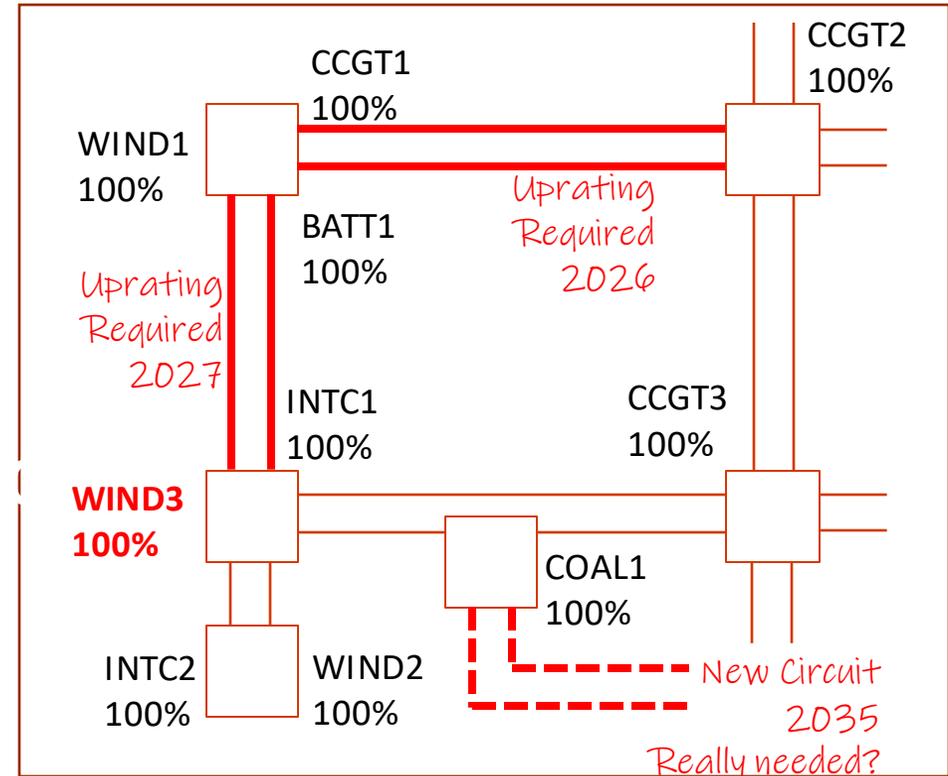
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## Light CPA



- Earlier connections dates
- No reinforcements
- Risk of constraint costs in actuality

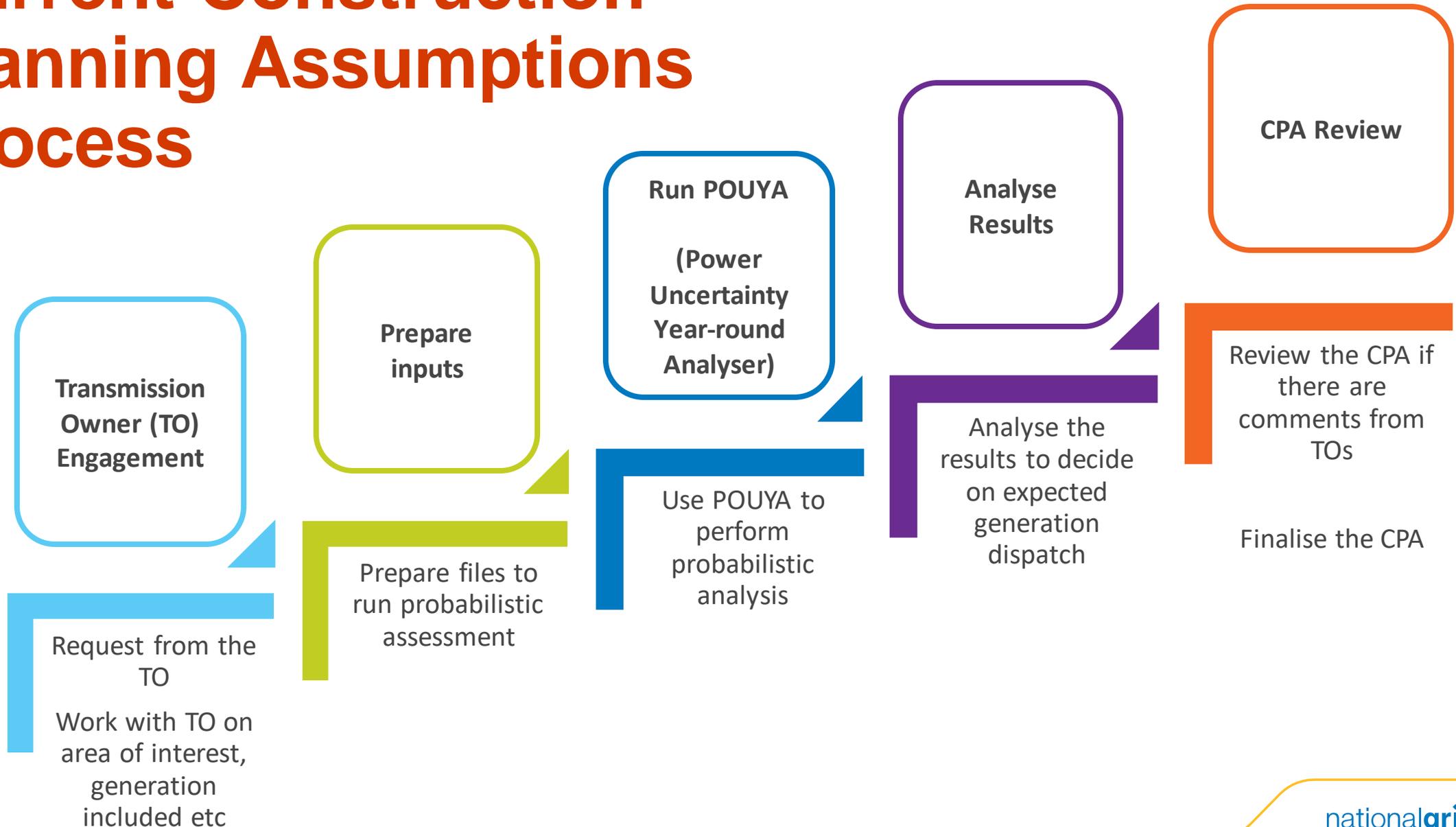
## Onerous CPA



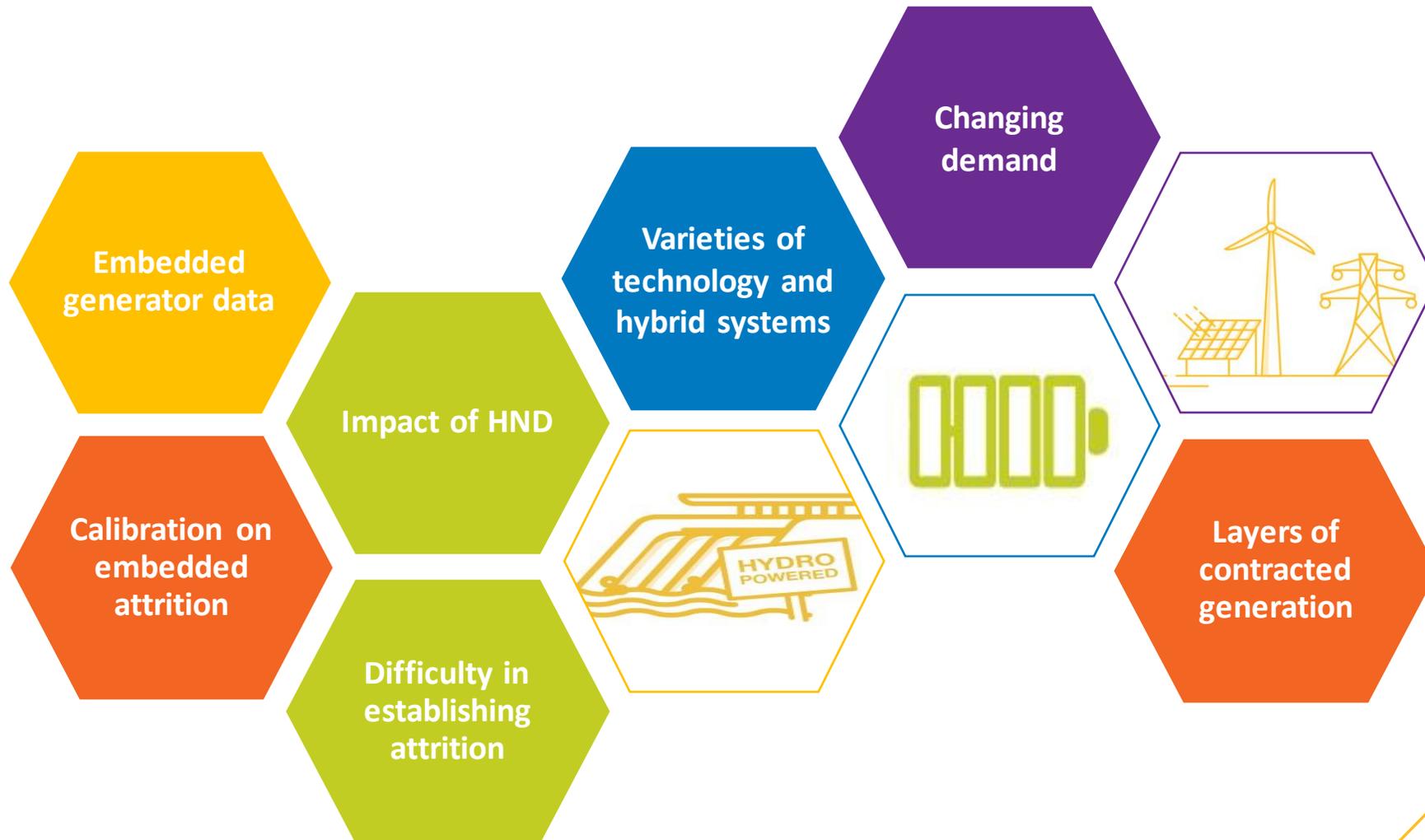
- Substantial reinforcements
- Late connections dates
- Reinforcements may not be economical in actuality

# Current Construction Planning Assumptions Process

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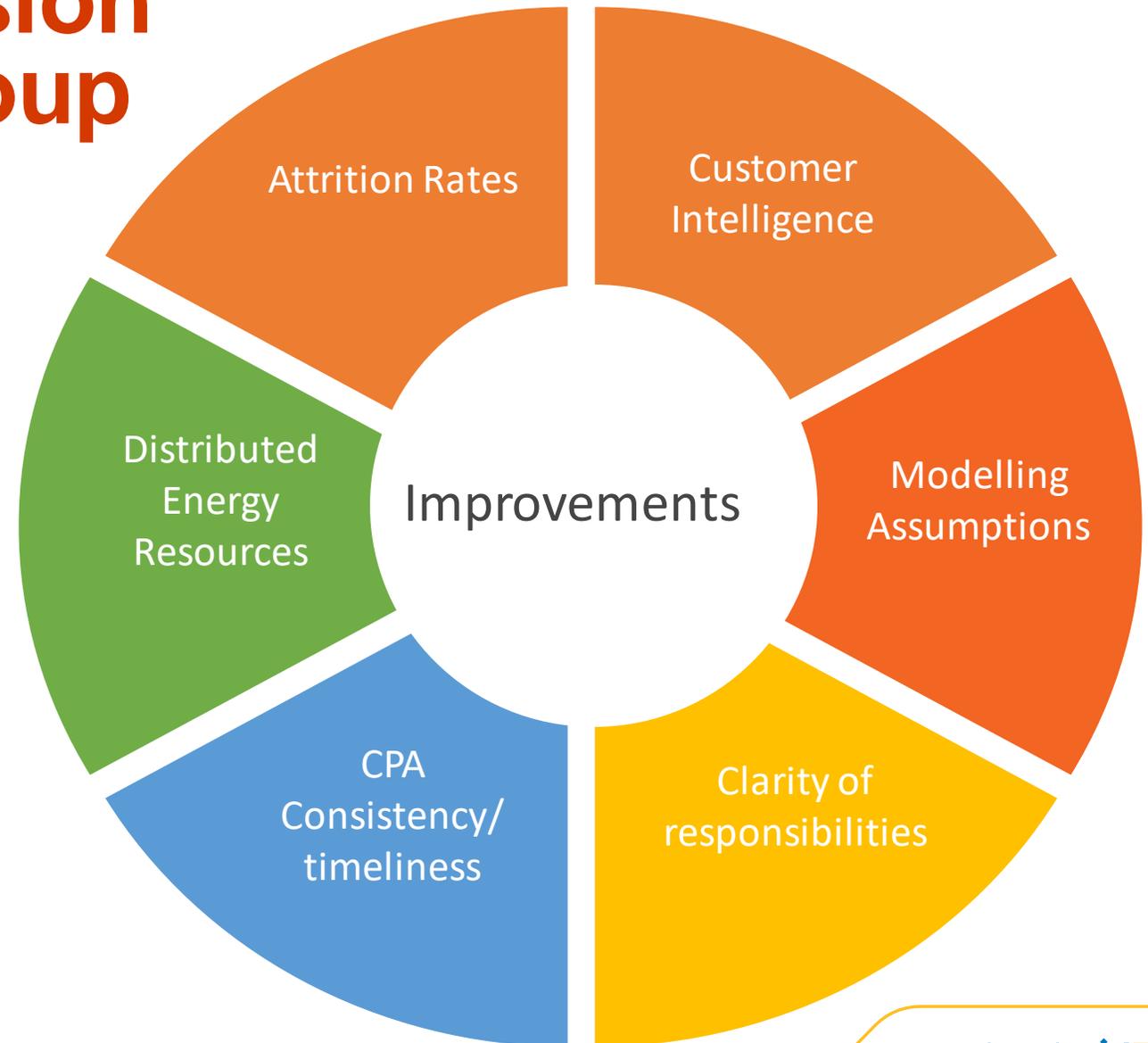


# Some challenges to preparing Construction Planning Assumptions #ncsjuly22

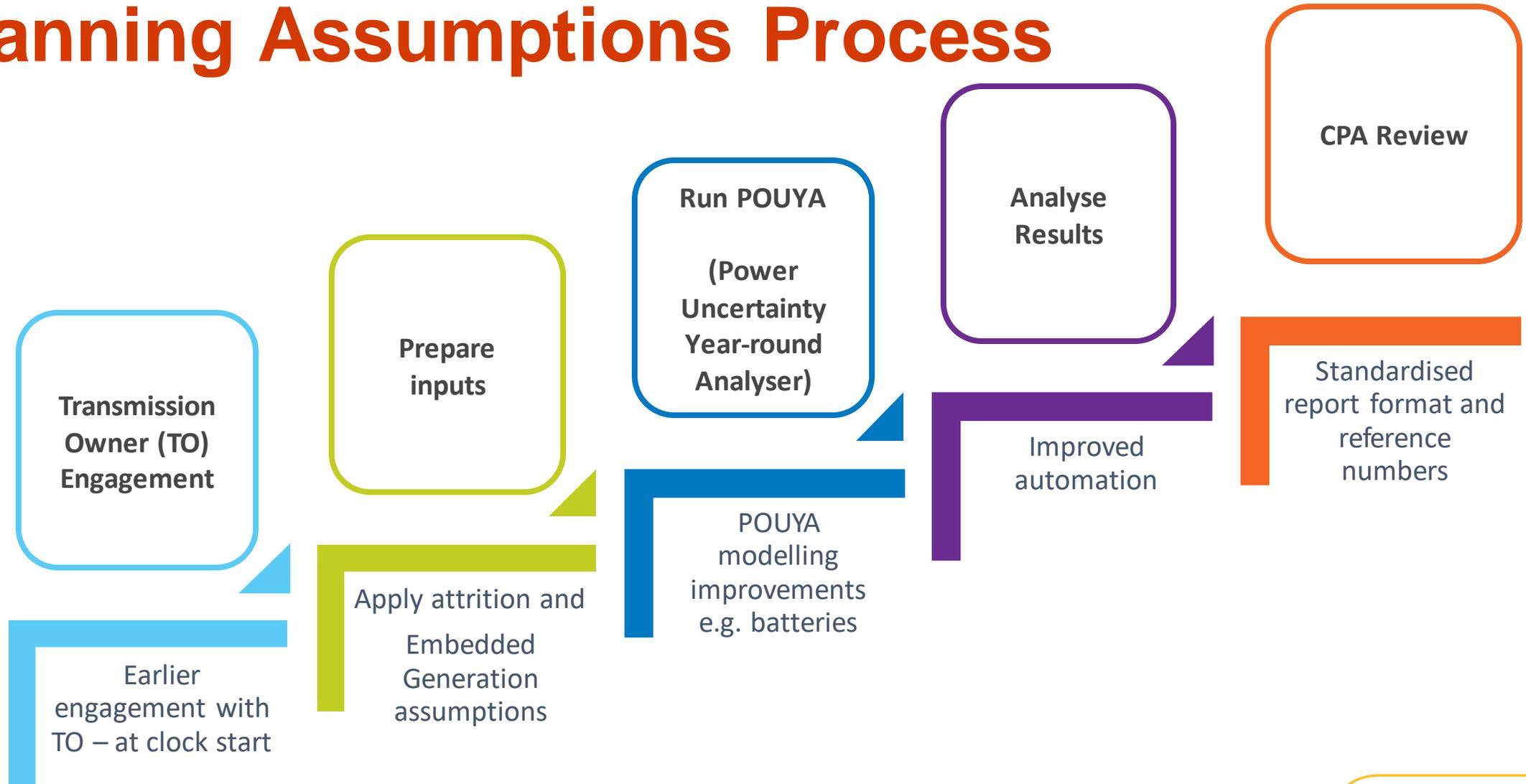


# ESO and Transmission Owner Working Group

- Ambition to enable earlier connections without compromising standards
- Review and improve key inputs, assumptions and processes

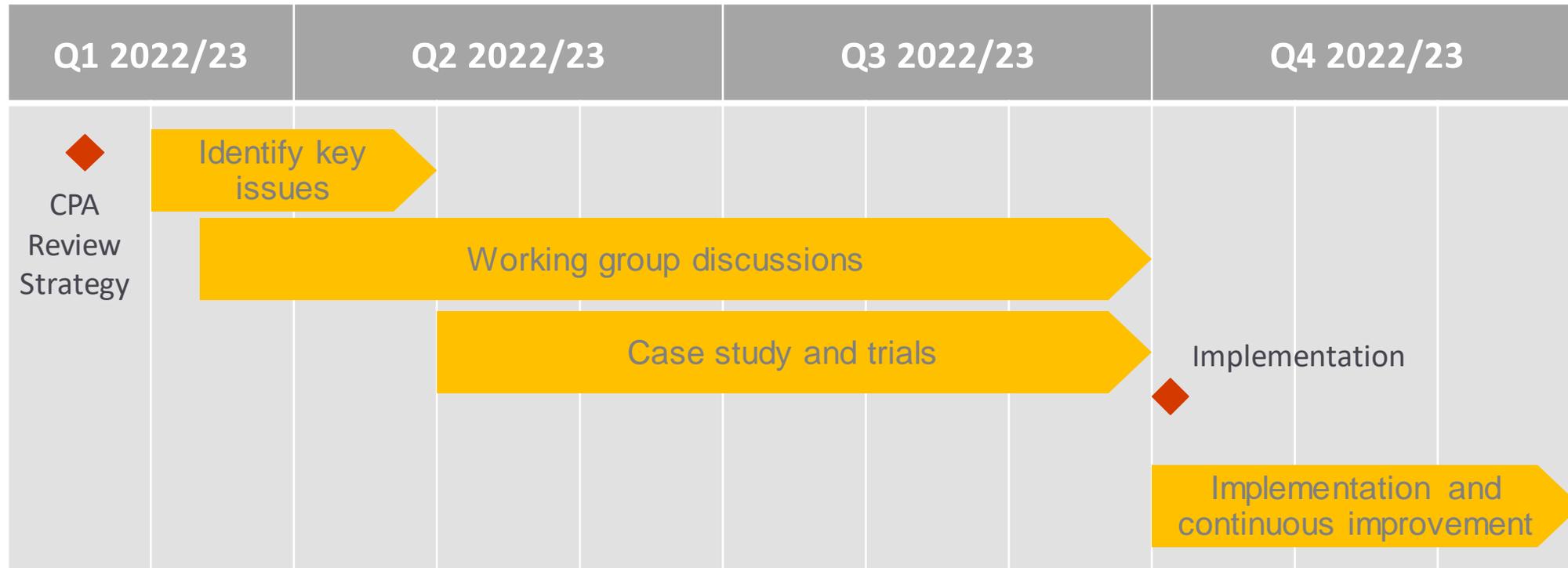


# Improvements to Construction Planning Assumptions Process



# Implementation / Next Steps

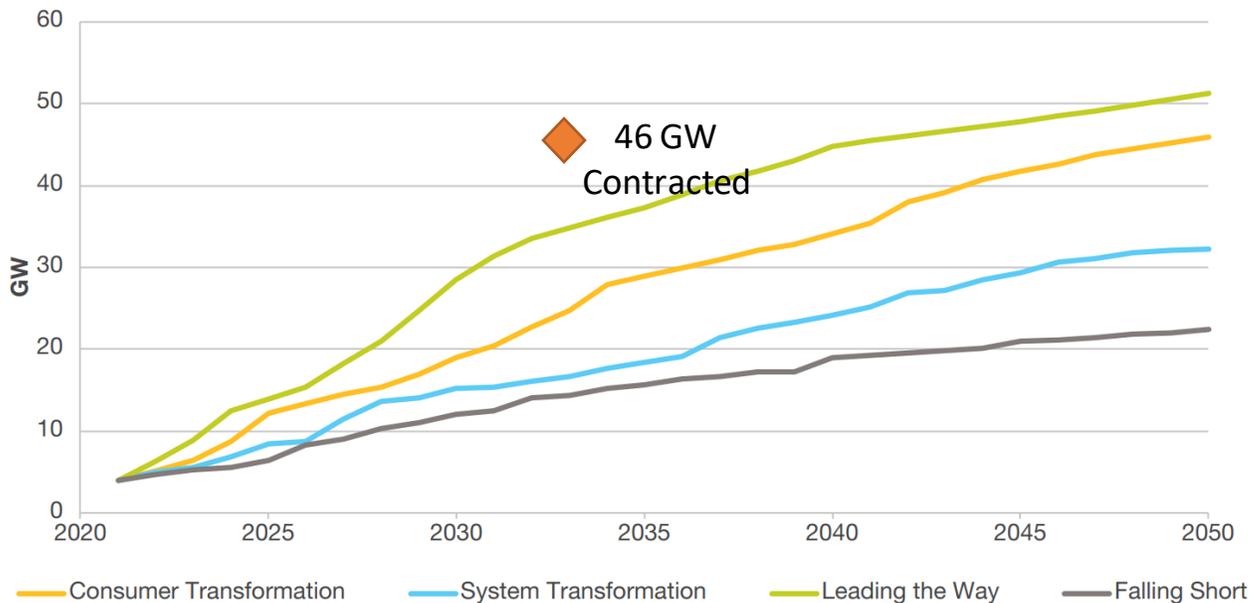
- Review several options
- Case studies with TOs
- Internal sign off for the implementation
- Steering group for feedback and continuous improvement



# Connections of Battery Storage

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FES 2022 Electricity storage capacity, excluding V2G and hydrogen storage (GW)<sup>13</sup>



- Connections of Battery energy storage systems are currently studied assuming the worst case conditions
- There is also an unprecedented volume of projects under the contracted background
- Substantial transmissions constraints are being observed in system studies
- This drives the need for considerable enabling works

# Working Group

- An important part of the business model for Battery storage is energy arbitrage
- Battery operation can have a negative correlation with system constraints
- Energy storage can play an important role as enabler of renewable energy penetration and facilitate the transition to net zero
- A working group has been set up to explore news way of assessing battery connections that better reflects how the assets operate
- Solutions that could enable battery energy storage systems to achieve earlier connection dates are being explored

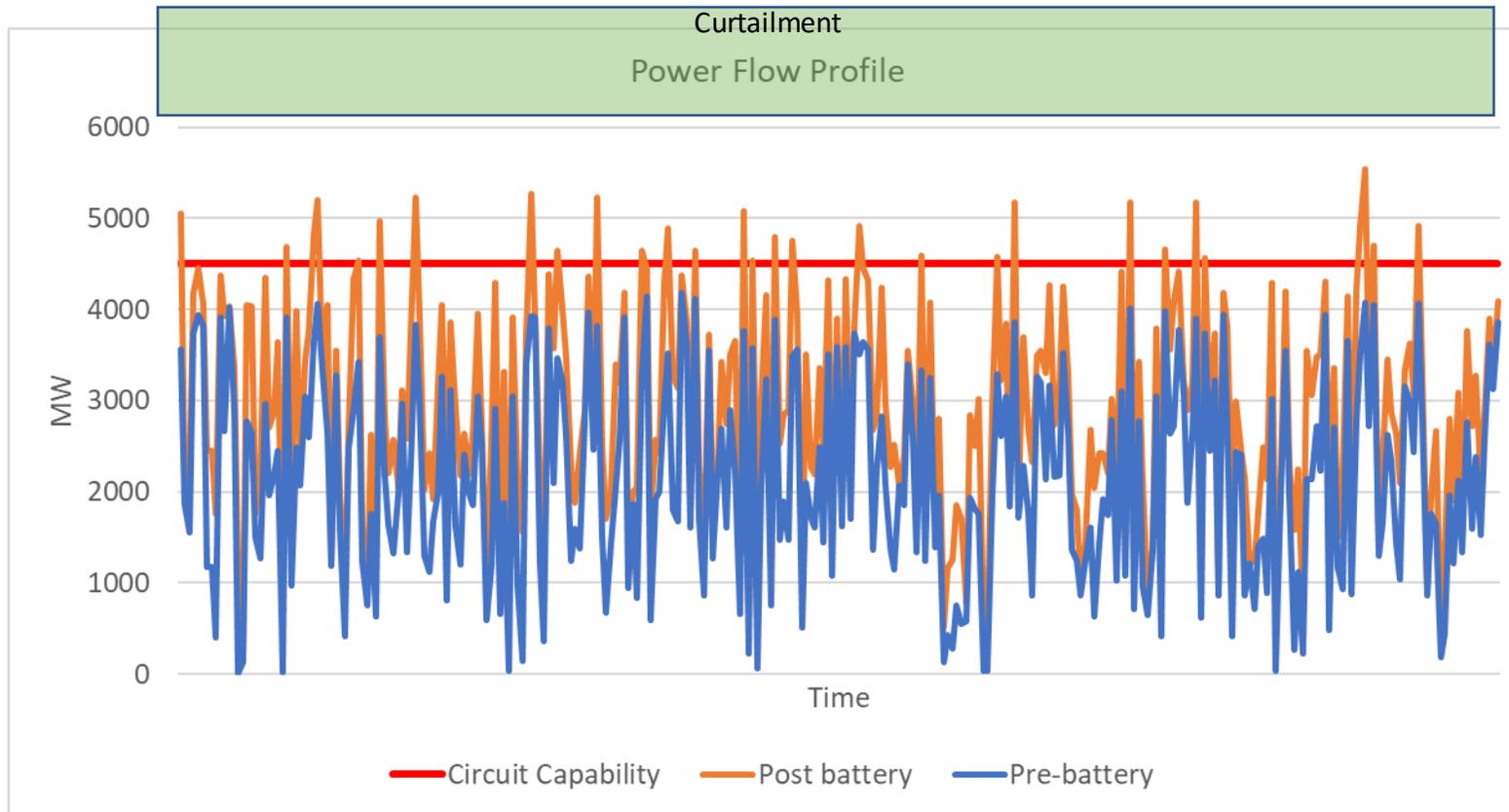
nationalgridESO

nationalgrid



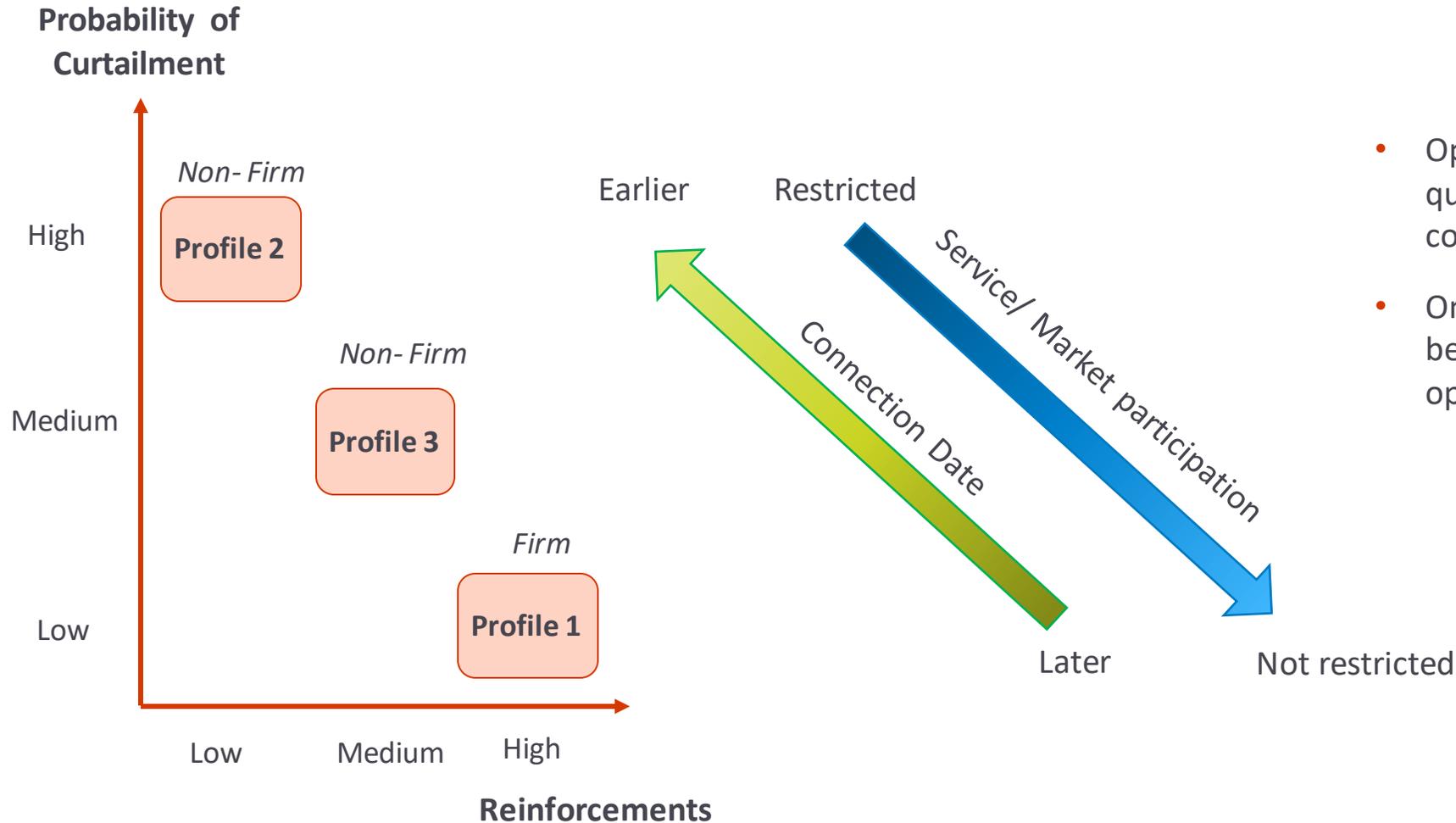
# Progress to Date - Curtailment

Example of Curtailment



- Non-firm connections to offer earlier connections to the network
- Output of the battery storage to be curtailed during system constraints
- Mix of a contractual and technical solution to ensure the output of the battery storage systems is managed

# Progress to Date – Operational profiles



- Operational profiles to be selected via a questionnaire when submitting a connection application
- Once fully defined, more information will be provided on the implications of each operating profile

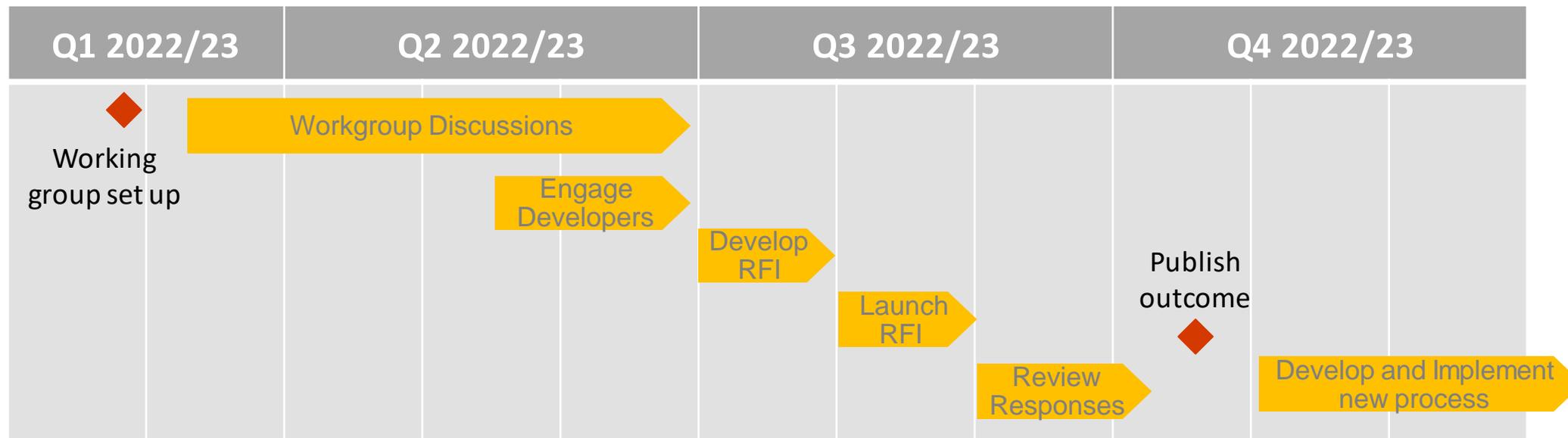
## Sli.do Poll

Would you be willing to accept some level of curtailment if it enabled you to have an earlier connection?

# Next Steps and Proposed Timeline

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- Continue Working group discussion on outstanding topics
- Engage with selected battery developers to understand their business models and operating profiles. If you would like to get involved please contact us at [transmissionconnections@nationalgrideso.com](mailto:transmissionconnections@nationalgrideso.com)
- Develop a request for information (RFI) to engage a wider range of battery developers to enable us to get better insights into the operating modes of battery storage



\* Timeline is subject to change depending on the outcome of the engagement

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Q&A



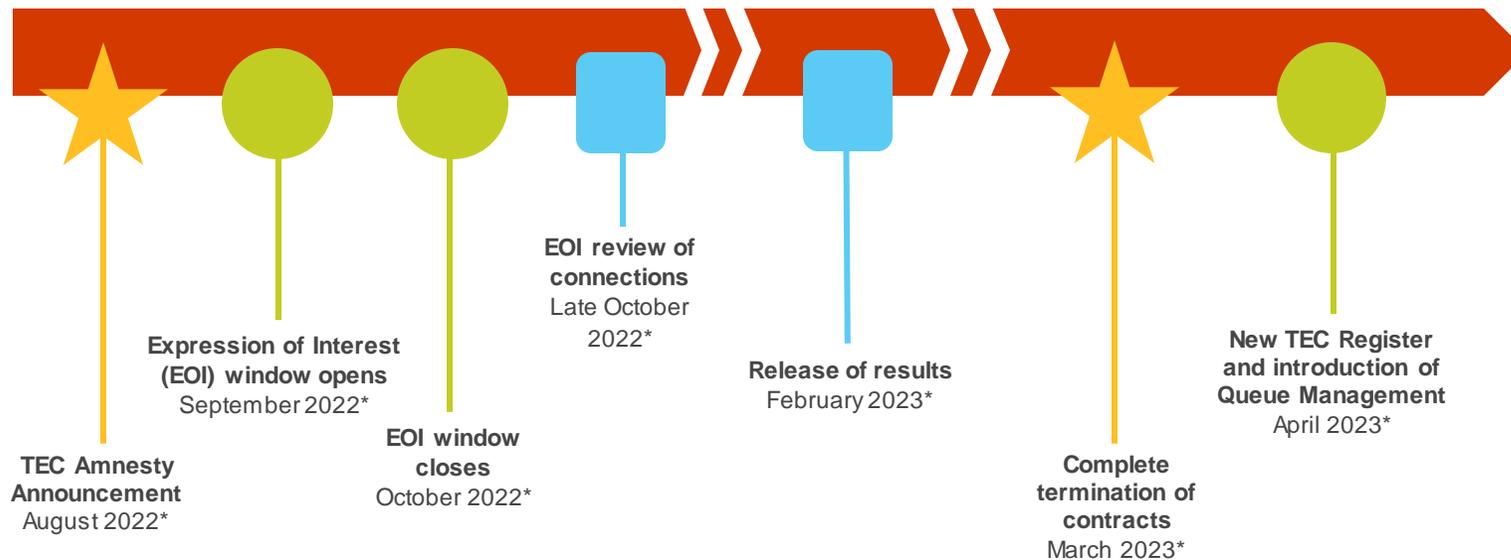
# Connections Overview: TEC Amnesty and Queue Management

# Short term to intermediate actions and strategies

## Transmission Entry Capacity (TEC) Amnesty

Later this year, the ESO will be launching a programme to reduce congestion within the transmission capacity queue

TEC Amnesty is a process run by the ESO whereby we invite all parties with connection agreements listed on the TEC register (i.e. generation developers) to confirm whether they would be willing to terminate their agreement at minimal or no cost



\*Dates for reference only

# Short term to intermediate actions and strategies

## Queue Management

We're developing and enhancing Queue Management guidelines to ensure suitability for transmission connections.

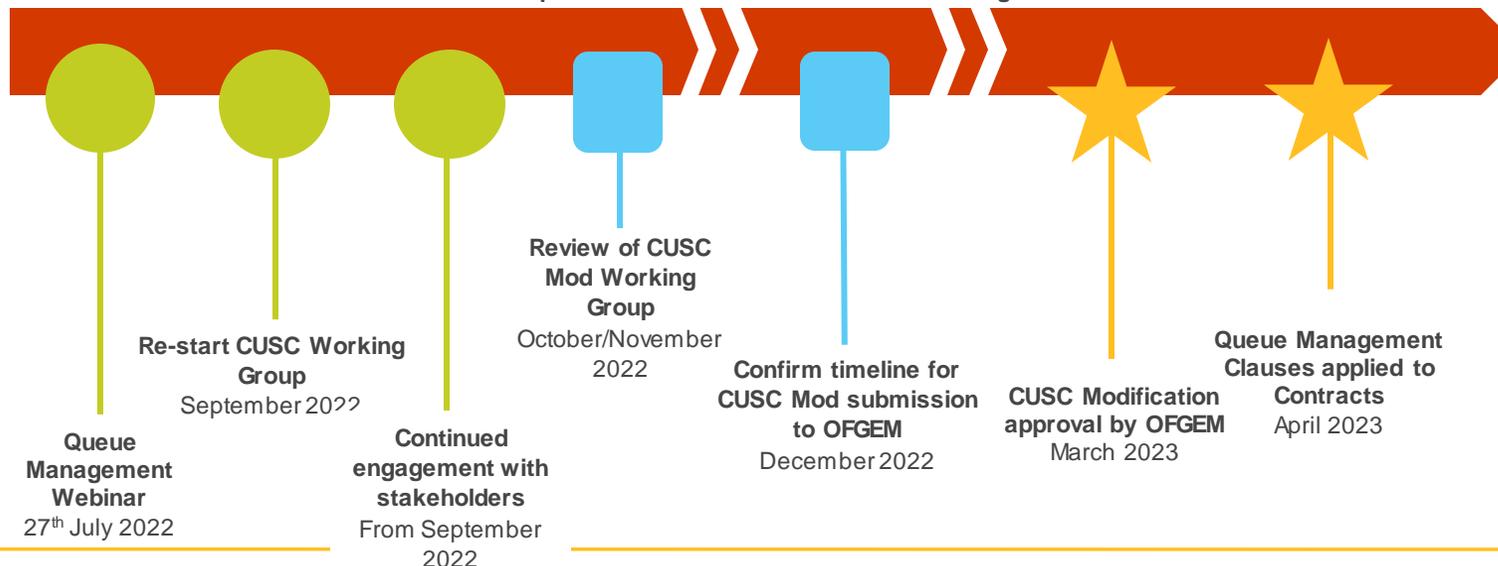
Queue Management is the process of managing the order in which generators on the TEC register are connected to the National Transmission System.

Earlier in 2022, the ESO made the decision to pause the use of Queue Management

Next steps for this project include:

- **Introducing Queue Management as a CUSC Modification**
- **Introducing new Queue Management contract processes**

\*Illustrative view of the timeline we hope to maintain to introduce Queue Management to Transmission Connections

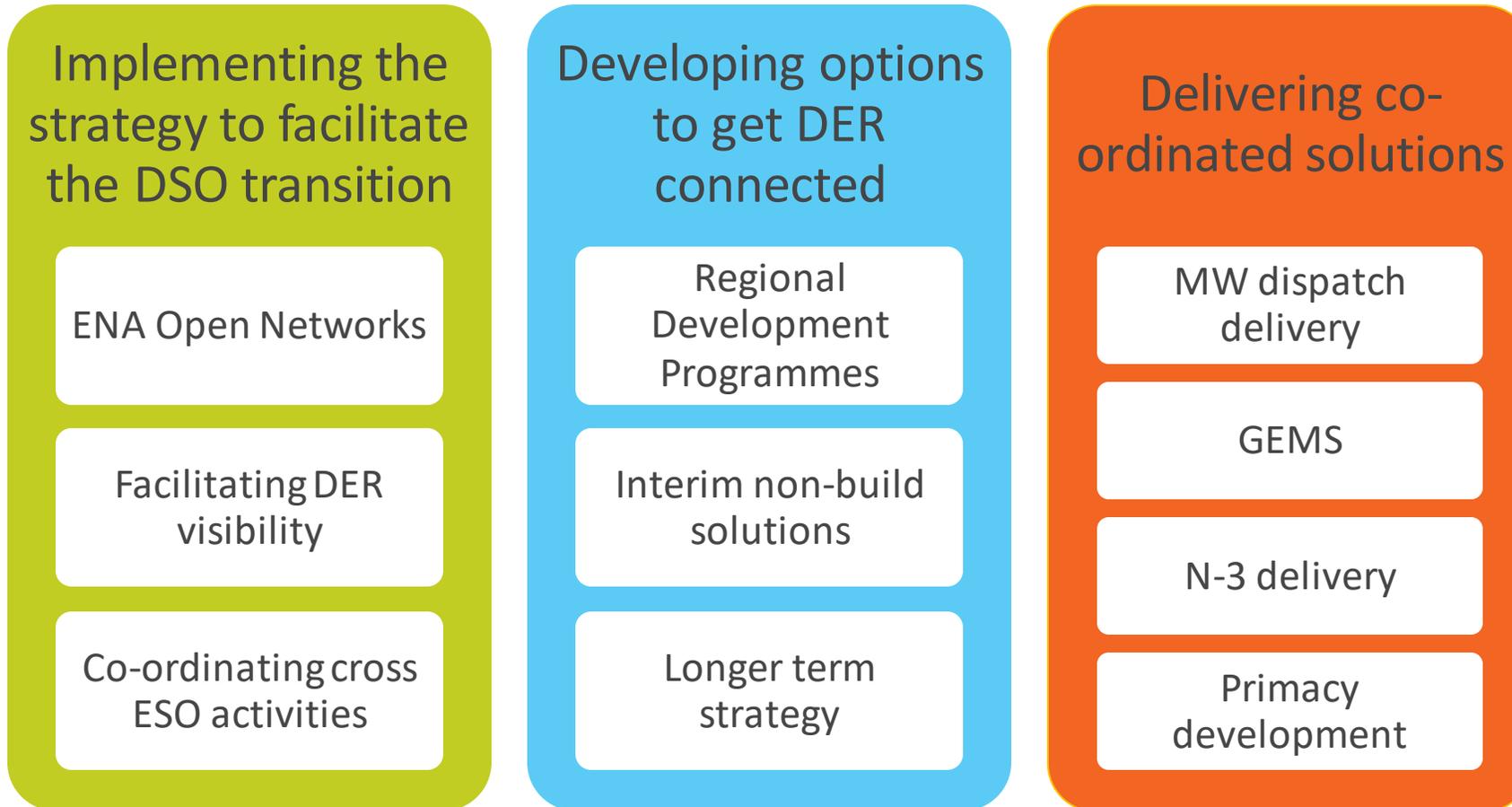


# Whole Electricity System & Regional Development Programmes



# Whole electricity system

The Whole Electricity System team leads the ESO input into the DSO transition and the development of co-ordinated local flexibility markets

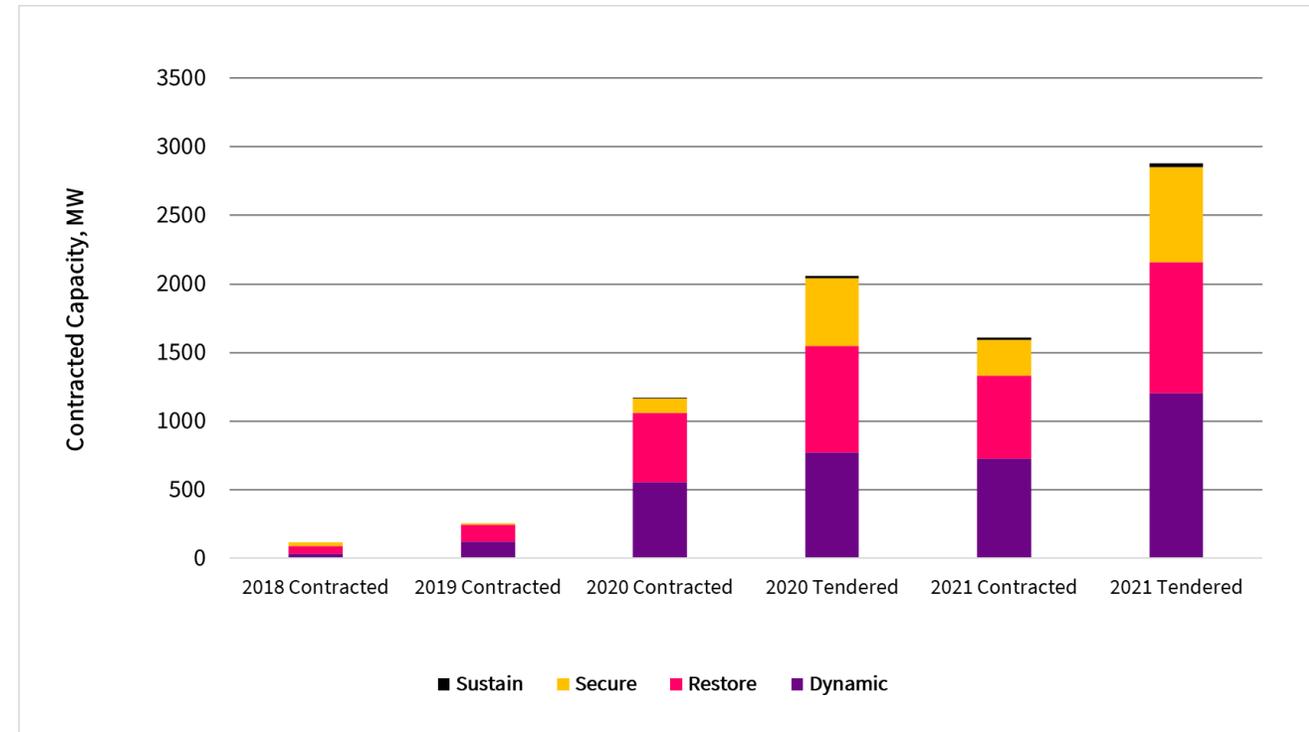


Sli.do Poll

**What should be the areas of focus for the ESO to help drive the DSO transition and support DER connection and flexibility?**

# Facilitating distributed flexibility

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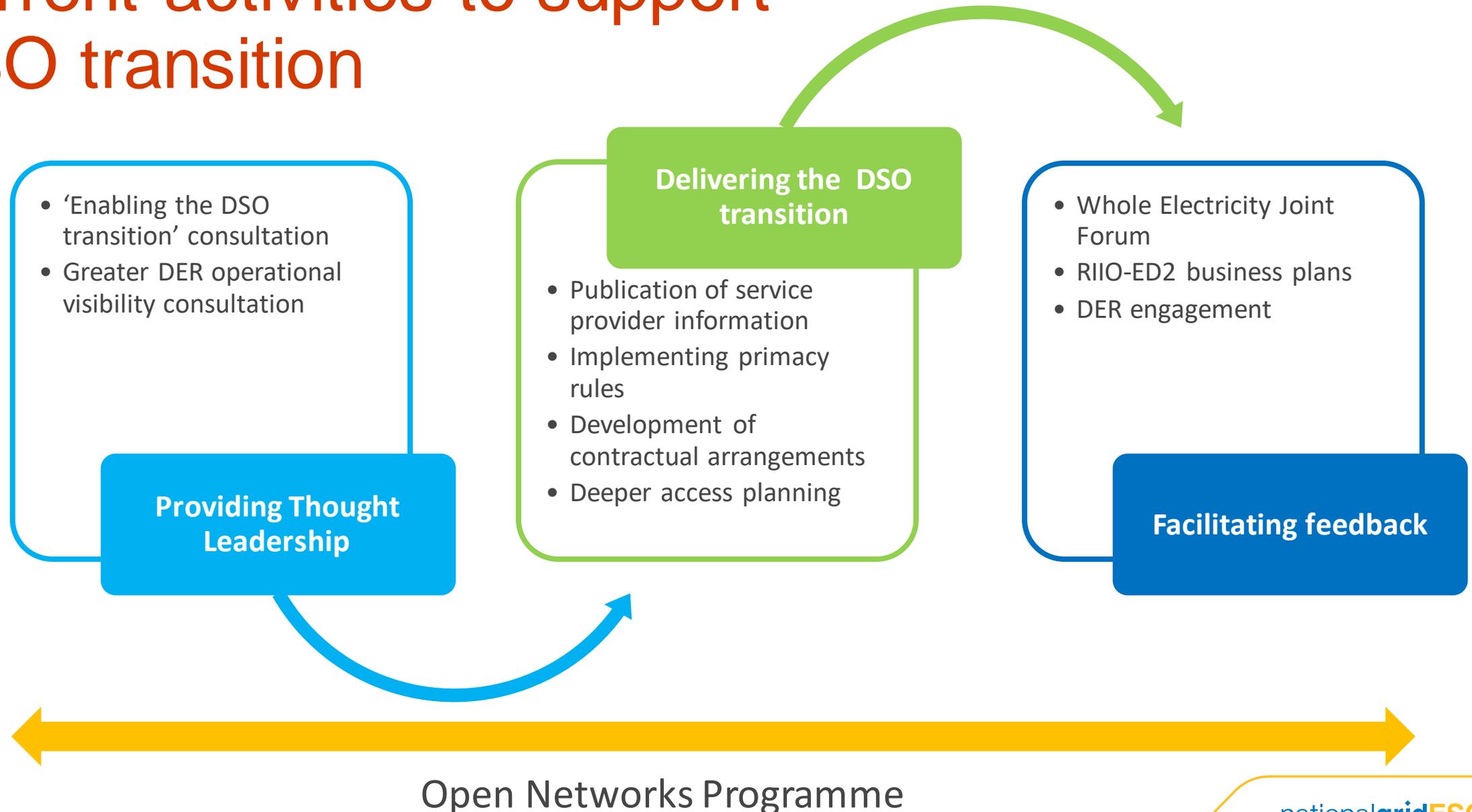
**Tendered and contracted DSO services continue to climb upwards in 2021**

Volumes of DSO services by service type, 2018 to 2021, MW

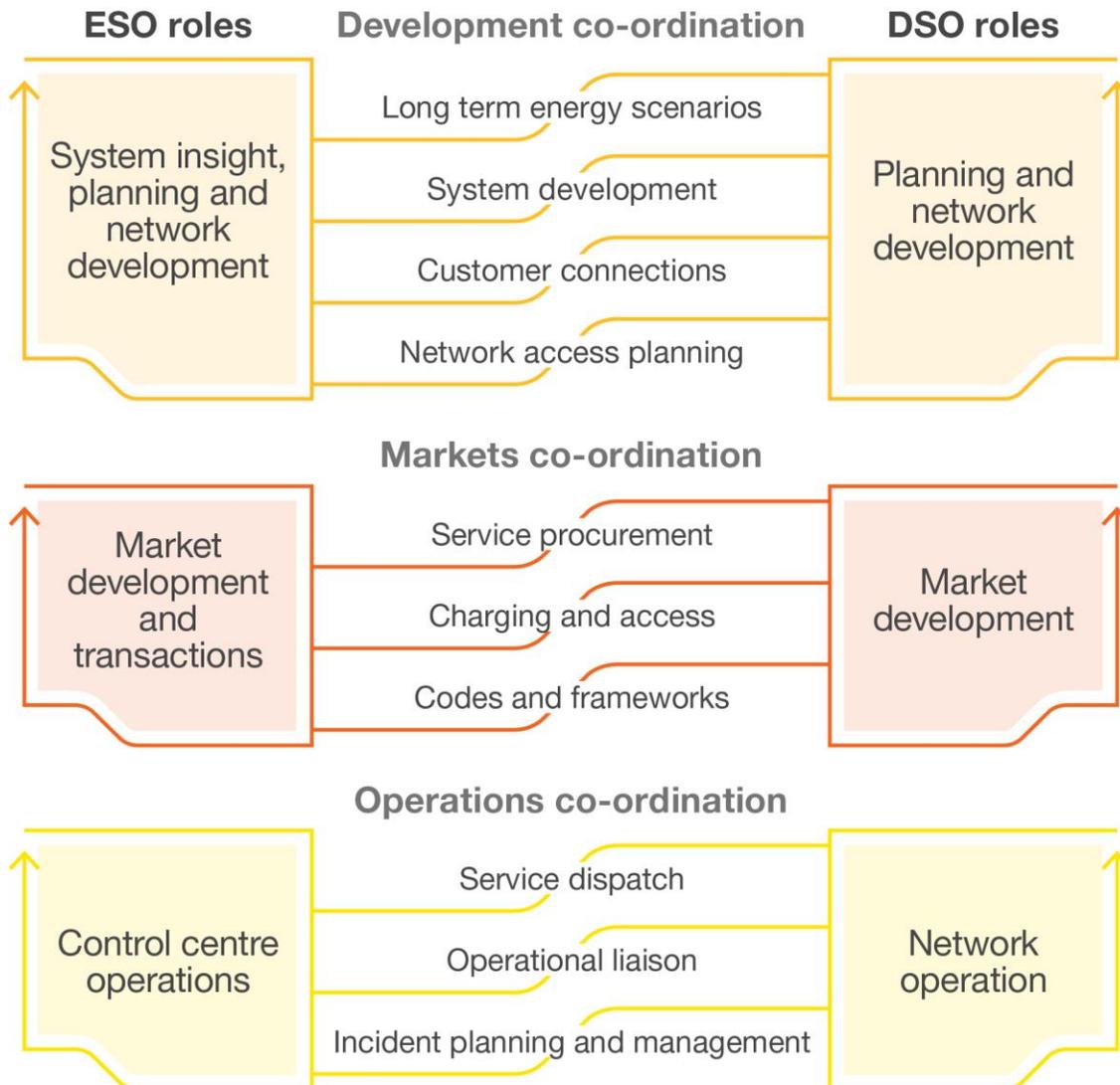
Source: Power Responsive Annual Report 2021

# Current activities to support DSO transition

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# Enabling the DSO transition



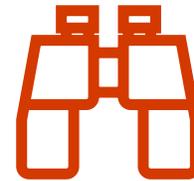
# Facilitating Distributed Flexibility



**Facilitating market  
access for distributed  
flexibility**



**Service  
coordination  
between markets**



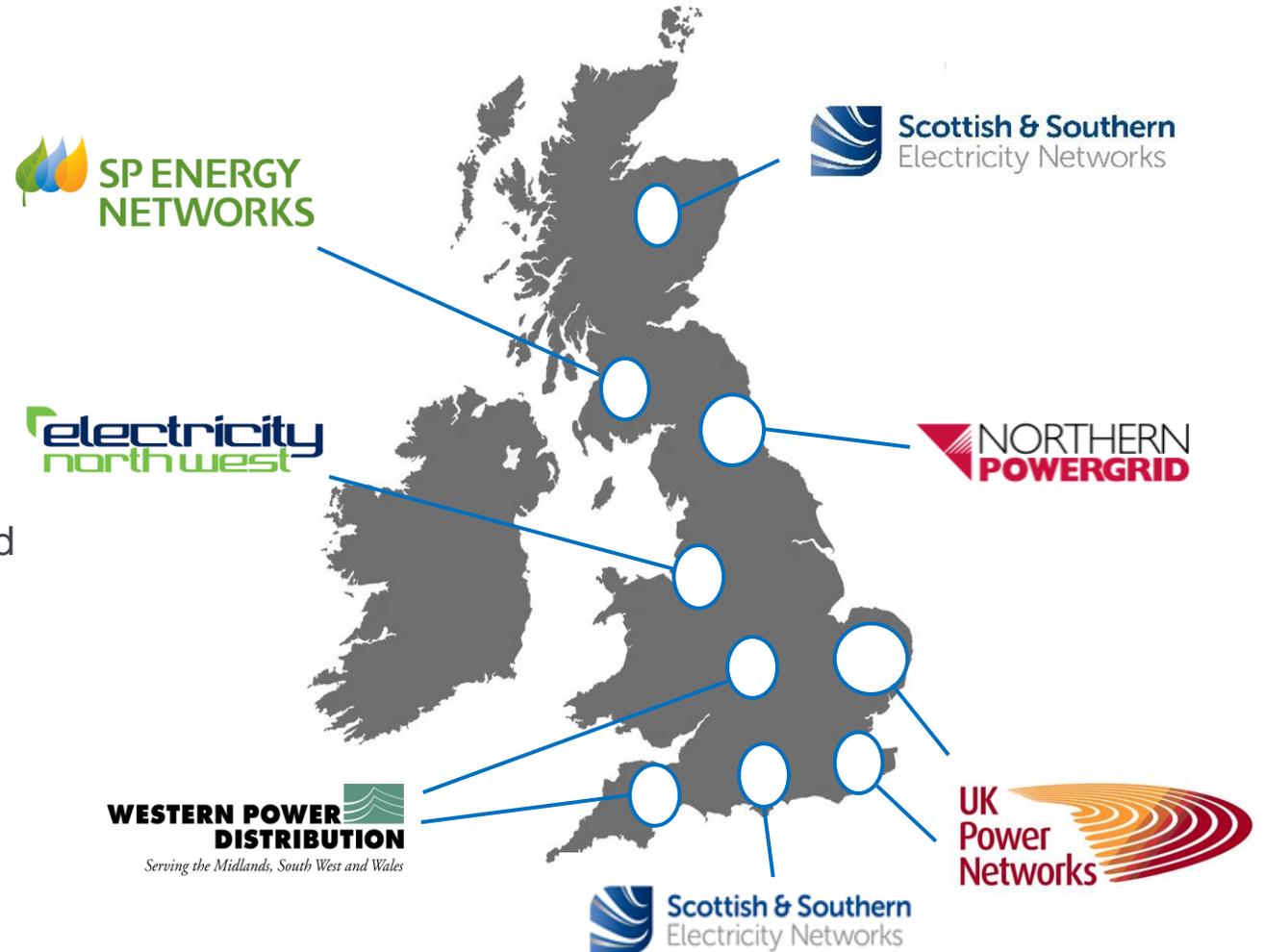
**Increased DER  
visibility in real-time  
operations**



**Facilitating DSO**

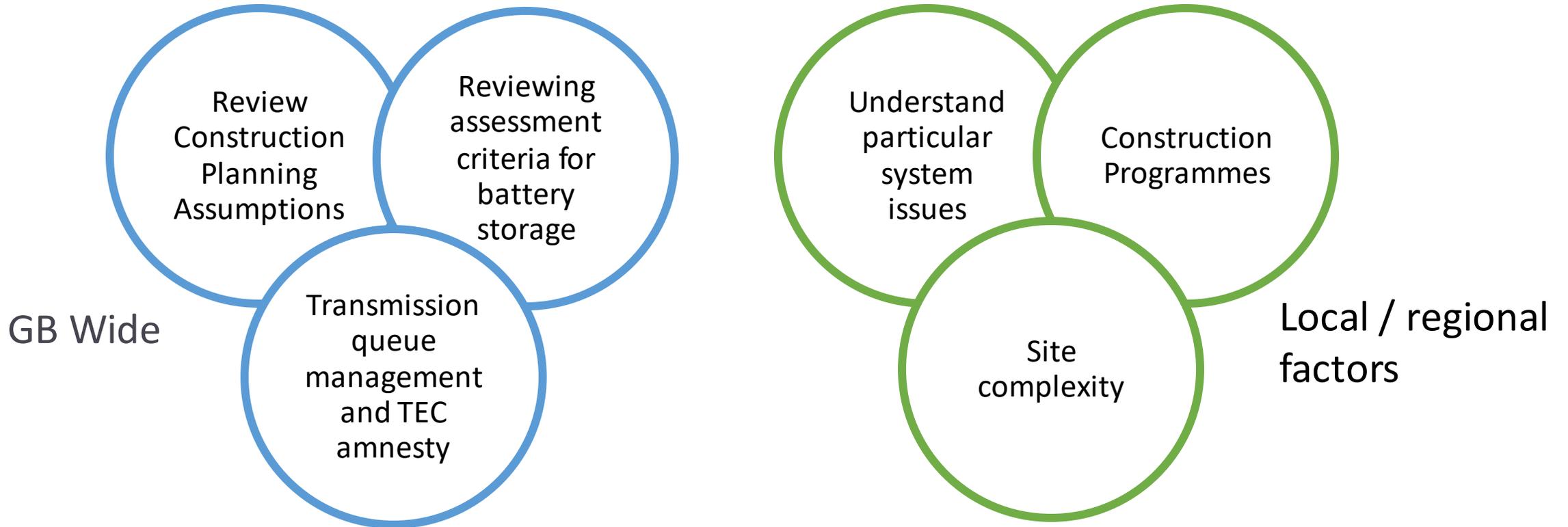
# Regional Development Programme (RDP) overview

- Whole system examinations of areas of the network
- Working with network organisations to find ways to 'unlock' more capacity through non-network solutions
- Consider use of flexibility services from DERs and developing coordinated markets, systems, processes and ways of working with distribution network operators (DNOs)
- RDPs are design by doing projects. They are informed by, and inform, the ENA Open Networks project



# Identifying and assessing options

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1

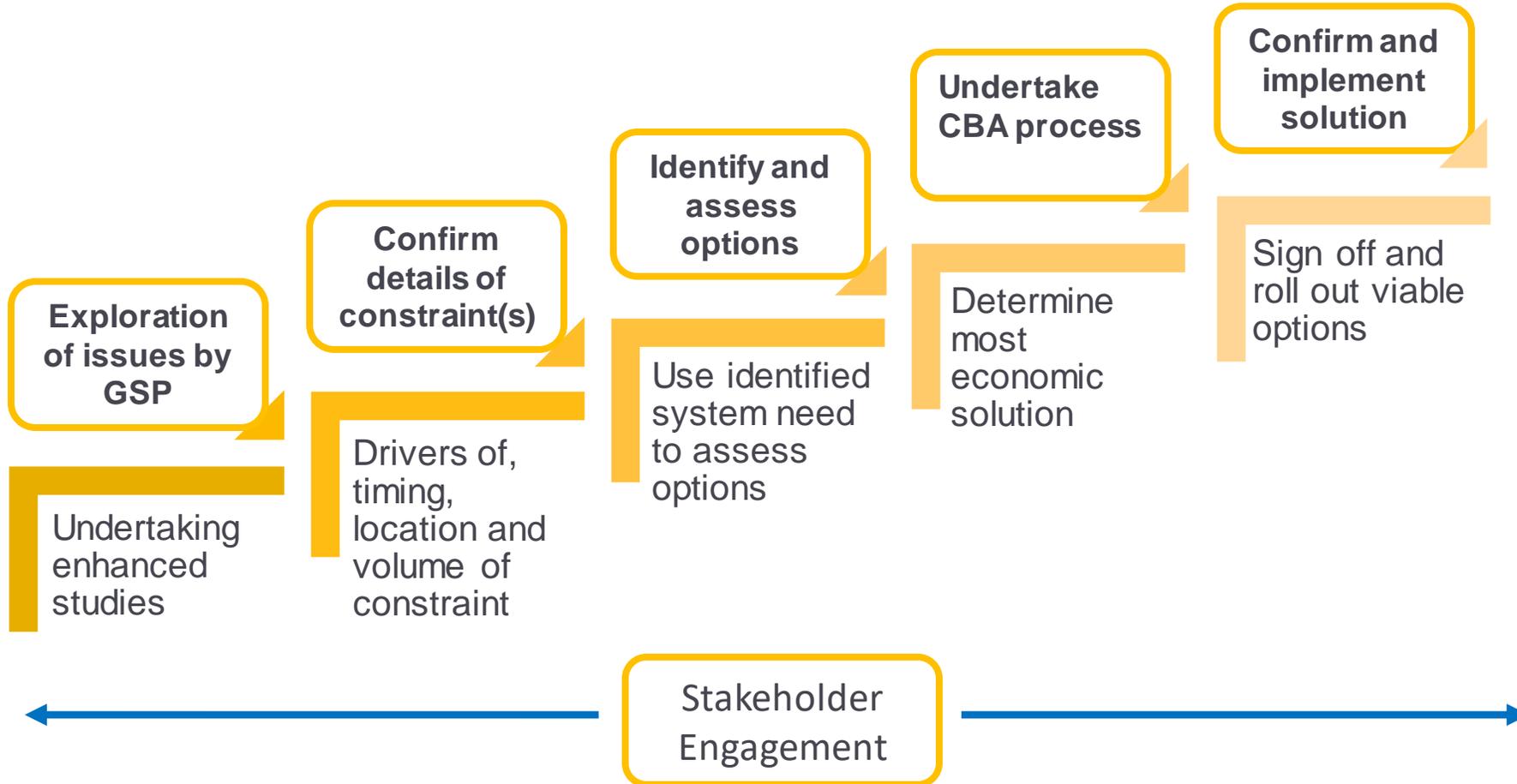
## DER able to connect sooner:

- With time limited restrictions
- Without restriction
- Through a non-build alternative

2

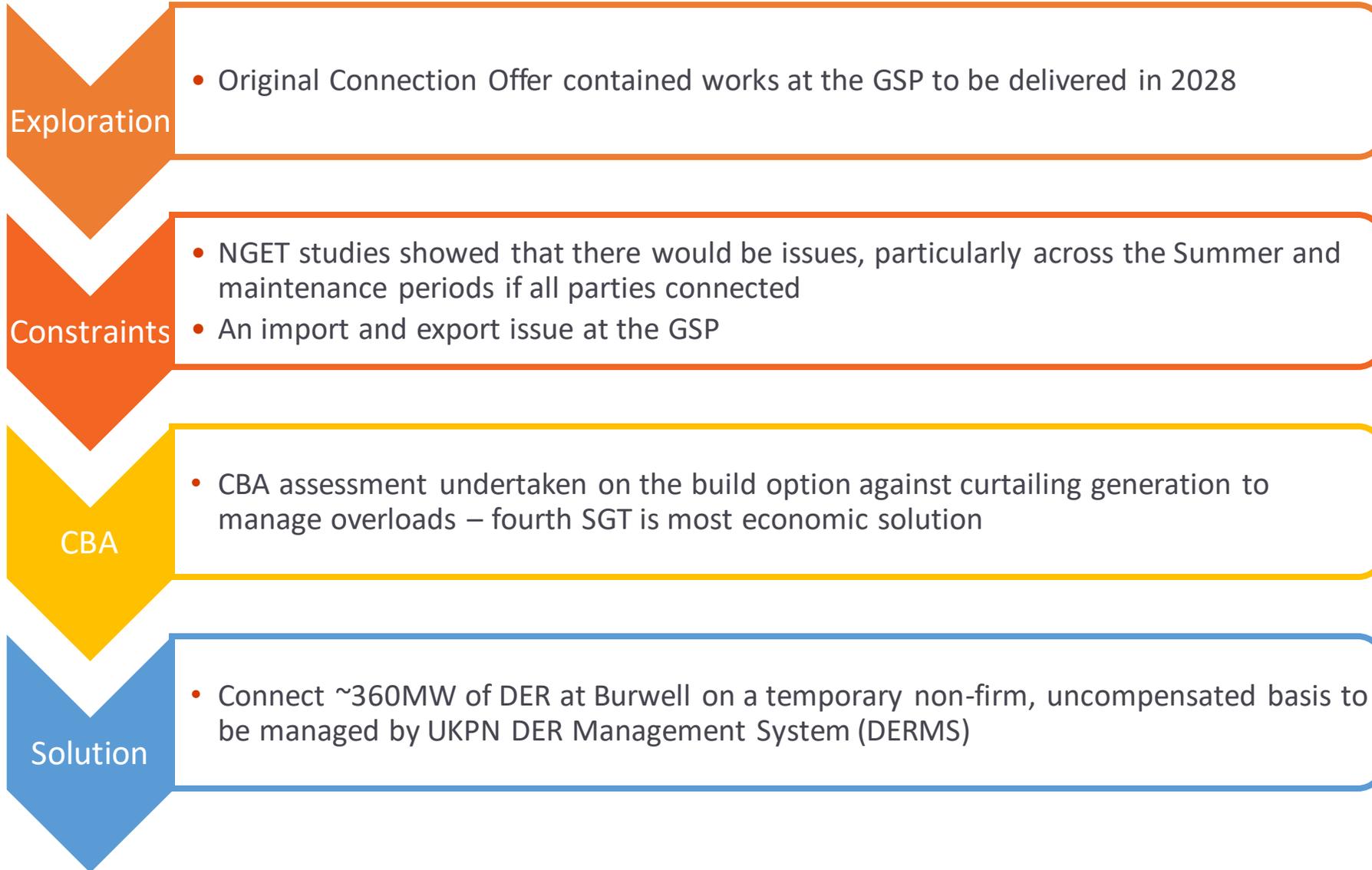
## Reinforcement required to connect DER

# RDP solution development framework



# Finding a solution at Burwell

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# Current Projects in Delivery

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## Generation Export Management Scheme (GEMS) + SPD ANM

- Project in partnership with SPT and SPD
- First application of automated dispatch technology to help manage multiple nested constraints
- Pilot site delivery aimed at Q4 2023\*

## MW Dispatch

- Project in partnership with WPD (South West) and UKPN (South East)
- Development of processes, tools and systems to enable dispatch of DER for basic transmission constraint management service
- Aim to roll-out solution GB-wide over time

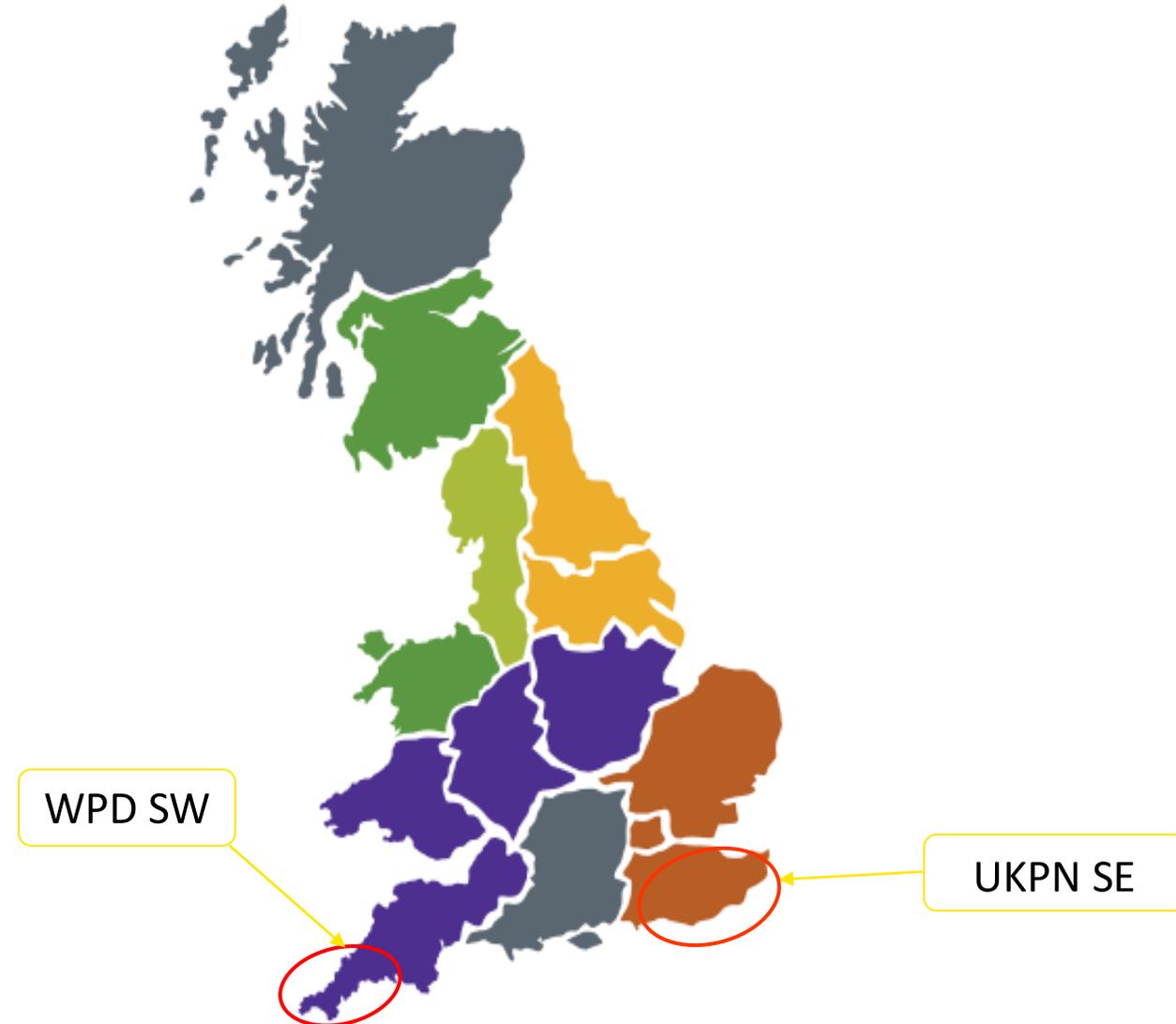
## N-3 Intertipping

- Project in partnership with WPD (South West), UKPN (South East) and SSEN (South Central) UKPN Phase 1 (MVP) has already been delivered
- Integration of NGET OTS, ESO SCADA and DNO SCADA/ANM systems to enable intertipping of DER under certain outage + fault scenario

# MW Dispatch in detail

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- Local constraint markets for thermal overload management under certain intact and N-1 conditions
- Initial roll-out with WPD (southwest) and UKPN (southeast)
- Currently being developed as an active power turn to zero service, with further enhancements developed over time
- Contractually managed via a tri-party agreement between ESO, DNO and DER
- Instructions will be sent via the ESO's ASDP platform and passed to DER via DNO's DERMS/ANM systems
- Initially open to parties with Visibility and Control clauses in DNO connection agreements
- Other communication integration options will be considered in future releases to broaden market participation



# MW Dispatch Service Design (1)

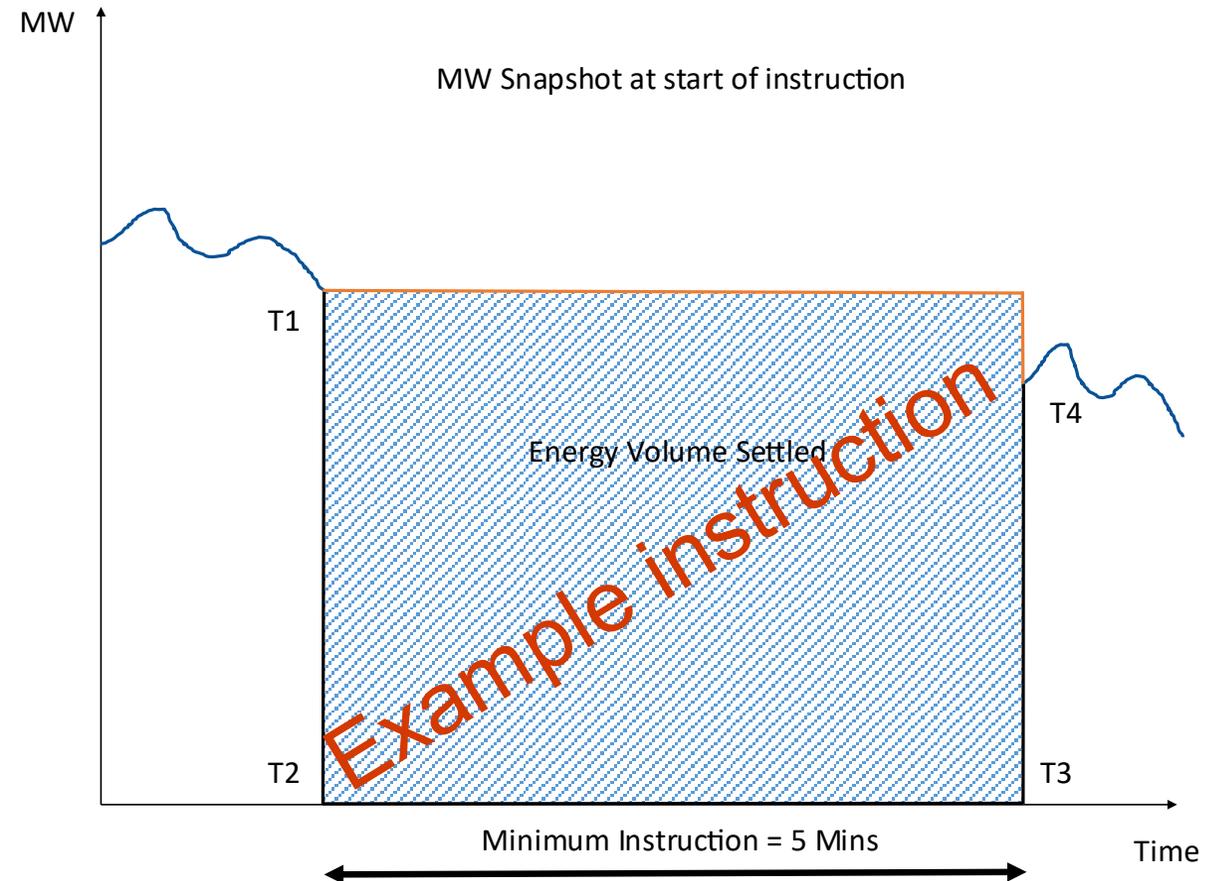
Instruction from ESO via DNO system	Instruct to 0MW or “float” for storage	Utilisation payments only
A continuous service – assumed available (unless declared otherwise)		Price can be resubmitted regularly (day ahead for trial)
A separate commercial contract with the ESO		

- Alternative dispatch mechanisms being investigated
- Intend the launch design to be simple and provide an alternative route for DER to fulfil their ‘visibility & control’ connection terms
- The Balancing Mechanism or Wider Access remain alternative options

# MW Dispatch Service Design (2)

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- The service instruction will instruct DER from their current output to 0MW
- Instructions will have a minimum settlement volume calculated over a time period of 5 minutes
- Proposed response time to be within 2 minutes
- Basis of service payment will be to take a snapshot of output at T1 and assume straight line delivery for duration of instruction



# Service trial roadmap

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Late 2022

Early 2023

Mid 2023

## Registration

- Start to sign terms with, and register, trial DER (following consultation period on contract terms)

## Testing

- Registration
- Data exchange
- System integration (ESO – DNO, DNO – DER, ESO internal systems)

## Commence trial

- Trial service use:
  - Planning
  - Scheduling
  - Dispatch
  - Settlement

4 – 8  
week  
trial  
period

## Enhancements

- Make incremental enhancements based on prioritised list

Roll out

Trial learning

# Example future service enhancements

Possible future 'upgrades' to service design following trial period:

- 1) Alignment of pricing submission window to BM timescales
- 2) Inclusion of 0.5-1MW DER Units
- 3) Enable registration by previously connected DER (without V&C terms)
- 4) Consideration of unique Ramp Rates
- 5) Configurable Baseline Methodology

## Subsequent developments (longer development timeframes)

- 6) Dispatch of decremental (non-zero) instructions
- 7) Support for Aggregated DER Units
- 8) Support for service instruction via alternative routes to DNO dispatch infrastructure
- 9) DNO access to the service for distribution needs

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Q&A

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# Lunch



# Breakout Rooms

We will now be breaking out into roundtable discussion groups. You will be rotating rooms according to the order of the coloured dots on your name badge.

# Ask the panel

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**Thank you for attending  
today's seminar**

**Please provide feedback  
now on Sli.do: #ncsjuly22**