Balancing Costs Strategy

ESO

Factors that Impact Balancing Costs with influence level that ESO has over these factors

- These 15 factors are not mutually exclusive; they directly or indirectly influence each other
- ESO has different levels of influence on these factors.
- The level of influence may change with FSO and the new roles this will bring

UK Government Policy

Energy Security Strategy

e.g. 50 GW of offshore wind by 2030, Whole system energy strategy, nuclear strategy

EU Policy

e.g. Clean Energy Package, Cannot buy more than 30% reserve and response and day ahead

Grid code changes

FRCR, Grid forming, Fixed BSUoS

Interconnectors

New interconnectors imminent, flow on interconnectors depends on market price

Wholesale electricity prices

Set entirely by wholesale market but directly drives BM prices

Network outages

We optimise when outages take place but still has a significant impact on balancing costs

Generator Outages

Balancing options more limited when these are significant

Transmission Network build

What, where and when new transmission networks coming online alleviates constraints

New Products and Services

ESO can design new ancillary services and procure them according to rules of transmission licence, European laws etc

New Generator Connections

When and where new generators connect to the transmission network

Market Design

REMA: incentives on market actors to schedule and trade in a way that respects system security

Operating Margin

The level of operating margin required to cover demand changes or generation breakdowns is defined by ESO.

Market Monitoring

ESO will notify Ofgem of potential market misuse or identify potential market changes required

System Modelling and Data

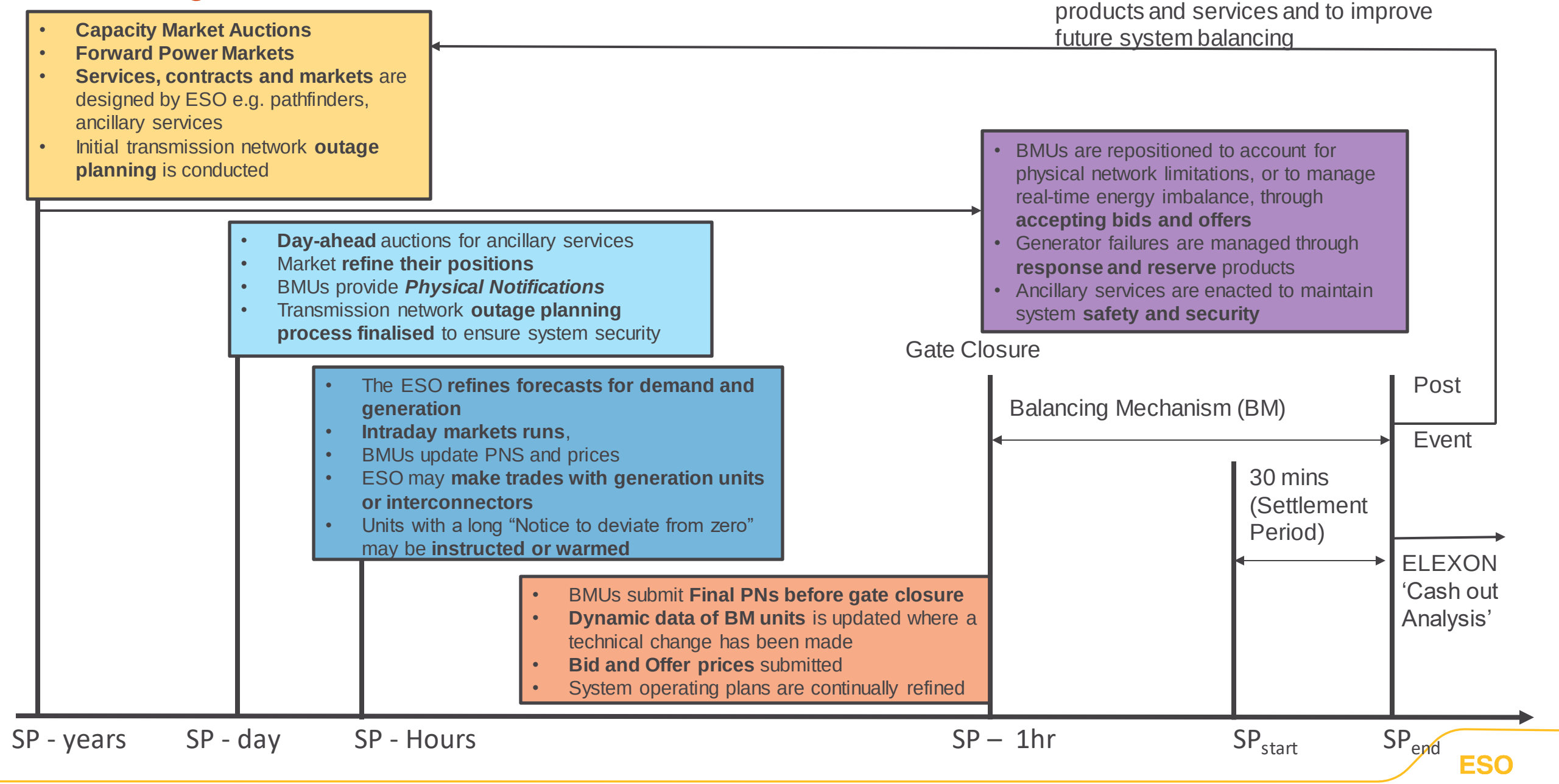
We build system models that result in published data e.g. demand forecasting and transmission constraints

Control Room/BM

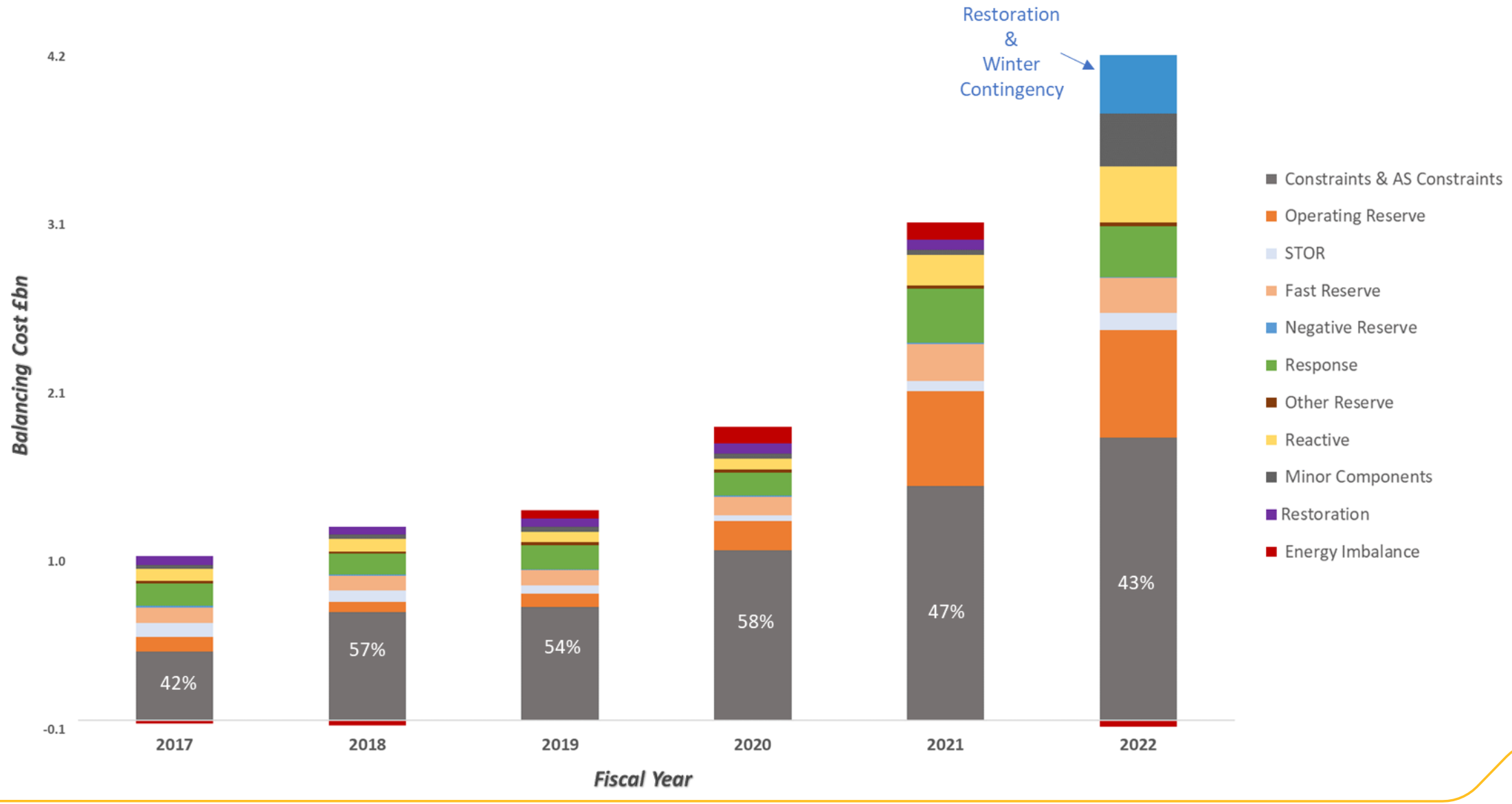
Balance supply and demand at lowest cost whilst meeting security standards

Very little influence | Some influence | Strong influence

Balancing Costs Timeline



Total Balancing Costs Category Breakdown



The ESO’s Strategic Levers

Our Strategy

Levers to minimise balancing costs

Network Planning & Optimisation

Designing the GB network and managing delivery of changes to optimise availability and reduce Constraints.

Commercial Mechanisms

Designing and Procuring new services, with greater competition at an optimised price.

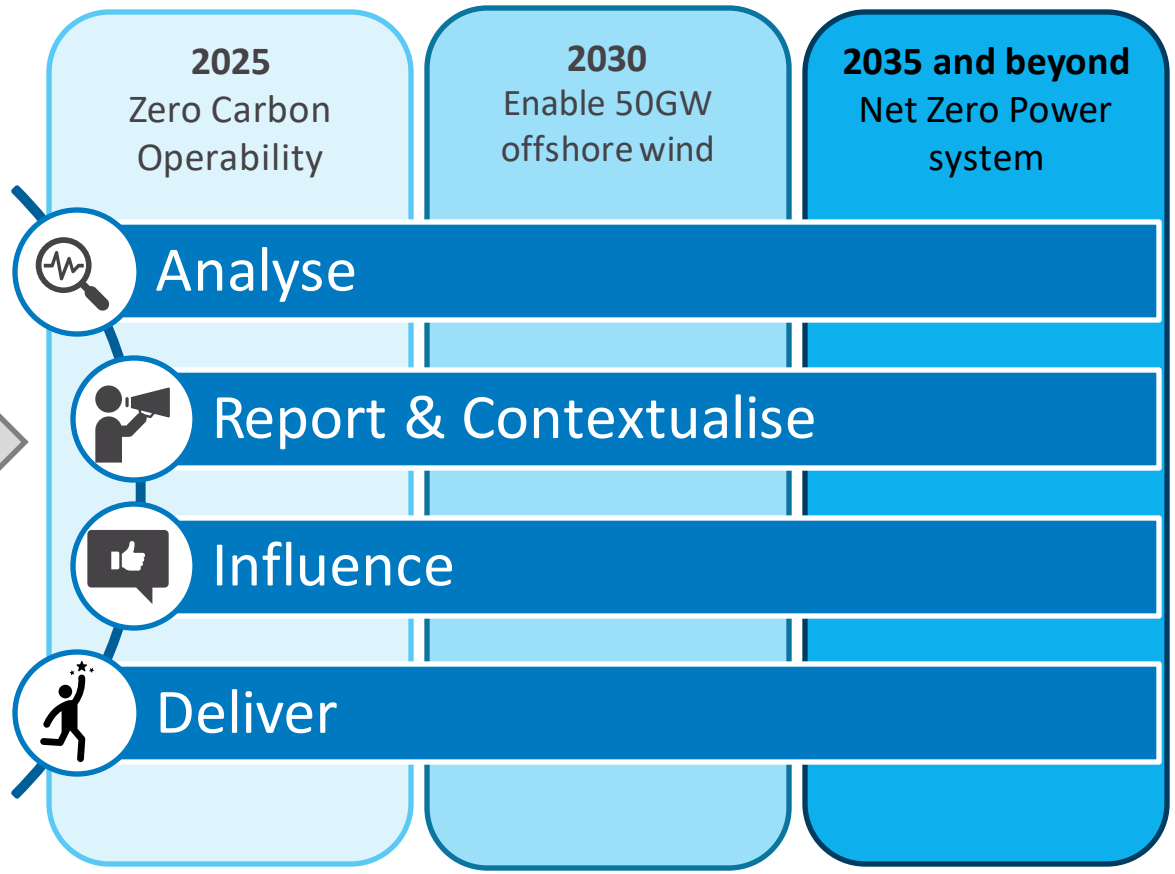
Research, Innovation, Engagement

Experimenting with first in sector approaches and technologies, collaborating with Industry and Academia.

Control Room Processes

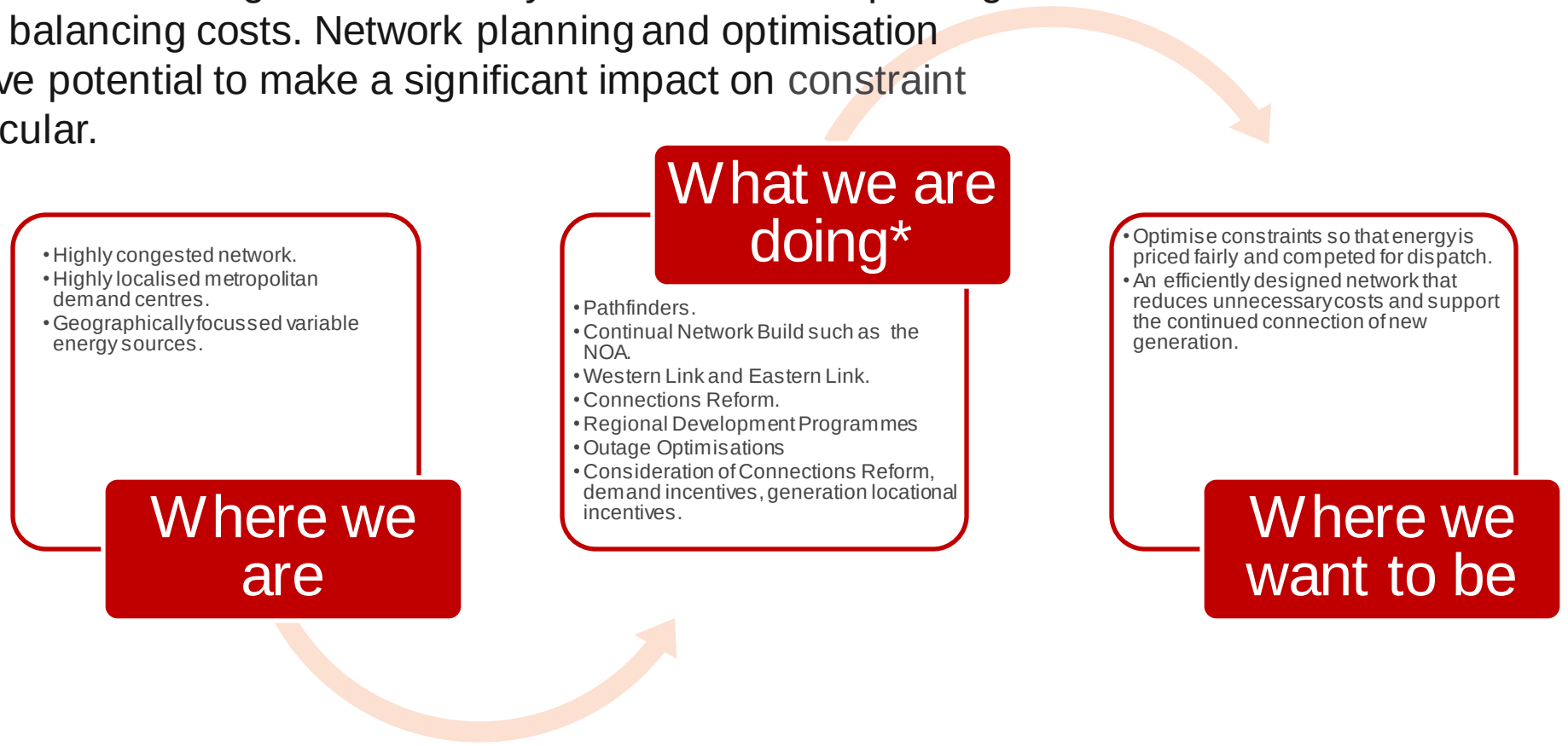
Using enhanced products and services provided to the Control Room, optimising security, supply and cost.

How we use this leverage



Network Planning & Optimisation

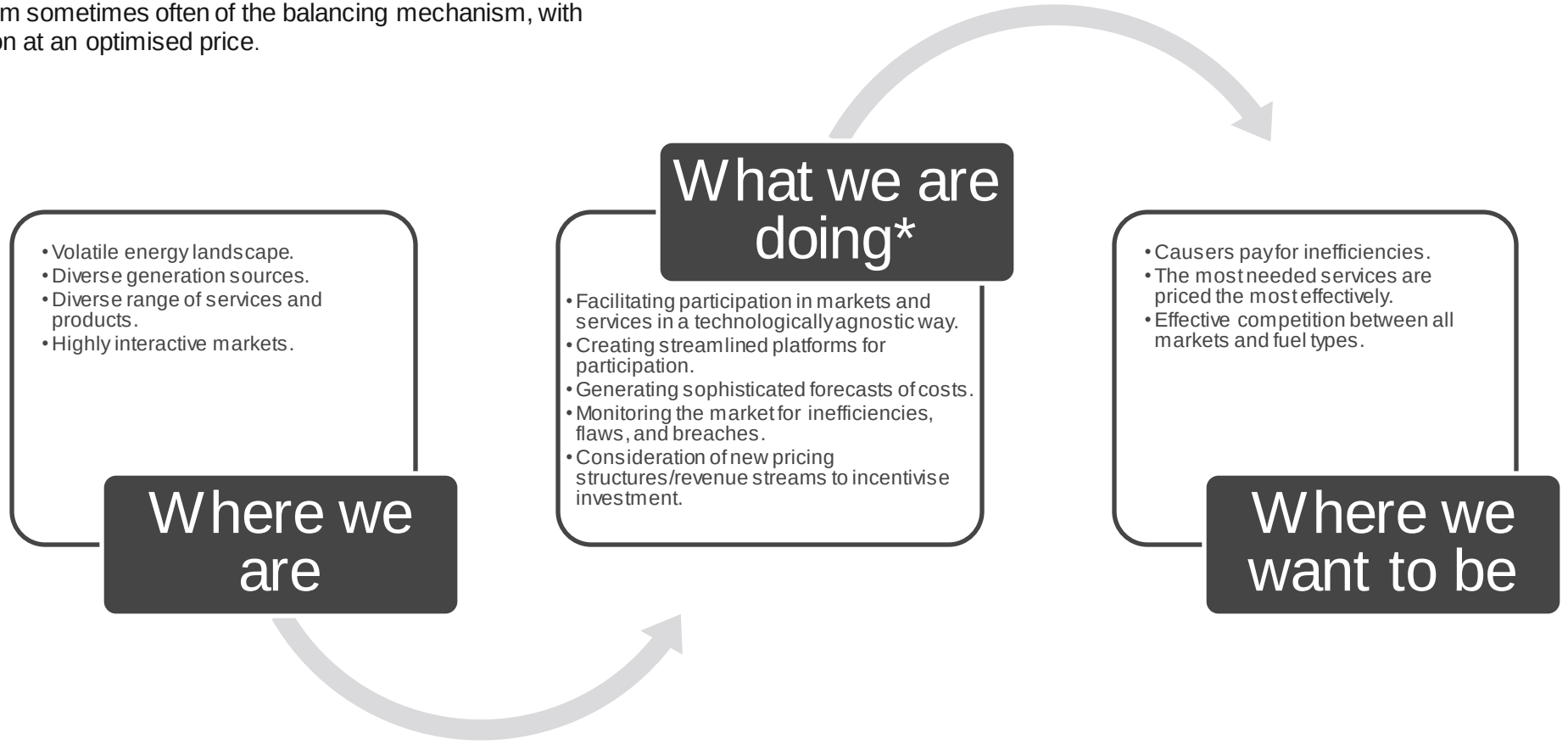
Costs associated with congested electricity networks make up a large proportion of balancing costs. Network planning and optimisation initiatives have potential to make a significant impact on constraint costs in particular.



* For the full list of activities in this area can be found in our balancing costs portfolio.

Commercial Mechanisms

These are initiatives where we design and procure new services to balance the system sometimes often of the balancing mechanism, with greater competition at an optimised price.



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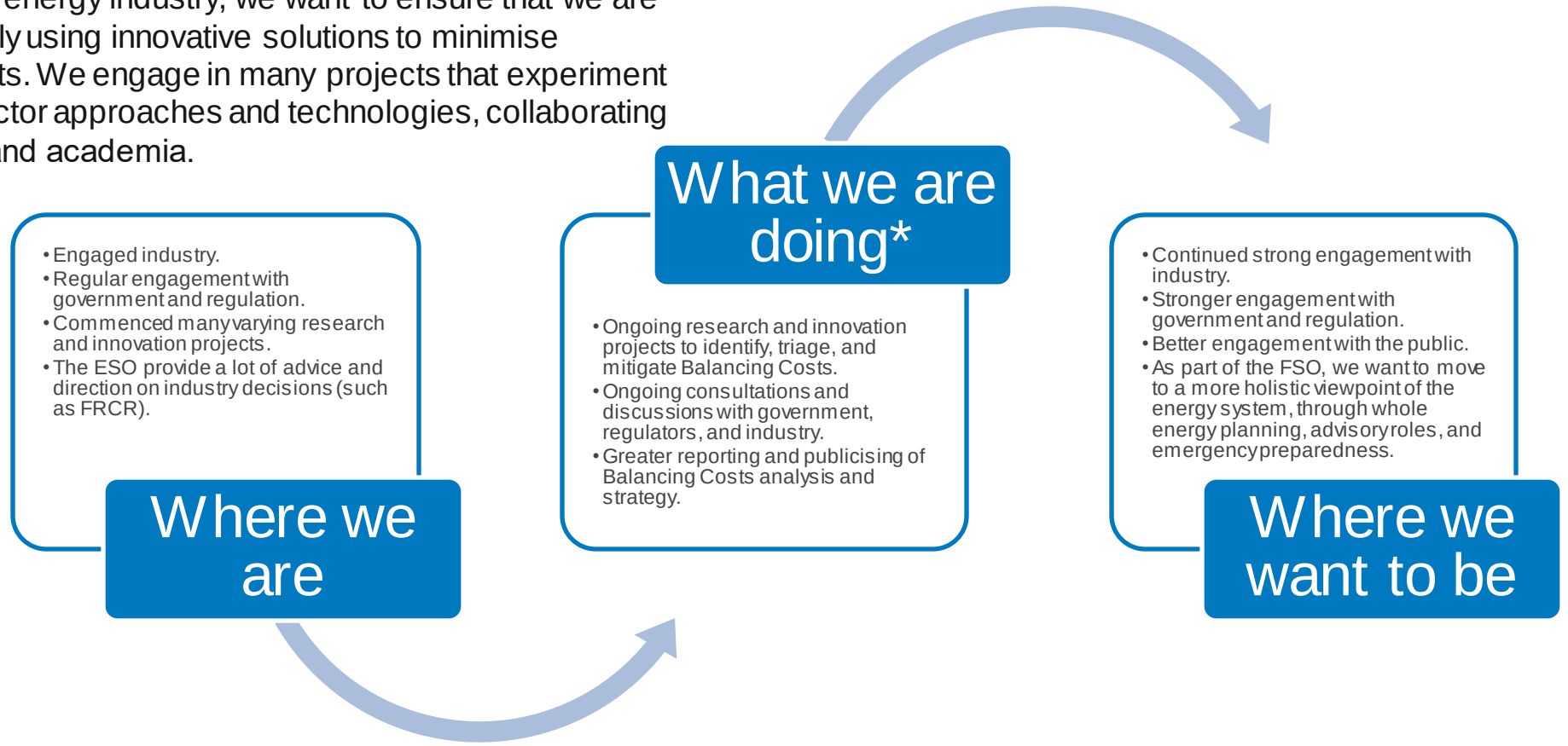
Research, Innovation, Engagement

In an evolving energy industry, we want to ensure that we are most effectively using innovative solutions to minimise balanxing costs. We engage in many projects that experiment with first in sector approaches and technologies, collaborating with industry and academia.



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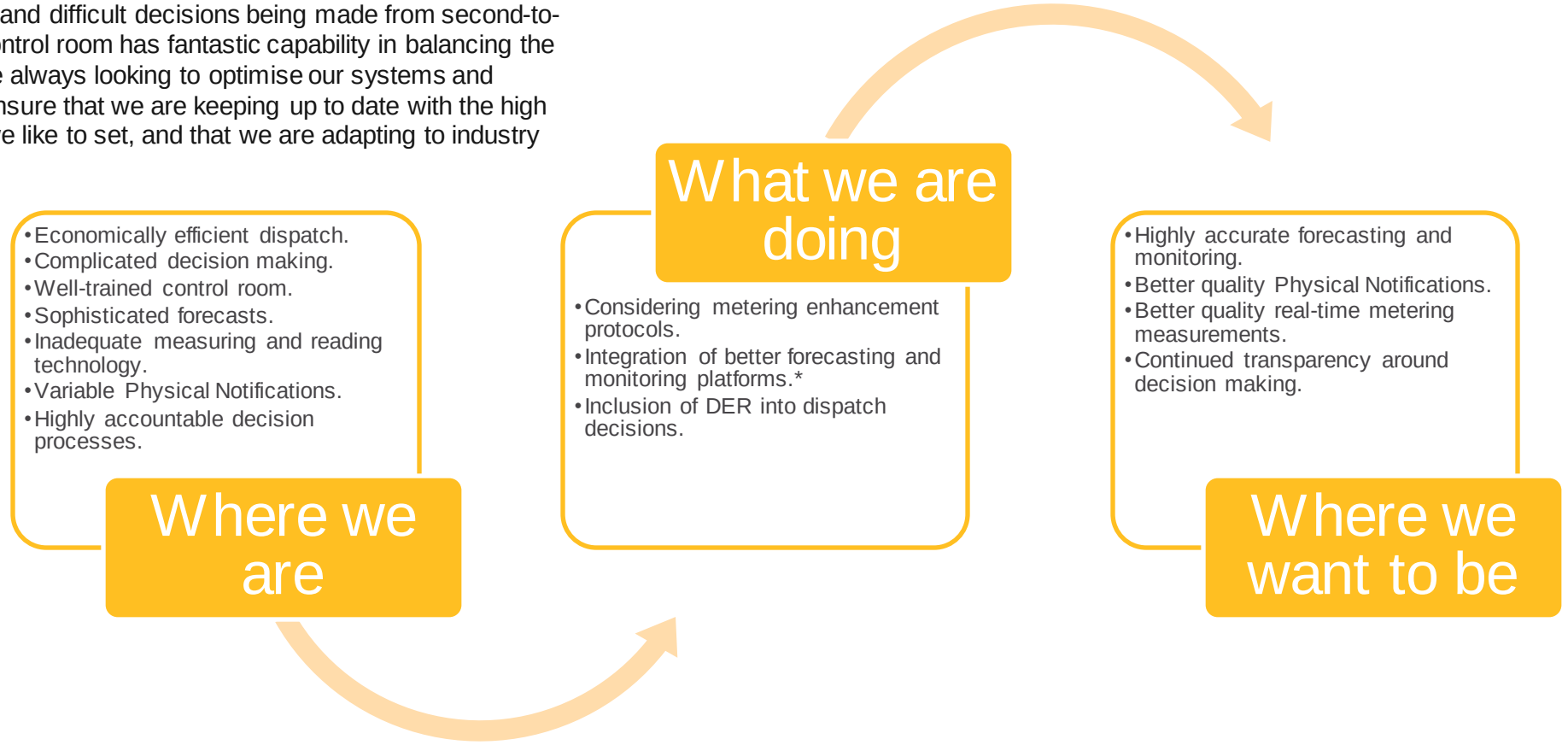
Control Room Processes

Balancing GB's electricity system is an incredibly complicated task, with significant and difficult decisions being made from second-to-second. Our control room has fantastic capability in balancing the grid, but we are always looking to optimise our systems and processes to ensure that we are keeping up to date with the high standard that we like to set, and that we are adapting to industry changes.



*As outlined in our Balancing Programme

The ESO’s Strategic Timeline

2025 – Zero Carbon Operability

We will be able to operate the network for a time interval, if the market provides the correct generation mix, using 100% zero carbon electricity by 2025 with lowest cost solutions

Strategy

Our initiatives across all categories will:

- Increase operability envelope for secure system operation (**Control Room Actions**, **Innovation & Technology**),
- Enable new zero-carbon providers for ancillary services (**Network Planning & Optimisation**, **Commercial Mechanisms**)

Impact

Our increased ability to operate a zero carbon system will reduce balancing costs through:

- mitigating/eliminating frequency risks
- alleviating constraints
- reducing renewable generation curtailment
- competitively procuring services in advance to reduce need for expensive interventions in the BM.

Activity essential for 2025 zero carbon operation (Operability Strategy Report 2022)

		2019	2020	2021	2022	2023	2024	2025
Frequency								
DC	Dynamic and fast acting response product to manage larger losses at lower inertia levels		■					
DM	Dynamic response to better manage large changes in intermittent generation at lower inertia levels			■	■			
DR	Dynamic response to better manage pre-fault frequency at lower inertia levels			■	■			
Reformed Markets	Market reform across all response and reserve products to facilitate new zero carbon operation		■	■	■	■	■	
Stability								
ALOMCP	Removes the risk of DER activation at lower inertia levels		■	■	■			
Phase 1	12.5GVAs of inertia		■	■				
Phase 2	6.5GVAs of inertia and 11.5GVA SCL for Scotland		■	■	■	■	■	
Phase 3	17GVAs of inertia and 12.7GVA SCL for E&W			■	■	■	■	
FRCR	Enables the enhancements from the Frequency provisions to change how we operate the system at lower inertia			◆	◆	◆	◆	◆
Inertia monitoring	Implementing first of its kind inertia monitoring tools, providing instantaneous, real time data	■	■	■	■			
Voltage								
Mersey	Reduce the reliance on a single CCGT for voltage in one area		■	■				
Pennines	Expand the learning to cover a larger area and reduce reliance on a number of units		■	■	■	■		
E&W	Cover the whole of E&W to ensure no reliance on machines to manage voltage				■	■	■	
Efficiency	Increased access to existing capability through changes to codes and developments with the Transmission owners				■	■	■	
Thermal								
Efficiency	Five point plan and Constraint Management Pathfinders to increase zero carbon capabilities		■	■	■	■	■	
Restoration								
ESRS Services	Ensured that all ESRS services are in place and do not require units to be 'warmed' to provide the service	■	■	■	■	■	■	■

2025 – Zero Carbon Operability

ALoMCP, FRCR & Dynamic Containment

Context

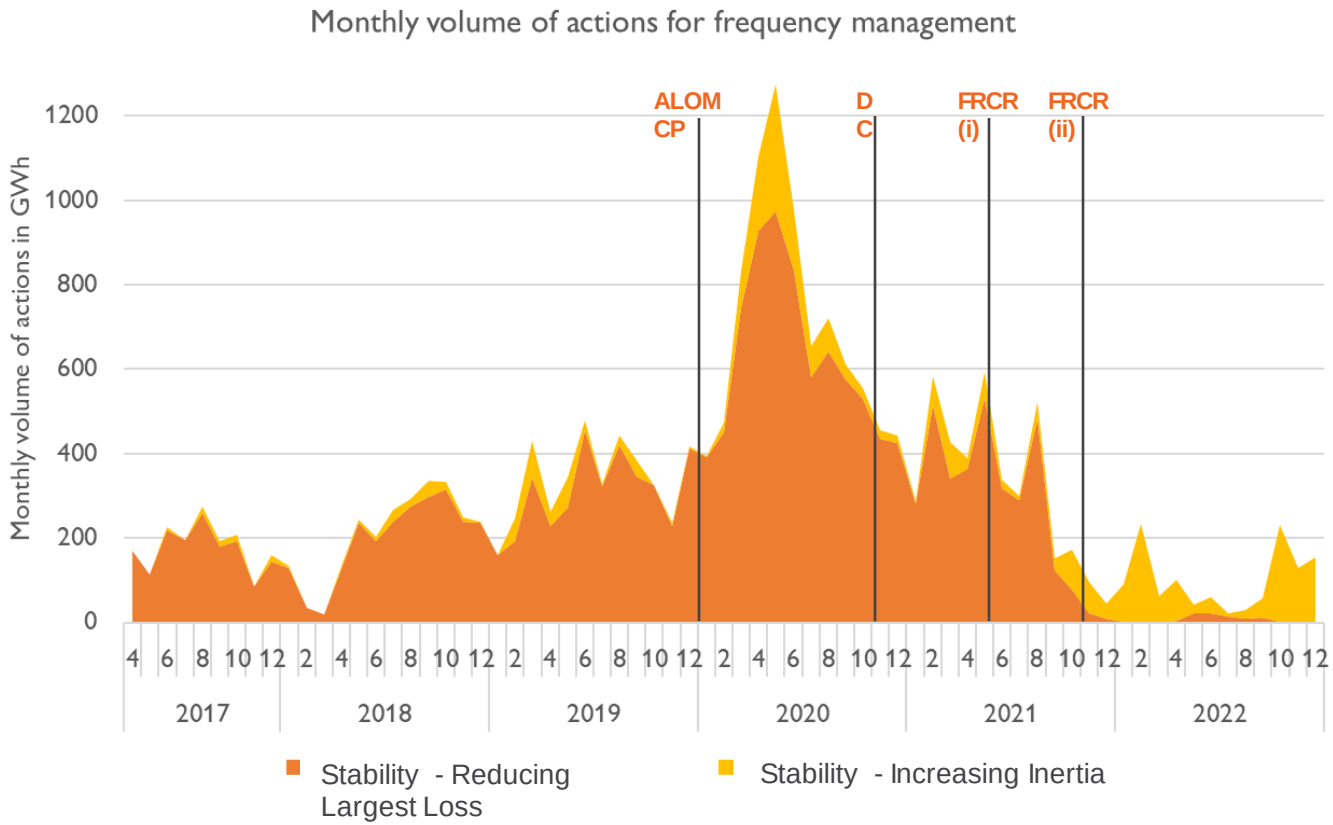
- Increasing renewable generation is leading to lower system inertia.
- The rate of change of frequency (RoCoF) is higher as a result and, without management, loss of mains protection is at greater operational risk.

Initiatives

1. **Accelerated Loss of Mains Change Programme (ALoMCP) 2017 - 2022**
2. **New Response Services (Dynamic Containment, DC) 2020**
3. **Frequency Risk and Control Report (FRCR) 2021, 2022 & 2023**

Impact

- All three initiatives have significantly reduced volume of bids for stability required to manage largest losses and increase system inertia
- Without them, we would need over **1.5 TWh of additional actions in 2023/24 to ensure system security, costing at least £1,100m**



2030 – 50GW of Offshore Wind

Modelled Constraint Costs after NOA7 / NOA7 Refresh Optimal Reinforcements

Context

- Constraint costs are projected to rise to up to c£3bn/ year by 2028 (FES scenario 'Leading the way').
- Driven by increasing offshore wind capacity to reach government target of 50GW by 2030 from ~10 GW in 2023.
- We are mitigating these forecast balancing cost rises with **Network Planning & Optimisation** initiatives.

Acceleration of Strategic Transmission Investment (ASTI)

- We have collaborated with Ofgem on Acceleration of Strategic Transmission Investment (**ASTI**) framework
- Our **HND** and **NOA7 refresh** identify onshore and offshore transmission network projects to be accelerated.
- Significant shift in how large projects are identified, assessed, and funded.

Impact on balancing volumes and costs

- **Ofgem sanctioned 26 projects in December**
- Accelerating these projects will deliver additional **balancing costs savings of up to £2.1bn** and enable benefits of decarbonisation through increased offshore wind capacity

2030 – 50GW of Offshore Wind

NOA Network Services Procurement (Pathfinder) Projects

Context

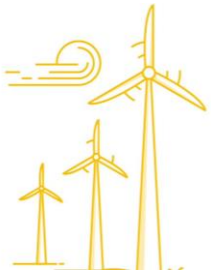
- Pathfinders launched May 2019 to **proactively target known network issues** that would increase balancing costs as we progress to net zero power system
- We identified **innovative, strategic solutions** to these issues *(Network Planning & Optimisation)* and secured lower cost, long-term contracts for these services *(Commercial Mechanisms),* with **significant balancing costs savings through to 2035.**

Impact on balancing volumes and costs

- Voltage Mersey, Stability Phase 1 and CMIS are beginning to reduce balancing costs and volumes.
- Costs have reduced as long-term contracts are cheaper than using the BM, or TO counterfactual build
- Volumes have reduced as we are procuring services through long term contracts rather than via the BM.
- CMIS B6 has additionally reduced volume of pre-emptive curtailment when there is risk of a fault.
- These trends will continue with remaining pathfinders, with **forecast total balancing costs savings of >£15bn out to 2035.**

Pathfinder	Contract start	Contract end	Savings to date (£m)	Total forecast savings (£m)
Stability Phase 1	Jan 20	Apr 27	26	128
Stability Phase 2	Apr 24	Mar 34	-	130
Stability Phase 3	Apr 25	Mar 35	-	14,900
Voltage Mersey	May 22	Apr 31	13	
Voltage Pennine	Apr 24	Mar 34	-	15
CMIS B6 Interim contracts	Apr 22	Sep 23	80	
CMIS B6 2023/24	Oct 23	Sep 24	-	40-60
CMIS B6 2024/25	Oct 24	Sep 25	-	70
		Total savings	117	15,293

2035 and beyond – Net Zero Power System



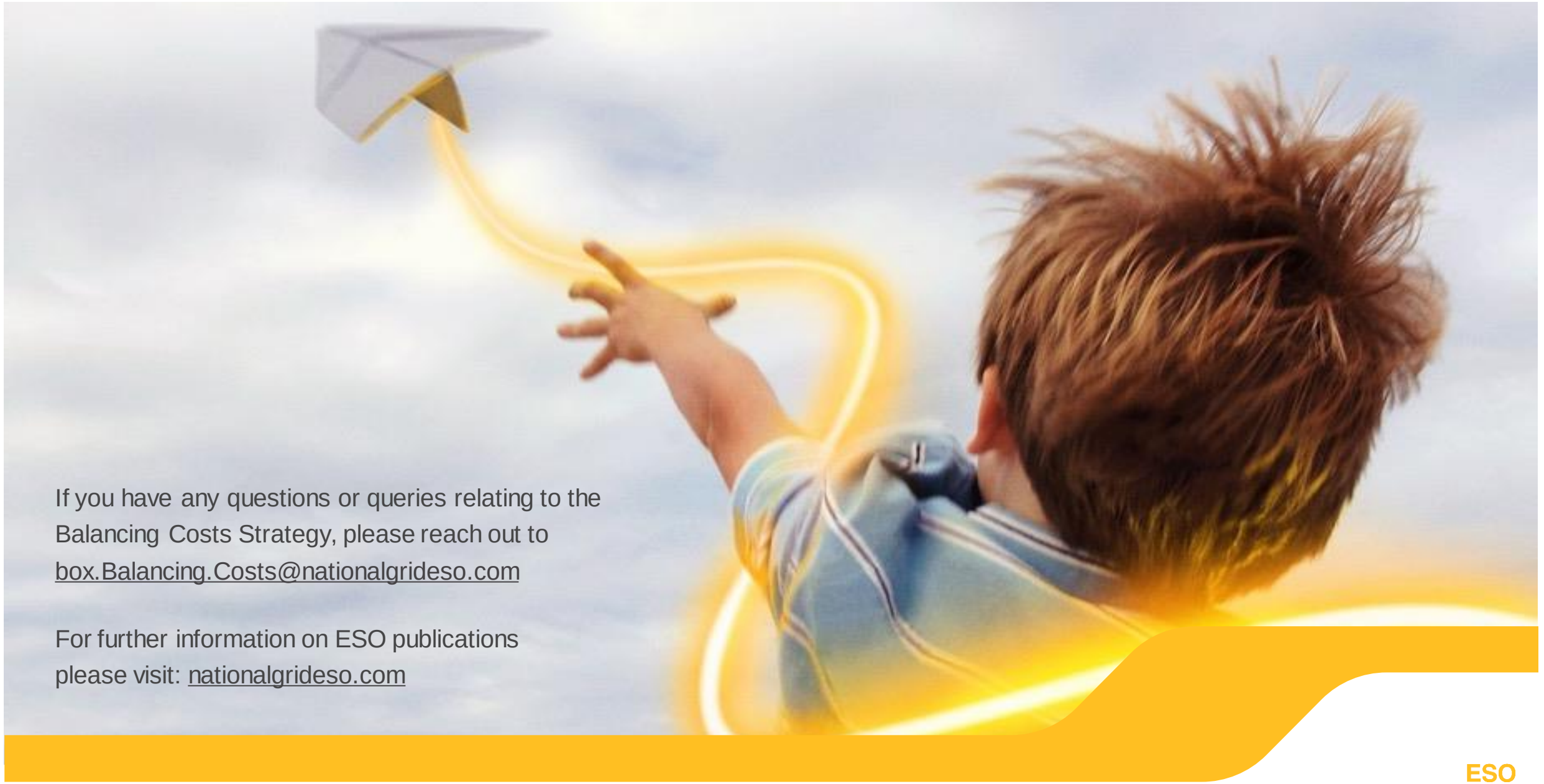
Context

- **Constraint costs** will continue to be a major driver of increasing balancing costs as more offshore wind is connected
- The role of the ESO is changing. As we become a **Future System Operator (FSO)** we will be in a better position to **drive government policy** and provide expert advice on network planning

Strategy

- We have already made fundamental changes in the way we deliver network infrastructure solutions via the **Holistic Network Design** *(Network Planning & Optimisation)*
- These changes will continue as we develop a **Centralised Strategic Network Plan (CSNP)** to plan onshore and offshore more holistically and as the FSO take on new roles as a whole energy system planner *(Network Planning & Optimisation)*

- This will go hand in hand with the fundamental changes happening **via connections reform** *(Network Planning & Optimisation)* **and Net Zero Market Reform** *(Commercial Mechanisms).*
- A **holistic, whole energy system network plan** in an environment where **efficient decision making** can thrive will enable us to meet the challenges of net zero and is the key to driving down balancing costs in the longer term



If you have any questions or queries relating to the Balancing Costs Strategy, please reach out to box.Balancing.Costs@nationalgrideso.com

For further information on ESO publications please visit: nationalgrideso.com

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