ESO experience of inertia monitoring and measurement tools

October 2023

Agenda

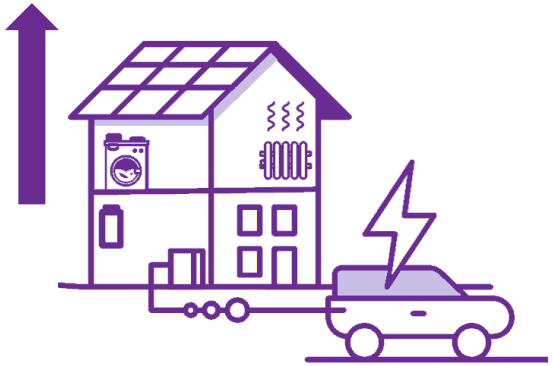
- Changes to GB system inertia
- How we have managed and calculated system inertia historically
- Mitigating lower inertia levels on the system
- Our two approaches for monitoring system inertia
- Looking ahead – other advantages of utilising monitoring technologies

The gap to operating a net zero power system

Year round zero carbon operation in GB in 2035 introduces a number of **challenges** to system operation.

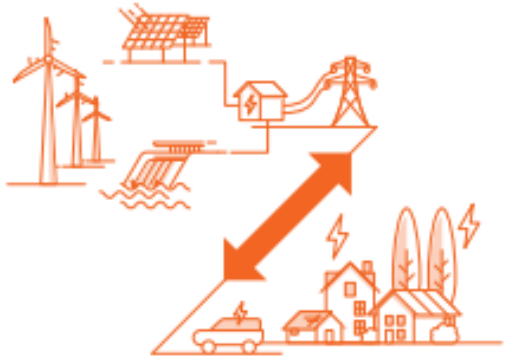
Less dispatchable generation

More asynchronous generation



More variable and unpredictable demand

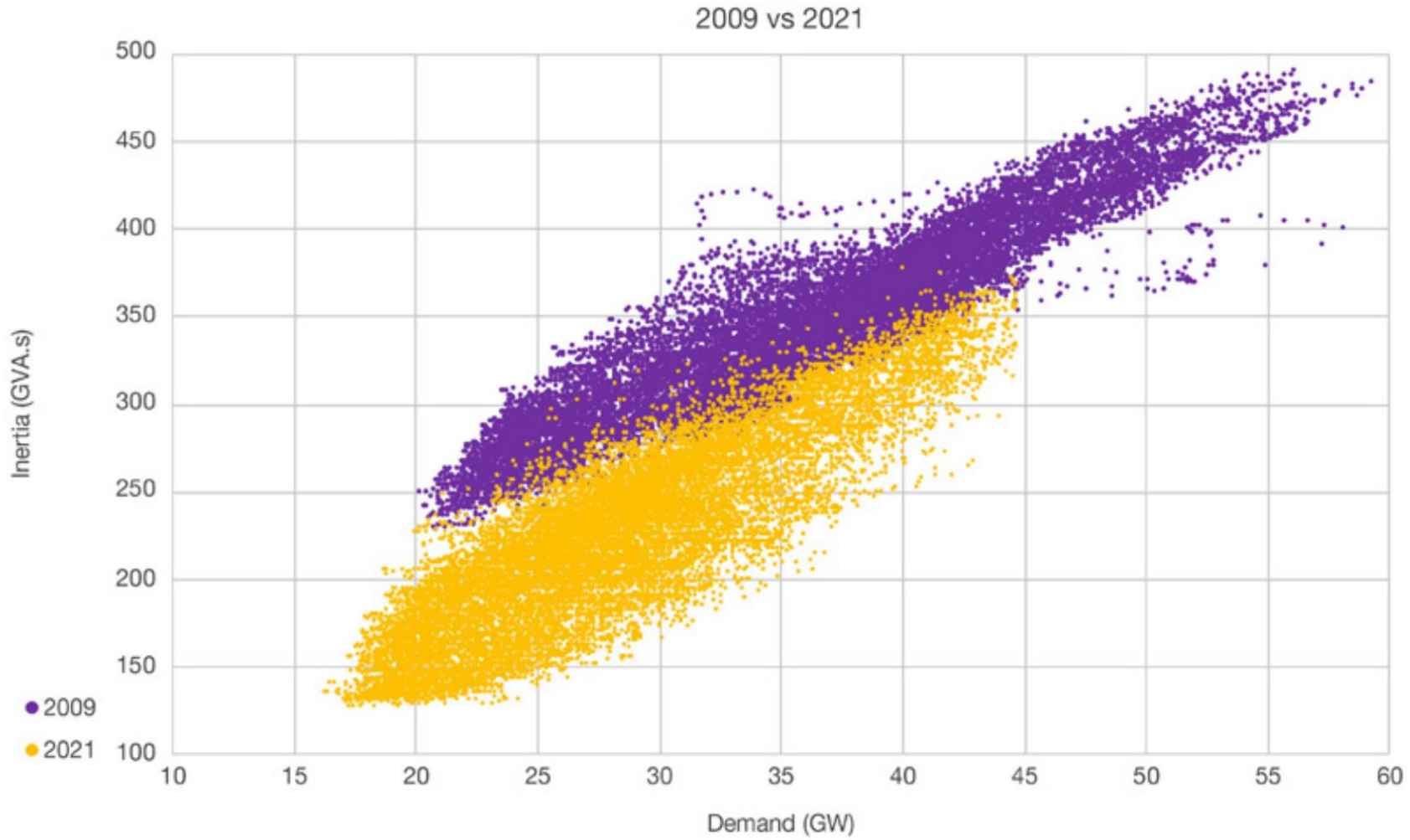
More variable sources of generation



Generation moving to different areas

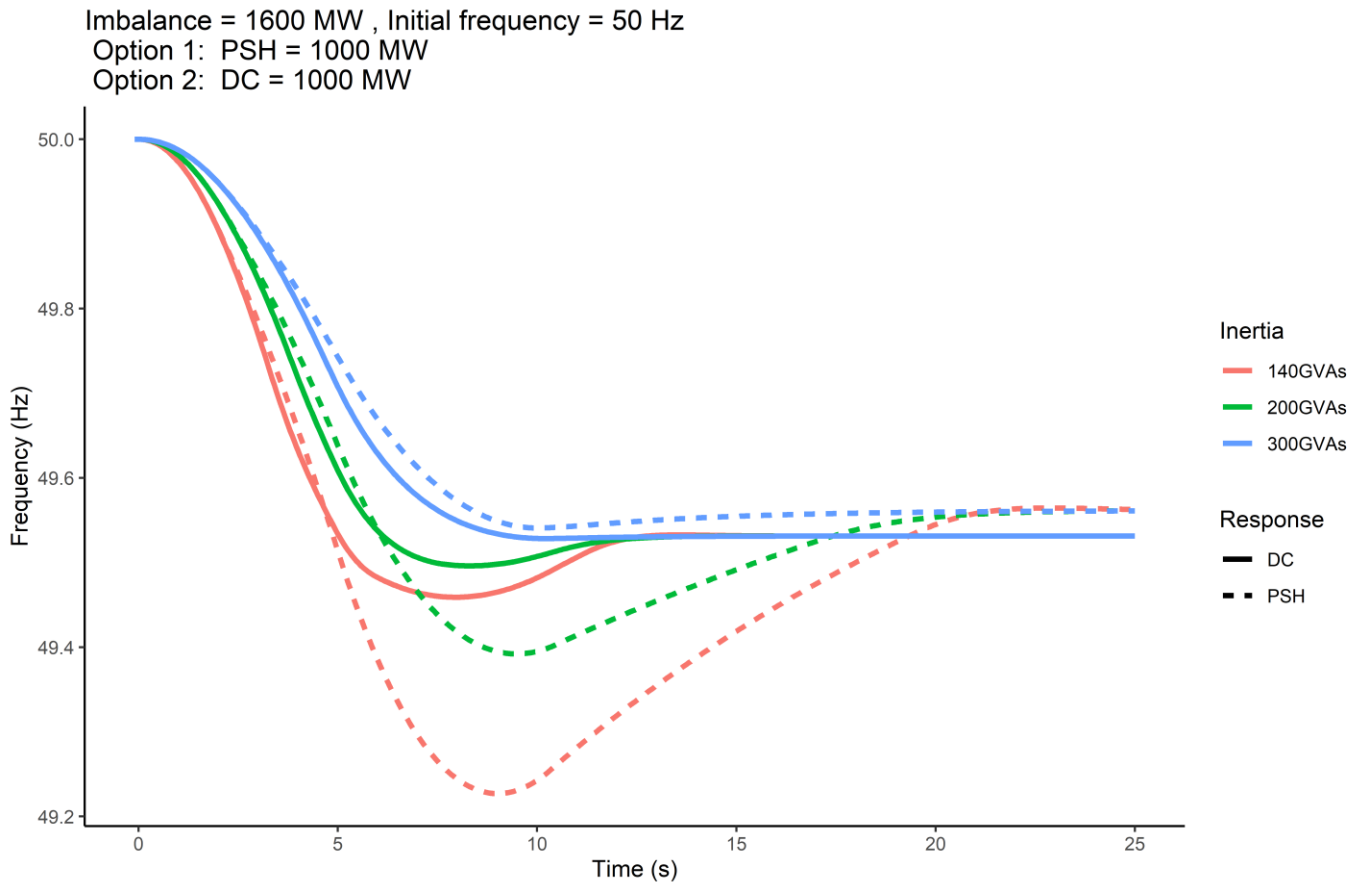
How inertia has changed on the GB system

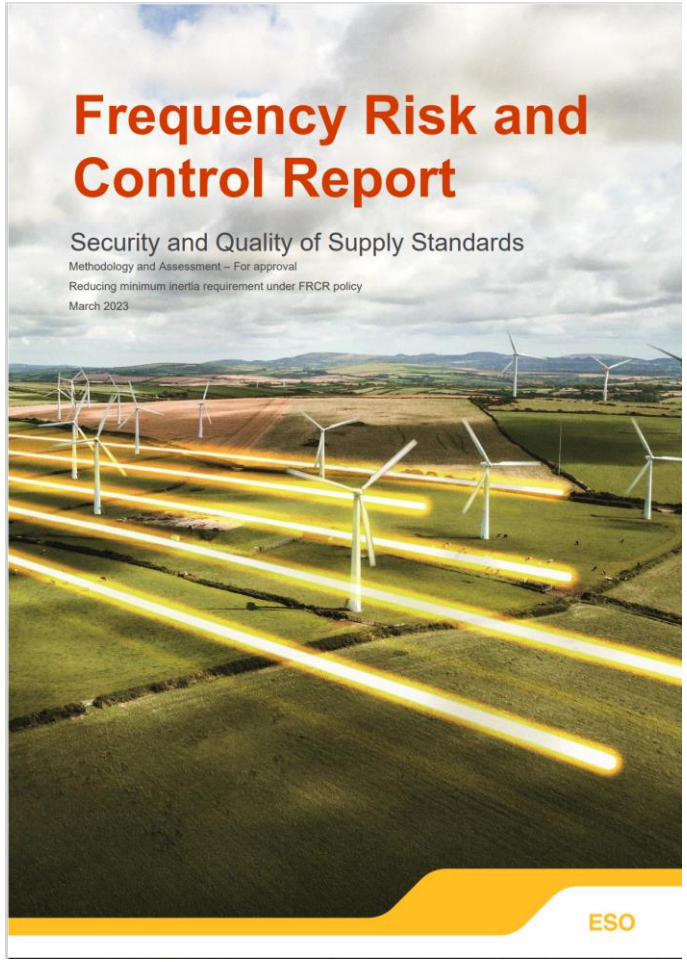
Inertia vs Demand



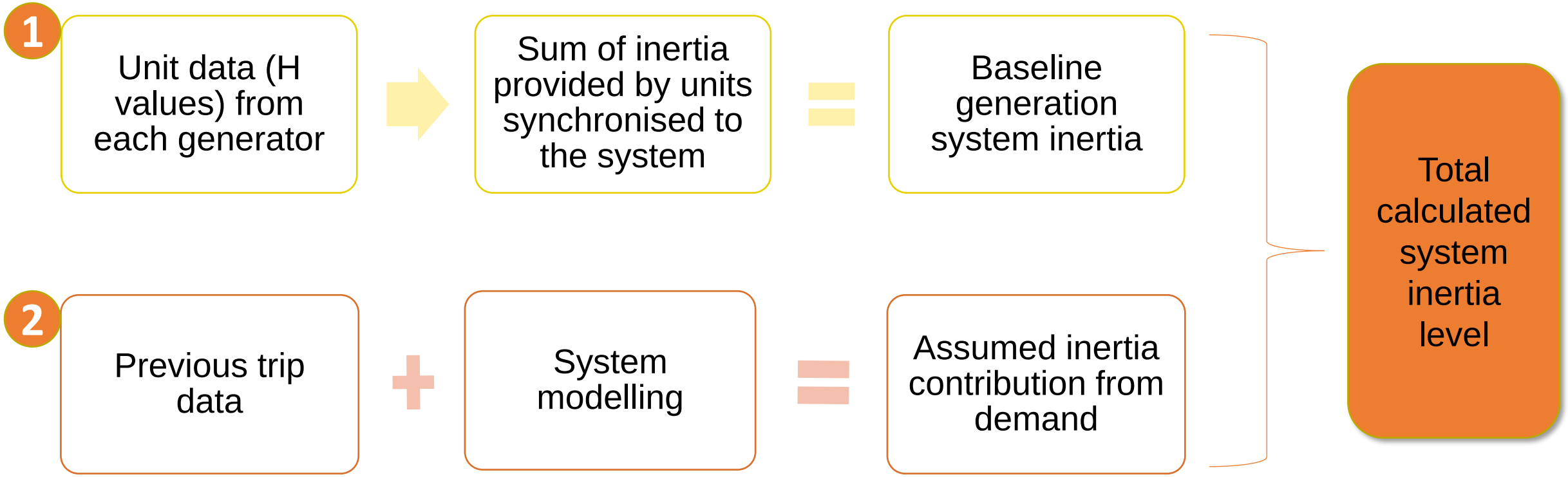
- Generally the maximum inertia now is lower than the minimum inertia was in 2009
- Average inertia provided by the market (pre-ESO actions) in 2023 to date is 180GVA.s

Mitigating lower inertia with new response services and changing the standards





How have we previously calculated system inertia?



Two approaches to monitoring system inertia – PMUs and XMUs

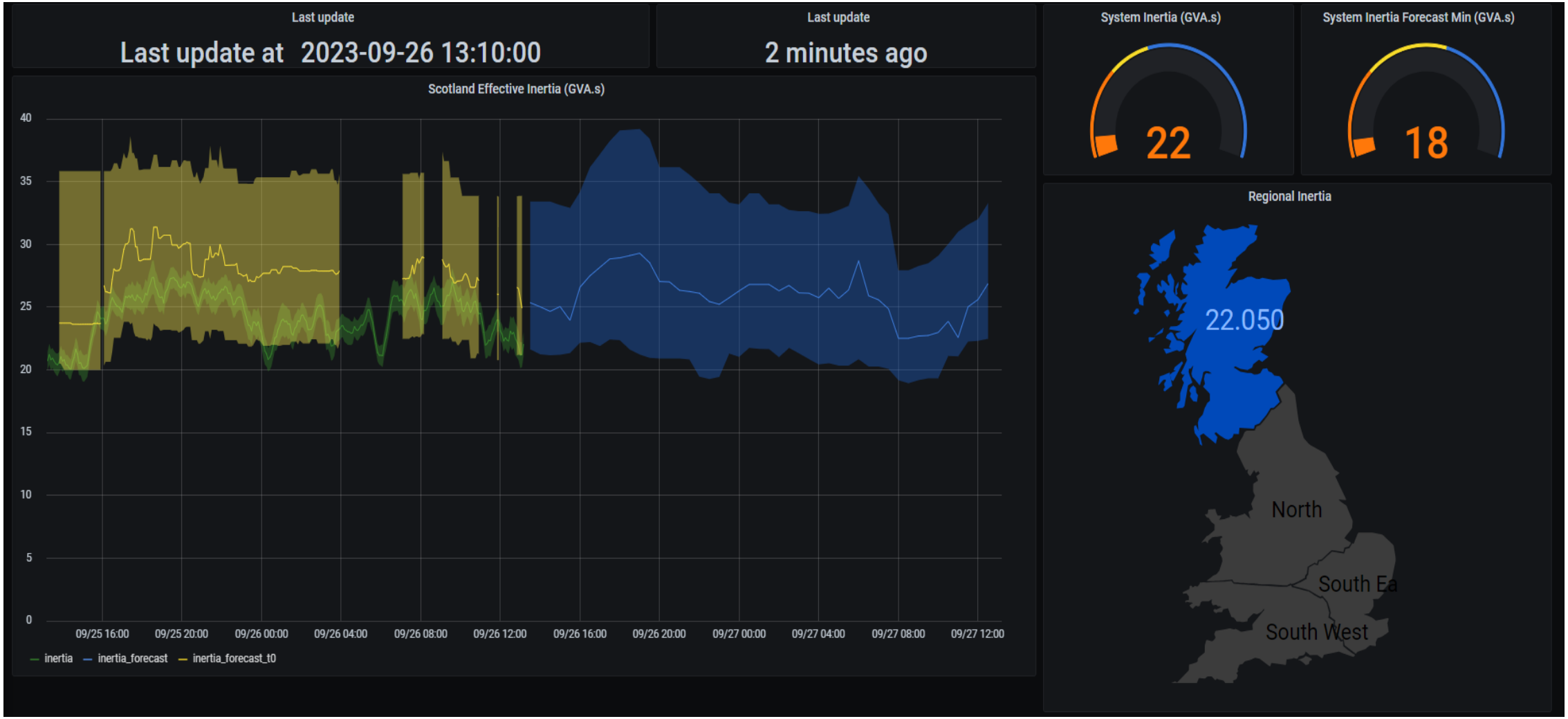
GE: Scotland PMU's

- Operational since late 2021
- Limited PMU availability (Scotland only)

Reactive Technologies: England & Wales (XMUs)

- Operational since July 2022
- Measures across England and Wales with >30 XMU devices

GE


Last update
Last update at 2023-09-26 13:10:00
Last update
2 minutes ago
System Inertia (GVA.s)
22
System Inertia Forecast Min (GVA.s)
18
Scotland Effective Inertia (GVA.s)
40
35
30
25
20
15
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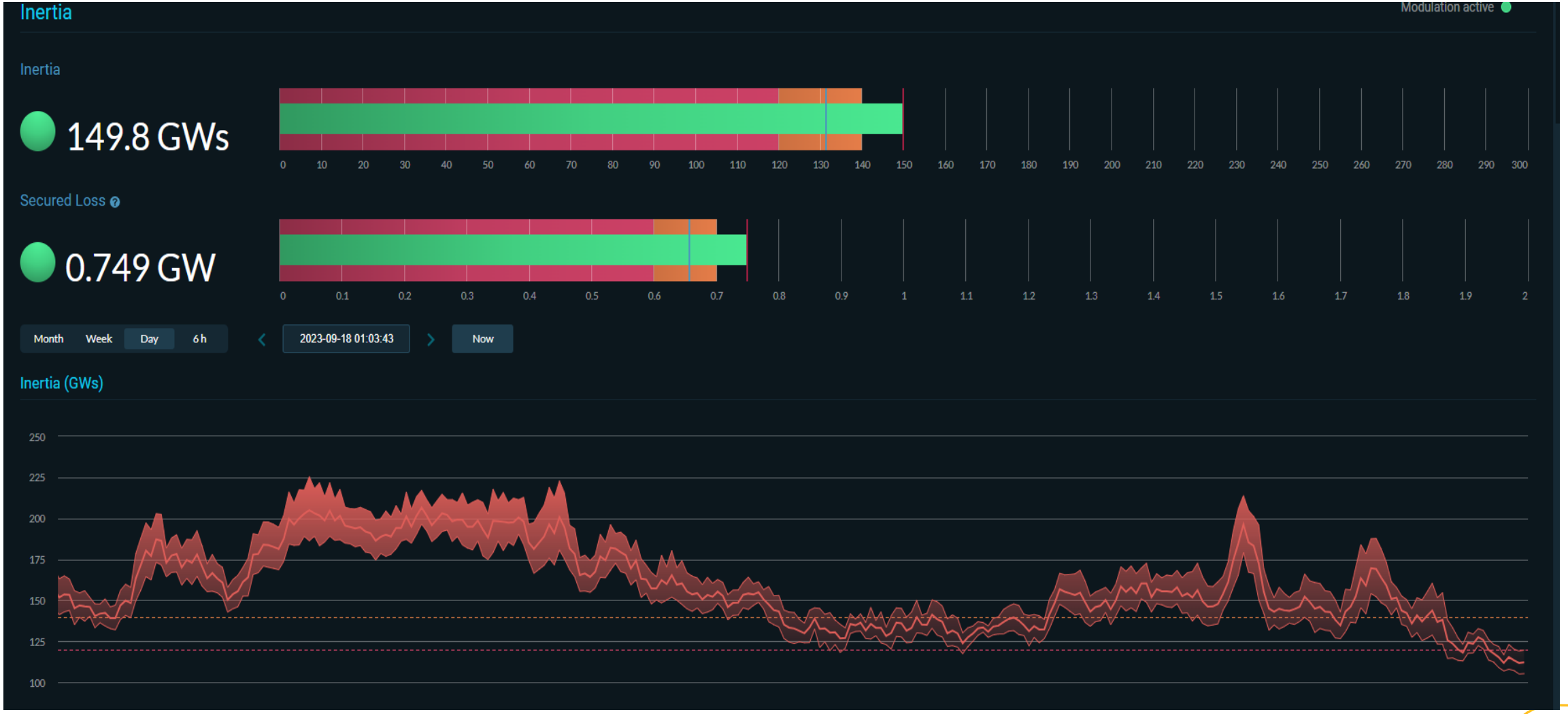
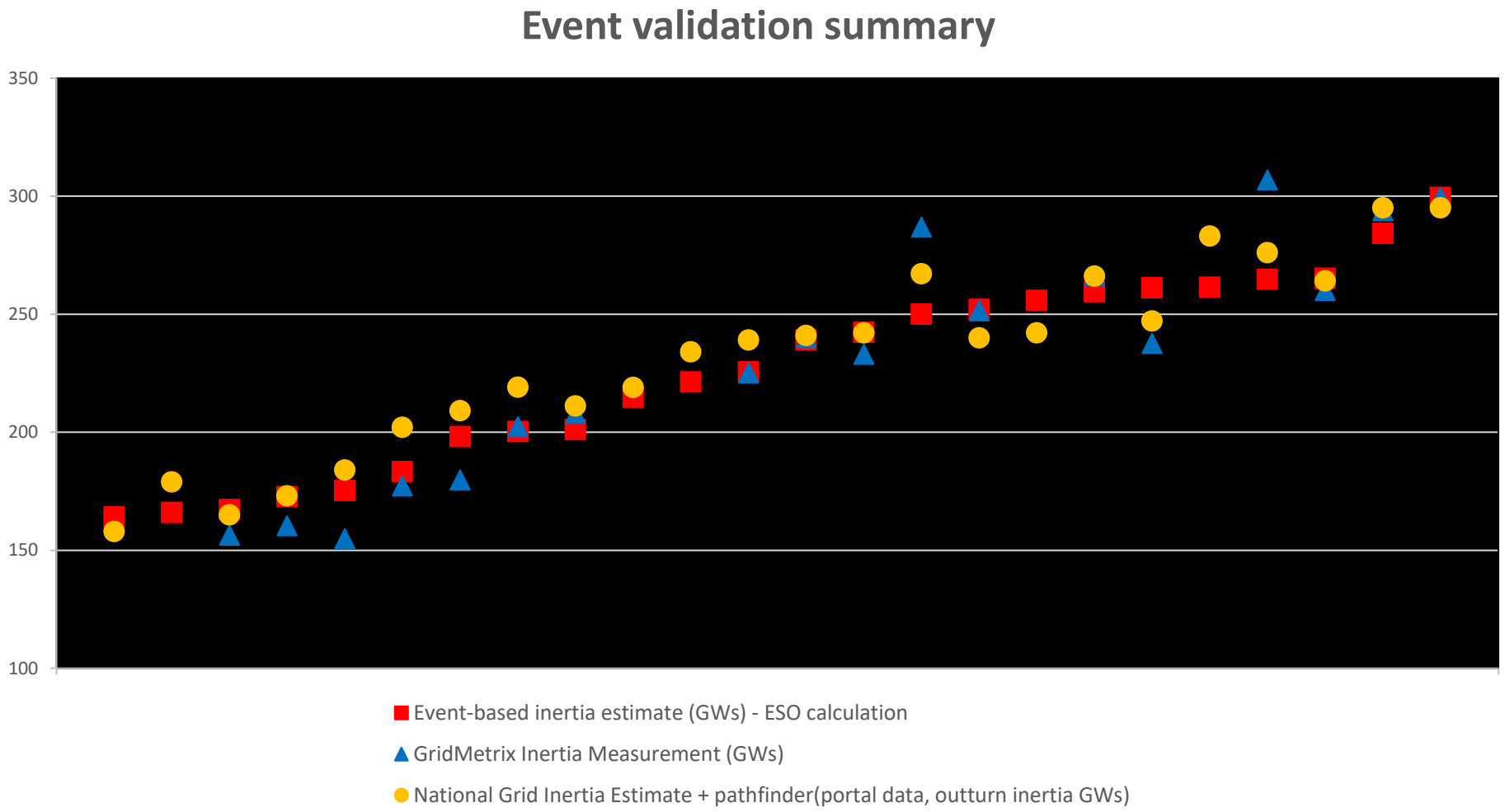
Reactive Technologies



Challenge of validating tools, based on large loss events

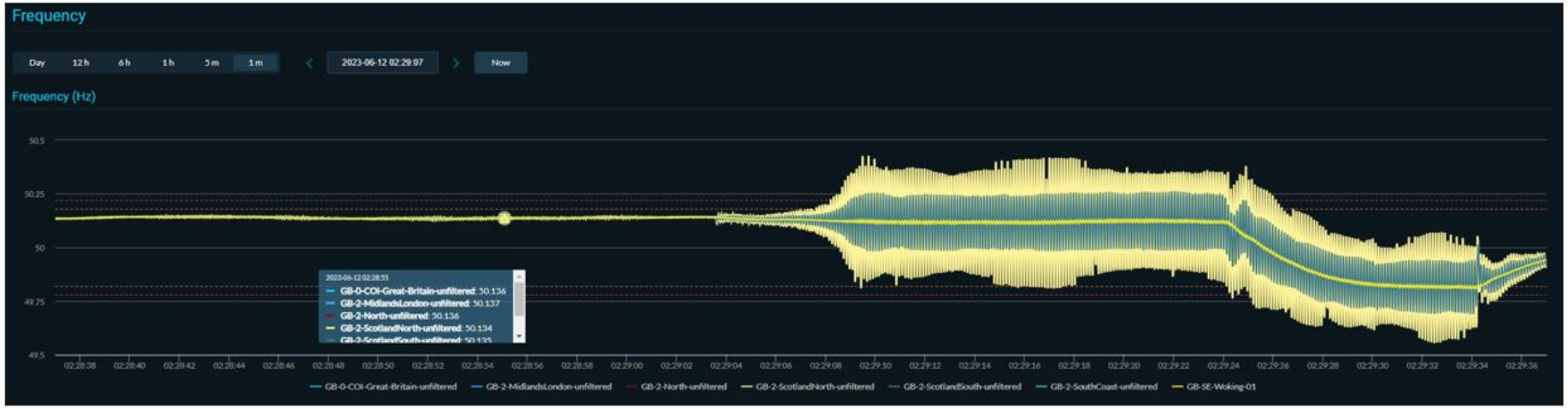
- RoCoF of trip events used to validate data
- >500MW trips, majority interconnector trips
- No trips below 160GVAs
- Working to understand variation at lower inertia (<180GVAs)
- Independent review underway by National Physical Laboratory



Looking ahead

Oscillation detection

- Alongside SCADA replacement and PMU rollout we are implementing wide area monitoring (WAMS) oscillation detection system.
- Implementing service from Reactive Technologies to monitor Scotland for indication of Oscillations within network.
- Initial PoC solution to be made available in October 2023 using the XMUs installed as part on Inertia Monitoring solution

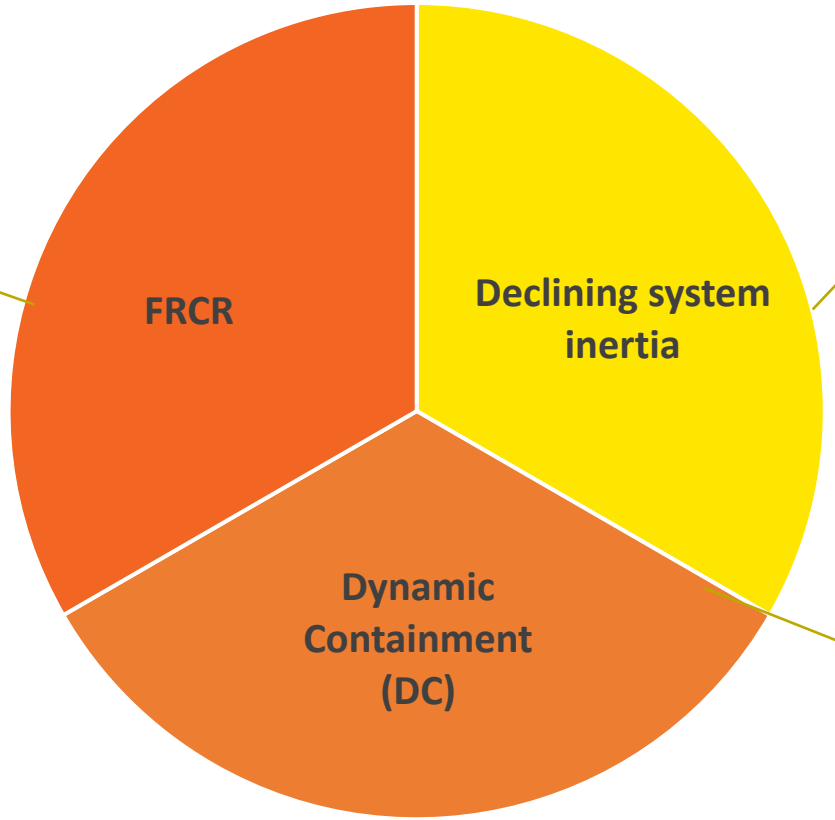


ESO

Why is inertia monitoring important?

- Improved management of system inertia (and frequency) through some key deliverables, reducing the overall cost for consumers.
- We are able to optimise these deliverables to achieve an optimal balance of cost against managing system risk.

Considers 'controls' available to the ESO for managing frequency risks, including system inertia.



Ambition to operate at 102GVA.s inertia by 2025

Implementation of DC has enabled us to begin to look at operating the system with lower inertia levels