Current state

- System inertia is falling so RoCoF is increasing
- We do not have a well-established or accurate way to calculate RoCoF from frequency data.
- Frequency and RoCoF measurements are used in system planning and operation, e.g. to find residual inertia from demand
- Cost through balancing services to reduce largest loss or increase system inertia above 0.125Hz/s is c. £30m per annum
- An upcoming Grid Code mod will potentially require us to report the max RoCoF in a system event

Ideas / hypotheses

- We can design an approach to decompose, analyse and calculate RoCoF by finding fundamental and common parameters within frequency data
- The use of wavelets would allow us determine these parameters for past events and in real-time
- Having consistent and accurate RoCoF measurements could reduce system costs and improve system security

Project activities

1. Pre-processing and integration of datasets at different PMU measurement sites and for various frequency events
2. Transformation of frequency PMU data using smoothing, wavelets, Empirical Mode Decomposition and Variational Mode Decomposition methods
3. Determination and reconstruction of fundamental patterns for relevant components from the transformed frequency measurements
4. Development of a mathematical model to translate frequency data into reliable and accurate RoCoF representations

Benefits

- More accurate and secure demand inertia estimation analysis to facilitate RoCoF management in balancing services
- It is estimated that if the system inertia assumptions were revised based on the more accurate RoCoF value, potential frequency management savings could be up to £2-3millions/annum
- The 27th May 2008 low frequency event created significant disruptions to the customer. By providing the accurate RoCoF value for historical events, system behaviours can be better understood and future operation risks can be managed more effectively

PROJECT SUMMARY (1/2)

- Bullet points are fine
- Font size 12 – 14 only

Fit with strategy (mark all that apply)	
1. Developing DSOs & whole system operability	
2. Improving short-term forecasting	
3. Managing volatility in a low-inertia system	
4. Leveraging analytics in a data-enabled future	
5. Delivering enhanced cyber security	
6. Enabling more non-synchronous connections	
7. Supporting voltage and reactive power	
8. Optimising constraint management	
9. Reimagining system restoration	
10. Creating markets for the future	
11. Harnessing a digitised grid	
12. Understanding long-term behavioral change	
13. Enabling changing gas flows	
14. Enhancing visibility of DER	
15. Unlocking flexibility	
16. Embracing gas specification diversity	

Potential suppliers

- *<University>*

SO customers

- GC0105 review panel
- *<Internal SO beneficiaries of project outputs>*
- *<Link to system benefit>*

Estimated costs	
£0k - £150k	
£150k - £300k	
£300k +	

Estimated duration	
Up to 12 months	
12 – 24 months	
More than 24 months	

PROJECT SUMMARY (2/2)

- Bullet points are fine
- Font size 12 – 14 only