

What can we learn from Continental Europe Synchronous Area Separation on 08 January 2021?

GC0151: Grid Code Compliance with Fault Ride Through Requirements

Andrew Larkins

19/07/2021

GC0151: Grid Code Compliance with Fault Ride Through Requirements

UK Recap

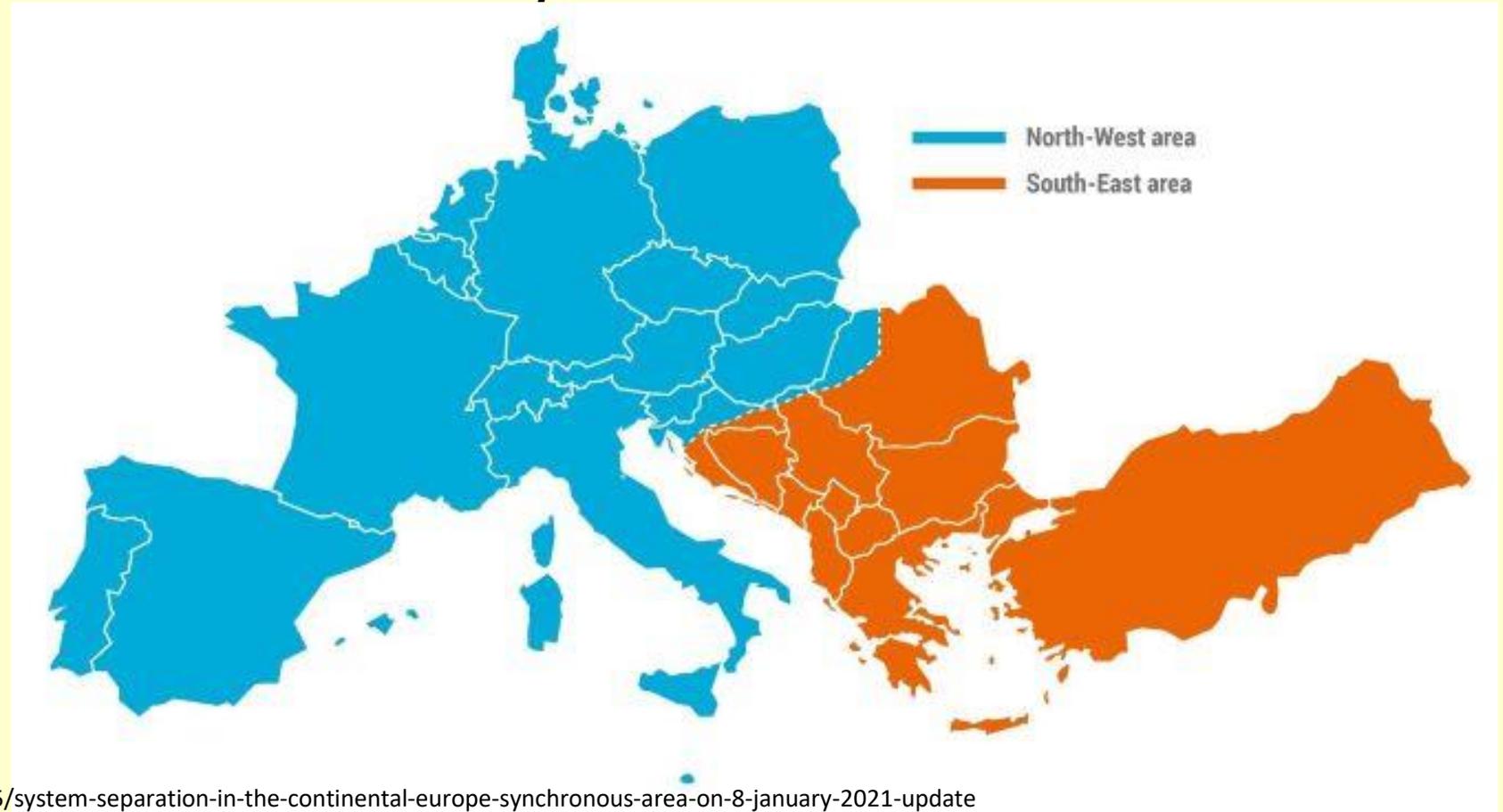
- There were 8 transmission faults between 10th February and 18th April where generation was unexpectedly lost coincident with the fault.
- There is a significantly increased risk of cascade failure impacting grid security

Post event analysis presented by ESO at last meeting

- Most cases – simple protection settings were cause
- Even after compliance process these we are still get issues
 - Maintenance upgrades, software or setting may impact FRT
 - Relatively few complex power electronics interactions

Continental Europe Synchronous Area Separation on 08 January 2021

The synchronous area of Continental Europe was separated into two separated areas due to outages of several transmission network elements in a very short time.



- <https://www.entsoe.eu/news/2021/01/15/system-separation-in-the-continental-europe-synchronous-area-on-8-january-2021-update>
- ICS Investigation Expert Panel » Final Report » 15 July 2021
- https://eepublicdownloads.azureedge.net/clean-documents/SOC%20documents/SOC%20Reports/entso-e_CESysSep_Executive_Summary_210715.pdf
- https://eepublicdownloads.azureedge.net/clean-documents/SOC%20documents/SOC%20Reports/entso-e_CESysSep_Final_Report_210715.pdf

Grid frequency of separated areas

Areas were unbalanced at the time of separation

South-East

- Imbalance 6 GW / 70 GW = 8.6 %
- RoCoF + 300 mHz / s

North-West

- Imbalance 6 GW / 326 GW = 1.8 %.
- RoCoF – 60 mHz / s

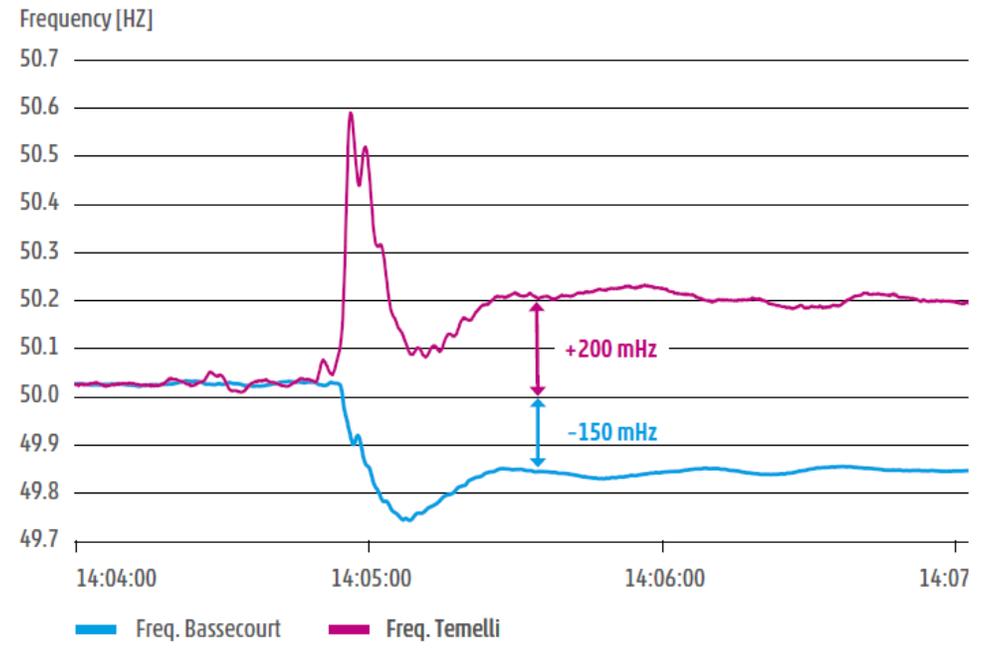


Figure 3.5: Frequencies of the decisive minutes before and after the event

Good control of grid frequency

Frequency range	Time period for operation
47.5 Hz - 48.5 Hz	To be specified by each TSO, but not less than 30 minutes
48.5 Hz - 49.0 Hz	To be specified by each TSO, but not less than the period for 47.5 Hz - 48.5 Hz
49.0 Hz - 51.0 Hz	Unlimited
51.0 Hz - 51.5 Hz	30 minutes

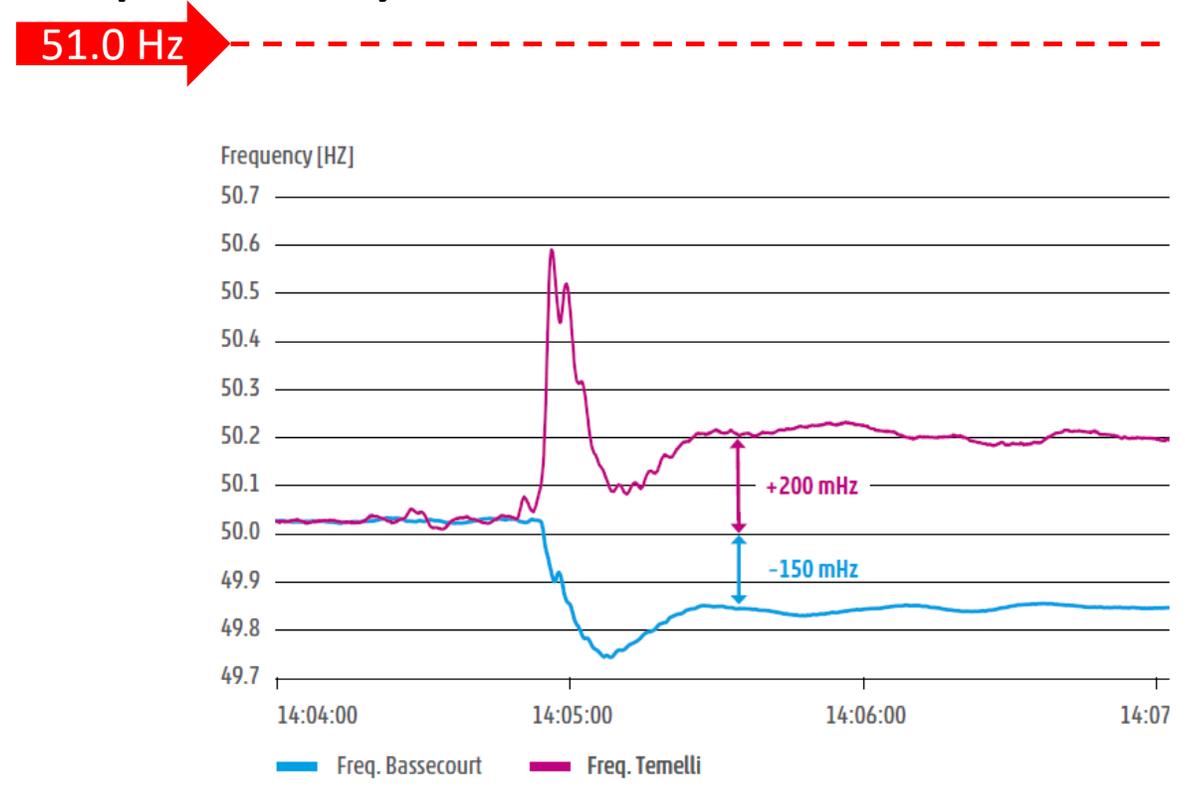


Figure 3.5: Frequencies of the decisive minutes before and after the event

Non-grid code conform disconnection of generation and loads

3.2.2 Disconnection of non-conforming generation units, loads or transmission elements far from the separation line due to frequency deviations

“Unfortunately, several automatic disconnections took place, even very far from the system separation line, based only on the system frequency deviation which was, in both areas, outside the normal operation range of $\pm 200\text{mHz}$.” but within 49.0 -51.0 Hz range.

Generation tripped unexpectedly

South-East area 3.3 GW is 70 GW = 4.7%

North-West area 0.6 GW in 326 GW

Disconnections were due to frequency variation well within regulatory limits

ID	Recommendation	Justification	Responsible
Non-grid code conform disconnection of generation and loads			
R-14	For the TSOs, where a non-conform disconnection of generation and loads occurred during this incident, each TSO must review the cause with generation companies and DSOs and derive corrective measures to avoid the non-conform disconnection in the future. Progress of the corrective measures will be monitored by ENTSO-E and ACER.	It is to be assumed that for the case of more severe events and related higher frequency deviations, the percentage of disconnected power will be much higher and will lead to a more severe system disturbance.	TSOs to implement ENTSO-E and ACER to monitor

Relevance to GB grid

- The report highlights Non-grid code conform disconnection of generation and loads in part **“Due to incorrect frequency protection settings”**.

So this issue is boarder than just the GB grid.

- Why is this common across grids?
- Is there scope for shared learning from root cause analysis?
- How can we prevent it?
- What impact is the on security of supply and N-1 ?

GC0151 focus is how we react when it has occurred