

# Paris Session 2022



## RoCOF: Measurement, utilization in AUFLS for existing and emerging low-inertia networks

SC B5 PS1 Question 1.04: Addressing Protection related Challenges in  
Network with low-inertia and low fault-current Level

Q1.04 Are there any key consideration for securing the ROCOF protection against maloperation?

Nirmal NAIR, New Zealand

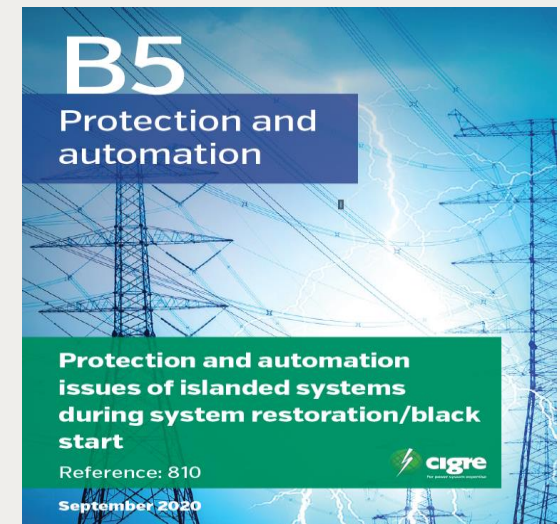
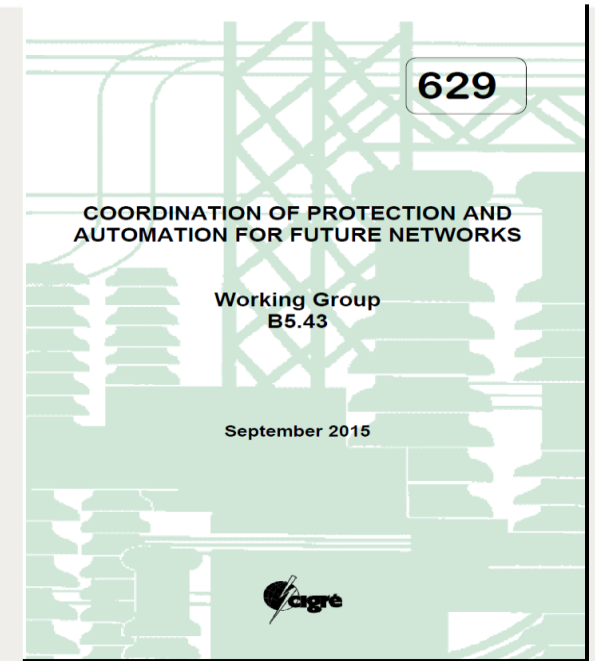


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# ROCOF in Low-inertia Power system network

- This contribution based on TB 629 material and the understanding of this contribution based on TB 810
- One of the emerging consequence of low-inertia network is modelled (Transient and Dynamic) and observed (PMU) changes to network frequency dynamics.
- These changes are being observed during normal, abnormal and extreme event progression. Three examples given here to answer question PS 1: Q 1.03.
- AUFLS (Automatic Under Frequency Load Shedding) enabled through protection relay coordinated setting is typically the very last defense before large-scale blackout event. (Details available from TB 810)
- The next slide graphically identifies the ROCOF issues that might affect low-inertia power system networks

Group Discussion Meeting



# ROCOF from viewpoint of measurement, use and AUFLS design for low-inertia networks

Plain underfrequency (81U)

Average rate of frequency decrease ( $\Delta f/\Delta t$ )

Instantaneous rate of frequency decrease ( $df/dt$ )

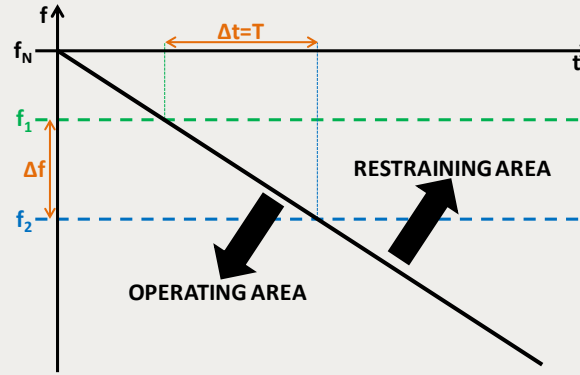


Figure 45 –  $\Delta f/\Delta t$  Measuring Philosophy (TB 629)

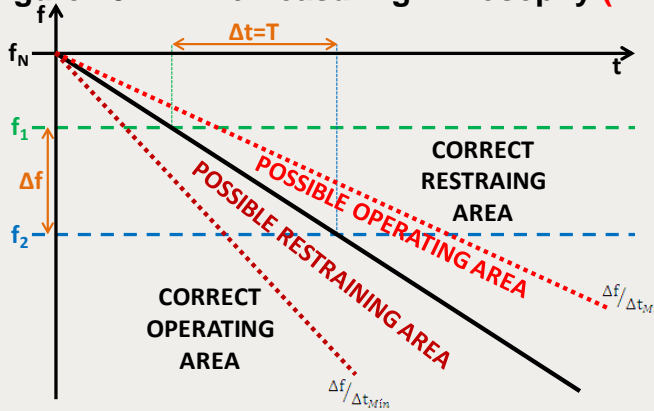


Figure 46  $\Delta f/\Delta t$  Measurement Warranted Accuracy (TB 629)

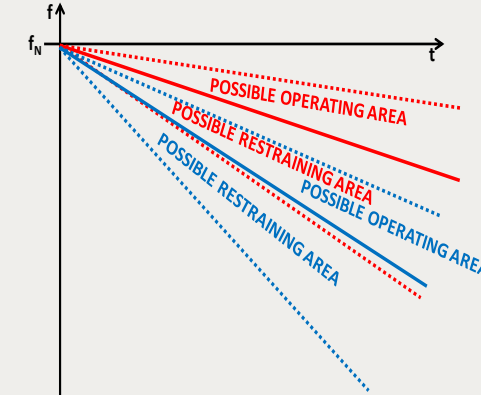


Figure 47  $\Delta f/\Delta t$  Measurement Risk Overlapping (TB 629)

None of the above measuring method is fully selective from protection scheme setting viewpoint ->> LEADS TO CONSERVATIVE LOAD SHEDDING

Current AUFLS Load shedding schemes globally are a mix of different frequency blocks (more blocks in highly renewable power system networks) and ROCOF.