



NERC Lessons Learned

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Single Phase Fault Precipitates Loss of Generation and Load



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- August 9th, 2019 in Southern England
- Single phase to ground fault on 400 kV transmission
- Event precipitated loss of 1,878 MW of generation and 931 MW of load



Figure 1: Simplified Transmission Map for SE Britain [1]

- A lightning-initiated single phase-to-ground fault on a 400 kV transmission line was detected, isolated, and reclosed 20 seconds later

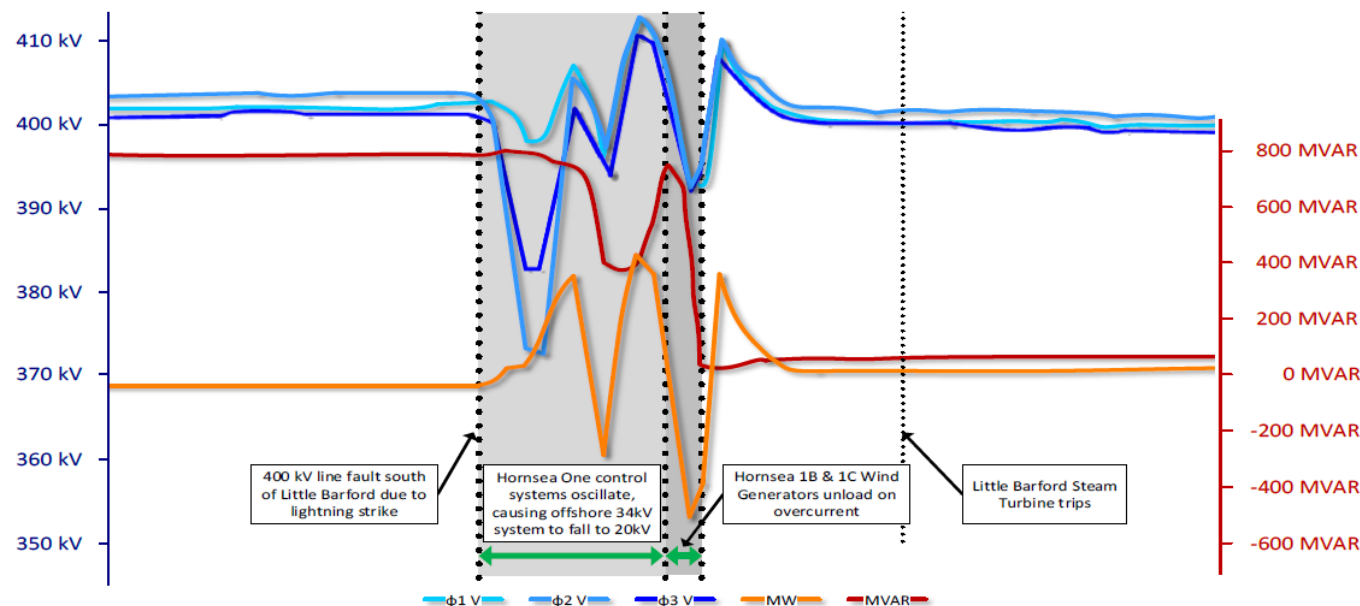


Figure 2: Parameters Measured at Hornsea Onshore Station – MW and MVAR [1]

- At the same time a steam turbine tripped (244 MW)
- Offshore wind unexpectedly reduced from 799 MW to 62 MW
- Loss of 150 MW (anticipated) and 350 MW (unanticipated) DER

- Speed sensor input error caused steam turbine to come off-line
- Offshore wind turbine controllers reacted incorrectly to voltage fluctuations unable to dampen oscillation
- Expected DER loss was due to phase shift protection
- Unexpected DER loss due to incorrect ROCOF settings (48.9 Hz vs. 47.0 Hz)
- Under frequency load shedding (UFLS) schemes operated at 48.8 Hz, disconnecting 931 MW of load

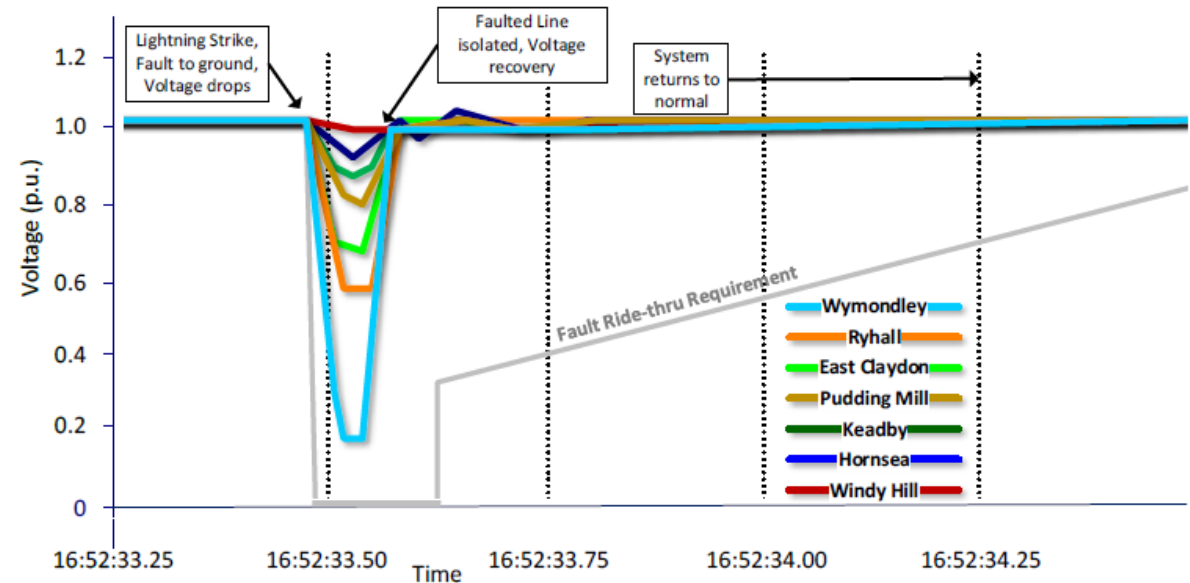


Figure 3: Voltage (p.u.) Profile at Various Locations During the Event [1]

- Conduct frequent enhanced compliance testing and identify any deficiencies
- Maintain clear and coordinated interactions between onshore and offshore wind generation control systems
- Initiate transparent communication and procedures in response to stressed or weak grid conditions

[1] Single Phase Fault Precipitates Loss of Generation and Load
https://www.nerc.com/pa/rrm/ea/Lessons%20Learned%20Document%20Library/LL20201001_Single_Phase_Fault_Precipitates_Loss_of_Generation_and_Load.pdf

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