

**Hazards Forum Workshop
9 October 2025, Manchester**

Resilience in a Complex World

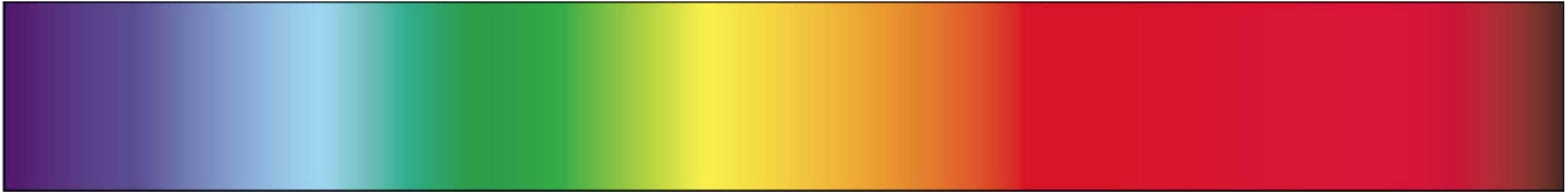
Roger Kemp

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Hazards that reduce resilience

- Natural hazards
- Engineered hazards
(Includes unfortunate policy decisions)
- Malicious hazards

Everyone wants resilience?



Resilient

Efficient

Natural Hazards: Carmont derailment

12 August 2020



06:38 train from Aberdeen to Glasgow. Ran into debris washed onto the track by very heavy rain and derailed; one coach went down an embankment. Three fatalities.

Natural Hazards: Storm Desmond

December 2025



22:39 on 5 December 2015

River Lune burst its banks. Substation flooded

Supplies lost to 60,987 Lancaster properties

Fully restored 19:18 on 8 December

Photo: SP Electricity North West



FINANCIAL TIMES

UK COMPANIES TECH MARKETS CLIMATE OPINION LEX WORK & CAREERS LIFE & ARTS HTSI

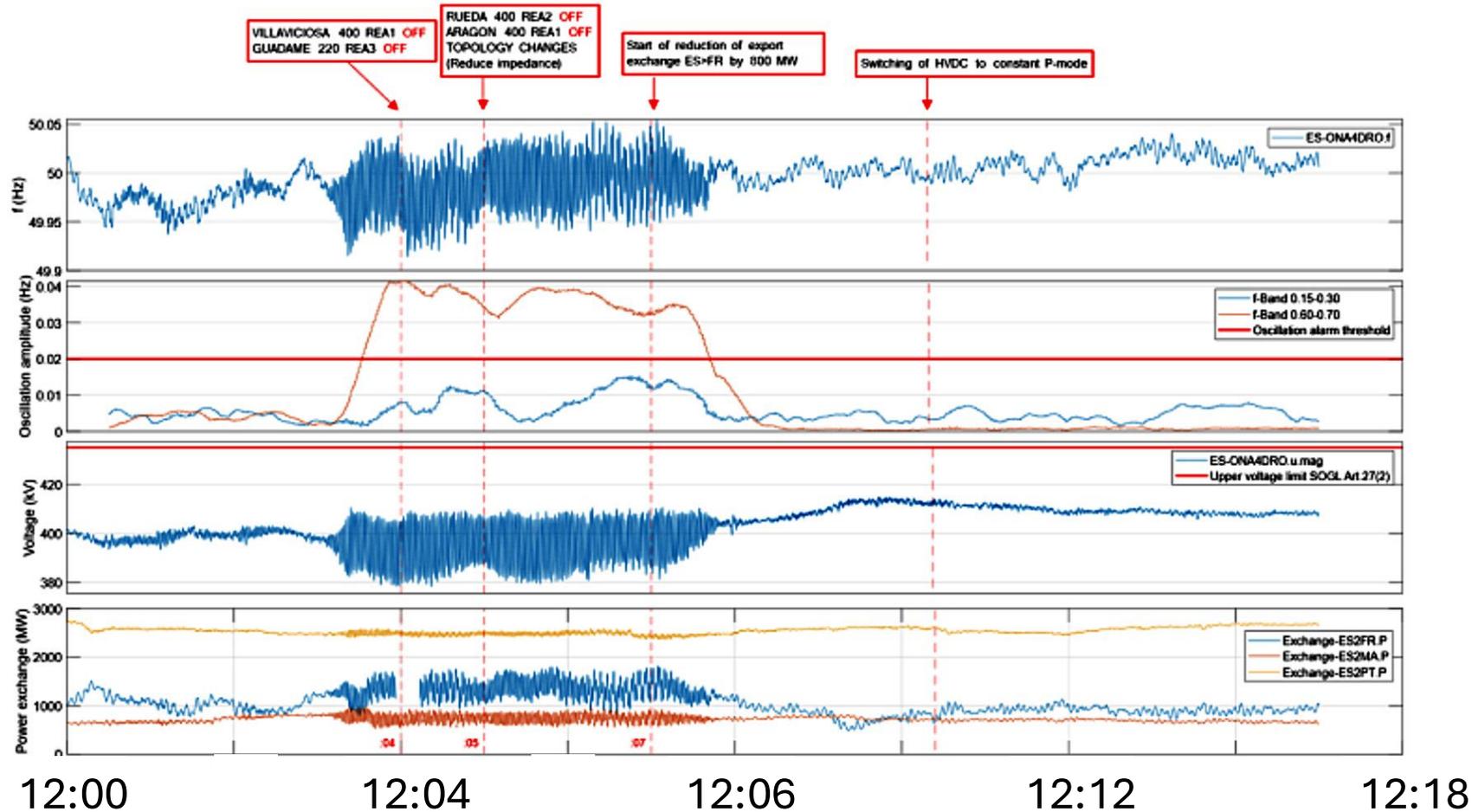
Spain

+ Add to myFT

Spain declares state of emergency in the wake of huge power outage

Many face night without electricity after train network, traffic lights and mobile connections shut down by mystery blackout

28 April measurements



Timeline

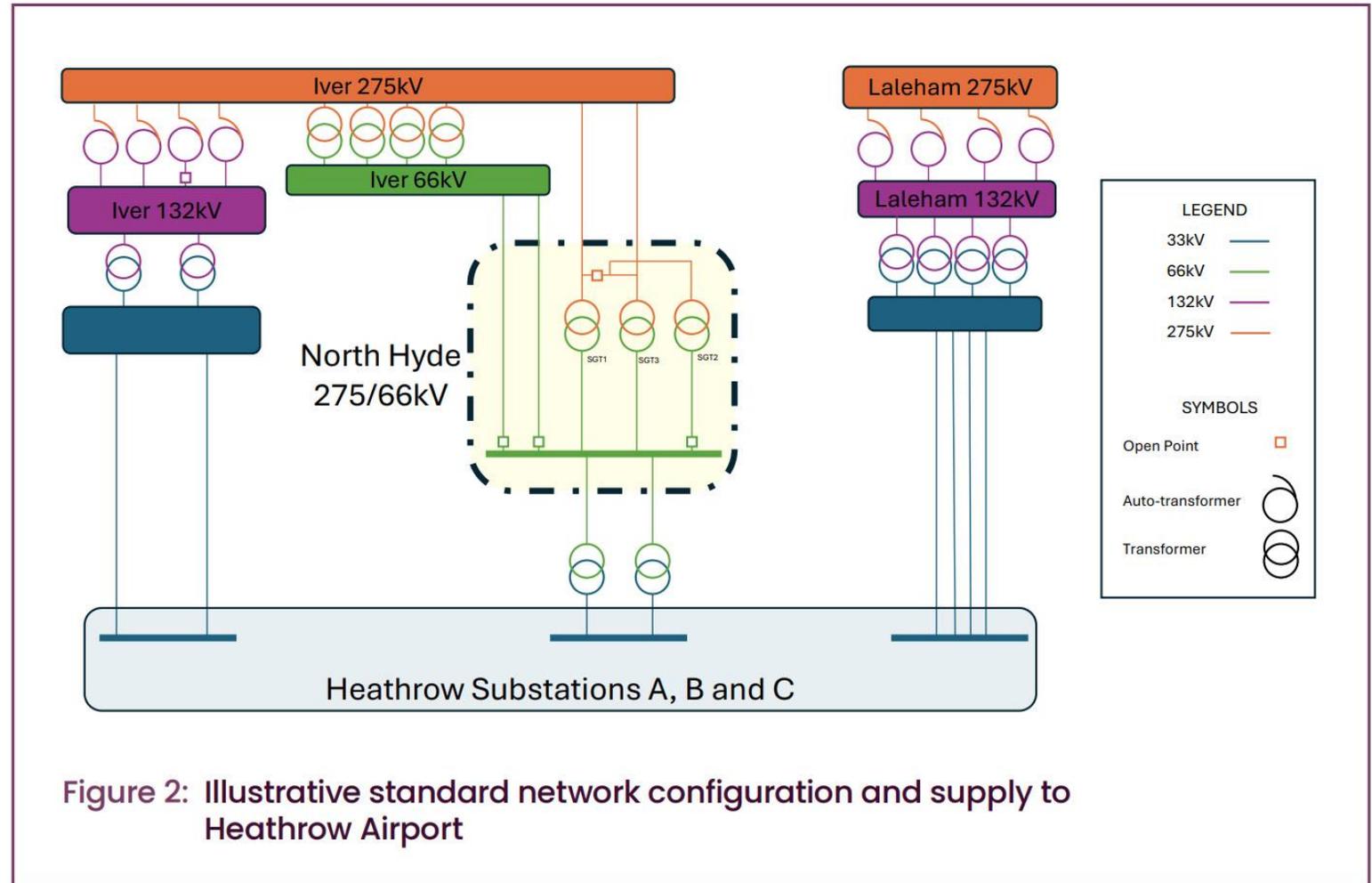
12:03 First oscillation

12:20 Second oscillation

12:33 Shutdown

Data from preliminary report

Engineered Hazards: Heathrow power outage 21 April 2025



Politically engineered hazards – Bexley derailment

4 February 1997



- Railways Act 1993 privatised the railways
- Three contributors to accident:
 - **Poor track maintenance**
 - **Train excess speed**
 - **Wagons overloaded**
- Each was the responsibility of a different privatised entity.
- A railway is a complex system but there was no single body with overall responsibility for safety.

Remember the spectrum!



See: <https://engineeringx.raeng.org.uk/media/m3kbpmdm/engx-bexley-train-crash-a-system-failure.pdf>

Malicious hazards



Hackers behind Ukraine power cuts, says US report

© 26 February 2016



REUTERS | Ukraine has been forced to turn to back-up power sources in recent months following a spate of power cuts

Hackers were behind an attack that cut power to 225,000 people in Ukraine, a US report has concluded.

The December 2015 incident is thought to be the first known successful hack aimed at utilities.

The report, written by the Department of Homeland Security, is based on interviews with staff at Ukrainian organisations that dealt with the aftermath of the attack.

FOREIGN AFFAIRS

China Is Winning the Cyberwar

America Needs a New Strategy of Deterrence

ANNE NEUBERGER

September/October 2025

Published on August 13, 2025



EDUARDO MORCIANO

Malicious Hazards: JLR cyber attack

September 2025



- Implications:
 - 33,000 employees
 - 200,000 in supply chain
 - Potential cost in billions
- What were the priorities in designing the JIT manufacturing system?
- And where was resilience in the list?



Resilient

Efficient

Summary

- Natural hazards
 - More extreme events due to climate change
 - Need to revisit decisions from many years ago
- Engineered hazards
 - Many decision makers don't understand the complex system of which their project is a part
 - Resilience is not usually a priority
- Malicious hazards
 - Where there is a software-controlled system, there is a door for a cyber attack

END