Hannah Bloomfield[1], Ji-Eun Byun,[2] Colin Manning,[1] Sean Wilkinson,[1]
1. Newcastle University, 2. University of Glasgow.

Science and Technology Facilities Council

Scientific Computing

scd.stfc.ac.uk

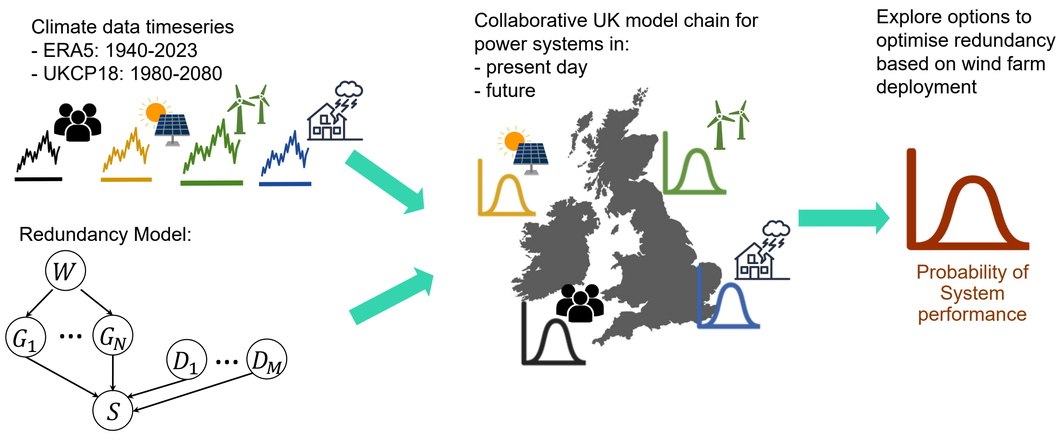
BRINES: Building Risk Informed redundancy for Net-zero Energy Systems

Background and context

Power systems are rapidly changing as we transition to net-zero.

- The weather-sensitivity of demand is increasing as the heating sector is electrified.
- Supply is also becoming increasingly variable due to significant growth in renewable energy technologies (particularly wind power and solar photovoltaics).
- Extreme weather events are also becoming more frequent and impactful due to climate change.
- This adds **previously unseen levels of variability** to the power system and creates **compound consequences** caused by extreme weather events.
- Such compound consequences require more rigorous treatment of uncertainties in energy model simulations.
- Another challenge arising from heightened meteorological variability is that **power infrastructures require more redundancy** (i.e. more generation units than for normal situations) and hence more investments.
- **Quantifying impacts of climate change on energy systems requires new datasets.** Weather-dependent models need to be developed with an inter-disciplinary calibration and design process. This requires a sustainable data sharing infrastructure.

BRINES explored the use of weather and climate data to highlight future resilience challenges to the UK power network from both an operational perspective (maintaining the balance of supply and demand) and from an asset management perspective (making sure assets are not damaged by extreme weather)



BRINES has made state of the art weather and climate data more accessible to energy sector stakeholders for detailed system analysis.

Who do we co-design these datasets with?

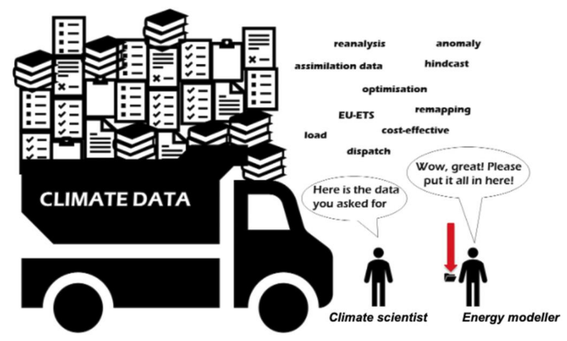
Wide energy system benefits from distribution to policy level.

- DESNEZ: Asset level vulnerability to climate change
- UK Climate Change Committee: security of supply stress tests.
- OFGEM: HB and SW in climate resilience working group.
- National Grid, and the National Energy System Operator (NESO) integrating climate data into power system model.

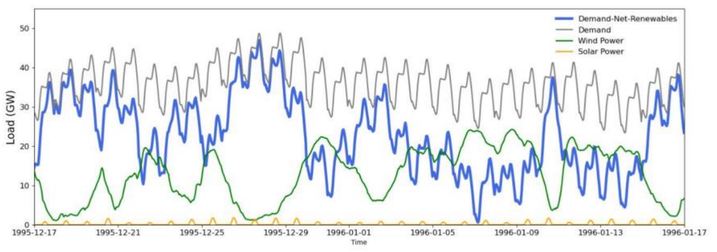
Department for Energy Security & Net Zero · Climate Change Committee · nationalgrid · ofgem

Benefits to data sharing

- **Historical disconnect between energy systems and climate modelling** and platforms like DAFNI allow for a removal of some of the methodological challenges for each field.



- Incredibly useful for ongoing stress test scenarios such as recent Climate Change Committee report and planned OFGEM stress tests.
- Fantastic educational resource for use in teaching, workshops and engaging new stakeholders.



Lessons learnt and recommendations

The DAFNI platform provides a good facility to share our meteorologically driven datasets and can allow them to be used as inputs to modelling frameworks on the platform.

- Good place to store data for stakeholder interaction.
- Learnt about **data collections** from DAFNI team and these would be a useful synthesis tool.
- Would like to investigate integration of datasets into other power system modelling tools

Barriers of data sharing

- Key time commitment was upskilling to use the DAFNI platform to upload datasets appropriately.
- Initially through Docker Desktop but issues around academics having admin rights for PCs.
- As academics we **require DOI's** for datasets to be citeable, so will co-host on Zenodo.
- Sharing our datasets is relatively easy, but there is underlying data we use to make them (e.g. thewindpower.net database which cannot be shared). So, the process is not 100% open.

Acknowledgements and Contact details

- For more details about BRINES contact Hannah.bloomfield@ncl.ac.uk
- The BRINES team thank parallel project teams in CS-NOW and the UK Climate Change Committee who funded the creation of the weather and climate datasets.
- The team also thank Newcastle University for funding HB's academic track fellowship which strongly links to this work.