

D-RES PROJECT

Provision of distributed grid resilience using EVs during extreme weather events

Peter McCallum | Killua Qin | Laiz Souto | Desen Kirli

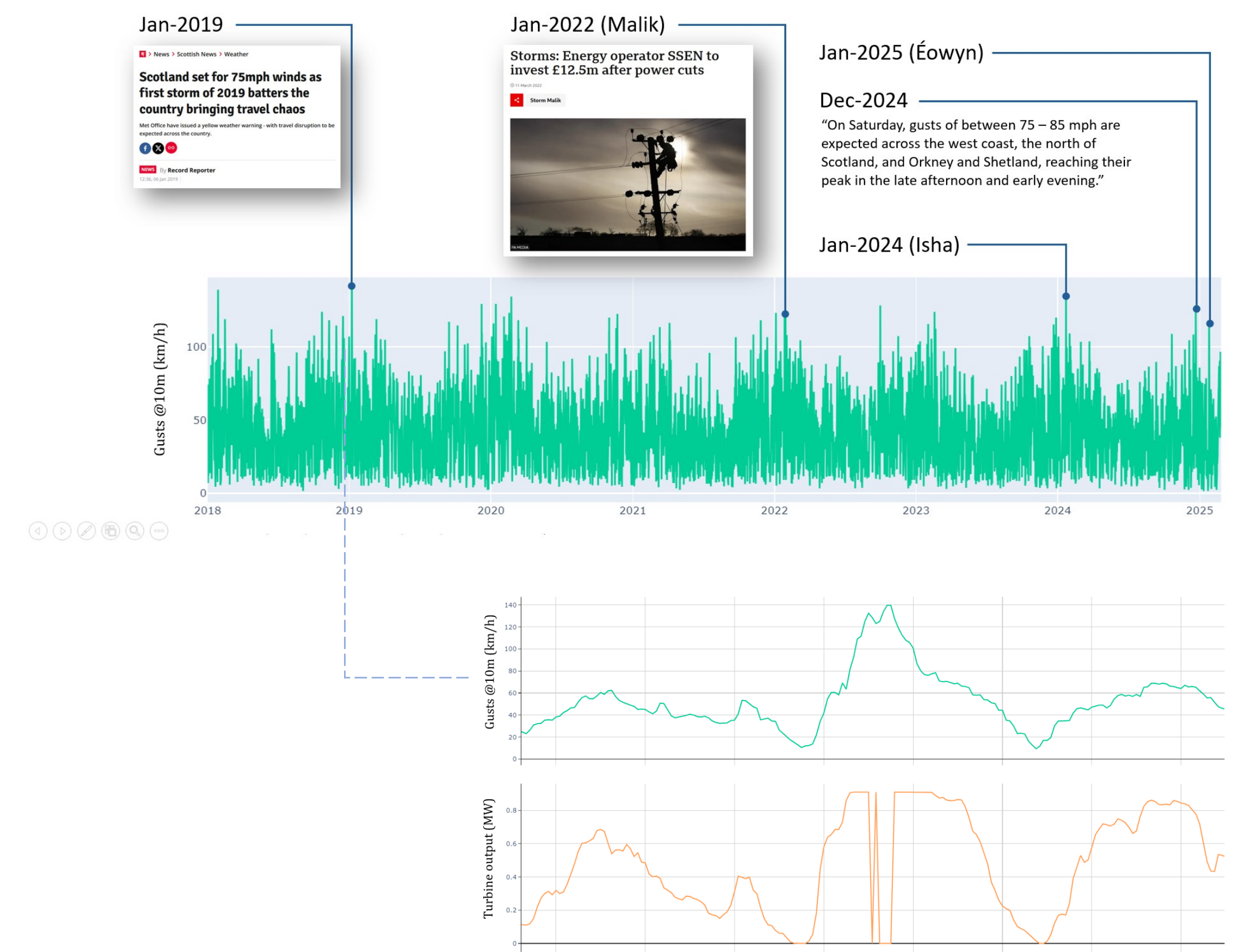
Background and context

- Aim:** To develop weather-informed adaptive strategies for grid management amidst **increasing EV penetration** and **worsened climate risk**
- Evidence:** Driven by 2022 Storms "Dudley", "Eunice" and "Franklin" which left over **a million homes without electricity** in the UK.
- Approach:** Through effective use of data from distributed assets, and **optimal coordination** methods, EVs can provide distributed resilience during system shocks via **Vehicle-to-Grid** services.
- Case study: Orkney Islands, Scotland**
 - Notable for high penetration of renewables, EVs and harsh weather
 - Suitable for EV-based grid resilience strategies
- Stakeholders:** Universities of Edinburgh and Bath, DAFNI-DINI, local authorities, Scottish Climate Intelligence Service, SSEN Distribution, UKPN and MET Office.
- Sector/Domain Relevance:** Energy sector, focusing on aspects of transport, energy storage, security, and climate resilience.

Contact
desen.kirli@ed.ac.uk



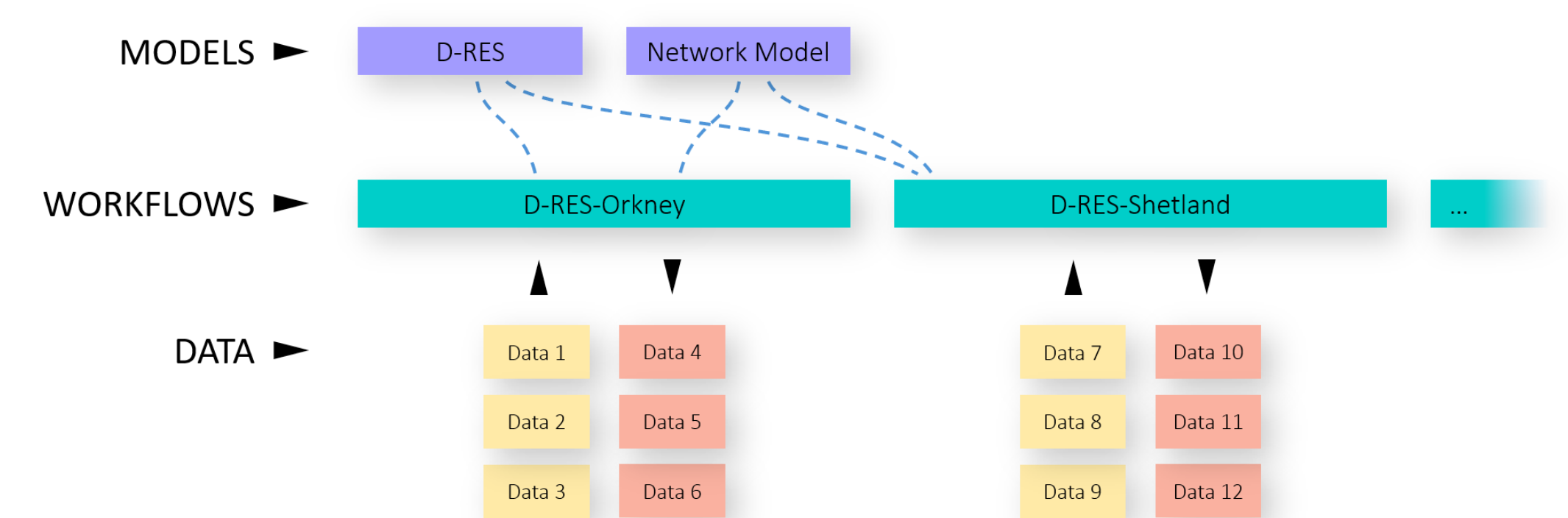
Storms in Orkney



Barriers of data sharing

- Complexity and Labour Intensity:** Energy system models are heavily dependent on precise input data
- Privacy and Security Concerns:** Data privacy issues with V2G systems and increased cybersecurity risks.
- Data Quality and Accessibility Challenges:** Issues with real-time data access and quality.
- Public Acceptance and Trust:** Necessity for public and corporate understanding of V2G systems benefits.
- Suggestions for Overcoming:** Promoting standardised and automated data handling and improving model adjustability for varied geographic data inputs.

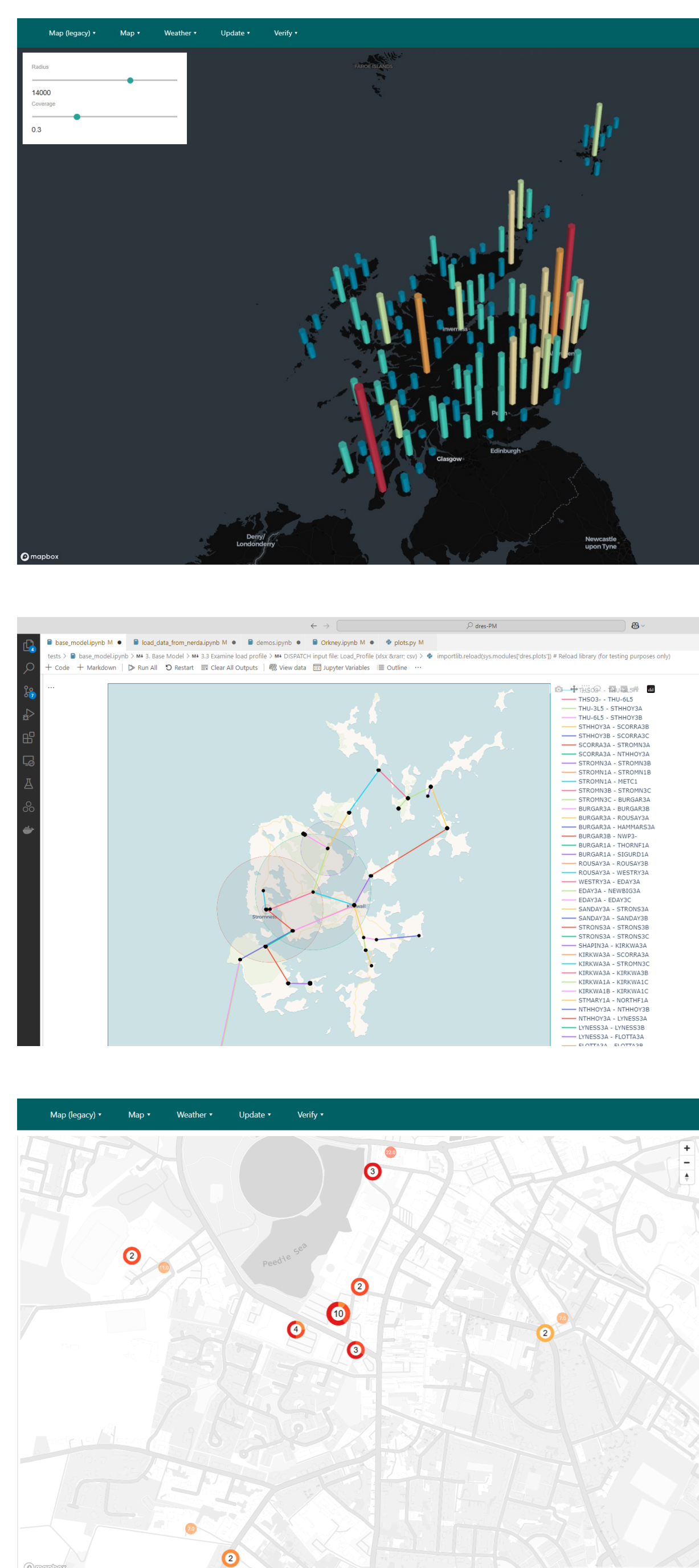
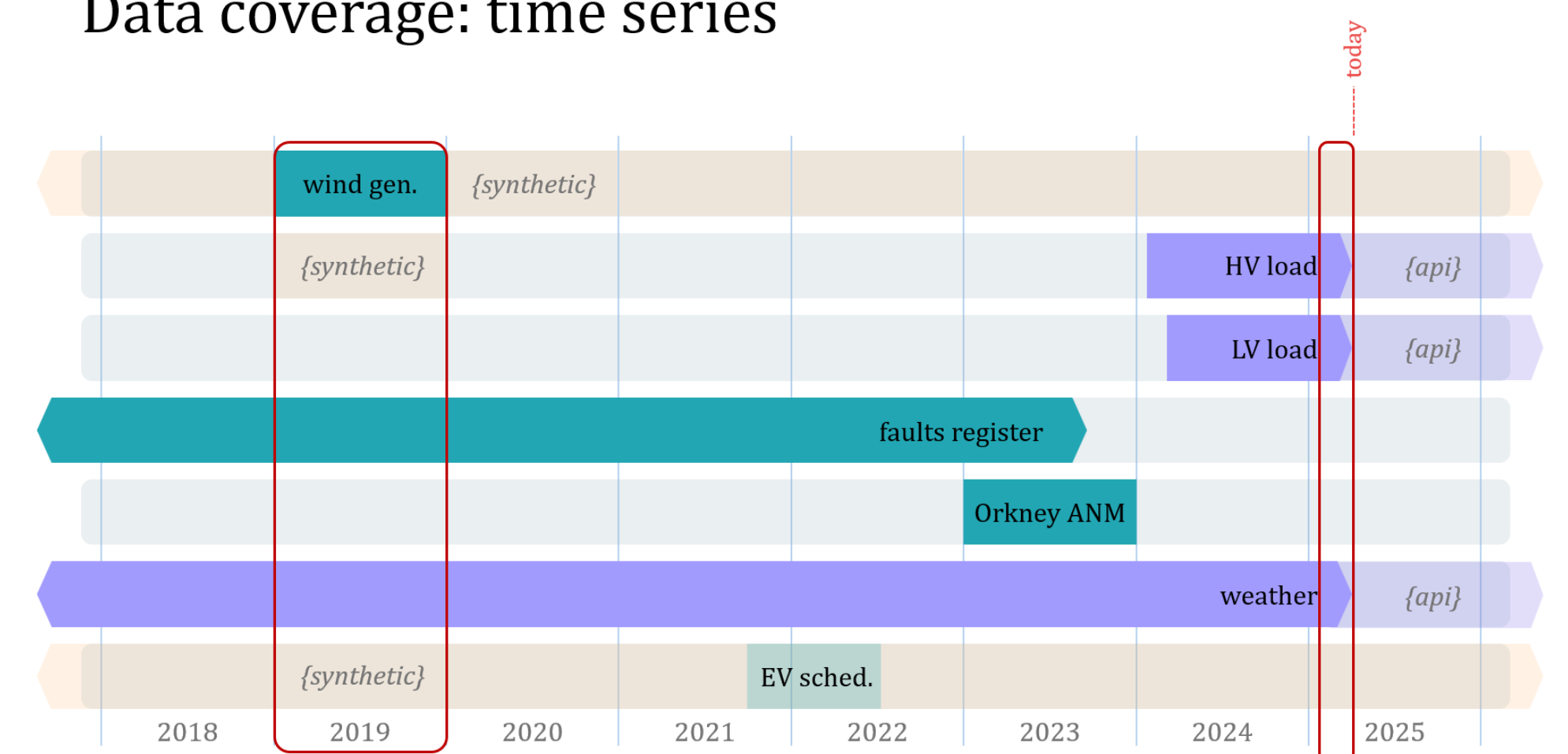
Deployment for Re-use



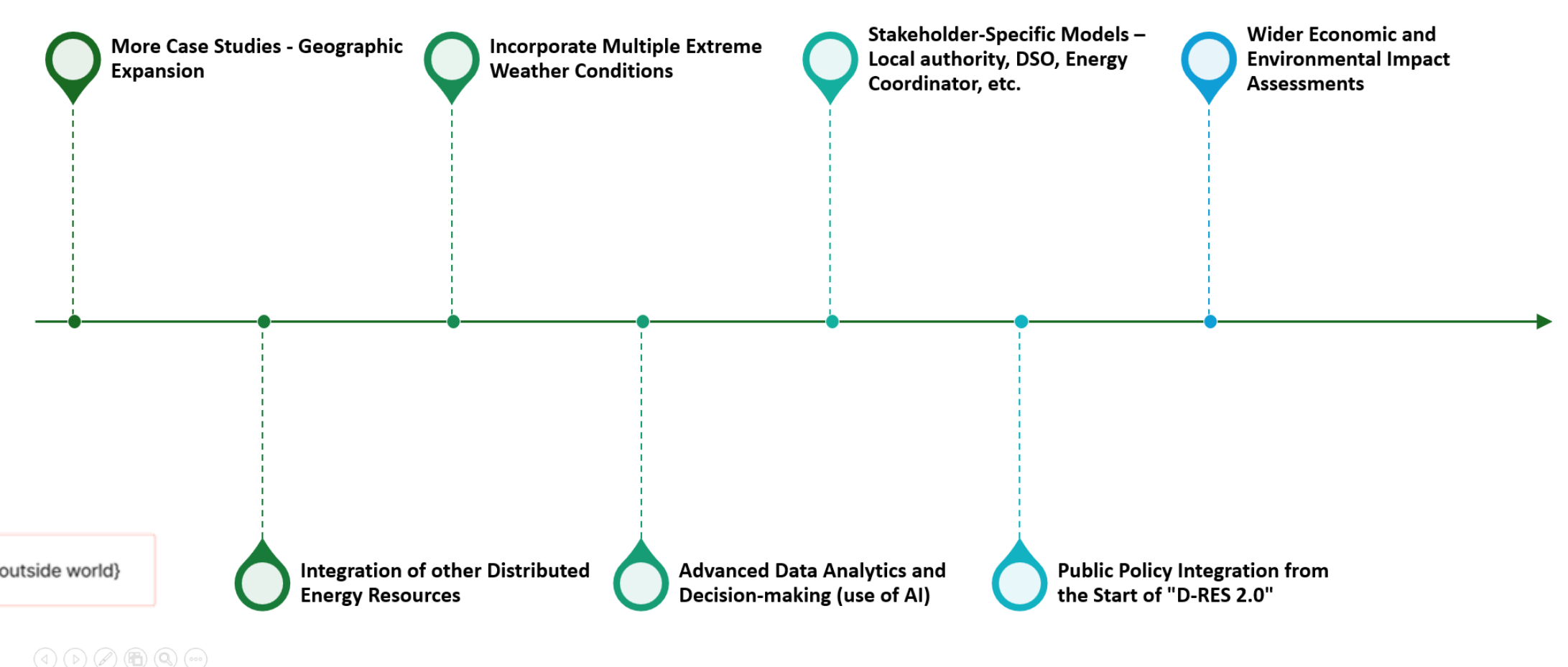
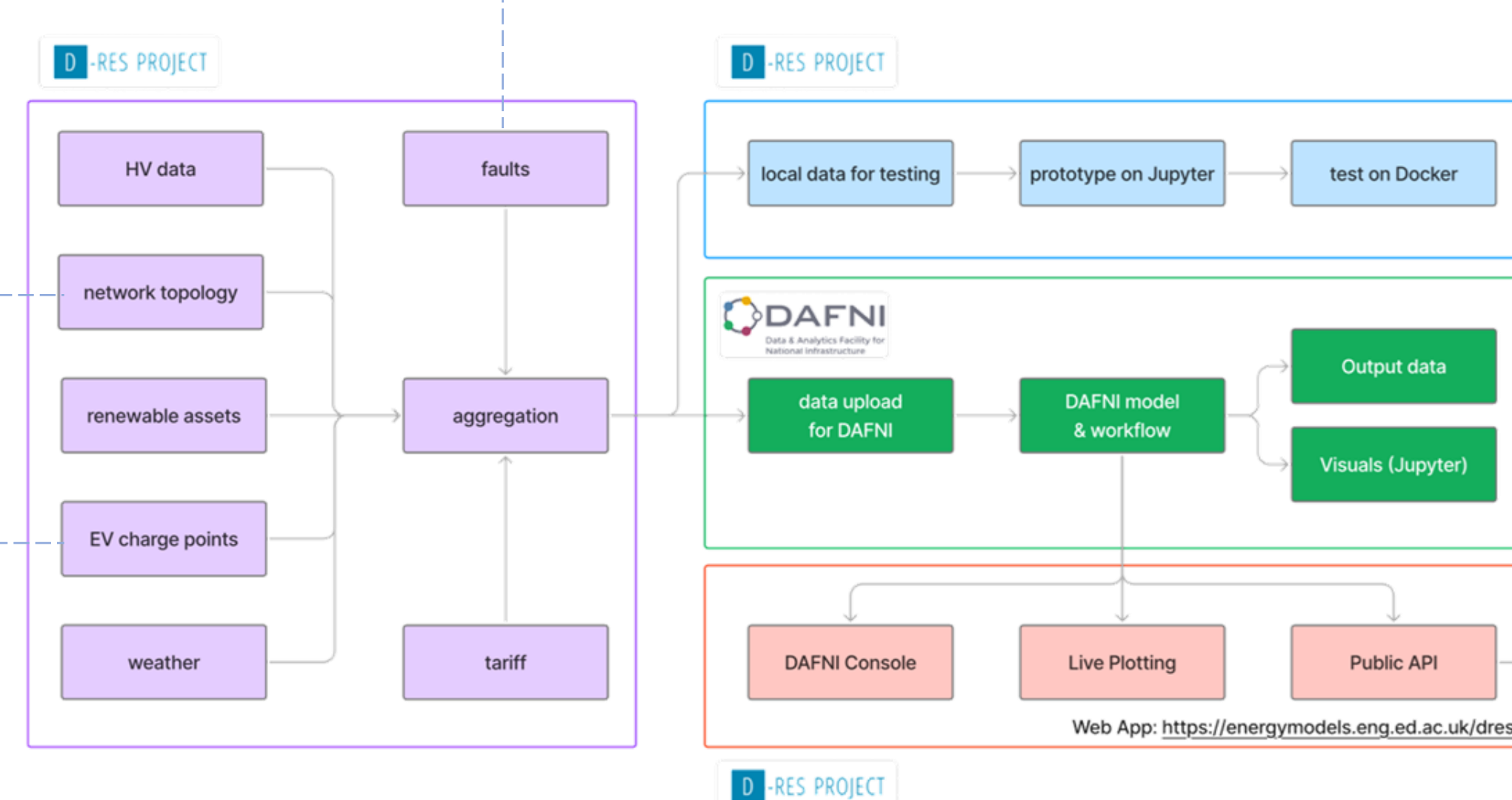
Benefits of data sharing

- Efficiency in Simulation and Modeling:** Access to open-access datasets like those from EPSRC-funded DISPATCH facilitated efficient project execution.
- Future Research Enablement:** Output datasets and models will be made open access to assist future research and technology trials.
- Stakeholder Benefits:** Models and data made accessible via DAFNI can aid various stakeholders including researchers and public sector bodies.

Data coverage: time series



D-RES Codebase



Lessons learnt and recommendations

Improvements in Grid Resilience and User Bills: Effective coordination of EVs found to reinforce grid stability and decrease user bills during extreme weather.

Effective Data Sharing Needs: Leveraging the power of comprehensive, high-resolution datasets to optimise energy management.

Successful Stakeholder Engagement: We held a two-day workshop to present findings and get their input for future research, "D-RES 2.0".

Future Directions: Expansion of resilience testing to multiple weather conditions and energy resources, and enhanced stakeholder-specific model development.