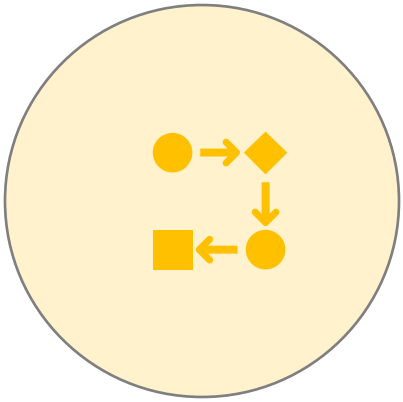
Net-Zero Digital Research Infrastructure – Vision and Expertise (NetDRIVE)

Theme Descriptions

Martin Juckes and Sarah Sparrow
03 October 2024

Systematic Change



- System level view
- Delivering value
- Block rebound
- Build trust

Increase in computational efficiency over recent decades have been offset by increases in capacity, resulting in a net increase in the carbon footprint for computation. Such gains in efficiency in computation are essential, but to convert efficiencies into emissions reductions, avoid the rebound effect, and remain aligned with the balanced pathway to net zero, we need a paradigm shift in the evaluation of computation and the use of computing in research. We need continuous assessment and focus on the mission of achieving sustainability as well as active measures to counter the risk of enhanced demand negating efficiency gains. Working with peers and suppliers to understand the mutual benefits of a low carbon supply chain is essential. UKRI needs to support the Climate Change Committee's balanced pathway for achieving national sustainability by delivering high levels of innovation while restraining resource usage.

Target audience

- team and institute leaders
- strategic planners
- policy makers

Topics

- system level view
- delivering value
- block rebound
- culture shift
- EDI and RRI
- open science and data
- building trust

Objective

- Ensure that the UKRI DRI achieves a clear leadership role in the net zero transition

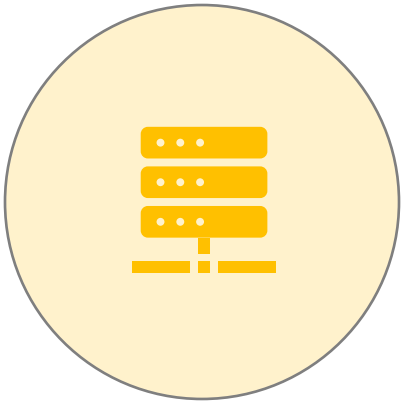
Galvanizing Individual Action

- Culture shift
- Listen and Empower
- Inclusivity
- Open science and data

Behaviour change is difficult to guide but crucial in the pursuit of DRI Net Zero. All staff (from student to CEO) should be mandated and empowered to take proportionate action to drive change and reduce the environmental impact of their work. Discussions among colleagues, proven to be effective in fostering positive changes, should be encouraged. Work must start now with commitment appropriate to the climate emergency while recognizing the need for adjustments and learning from experience as we seek a pathway to sustainability.

Target audience	Topics	Objective
• UKRI staff using or managing the DRI.	• empowerment • motivation • creative thinking	• Build a sense of individual and community engagement and ownership of the transformation

Machine Room and Hardware



- Procurement
- Lifecycle Analysis
- Sustainable Capacity
- Cloud

Amazing gains in computational power and capacity are being delivered through advances in technology which also drive increases in complexity of hardware and associated supply chains. We need to bring sustainability to the forefront of the management of our infrastructure. Full and authoritative life cycle analysis of infrastructure will be needed, including effective measurement and management of impacts during the use phase, clear contracts and conditionalities to develop a low carbon supply chain, and clear end-of-life planning for hardware.

Target audience	Topics	Objective
• infrastructure funders • machine room operators • infrastructure policy	• procurement • lifecycle analysis • sustainable capacity • HPC • cloud	• deliver platforms for sustainable research computing

Green Software Engineering

- Skills and Career Pathways
- Data workflows
- Exploiting Artificial Intelligence

This theme covers a wide spectrum of digitized instructions and knowledge systems, whether a code used or developed by a researcher, or the environment within which such codes run (e.g. schedulers on multi-user machines or use of ChatGPT as a tool). It covers the whole lifecycle of development of software, from gathering requirements, through design, implementation and deployment, and the science of doing so in an efficient manner. Traditionally, Software Engineering has focused on functionality, reliability, extensibility and how well the software product performs in terms of time, hardware resources and people to maintain it. Green software engineering shifts the focus to sustainable use of resources which can be achieved both through efficient programming and an inclusive approach to project management and development.

Target audience	Topics	Objective
• research software engineers • computational scientists	• Skills and career pathways • data workflows • exploiting/taming artificial intelligence • exploiting novel architectures	• Develop and embed the paradigm of green software engineering in the UKRI research culture