Environmental sustainability at EPCC: our vision for the future

EPCC is committed to operating sustainably, creating a future that provides world-class computational and data services within a Net Zero framework, and supporting research and innovation that helps address the climate emergency. We also work in an environmentally sustainable way to improve natural habitats around the infrastructure we develop and maintain. This work cuts across the entire centre, taking a key role in our machine room design and improvements, our delivery of services, our research activities, and the way we engage with the community.

Sustainability at the ACF

Reducing greenhouse gas emissions and improving environmental sustainability is a continuous activity at the Advanced Computing Facility (ACF), our state-of-the-art advanced compute and data centre.

All our electricity is purchased through a large-scale, long-term power purchase agreement, with our supply certified by the Renewable Energy Guarantees of Origin (REGO) scheme. This combination enables significant additional investment in renewable energy generation in Scotland. We utilise free cooling where possible, circulating closed-loop cooling liquid from our systems to the ACF roof.

The Edinburgh Geobattery[1] project is looking to transfer excess heat to flooded disused mines, using it to warm at least 5,000 local homes. If successful the study could provide a blueprint for underground heat storage sites in flooded coal, shale, and mineral mine networks.

A place for nature

As well as considering sustainability of infrastructure and services, we look to promote biodiversity literacy and nature positivity. Our closed-loop cooling system eliminates the need for water consumption, reducing demand on our rivers and lochs and so supporting biodiversity. We are committed to understanding our impact on local site biodiversity and working to ensure we have a positive influence on nature around the ACF.

Net Zero service provision

Many researchers struggle to understand the relative scale of emissions from the production of their research. We have been working to improve this and to increase our users' carbon awareness. In particular we have estimated the carbon emissions associated with the UK's National Supercomputing Service, ARCHER2, developing tools to provide carbon emission estimates for users' jobs. We have also investigated emissions reduction and its relation to energy efficiency.

Emission reduction

A key aspect of this work is supporting all HPC stakeholders with information and skills to reduce emissions and assess the impact of their activities. We have developed open source training around understanding and reducing emissions from HPC system use aimed at all people involved in HPC service delivery, from procurement to use to decommisioning[2].

HPC's role in sustainability

Systems such as ARCHER2 are instrumental in reducing emissions in many areas of science and engineering, for example through the improved design and increased efficiency of wind turbines and wind farms, or by supporting the design of next-generation aero-engines. HPC services support climate research, growing our understanding of how and why our climate is changing, and driving policy decisions.

Research

For well over a decade, EPCC has been researching ways to improve energy efficiency and sustainable use of compute resources. This has included investigating high-fidelity methods to accurately attribute power and energy consumption to applications and hardware components; developing programming tools to facilitate the use of low-power hardware for scientific computing, and researching how to flexibly allocate work across HPC services to ensure balanced utilisation of resources.

Daily activities include optimising and improving the efficiency and performance of applications that use HPC systems such as ARCHER2, ensuring these resources are used as efficiently as possible. For example it is estimated the Embedded Computational Science and Engineering programme that helped optimise applications on the previous national HPC service, ARCHER, saved around £25m of computing costs[3], which translated directly into more science achieved for the same amount of electricity and computing hardware.

Community engagement

EPCC is a leader in the UK digital infrastructure sustainability community, raising the profile of environmental sustainability, working for change, and providing expertise and resources to support the wider community. We do this through involvement in initiatives such as **GreenDISC**, our leading role in key projects such as **NetDRIVE** and **UKRI Living Benchmarks**, and our open and collaborative approach to engagement.

Three EPCC staff members have been chosen as sustainability champions for **NetDRIVE***, a UKRI-funded project that is working across the full range of digital research infrastructure (DRI) to connect communities, share expertise, and build a pathway to decarbonising research. Each champions' separate but complementary approach will help to ensure sustainability is embedded in the future design, build, and use of DRI in the UK.

*Network for sustainable Digital Research Infrastructure Vision and Expertise

1. https://edin.ac/46JZWwW
2. https://edin.ac/3Ku08HP
3. https://edin.ac/3KbzWSi

The Advanced Computing Facility, home to the supercomputing services operated by EPCC.