Powering a more sustainable future

Achieve greater performance, use less energy. It's one of high performance computing's (HPC) most critical challenges.

Across the computing spectrum – from supercomputers to smartphones – the capability, complexity and sheer number of devices and volume of data is growing immensely, triggering a relentless rise in the energy needed to fuel the digital revolution. Environmentally and financially, the cost of meeting this need goes on growing and only a step change in energy efficiency can turn back the tide.

The Hartree Centre is at the forefront of the drive to establish the UK as a global leader in energy efficient computing – a lead that will enable UK companies to compete and succeed in this key field, both at home and abroad.

Backed by £19m of Government investment, our Energy Efficient Computing programme (EEC) is pinpointing what's needed and producing solutions to deliver it. In close collaboration with industry and academia, this multi-dimensional initiative is exploring every aspect of power use in HPC and devising ways of achieving not only incremental improvements but also step changes in energy efficiency.

- **Understanding the challenges:** the EEC programme is measuring the energy used by our supercomputers and supporting infrastructure within the Hartree data centres. By running our scientific applications and base lining their performance and energy consumption, we can identify energy hotspots and develop solutions to reduce power consumption while maintaining performance.

- **Enhancing our expertise:** the EEC programme is developing the skills and knowledge vital to designing and optimising the next generation of high performance computers. Drawing upon our existing expertise we are seeking to develop portable, energy efficient applications capable of running at scale across a range of high performance systems.

- **Advancement through collaboration:** the field of HPC is undergoing radical change as we advance towards the exascale era. To achieve exascale computing within a sensible power budget both incremental improvements to existing architectures and novel revolutionary approaches will impact on future developments. The Hartree Centre's EEC programme will contribute to these developments through collaboration with research and industrial partners from around the world.

The focus of the programme includes:

- The development of tools and approaches to support the optimisation of scientific applications for both performance and energy

- Collaboration with hardware and software vendors to support co-design and the delivery of integrated solutions

- Rewriting of scientific applications to enable portability to new low power architectures

- Understand the total cost of ownership for HPC systems through developing accurate measurement and monitoring capabilities.

- Sharing best practice across UK industry and academia

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