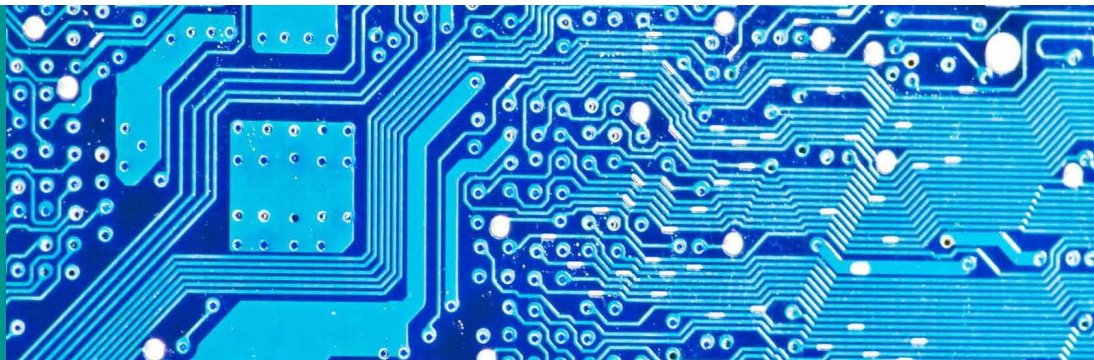


Technology Strategy Board

Driving Innovation



# Energy-efficient computing

**COMPETITION FOR FEASIBILITY FUNDING**

**OCTOBER 2012**

**[dstl]**

**EPSRC**

Pioneering research  
and skills



# Energy-efficient computing

## COMPETITION FOR FEASIBILITY FUNDING

### Summary

The Technology Strategy Board, with its partners, the Engineering & Physical Sciences Research Council (EPSRC) and Defence Science & Technology Laboratory (DSTL) Futures and Innovation Domain, are to invest up to £1.25m in feasibility studies to encourage technologies which can reduce the mounting energy burden of computing and communications devices and systems.

The increasing trend in electronic and computing systems on a global scale is set to continue, to the point where it is likely to have a significant impact on climate change.

For many years, electronic and computing systems and the software which runs on them have been designed with a view to ever-improved performance. However, there is now greater focus on improving energy efficiency of the system as a whole. By devising more energy efficient computing devices and software, we can

reduce the global energy burden of such systems and increase customer satisfaction by extending battery life, reducing device size and other measures.

This collaborative demonstrator competition focuses on the design and development of energy-efficient hardware and software, not only for large-scale systems relying on computing capacity but also for mobile devices and embedded chips.

These feasibility projects must be undertaken by a consortium of at least two partners, one of whom can be an academic institution, but they must be led by a business, which can be of any size. Projects are expected to last six to 18 months and can attract public funding of up to 75%, with a maximum grant of £100k for an individual project

This is a single stage competition. It opens on **8 October 2012** and the deadline for the receipt of applications is noon on **5 December 2012**. A briefing day for potential applicants will be held on **23 October 2012**.

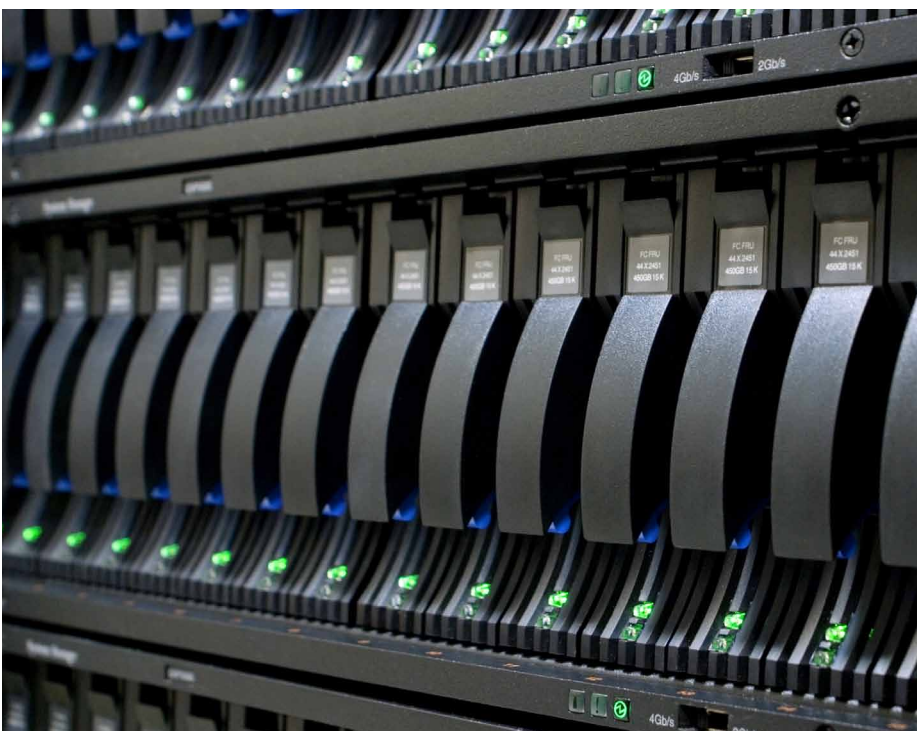
### Background

The use of digital devices and systems – big and small, complex and simple – is already responsible for a significant proportion of the electricity consumption of developed economies and is set to grow. Across the world nations are becoming increasingly aware of the impacts of climate change, and are putting in place measures to mitigate them. In this context, more energy efficient computing will become a necessity. For example, cloud computing data centres currently consume 2% of global electricity generation and this is expected to reach 5% by 2020; although physical plant design is part of the answer, as much as 50% of the energy consumption of these centres is from the devices and software that they run.

For some time, electronic and computing systems, along with the application software which runs on them, have typically been designed with a view to ever-improved performance. However, there has been limited characterisation or optimisation of power and energy consumption of the whole system.

In order to reduce the global energy burden of the multitude of such systems we must devise more energy-efficient computing devices and software. There is also a primary need to understand, characterise and measure the energy consumption of devices, software and systems.

The creation of more energy-efficient systems will require new devices to be designed with software development in mind – and vice-versa – so that software becomes energy-efficient for particular devices and those devices are able to optimise their operation accordingly. There is a considerable drive towards satisfying consumer demand for extended battery life through more efficient software and systems in handheld devices, affordable high performance computing and energy-efficient gaming.





## Challenge

The design and development of computing devices, systems architecture and the software which runs on them has become increasingly complex; devices and systems and the software which run on them have, as a result, become more energy consuming. Energy consumption has become a major issue in electronic design. The challenges we face include:

- the design and development of novel computer and device architectures to optimise energy efficiency and to address the 'dark silicon' problem (the increasing proportion of transistors on a chip which have to be switched off because of power constraints)
- enabling energy-aware or energy-optimised software through new techniques and algorithms in order to exploit novel architectures for greater energy efficiency among devices and systems
- developing low-power designs for digital signal processing, energy-efficient chip-to-chip interconnects and cross-layer (3D) chip optimisation.

Critically, these challenges are pertinent to both mobile devices, including smartphones, and to large-scale systems, such as high performance computing systems and cloud-based data centres; both require measurement and characterisation of the energy efficiency of current devices, systems and software and modelling of future devices, systems and software.

In addressing these challenges, applicants should consider the commercial and technical issues that may arise in migrating from legacy devices and software architectures.

## Scope

The competition will support the development and demonstration of technologies which address challenges in measuring, characterising and comparing energy use of individual devices and systems and the software that runs on these systems. Projects will also explore the feasibility of redesigning devices or writing software to reduce and manage energy consumption by these devices and systems.

Priority will be given to demonstration projects able to showcase prototypes that have a clear and unambiguous energy consumption measure, with a view to setting a standard of device and software efficiency.

For example, projects may involve (but are not limited to) the use of technologies which enable:

- device, system and software energy consumption to be measured and characterised
- the design of novel computer and device architectures to optimise energy efficiency
- the exploitation of novel device technologies (such as Silicon on Insulator (SOI) to reduce parasitic device capacitance) to reduce device power consumption
- device design which addresses the 'dark silicon' challenge
- the development of new techniques and algorithms to produce energy-efficient software
- the exploitation of novel architectures of hardware and software for greater energy efficiency
- the development of low-power designs for digital signal processing and device optimisation for energy-efficient chip-to-chip interconnects
- the development of standards based around energy-efficiency of devices and software (for example, a device or software 'energy efficiency mark').

## Exclusions

The scope of the programme is limited to devices and software. It excludes the physical design of large systems such as data centres and their physical architecture, such as integrated cooling systems and power supplies. Demonstration of a commercial application forms only part of what can be done to support the advancement of a technology; future success in deploying energy-efficient computing in a business environment will also rely upon development of a whole supply chain of integrated technologies and services. Projects should indicate how they would take the technology forward to achieve commercial success.

## Funding allocation and project details

This initiative is open to all UK-based companies and research organisations.

A total of up to £1.25m will be made available for feasibility studies which aim to demonstrate the application of energy-efficient computing in a commercial setting.

Projects must be led by a business, of any size, and be undertaken by a consortium comprising at least two partners (either academia or business). Consortia are likely to comprise organisations with multi-disciplinary expertise. Projects which address both hardware and software aspects of energy efficiency are particularly welcome.

Grants available will not exceed £100k. Each project is expected to last between six and 18 months.



## Application process

This single-stage competition will open on **8 October 2012**. The deadline for registration is at noon on **28 November** and the deadline for completed applications is at noon on **5 December 2012**. Applicants will be informed of the outcome of their application by **25 January 2013**. A competition briefing will be held in London on **23 October 2012** to explain the process and we strongly recommend that applicants attend.

We will be organising supporting activities, such as consortia building events, to showcase the academic expertise available in the UK to our industrial communities facilitating networking opportunities from which collaborations may develop. **Go to [\\_connect \(www.innovateuk.org/connect\)](http://www.innovateuk.org/connect)**

Further details can be found in the Guidance for Applicants for this competition (available from our website after you have registered for this competition).

**NB: All deadlines are at noon**

## Key dates

Competition opens	<b>08 October 2012</b>
Briefing event	<b>23 October 2012</b>
Registration deadline	<b>28 November 2012 noon</b>
Deadline for applications	<b>5 December 2012 noon</b>
Applicants informed of decision	<b>25 January 2013</b>
Offer letters issued and feedback given	<b>22 February 2013</b>

## More information

To apply for this competition you must first register with us. You can do this by going to our web page for this competition at **[www.innovateuk.org](http://www.innovateuk.org)** under Competitions. When you register you will get access to all the supporting information you need to read before you apply, including the *Guidance for Applicants* and the application form.

Competition helpline:  
**0300 321 4357**

Email:  
**[competitions@innovateuk.org](mailto:competitions@innovateuk.org)**

## Publicity

As part of the application process all applicants are asked to submit a public description of the project. This should adequately describe the project but not disclose any information that may impact

on intellectual property, is confidential or commercially sensitive. The titles of successful projects, names of organisations, amounts awarded and the public description will be published once the award is confirmed as final. Information about unsuccessful project applications will remain confidential and will not be made public. E-mail [pressoffice@tsb.gov.uk](mailto:pressoffice@tsb.gov.uk) with any queries.

*The Technology Strategy Board is a business-led executive non-departmental public body, established by the Government. Its role is to promote and support research into, and development and exploitation of, technology and innovation for the benefit of UK business, in order to increase economic growth and improve quality of life.*

*Collaborative research and development is part of the Government's Solutions for Business portfolio.*

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