EPSRC
Engineering and Physical Sciences Research Council

Quick Reference

Please note that you must read the full Call document for guidance before submitting your proposal

Hardware for Efficient Computing

Call type: Invitation for full proposals

Closing date: 16:00 23 July 2020

Funding Available: Total of £3,000,000 to fund 4 – 6 proposals

How to apply: Invitation for proposals

Assessment Process: Full proposals will undergo postal peer review, followed by a prioritisation panel (if reviews are sufficiently supportive), resulting in a rank ordered list.

Key Dates:

Activity	**Date**
Call Live on JeS	15 May 2020
Deadline for Full Proposals	23 July 2020
Prioritisation Panel	October/November 2020
Funding decision	December 2020
Grant start date	Spring 2021

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For JeS help: JeSHelp@je-s.ukri.org 01793 44 4164 - Monday to Thursday 8.30am to 5pm and Fridays 8.30am to 4.30pm (excluding bank holidays and other holidays)

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Related themes: Information Communication Technologies

Contents of this call document

We recognise that the current restrictions imposed during the COVID-19 pandemic may present additional challenges for applicants to this call. To help applicants as much as possible, we published a pre-announcement on 24 April 2020 and have extended the submission period (to a total of 10 weeks) to give applicants an extended duration within which to apply.

Summary

The Engineering and Physical Sciences Research Council (EPSRC) is allocating up to £3 million to develop hardware technologies and architectures that can lead to increased computing efficiency, with a focus beyond Von Neumann systems. We aim to support 4 - 6 novel research projects of 18 – 36 months in length.

Once full proposals are received, they will be assessed by EPSRC staff for their fit to call, with those which meet the call relevance being sent out to peer review. If sufficiently positive reviews are received, the proposal will be ranked against other proposals submitted under this call at a prioritisation panel.

Background

It is recognised that "conventional" digital computing systems based on the Von Neumann architecture are restricted by a data transfer bottle neck. This limits further increases in computing efficiency, which could prevent computing systems from meeting demand requirements from increasingly complex problems and increased global energy demand. Coupling this with a reduction in return on investments in Moore's law and an increase in global demand for computational capacity, there is a need to develop new hardware solutions beyond the Von Neumann architecture to achieve greater computer efficiency.

The development of non-Von Neumann hardware and architectures are expected to impact areas limited by "conventional" digital computing including Artificial Intelligence (AI) and the Internet of Things (IoT) as well as creating low powered devices for sensing, healthcare and low energy computing.

EPSRC recognises the importance of fundamental research and development in these novel hardware systems and are launching this call to ensure that the UK continues to have an excellent base of electronics and hardware research in this important area.

Projects submitted to this call may include (but are not limited to): novel microelectronics designs, non-Von Neumann designs, programmable hardware, analogue computing, novel microelectronic device technologies, neuromorphic systems, memristors, bio-inspired devices, in-material computing, novel computer architectures, parallel computing and unconventional computing.

EPSRC are not looking to fund projects which focus specifically on Quantum devices, Energy Harvesting devices or projects in which the novelty lies outside of the hardware (e.g. a novel sensor on existing hardware).

The need for software tools to enable the use of novel hardware is recognised and welcomed under this call, however the main focus of submitted proposals must be on the **hardware** being developed and/or its design.

Objectives

With this call we wish to support a range of novel projects aimed at providing hardware solutions to increase compute efficiency.

This is recognised as an area of national importance in which the UK has an international standing and, in line with our delivery plan aim of "Promoting excellence in research", we wish to stimulate and encourage research which addresses possible alternatives to the Von Neumann architecture. This will be aided by extensive cross disciplinary research and we therefore encourage proposals to develop collaborations across the microelectronic design, device technology and architecture disciplines, as well as other disciplines where necessary, to deliver a common goal of increasing the efficiency of computing.

Applicants are encouraged to outline in their cover letter how they intend to embed equality, diversity and inclusion (EDI) in the project.

This call also has a focus on Object 1 of the EPSRC's delivery plan: Delivering economic impact and social prosperity via the Connected nation: Enhancing future digital technologies. We also aim to enhance sustainability across our portfolio and ensure the UK remains at the forefront of digital technology innovation.

Our objectives for this call are to:

- Develop solutions to unsustainable levels of energy consumption in computing
- Grow technologies based on non-Von Neumann architectures
- Develop "unconventional" forms of computing
- Support a strong UK computer hardware community
- Promote long term sustained growth across the electronics research area
- Promote Equality, Diversion and Inclusion in the electronics research area

Funding available

The EPSRC has allocated £3 million of its core budget to this call to fund 4-6 proposals 18 – 36 months in length. This call is managed under the EPSRC ICT theme.

We will accept applications from across a range of EPSRC ICT research areas. For each project, the majority of research to be undertaken must fall within one of the following research areas: **Microelectronic Design, Microelectronic Device Technology** and/or **Architectures and Operating Systems.** Overlap with other EPSRC research areas is welcomed but the **focus/novelty should be within the hardware** aspect of the proposal.

Description of the three EPSRC research areas can be found here:

- Microelectronic Design: https://epsrc.ukri.org/research/ourportfolio/researchareas/microelecdesign/

- Microelectronics Device Technology: https://epsrc.ukri.org/research/ourportfolio/researchareas/microdevtechnology/
- Architectures and operating system: https://epsrc.ukri.org/research/ourportfolio/researchareas/archandos/

A full list of the current EPSRC research areas can be found here: https://epsrc.ukri.org/research/ourportfolio/researchareas/

Industrial partners or other end user organisations are welcomed on submitted proposals.

Equality, Diversity and Inclusion

The long-term strength of the UK research base depends on harnessing all the available talent. EPSRC expects that equality and diversity is embedded at all levels and in all aspects of research practice and funding policy. We are committed to supporting the research community, offering a range of flexible options which allow applicants to design a package that fits their research goals, career and personal circumstances. This includes career breaks, support for people with caring responsibilities, flexible working and alternative working patterns. With this in mind, we welcome applications from academics who job share, have a part-time contract, or need flexible working arrangements.

Peer review is central to EPSRC funding decisions, we require expert advice and robust decision making processes for all EPSRC funding initiatives. We are committed to ensuring that fairness is fully reflected in all our funding processes by advancing policy which supports equality, diversity and inclusion. Please see our Equality and Diversity webpages https://epsrc.ukri.org/funding/equalitydiversity/ for further information.

Responsible Innovation

EPSRC is fully committed to develop and promote responsible innovation. Research has the ability to not only produce understanding, knowledge and value, but also unintended consequences, questions, ethical dilemmas and, at times, unexpected social transformations. We recognise that we have a duty of care to promote approaches to responsible innovation that will initiate ongoing reflection about the potential ethical and societal implications of the research that we sponsor and to encourage our research community to do likewise.

Responsible innovation creates spaces and processes to explore innovation and its consequences in an open, inclusive and timely way, going beyond consideration of ethics, public engagement, risk and regulation. Innovation is a collective responsibility, where funders, researchers, interested and affected parties, including the public, all have an important role to play. Applicants are expected to work within the EPSRC Framework for Responsible Innovation given on the EPSRC website (https://epsrc.ukri.org/research/framework/).

Guidance on Journal-based metrics

As part of our commitment to support the recommendations and principles set out by the San Francisco Declaration on Research Assessment (DORA; https://sfdora.org/read/), UKRI reviewers and panel members are advised not to use journal-based metrics, such as journal impact factors, as a surrogate measure of the quality of individual research articles, to assess an investigator's contributions, or to make funding decisions.

The content of a paper is more important than publication metrics, or the identity of the journal, in which it was published, especially for early-stage researchers. Reviewers and panel members are encouraged to consider the value and impact of all research outputs (including datasets, software, inventions, patents, preprints, other commercial activities, etc.) in addition to research publications. We advise our peer reviewers and panel members to consider a broad range of impact measures including qualitative indicators of research impact, such as influence on policy and practice.

Equipment

Equipment over £10,000 in value (inc. vat) is not available through this call. Smaller items of equipment (individually under £10,000) should be in the Directly Incurred - Other Costs heading.

For more information on equipment funding, please see: https://epsrc.ukri.org/research/facilities/equipment/

Eligibility

Standard EPSRC eligibility rules apply. Please ensure sufficient time to create Je-S accounts for Investigators who do not currently have one.

For information on the eligibility of organisations and individuals to receive EPSRC funding, see the EPSRC Funding Guide: https://epsrc.ukri.org/funding/applicationprocess/fundingguide/

A list of eligible organisations is provided at: https://www.ukri.org/funding/how-to-apply/eligibility/

How to apply

Submitting an application

You should prepare and submit your proposal using the Research Councils' Joint electronic Submission (Je-S) System (https://je-s.rcuk.ac.uk/).

When adding a new proposal, you should select:

- Council 'EPSRC'
- Document type 'Standard Proposal'

- Scheme 'Standard'
- On the Project Details page you should select the 'Hardware for Efficient Computing' call.

Note that clicking 'submit document' on your proposal form in Je-S initially submits the proposal to your host organisation's administration, not to EPSRC. Please allow sufficient time for your organisation's submission process between submitting your proposal to them and the call closing date. EPSRC must receive your application by **16:00** on **23 July 2020**.

Guidance on the types of support that may be sought and advice on the completion of the research proposal forms are given on the EPSRC website (https://epsrc.ukri.org/funding/applicationprocess/) which should be consulted when preparing all proposals.

Guidance on writing an application

As well as the Je-S form the following documents must be submitted:

- Case for support – 8 A4 sides in total including
    - track record of applicant and team: 2 A4 sides
    - description of the proposed research and how it fits the scope of the call, including how this work contributes to the development of more efficient hardware: 6 A4 sides
- Justification of resources – 2 A4 sides in total. This should be a narrative description of the need for the resources requested.
- Workplan – 1 A4 side in total. This should include a diagrammatic work plan such as a Gantt chart.
- Cover letter – Up to 2 A4 sides in total. Detailing how the proposal fits to the call, how EDI will be embedded in the project, which EPSRC research area(s) and strategies the proposals aligns with and how the proposed project will increase the efficiency of digital technologies (this document will not be sent to reviewers or prioritisation panel members).

Applicants should use the Ethical Information section on the Je-S form to demonstrate to peer reviewers that they have fully considered any ethical issues concerning the material they intend to use, the nature and choice, current public perceptions and attitudes towards the subject matter or research area. EPSRC will not fund a project if it believes that there are ethical concerns that have been overlooked or not appropriately accounted for. All relevant parts of the Ethical Information section must be completed. If the research will involve human participation or the use of animals covered by the Animals (Scientific Procedures) Act 1986 it is recommended that applicants pay particular attention to the guidance highlighted below. EPSRC reserves the right to reject applications prior to peer review if the Ethical Information sections are not completed correctly.

Further guidance on completing the Je-S form can be found at https://je-s.rcuk.ac.uk/Handbook/pages/GuidanceonCompletingaStandardG/EthicalInformation.htm. Other relevant guidance includes: EPSRC's policy on animal use in research (https://www.epsrc.ukri.org/about/standards/animalresearchpolicy/) and the Responsible Innovation Framework (https://epsrc.ukri.org/research/framework/).

Please note that on submission to EPSRC **all** non-PDF documents uploaded onto Je-S are converted to PDF, the use of non-standard fonts may result in errors or font conversion, which could affect the overall length of the document.

For advice on writing proposals see:

https://epsrc.ukri.org/funding/howtoapply/preparing/

Following the recent change to the UKRI assessment of impact, more detailed guide to writing your Case for Support can be found through the updated guide linked from this page: https://epsrc.ukri.org/funding/applicationprocess/preparing/writing/caseforsupport/

Assessment

Assessment process

Proposals in this call will be reviewed via standard postal peer review. Proposals with sufficiently supportive reviews will be assessed at a prioritisation panel. The assessment criteria detailed below will be used for all stages of the process.

Assessment criteria

- Quality of research (Primary)
    - The novelty, relationship to the context, timeliness and relevance to identified stakeholders;
    - The ambition, adventure, transformative aspects or potential outcomes;
    - The suitability of the proposed methodology and the appropriateness of the approach to achieving impact.

  (For reviewers: For multi-disciplinary proposals please state which aspects of the proposal you feel qualified to assess)

- National Importance (Secondary Major)
    - Contributes to, or helps maintain the health of other disciplines, contributes to addressing key UK societal challenges and/or contributes to future UK economic success and development of emerging industry(s);
    - Meets national needs by establishing/maintaining a unique world leading activity

    - Complements other UK research funded in this area including relationship to the EPSRC portfolio

- Applicant and Partnerships (Secondary): The applicant's ability to deliver the proposed project, making reference to
    - Appropriateness of the track record of the team
    - Balance of skills of the team including collaborators
- Resources and Management (Secondary): The effectiveness of the proposed planning and management and whether the requested resources are appropriate and have been fully justified, making reference to
    - Any equipment requested, or the viability of the arrangements described to access equipment needed for this project, and particularly on any university or third-party contribution;
    - Any resources requested for activities to either increase impact, for public engagement or to support responsible innovation.
- Fit to call (Secondary): The extent to which the proposal meets the call criteria.
    - Fits and contributes to the published Microelectronics Design, Microelectronics Device Technologies and/or Architectures and Operating systems research area definitions and strategy
    - Details how the hardware being developed is novel and aims to lower the energy requirements or increase the efficiency of the system

Feedback

Feedback will consist of reviewer's reports and, if they are sufficiently supportive, the ranking position at the prioritisation panel. The prioritisation panel may provide specific feedback if deemed necessary, but this will not be given as standard.

Guidance for reviewers

When completing your assessment please use the section marked 'Call Specific Criteria' to address the Fit to Call criterion.

Information about the EPSRC peer review process and guidance for reviewers can be found at: https://epsrc.ukri.org/funding/assessmentprocess/review/

Guidance for reviewing standard grants can be found here:

https://epsrc.ukri.org/funding/assessmentprocess/review/formsandguidancenotes/standardgrants/

Moving forward

Submissions to this call will count towards the Repeatedly Unsuccessful Applicants Policy. Further information about the policy can be found at: https://epsrc.ukri.org/funding/howtoapply/basics/resubpol/rua/

Key dates

Activity	Date*
Call Live on Je-S	15 May 2020
Call Webinar	9 June 2020
Closing date – full proposals	23 July 2020
Prioritisation Panel	October/November 2020
Funding Decision	December 2020
Grant Start Date	Spring 2021

*EPSRC aims to adhere to the key dates as published, however there may be exceptions where the sift, prioritisation or interview meeting may have to change due to panel member availability.

Contacts

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Change log

Name	Date	Version	Change
James Coombs OBrien	06/04/2020	1	N/A

Appendices (includes Attachment Checklist and Fund Headings)

Je-S attachments Check List

Standard:

Attachment Type	Maximum Page length	Mandatory/Optional	Extra Guidance
Case for Support	Eight pages	M	Comprising up to two A4 sides for a track record, and six A4 sides describing proposed research and its context.
Workplan	One page	M	
Justification for Resources	Two pages	M	
Proposal Cover Letter	Two pages	M	Used to highlight any important information to EPSRC (e.g. fit to call). This attachment type is not seen by reviewers or panel members.
Technical assessment	No page limit	M if facilities are used	
Project Partner Letters of Support	No page limits	M if Project Partners are listed	Must be included from all named project partners. Must be on headed paper and be signed and dated within six months of the proposal submission date.
Letters of Support	No page limits	Not required	
CVs	Two pages each	Not required	
Equipment Quotes	No page limits	Not required	

All attachments must be completed in single-spaced typescript in Arial 11 or other sans serif typeface of equivalent size, with margins of at least 2cm. Arial narrow and Calibri are not allowable font types. Text in embedded diagrams or pictures, numerical formulae or references can be smaller, as long as it is legible.

Text in tables and figure labels not within embedded diagrams or pictures should be at least 11 point.

Please ensure you adhere to the above attachment requirements when submitting your proposal. Any missing, over length or unnecessary attachments may result in your proposal being rejected.