Adventurous energy research for a sustainable net zero: outlines

Opportunity status: Open

Funders: Engineering and Physical Sciences Research Council (EPSRC)

Funding type: Grant

Total fund: £2,000,000

Maximum award: £250,000

Publication date: 23 April 2021

Opening date: 23 April 2021

Closing date: 8 July 2021 16:00 UK time

Last updated: 23 April 2021

Apply for funding for high-risk decarbonisation research to develop or model:

- materials
- devices
- fuels
- technologies.

Mathematical, digital, artificial intelligence and software-based solutions are excluded.

Solutions must be sustainable beyond 2050 and compatible with a circular economy.

You must be a UK-based researcher employed by an eligible research organisation.

Holders of postdoctoral fellowships are not eligible to apply.

Projects must be for 24 months.

This is an outline stage. If you’re successful, we will invite you to interview.
Institutions may only submit a limited number of applications.

Who can apply

Due to anticipated high demand, organisations must limit the number of submissions.

They are asked to confirm in a letter to EPSRC the applications they are endorsing and give details of any selection process they have used. Further details including the allocations for organisations are provided below.

It is expected that this award is for a principal investigator (PI) only. If the grant crosses disciplinary boundaries, a co-investigator (Co-I) may be permitted if it is demonstrated that they are from a different discipline to the PI. For example, it is not usually expected that the Co-I is from the same department as the PI.

Please ensure sufficient time to create Je-S accounts for investigators who do not currently have one.

Standard EPSRC eligibility rules apply. Research grants are open to:

- UK higher education institutions
- research council institutes
- UKRI-approved independent research organisations
- public sector research establishments
- NHS bodies with research capacity.

Read the guidance on institutional eligibility.

You can apply if you are resident in the UK and meet at least one of the following criteria:

- are employed at the submitting research organisation at lecturer level or equivalent
- hold a fixed-term contract that extends beyond the duration of the proposed project, and the host research organisation is prepared to give you all the support normal for a permanent employee
- hold an EPSRC, Royal Society or Royal Academy of Engineering fellowship aimed at later career stages
- hold fellowships under other schemes (please contact EPSRC to check eligibility, which is considered on a case-by-case basis).

Holders of postdoctoral level fellowships are not eligible to apply for an EPSRC grant.

If you are currently restricted under the Repeatedly Unsuccessful Applicants Policy, you may submit unlimited outlines, but you will only be able to submit one full proposal (as PI or Co-I) during the 12-month restricted period.
Submissions to this call will not count towards the EPSRC Repeatedly Unsuccessful Applicants Policy.

Applicants should have a start date of 1 March 2022 on their application and aim to start within six months of that date.

There are a limited number of applications possible from each institution. The allocation per institution is based on the current number of investigators at the institution on relevant EPSRC grants.

If there are more prospective applicants at the institution than the allocation for that institution permits, then it is recommended that institutions will have an internal process to decide which applications are submitted. This is so the allocation is not exceeded.

For the purposes of equality, diversity and inclusion, we would encourage that, as far as is feasible, any such internal process is also anonymised. The research organisation has a critical role in ensuring that all potential applicants regardless of their background have a fair chance of being put forward for this call and applicants are encouraged and supported through a transparent selection process.

Each institution should provide a cover letter to EPSRC, listing:

- the project titles
- principal investigator names for all proposals from that institution submitted to the call.

Where the number of prospective applicants at an institution has surpassed the allocated number, details of the internal selection process used should be provided. It should also state the total number of prospective applicants within the institution who expressed interest in applying to the call. This will not form part of the proposal assessment criteria.

The cover letter should be sent via email to both call contacts:

- Strachan McCormick
- Gerard Davies.

If more proposals are received from an institution than their allocation permits, and no cover letter has been provided, proposals will be accepted in the chronological order of submission until the institutional allocation has been reached. All proposals submitted after the institutional allocation has been reached will be rejected.

The table below gives details of the maximum number of applications for those institutions who can submit more than one application. All other eligible institutions can submit one application only.

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What we're looking for

We are looking to fund feasibility projects:

- of two years’ duration
- aimed at high-risk discovery research to enable decarbonisation of the UK economy
- to facilitate a sustainable transition to a net-zero greenhouse gas (GHG) emissions future.

For the current call, decarbonisation will be defined as the reduction or elimination of the net anthropogenic contribution to the atmospheric concentration of GHGs, in terms of total combined global warming potential (CO2 equivalents).

Contributions to decarbonisation may be made, for example by:

- the reduction or elimination of the GHG-intensity of processes, materials, products and infrastructure
- the removal of atmospheric GHGs
- the demand reduction, encompassing both energy demand and demand for materials and products.

This definition is concerned with all atmospheric GHGs for which there is an anthropogenic source, including but not limited to:

- carbon dioxide
- methane
- F gases, such as:
  - chlorofluorocarbons
  - hydrofluorocarbons
  - perfluorocarbons
  - sulphur hexafluoride
- other haloalkanes
- nitrous oxide.

Although there are many mature technologies and solutions that can be developed and deployed to move the UK closer to net-zero, the rationale for the current call is that there is potential to develop new solutions to reduce the time to a sustainable net-zero. Whilst also, improving that transition and ensuring that it provides a sustainable future for well beyond 2050.

We hope these projects will develop the science to provide disruptive solutions, which will allow:

- a faster, better value, fairer and more sustainable transition to net-zero
- a net negative GHG emissions scenario to be attained.
These projects could provide a fresh approach in areas of decarbonisation where there has been a lot of focus or provide the foundation for work on areas that are particularly difficult to decarbonise. It is hoped that this call will ultimately result in a portfolio of cutting-edge projects, each of which has demonstrated that an innovative, disruptive decarbonisation technology has the potential to deliver significant impact.

The funding available is for research grants.

The expectation is that because the projects funded by this call will be inherently high-risk in nature, some may be unsuccessful in demonstrating the feasibility of the decarbonisation solutions they propose. However, those that are successful will have the potential to deliver significant impact with regard to decarbonising the UK economy.

In those cases, it is expected that further funding, through either follow-on funding or through a standard mode application, would be necessary to move the work towards a more applied phase. Therefore, realise that potential impact.

Please note, however, that at present no commitment has been made to providing a follow-on funding mechanism to further support successful projects from the current call.

**Scope**

There exist technical solutions to many of the challenges facing efforts to deliver net-zero emissions. Some of these solutions need further development or incremental research to enhance them. We are not looking to fund that work in this call.

We are looking to fund projects to investigate possible radical disruptive solutions that can deliver a net-zero, or net-negative future that is:

- more timely
- better value
- more comfortable
- more sustainable than that made possible by existing approaches.

The proposed solutions should avoid creating further problems to be solved by future generations. Moreover, applicants should provide a reasoned assessment of the scale of decarbonisation or other benefits that may feasibly be enabled as a result of their proposed work. They must explain how this can be achieved within the context of a circular economy.

Applicants to this call should be excited about the project they submit and should actively embrace the opportunity to develop an ambitious, high-risk idea.

The case for support of any proposal submitted to this call should, in addition to describing the project and the methodology, include the following headings, each of which should address the questions listed beneath:

Adventurous aspects of the proposal
what makes the proposed work adventurous and high risk in nature?

Benefits of the proposed work

- please describe, justify and, where appropriate, quantify the benefits of the proposed research. Examples of benefits that could feasibly be delivered if the project is successful include but are not limited to:
  - the scale of decarbonisation enable, nationally or internationally
  - improved value for money
  - other social and environmental benefits

- what additional research and/or development will be required following successful completion of the project to deliver a deployable technology or solution?

- what challenges will be addressed by the proposed work that are not addressed by existing approaches to decarbonisation?

Deployment within a circular context

- how can your proposed decarbonisation technology or solution be deployed in a manner compatible with the context of circular economy?

Projects must be working to facilitate a transition to a net-zero GHG emissions scenario or beyond.

The scope of this call is limited to engineering and physical sciences-based solutions for:

- decarbonising transport
- heating and cooling
- industry
- agriculture
- electricity generation.

Moreover, this call aims to enable the delivery of new:

- technologies
- materials
- processes
- systems.

These will have the potential to make a significant contribution to the decarbonisation of the UK economy, by funding high-risk research across a wide range of relevant disciplines.

Applications are welcomed from:

- researchers working in the fundamental physical sciences who are looking to apply underpinning concepts to the development of scalable and sustainable energy technologies
- established energy researchers aiming to deliver transformative solutions to the challenges associated with decarbonisation.
It is anticipated that applications to this call will be received from researchers working in a range of disciplines and research areas spanning engineering and the physical sciences.

However, whilst we recognise the importance of mathematical, digital, and artificial intelligence and software-based solutions, the focus of this call is on physical approaches and technologies for decarbonisation. Accordingly, proposals should be:

- concerned with developing energy materials, devices, fuels and technologies, sustainable for 2050 and beyond
- compatible with a circular economy.

Nonetheless, computational modelling undertaken for the purposes of developing such physical approaches to decarbonisation is considered in remit. It is anticipated that submissions to this call will have most relevance to the following themes of EPSRC:

- energy
- circular economy
- engineering
- manufacturing the future
- physical sciences.

This call is not intended to fund research in:

- the mathematical sciences
- ICT
- artificial intelligence or digital domains, with the exception of projects in which computational modelling is applied to the development and understanding of physical systems, technologies and materials.

A non-exhaustive list of example areas in which adventurous energy research aligned with the priorities of this call could take place is provided below, for illustrative purposes only:

- bioinspired systems for energy conversion and storage
- enabling science and technology for the valorisation of CO2 and creation of circular fuel economies
- unconventional zero-carbon fuels and novel sustainable energy vectors
- scalable energy storage technologies for medium-term and inter-seasonal applications
- materials and physical technologies for more energy-efficient ICT and artificial intelligence
- recyclable materials for energy applications, from low cost, abundant resources
- disruptive technologies for waste, low-grade heat utilisation, for example via thermoelectric materials
- disruptive designs for renewable energy converters
- innovative scalable solutions to energy inefficiency in domestic building stock
- transformative approaches to the sustainable manufacture, construction and recycling of renewable energy infrastructure.
The project must be in the remit of EPSRC with at least 50% of the proposed work falling within the energy and decarbonisation domain. Proposals that do not fall within EPSRC remit or are not sufficiently focused on the development of sustainable energy technologies will be rejected.

We do not intend to fund projects that could be described as:

- incremental
- low-risk or unadventurous
- incompatible with deployment within a circular economy context.

Due to the speculative nature of these projects, we will not be expecting specific industrial collaboration to be included in the outline application. However, support from project partners is welcome and letters of support can be attached to the full proposal submission if appropriate.

**Funding available**

Up to £2 million of EPSRC funding will be available to fund individual projects. Individual projects may be up to £312,500 full economic cost, of which EPSRC will fund 80% (£250,000).

Equipment over £10,000 in value (incl. VAT) is not available through this call. Smaller items of equipment (individually under £10,000) should be in the directly incurred – other costs heading.

Read further information on [equipment funding (EPSRC)](https://www.epsrc.ac.uk).  

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**How to apply**

Applicants should ensure they are aware of and comply with any internal institutional deadlines that may be in place.

You should prepare and submit your proposal using the research councils’ [Joint Electronic Submission system (Je-S)](https://www.epsrc.ac.uk).

When adding a new proposal, you should go to documents, select New Document, then select:

- Council: EPSRC
- Document type: Outline proposal
- Scheme: Outline

After completing the application, you must ‘Submit document’ which will send your application to your host organisation’s administration.

Your host organisation’s administration is required to complete the submission process. Applicants should 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 8 July 2021.

As well as the Je-S application form, the following documents must be submitted at the outline stage:

**Case for support**
- two pages
- mandatory
- must be anonymous
- include headings:
  - adventurous aspects of the proposal
  - benefits of the project
  - deployment within a circular context.

**Justification for resources**
- one page
- mandatory
- this does not need to be anonymous.

**Proposal cover letter**
- no page limit
- the cover letter can be used to highlight any important information to EPSRC. This attachment type is not seen by reviewers or panel members.

**Further guidance**
You should attach your documents as PDF files to avoid errors. They should be completed in single-spaced Arial 11 font or similar-sized Sans Serif typeface.

For advice on writing proposals see [preparing a proposal (EPSRC)](https://www.epsrc.ac.uk/).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. Read further guidance on the [ethical information section of the Je-S form](https://www.epsrc.ac.uk/). 

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**How we will assess your application**

**Assessment process**
Applications will be assessed via a two-stage process.

Anonymous outlines will be considered by an expert panel and successful outlines will then be invited to an interview. Those successful at interview will submit a full proposal consistent with the outline submission, which will be funded without further peer review.
Stage one: shortlisting of outlines

Eligible proposals received by the closing date will be assessed by an external panel. This stage is being performed anonymously. The panel will only see the anonymous case for support. This is to ensure the panel is focused on the research idea and cannot be influenced by other factors such as affiliation.

The panel will be looking for convincing evidence of how the applicant will approach their chosen problem, and the level of creativity and pioneering foresight. Assessment of proposals will be based on how well the description of the project in the case for support aligns to the assessment criteria below.

Any proposal not within remit or with a case for support which reveals the identity of the applicant or their institution will be rejected prior to the shortlisting panel meeting.

Stage two: interview

Applicants who are successful at stage one will be invited to interview and will receive further details on the process directly from EPSRC. From this stage the call will no longer be anonymous.

The interview panel will use the outline proposal as their initial source of reference, particularly with respect to any technical aspects of the research. The panel will have access to the justification of resources document. The panel have leave to ask the applicant for additional information and clarification.

The panel’s overall assessment will be based on the written documentation already submitted and the responses at interview.

At this stage the panel is looking for convincing evidence that the applicant is a creative investigator who can:

- deliver the proposed research idea
- examine the idea more deeply to check its potential to be transformative, adventurous and lead to significant impact in achieving a sustainable net zero or net negative future.

The panel will rank proposals at the interview stage against the assessment criteria and will be asked to make funding recommendations to EPSRC.

There will be no postal peer review of applications submitted against this call.

Assessment criteria

Stage one: shortlisting of outlines

Criteria to be assessed at outline stage are:

Quality (primary) the research excellence, making reference to:

- 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.

**National importance (secondary major), how the research:**

- 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 the area, including any relationship to the EPSRC portfolio.

**Fit to call (secondary major):**

- the project aligns with the aim of the call to fund high-risk high-return research with the potential to enable transformative solutions which deliver a sustainable net zero future for the UK.

**Stage two: interview**

At interview stage, the following assessment criteria will be assessed in addition to those above:

**Applicant and partnerships (secondary), the ability to deliver the proposed project, making reference to:**

- appropriateness of the track record of the applicant(s)
- balance of skills of the project 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.

**Feedback**

Brief feedback may be given to applicants at the stage one outline as directed by the panel.

The interview panel will offer feedback and advice to applicants who are not successful at stage two: interview.

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**Contact details**

**Strachan McCormick**
For help and advice on costings and writing your proposal please contact your research office in the first instance, allowing sufficient time for your organisation’s submission process.

Je-S Helpdesk

Any queries regarding the submission of proposals through Je-S should be directed to:

- jeshelp@je-s.ukri.org
- 01793 444 164

This inbox is monitored from Monday to Thursday between the hours of 8:30 and 17:00, and on Fridays between 8:30 and 16:30 (excluding bank holidays and other holidays).

Additional info

Background

Although research into sustainable energy technologies has seen extensive investment in recent years, much of this has been directed towards scale-up and deployment-focused work essential for the rapid, large-scale reduction of GHG emissions.

However, we recognise that it is necessary to maintain a balanced portfolio of decarbonisation-related research spanning a range of technology readiness levels. This includes fundamental and discovery research, to assess the feasibility of potentially disruptive new approaches to sustainable decarbonisation suitable for long-term deployment at scale.

Moreover, the successful delivery of net-zero is reliant upon a coherent research pipeline able to bring scalable decarbonisation technologies and solutions to deployment by pulling through concepts from the fundamental sciences.

To deliver a sustainable net-zero GHG emissions scenario, new decarbonisation technologies and solutions will be required that are compatible with operation in a circular economy context.
It is essential that the long-term net elimination of anthropogenic greenhouse gas emissions does not come at the expense of unsustainable resource use or the production of hazardous or environmentally harmful wastes.

Furthermore, whilst many scalable solutions have been investigated for the decarbonisation of high-emitting sectors such as electricity generation and personal transport, it is necessary to also address the challenges associated with the elimination of greenhouse gas emissions from so-called ‘difficult to decarbonise’ sectors and activities. These include, for example:

- air transport
- shipping and road haulage
- steel manufacture
- heating and cooling
- construction
- agriculture.

It is also envisaged that adventurous, high-risk research may deliver transformative new solutions for the rapid, sustainable deployment of existing types of renewable energy infrastructure, through the innovative development of materials and processes. In particular there is a need for materials and designs for renewable energy infrastructure that are compatible with recycling or reuse, and allow for circular resource-flow.

In the scoping of this call, members of the UKRI Energy Programme Scientific Advisory Committee were consulted as well as colleagues from across relevant themes within EPSRC.

Resolving any of the decarbonisation challenges discussed throughout this document will be, at least in part, reliant on technologies and approaches that are not currently a focus of mainstream energy research, and are not significantly represented within the EPSRC energy research portfolio. This call seeks to address this by providing the opportunity for the feasibility of high-risk, potentially transformative approaches to be assessed prior to potential large-scale investment.

For further information visit the energy theme webpages (EPSRC).

Additional documents

- equality impact assessment (DOCX, 66KB)

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Timeline

23 April 2021
Opening date
8 July 2021 16:00
Closing date

Mid October 2021
Shortlisting panel

Late November 2021
Interview panel

December 2021
Deadline for submission of full proposal

1 March 2022
Grant start date

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