

Towards Engineering Grand Challenges: Network and Multidisciplinary Research Consortia Call

Call type: Collaborative research

Closing time and date: 16:00 on 28 April 2015

Related themes: Engineering, LWEC

Summary

The Engineering and Physical Sciences Research Council (EPSRC) aims to support multidisciplinary research consortia that can further advance the following Engineering Grand Challenge areas:

- Challenge 1: Sustainable engineering solutions to provide water for all;
- Challenge 2: Future Cities: engineering approaches that restore the balance between engineered and natural systems; and,
- Challenge 3: Engineering across length scales, from atoms to applications.

This call aims to support three consortia, with each consortium covering one or more of the challenge areas. Each consortium must explain the fit to the chosen challenge area(s) and demonstrate evidence of how they will connect with on-going excellent research in the UK outside of the consortium.

EPSRC also aims to support Network Plus proposals to further develop and scope the Grand Challenge area of:

- Challenge 4: Identifying risk and building resilience into engineered systems.

This investment activity is being led by the Engineering theme working in close partnership with a number of themes across EPSRC.

Applicants must complete an Intent to Submit survey by the **26 March 2015**; applicants who do not do this will be ineligible for the call. EPSRC will make PI name, institutions involved and title of the Intents to Submit publically available on the website to enable further community building.

The closing time and date for full proposals is **16:00 on 28 April 2015**. Whilst not needed at the Intent to Submit stage, final applications must include an institutional letter of support from PVC-Research or equivalent for every participating university.

Background

In 2012 EPSRC and the Royal Academy of Engineering worked in partnership with a number of other organisations to lead a major Grand Challenges Summit held in London. International business, academic and policy leaders at the

summit identified a number of challenges for the next 50 years. This provided the context for an EPSRC retreat that followed in May 2014 in which a number of engineering-related themes were developed (<http://www.epsrc.ac.uk/newsevents/pubs/engineering-grand-challenges/>). Following advice from the Engineering Strategic Advisory Team three engagement workshops were held in November 2014, where researchers from a wide range of research backgrounds helped EPSRC to develop thinking further. Drawing these varied inputs together, a total of 12 challenge areas were identified through this process, spanning a range of areas. These have now been prioritised within the context of EPSRC's overall strategic direction, the opportunity for international collaboration and the potential for the Engineering Theme to add value in the current landscape. As a consequence, some of the challenge areas identified are not being taken forward through this call but will be used to inform other activities across EPSRC.

Scope of the Call

The four Grand Challenge areas in this call are outlined below. The examples given are illustrative and EPSRC encourages potential consortia to think widely about the areas.

Challenge 1: Sustainable engineering solutions to provide water for all

The aim of this challenge area is to ensure a sustainable supply of clean water for all against a background of environmental change. It takes a holistic view of the problem by considering the source, use and distribution of water. Thematic areas include water treatment and purification, water re-use, urban water sustainability, energy recovery and real-time optimisation. This can extend to understanding comparative costs and benefits, for instance in the consideration of retro-fitting solutions and to an engineering response to societal issues. An international development perspective can be incorporated, where clear and tangible benefit to the UK is demonstrated. Funding for this Grand Challenge area is also supported by the Living with Environmental Change Theme (<http://www.lwec.org.uk/>) at EPSRC.

Challenge 2: Future Cities: engineering approaches that restore the balance between engineered and natural systems

With an ever increasing population moving into cities worldwide these will have to be ever more adaptive and resilient to make them suited to the citizen's needs. This challenge area aims to bring together physical and digital interventions which will allow the city to operate more effectively and be adaptive to change. Whilst this challenge area focuses on engineering approaches relating to cities, aspects of natural ecosystems alongside man-made systems should be considered.

Research areas include the construction, use, management and modelling of the urban environment including critical infrastructure dependencies of transport, waste, water, energy IT-based information systems and their application. This includes global challenges such as sustainability, resilience, resource efficiency & societal wellbeing if applied to urban issues.

Challenge 3: Engineering across length scales, from atoms to applications

This Grand Challenge area considers design across the scales for both products and systems. Any challenge in this area should look at new approaches to bridge the meso-scale gap taking into consideration that many engineering systems are dynamic. In this challenge area, it is important to consider the information flow between each scale and level of accuracy required. Part of this will involve developing robust and efficient multi-scale methodologies which are generic and can be adapted to different engineering problems. Consortia are encouraged to consider sustainable and whole life cycle approaches.

Potential challenges include the understanding and engineering of atoms, in order to predict the behaviour and characteristics of materials at the macro scale for applications such as electronics, structures, and mechanical systems. Another challenge could be to enhance the understanding of the effect of changes between laboratory, pilot, and industrial scales.

Challenge 4: Identifying risk and building in resilience into engineered systems

This Grand Challenge area relates to complex systems i.e. systems where events at one scale can influence outcomes at another, and/or where multiple interconnections at one scale exist. An example could be a jet engine (a complex product consisting of many components) which depends for its operation on a large number of interrelated and physical interactions. Another example is a complex network, such as an electricity distribution grid deploying smart metering and signalling across diverse power supply generators and demands. The key focus of this challenge area is to enhance the understanding of the complex interdependencies in such systems which will allow introducing engineering solutions to manage the risk.

Note to Applicants

It is important to note that EPSRC has **not** defined specific challenges but rather broad challenge areas, following inputs from the research community. It is up-to applicants to articulate **specific** challenges under this framework, where UK engineering can take a lead working in a multidisciplinary context.

These challenges sit alongside the Global Grand Challenges for Sustainability and Resilience which are a fellowship priority area.

For more information about EPSRC's portfolio and strategies, see our website: <http://www.epsrc.ac.uk/research/ourportfolio/>

Funding available

A total of up to £1M is available to support between 2 and 3 Network Plus grants in Grand Challenge 4; the duration of the networks would be anticipated to be up to 36 months.

Network Plus proposals should aim to network relevant communities to further scope the challenge. In addition to network funding, funding can be requested for feasibility studies, for initial research questions and ideas that evolve during the network.

A total of approximately £12M is available across the Grand Challenges 1, 2 and 3 to support up to 3 multidisciplinary research consortia. Consortia funding can be requested for up to 5 years.

Consortia proposals should develop a research programme which addresses the challenge(s). These should also have a networking role and be inclusive of researchers in the community outside of the original consortium.

Equipment

Where possible, researchers are asked to make use of existing facilities and equipment, including those hosted at other universities. If equipment is needed as part of the research proposal, applicants must follow EPSRC's rules for requesting equipment over £10,000 in value. Individual items of equipment up to the current OJEC (Official Journal of the European Communities) procurement threshold can be included on research proposals submitted through this call, but research organisations will be expected to make a contribution to the cost. All requests for single items of equipment above the current OJEC threshold will need to go through a separate process which will assess the strategic need for the equipment and how to ensure maximum usage. These proposals will be assessed through the separate Strategic Equipment peer review process.

For more information on equipment funding, please see:

<http://www.epsrc.ac.uk/research/ourportfolio/themes/researchinfrastructure/subthemes/equipment/>.

The current OJEC threshold can be found at:

<http://www.epsrc.ac.uk/research/facilities/equipment/>

Eligibility

For information on the eligibility of organisations and individuals to receive EPSRC funding, see the EPSRC Funding Guide:

<http://www.epsrc.ac.uk/funding/howtoapply/fundingguide/>

As this call is a targeted funding opportunity provided by EPSRC, higher education institutions, and some research council institutes and independent research organisations are eligible to apply. A list of eligible organisations to apply to EPSRC is provided at: <http://www.rcuk.ac.uk/funding/eligibilityforrcs/>

Call specific criteria: Applicants must include an Institutional letter of support from PVC-Research or equivalent for every participating university, which highlights how the research aligns with the university's strategy.

Institutions can only lead one application per challenge area; however, institutions can be involved in consortia led by other institutions.

How to apply

Submitting application

Before submitting a proposal electronically PIs are required to complete an **Intent to Submit** survey available on our website by the **26 March 2015**. Applicants who have not completed this form will be ineligible for the call. The PI name, Institutions involved and title of the intents to submit will be made publically available on the website shortly after the deadline.

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:

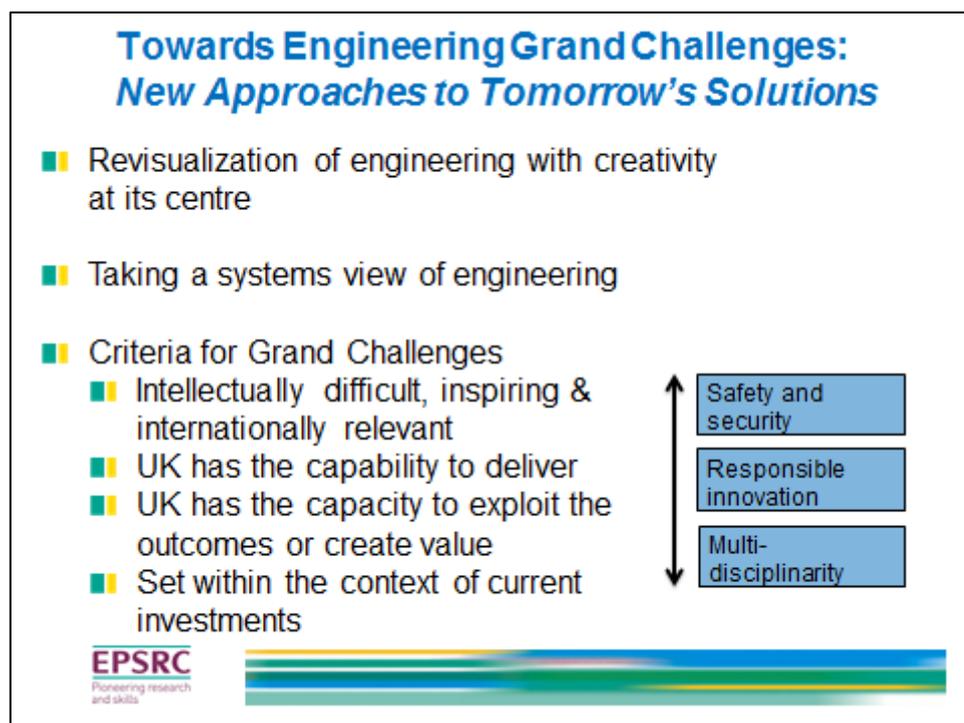
- Council 'EPSRC'
- Document type 'Standard Proposal'
- Scheme 'Standard'
- On the Project Details page you should select the 'Engineering Grand Challenges' call.

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 28 April 2015**.

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 (<http://www.epsrc.ac.uk/funding/howtoapply/routes/>) which should be consulted when preparing all proposals.

Guidance on writing application: Multidisciplinary Research Consortia

A framework for the Engineering Grand Challenges was scoped and refined through iteration at the engagement workshops, in discussion with partners and through advice from the Strategic Advisory Team. This framework is shown diagrammatically below:



It is at the applicants' discretion to decide how best they provide evidence against the above framework, within their case for support. The following questions may be useful in considering this:

- What are the most intellectually challenging aspects of the proposal?
- What are the most inspirational aspects of the proposal?
- What consideration has been given to the integration of responsible innovation? (see later guidance)
- How is the proposal positioned within the context of the UK and the international landscape, in terms of both research and potential impact?

In addition, evidence **must** be provided on how successful consortia will connect to on-going excellent research activities in the UK that is outside of the consortium. Activities to build international collaboration are also encouraged, using EPSRC standard mechanisms e.g. visiting researchers.

Applicants should consider the above framework and incorporate it into their submission which should include the following documentation:

1. A standard **JeS form**
2. An "**Engineering Grand Challenges Support Statement**" (up to 2 sides of A4). This should address the following points:
 - Grand Challenge area(s) being addressed;
 - High-level problem statement for the proposed research, expressed as a question, which addresses **both** vision and measurability e.g. how to put a man on the moon (vision) before 1970 (measurable)?
 - Provide evidence as to how the proposed work fits with the scope of Grand Challenge area(s) being addressed;
 - Identify explicit and tangible targets to be met after 12 months and 24 months. Include in this technical/methodological targets **and** targets for building collaborative effort across the research community; and,
 - Provide evidence of how the approach taken will extend capabilities for the benefit of the UK within an international context, drawing on expertise across faculties or departments.

This is **an essential part** of the assessment process. Please also ensure that relevant evidence provided in this form is integrated into the full case for support, where appropriate. This should be uploaded to JeS as a separate document using document type 'additional document'.

3. A **Case for Support** (up to 8 sides of A4)
The case for support must contain details on the following elements:
 - Track record of the applicants (maximum 2 pages)
 - Leadership
 - Background Information
 - Overall vision
 - Aims/Objectives of the grant
 - National Importance
 - Impact
 - Management Strategy

4. A diagrammatic **Workplan/Timeline** showing a timetable of planned activities associated with the grant. (1 page)
5. A **Pathways to Impact Statement** (up to 2 sides of A4) describing how the potential impact of the network or research grant in terms of societal and economic needs will be realised.

Within this, an engagement strategy must be included. This must cover plans on communicating research to a wider audience (e.g. how will this inspire future generations of engineers?) and the organisation of a community conference to be held within 12 months of the start of the grant and regularly thereafter. The impact strategy should be costed appropriately.

6. A **Justification of Resources** which should provide full justification for all resources requested. (up to 2 sides of A4).
7. **Institutional letter of support** from PVC-Research or equivalent for every participating university. These should be uploaded using document type 'letter of support'.

Guidance on writing application: Network Plus

Network Plus applicants must include **all documents** highlighted for consortia proposals. The management strategy should include clear mechanisms for funding short feasibility research studies relevant to the network.

Network Plus proposals can cover:

Investigator's salaries- Under full economic costing, the Principal Investigator (PI) can request funds to cover their salary costs for the time spent on setting up and managing the network. Requests can also be made, if appropriate, for Co-Investigators (Co-I) to assist with network management. Time spent by the PI and Co-Is on the co-ordination of the network should be reasonable and is not expected to form the majority of the cost of the proposal. The salary costs of network participants should not be included in the proposal and EPSRC would not expect these individuals to be Co-Investigators.

Travel and subsistence – Costs can be requested for travel and subsistence to enable members of the network to meet together for exchange of ideas and expertise. This may include visits by or to experts overseas.

Administrative support - Funding for administrative support can be requested to help in the co-ordination of the network. Costs should be reasonable and ideally only form a small part of the request for funding. Reasonable costs for monitoring and dissemination of the network outputs can also be included.

Organisation of Activities -Funding can be requested for costs involved in running activities such as networking events, expert working groups, debates, online discussion forums, lectures, seminars, short term people placements or exchanges, problem solving and team building workshops. Applicants are encouraged to think creatively about the range of activities that could support the delivery of the network goals.

Research - Research activity to support the research strategy developed within the network. EPSRC would expect some example projects at the application

stage, but the research challenges should evolve during the course of the network activities and should be collaborative in nature. This should be requested under 'Other Directly Incurred Costs' and is not expected to be the majority of the costs requested.

Guidance to all applicants

If the attachments are uploaded as Word documents, please be aware that once the application has been submitted to the Council/Funder, all the attachments will be converted and held as an Adobe Acrobat file (PDF). Also please note, that whilst we support a wide range, **we do not support all MS Word font types.** Therefore if an unsupported font type is used a different font type may be substituted which may result in changes to the layout of the document. For this reason we recommend that the documents are converted to PDF files before uploading.

Also, please note that on submission to council **all** non-PDF documents 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.

In addition, where non-standard fonts are present, and even though the converted PDF document may look unaffected in the Je-S System, when it is imported into the Research Councils Grants System some information may be removed. We therefore recommend that where a document contains any non-standard fonts (scientific notation, diagrams etc.), the document is converted to PDF prior to attaching it to the proposal

For advice on writing proposals see:

<http://www.epsrc.ac.uk/funding/howtoapply/preparing/>

User Engagement Strategy

Successful applicants will be required to develop and execute a strategy for engaging with potential users of the research funded in the project (resources for this activity can be requested as part of the Pathways to Impact statement and must be justified in the application). This strategy should be reviewed and updated regularly as part of the formal management of the grant.

The strategy should cover:

- How and when potential users have been / will be identified;
- What form the engagement will take;
- What steps will be taken to ensure that outputs of the research are made available to potential users, and
- Suitable metrics for determining the success of the strategy in delivering value to users.

Assessment

Assessment process

Proposals submitted to this call will be considered against the assessment criteria mentioned below by expert postal peer review followed by a prioritisation panel meeting in late July. The panel will identify networks to be funded at this stage. Consortia will also be ranked and the panel will advise which proposals should be invited for interview; which will take place in September.

The interview process will consist of a short presentation followed by a panel interview. **Further guidance will be given to applicants at this time. It is expected that the Principal Investigator will be available to attend the interview with up to two other members of their team.**

Assessment criteria

The assessment criteria for this call are:

- Research Quality
- Fit to Grand Challenge Area
- Leadership Qualities of the Team
- National Importance
- The Research Environment
- Impact
- Resources and Management

All these assessment criteria will be covered at postal peer review. In addition, consortia applications that reach the interview stage will also be assessed on:

- Novelty and creativity of the research programme – new approaches in engineering research;
- Capability of the consortium team to tackle the research challenges, engage with users and to deliver impact, including different levels of collaborator engagement. As well as ability to engage on-going excellent research in the UK outside of the consortium to maximise added value, and
- Demonstration of ability to be able to inspire future generations of engineers.

Guidance

Responsible innovation

Scientific research has the ability to not only produce understanding, knowledge and value, but also unintended impacts, questions, ethical dilemmas and, at times, unexpected transformations in social life. EPSRC recognises that it has a

duty of care to promote approaches to “responsible innovation” which will initiate on-going reflection about the potential ethical and societal implications of the research that EPSRC sponsors on behalf of the taxpayer and to encourage our research community to do likewise. As a research sponsor, our aim is to build capacity within our research community to discuss and consider social and ethical questions. Therefore EPSRC expects applicants to adhere to the Framework for Responsible Innovation (<http://www.epsrc.ac.uk/research/framework/>). In doing so you may wish to seek to consult and work with others outside of the EPS sphere e.g. social scientists, ethicists and public engagement experts.

Guidance for reviewers

Reviewers should complete the standard review form taking into consideration the assessment criteria.

Information about the EPSRC peer review process and guidance for reviewers can be found at: <http://www.epsrc.ac.uk/funding/assessmentprocess/review/>

Guidance for host organisations

An organisation can only lead one proposal per challenge area. Applicants must include an Institutional letter of support from PVC-Research or equivalent for every participating university, which highlights how the research aligns with the university’s strategy.

Additional grant conditions

In addition to standard terms and conditions for grants, successful applicants will be required to invite EPSRC representatives to events and to take part in management meetings.

A mid-term review of research consortia will take place 24 months of the start date to specifically assess progress towards solving the challenge(s) set.

Grants must start within 3 months after the interviews.

Key dates

Activity	Date
Compulsory Intent to Submit	26 March 2015
Closing date for submissions	28 April 2015
Prioritisation Panel	Late July 2015
Interview Panel	Week 7-11 September 2015
Funding Decision	Mid-September 2015
Expected Start Date	15 December 2015

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Change log

Name	Date	Version	Change
Roger Singleton Escofet	18/02/2015	1	N/A
Roger Singleton Escofet	04/03/2015	2	Clarified Institutional limit to lead only one application per challenge area. Added guidance regarding making Intents to submit publically available. Added expected start date.