Announcement of Opportunity

Networks of Sensors – Demonstration High Resolution Networks

Closing Date Outline Proposals: **4pm 25th March 2010**
Closing Date Full Proposals: **4pm 15th April 2010**

1. Background

The seven Science Themes[1] in NERC's Strategy (Next Generation Science for Planet Earth 2007-2012)[2] aim to deliver the science required to provide solutions to global environmental challenges. The Technologies Theme[3] aims to develop the tools and technologies needed for cutting-edge environmental science by working in partnership with others.

Distributed high density networks of sensors are identified in a number of the NERC strategy themes as offering a potential paradigm shift in the way that we observe and study the environment. The Technology Theme Action Plan[4] identifies sensors and sensor networks as an opportunity area for the future. Substantial environmental sensors research is already undertaken in the UK and internationally and is focussed primarily at low Technology Readiness Levels (TRL)[5] levels. This focus has meant that in practice few live sensor networks for environmental research actually exist; there has been a generic disconnection between basic development of devices in the lab and their pull through into a demonstration or operational environment. Those few networks that do exist have evolved primarily as a result of regulatory drivers, and not in response to research needs. This is despite the many research aspirations to widen monitoring and measurement science to higher spatial densities and scales, and to remote and inaccessible locations. The disconnection in pull through is not due to any fundamental flaw in underlying technologies or capabilities, but rather that an appropriate framework to support taking lab development into demonstration research-led observations has not been in place. Without addressing this issue the true scientific potential of high-resolution networks of sensors will remain untested.

The *Networks of Sensors – Demonstration High Resolution Networks Research Programme* aims to provide this framework and will contribute to the Technologies Science Theme challenge on "intelligent field sensors and networks of sensors".

2. Scope

The Network of Sensors Programme will comprise up to five collaborative research grant awards supporting demonstration environmental sensor networks. Proposals can be in any area relevant to the NERC science remit. Links to other NERC Research Programmes (e.g. Virtual Observatory[6], Urban Atmospheric Science[7]) are particularly encouraged.

Each award will not exceed £0.9 million (cost to NERC). Projects are expected to commence by 1 January 2011 (or within 3 months of the announced start date if sooner) and run for a period of

[1] http://www.nerc.ac.uk/research/themes/
[2] http://www.nerc.ac.uk/about/strategy/ngscience.asp
[3] http://www.nerc.ac.uk/research/themes/technologies/
[4] http://www.nerc.ac.uk/research/themes/tap/documents/tap-technologies.pdf
[5] http://esto.nasa.gov/files/TRL_definitions.pdf
[6] http://www.nerc.ac.uk/research/programmes/virtualobservatory/
[7] http://www.nerc.ac.uk/research/programmes/uas/

three years. Note that support for studentships cannot be requested through this Research Programme.

The Network of Sensors Research Programme will provide an opportunity for HEIs and NERC Research and Collaborative Centres to work closely with organisations in both the commercial and research sectors. While strongly encouraged, such partnerships are not mandatory for proposals to this programme.

The Network of Sensors Research Programme is not focussed on development of new sensor technologies, but proposals will need to develop new technological approaches to the deployment of sensors, some of which may be in remote and / or hostile environments. In this respect, the optional STFC and DSTL Partnership schemes offer the opportunity for inclusion of additional in-kind support funded by the Science & Technology Facilities Council (STFC[8]) and the Defence Science and Technology Laboratory (DSTL[9]). See Section 3.7 for further detail on how to access these resources.

Though the Programme is predicated on delivering environmental science, links to public sector and other stakeholders, including industry, will be facilitated by the TSB Sensors and Instrumentation Knowledge Transfer Networks (SI-KTN[10]). The SI-KTN will provide support to potential applicants in developing their proposals and advise them on ways to maximise the Knowledge Exchange (KE) potential of proposals post award, to maximise potential science and economic benefits.

3. Requirements

3.1 Scientific & Technical

Proposals should have the following characteristics:

- address relevant and clearly articulated environmental science questions relevant to the NERC Strategy, delivering new approaches to and understanding of environmental science observations;
- make substantial and clearly identified contributions to other NERC strategy themes, which when taken as a portfolio cover the full range of NERC science disciplines;
- make clear the benefits of the network in delivering NERC strategic priorities, and link where appropriate with other RP investments[11] (e.g. Virtual Observatory, Urban Atmospheric Science, Arctic and Macronutrient Cycles);
- take advantage of the new technologies arising that allow data to be collected from inexpensive, robust field-based sensors and instruments, which may also explore the potential use of existing infrastructures and technologies (e.g. mobile telephony; GPS);
- demonstrate the scientific opportunity of the approach using the latest developments in distributed computing and communications technology and scientific data repositories;
- achieve end-to-end integration — collection, calibration, transmission, databasing and assimilation — using mature or close-to-market sensors technology;
- be of sufficient size, scope and market opportunity to provide the stimulus for concurrent private sector investment in sensor device manufacture.

3.2 Implementation & Delivery

Each successful demonstration project team will be required to:

- commence by 1 January 2011 (or within 3 months of announced start date if sooner)
- procure, manage, maintain, and operate the infrastructure, in addition to negotiating agreements with site owners and managers, and

[8] http://www.scitech.ac.uk/
[9] http://www.dstl.gov.uk/
[10] http://www.sensorsktn.org
[11] http://www.nerc.ac.uk/research/programmes/opportunities.asp

- collaborate with the SI-KTN to promote networking between projects and future engagement opportunities

3.3 Knowledge Exchange and Impact Plan

Each successful demonstration project team will be required to (with advice and support from the SI-KTN):

- describe and deliver an appropriate and costed Impact Plan
- collaborate with the SI-KTN, post-award, to undertake programme-wide Knowledge Exchange activities; and, where appropriate, and
- engage with users to investigate potential marketing opportunities

NERC supports a number of Knowledge Exchange programmes, including CASE Studentships and Knowledge Transfer Partnerships (KTPs)[12]. Whilst not part of this call, applicants may consider these mechanisms as part of their Knowledge Exchange and Impact Plans.

3.4 Data Management

NERC believes that data generated from the research it funds is a valuable long-term, public-good resource. To ensure the data can be fully exploited in support of the activities that they were collected for, and to enable them to be available for effective, longer-term, post-programme exploitation, NERC's data policy[13] states that data must be managed effectively from the time of generation onwards. NERC grant-holders in academia are also required to offer to lodge with NERC a copy of the data resulting from the supported research when it is completed, together with documentation / metadata describing these data.

Questions applicants might wish to consider when developing their data management plans include:

- What data are planned for collection and which of these data are perceived as having long-term value?
- If existing data is required, who will supply these data and will there be a cost?
- How will the programme team manage data collected as part of the project during the life of the project?
- What specialist data and informatics skills will be required by the project and from where will these be obtained?
- Has the appropriate NERC Designated Data Centre been identified that will be in receipt of the final data when the project is completed?
- Are the costs associated with the above adequately covered in the data management plan?

3.5 Governance & Performance Management

In order for NERC to manage performance against its Strategic Objectives and Delivery Plan and report to the Department for Business, Innovation and Skills (BIS) and NERC Council, suppliers of strategic research are required to report regularly on the outputs and outcomes they have been commissioned to deliver. Principal Investigators (PIs) will therefore be required to submit the following.

- Periodic progress reports (frequency and format to be agreed) to the programme co-ordinators. These should also capture any key achievements or highlights and any additional required performance management information specified by NERC.
- Output and Performance Measures (OPMs). Currently collected annually, through the NERC Research Outputs Database (ROD).
- A Final Report.

[12] List of NERC funded schemes is at http://www.nerc.ac.uk/using/schemes/0all.asp and more details on KTPs at: http://www.ktponline.org.uk/

[13] http://www.nerc.ac.uk/research/sites/data/policy.asp

3.6 Eligibility & Funding

A prior call for Expressions of Interest[14] identified a broad range of potential applications from the environmental science community, and assisted the NERC Technologies theme leader in making the case for investment in the Network of Sensors programme. It is not a pre-requisite for submission to this announcement of opportunity, to have previously submitted an Expression of Interest.

This call is open to individuals and organisations eligible for NERC research grant funding. Please refer to eligibility conditions on the NERC website[15] and the Research Grants Handbook[16] for details. Potential applicants should contact NERC well in advance of the submission deadline if they have any doubts concerning their eligibility to apply for a research grant from NERC. Although private sector companies and some public sector organisations are not eligible for direct NERC research funding, their involvement as key providers of technology and expertise is strongly encouraged where appropriate. This may be delivered as a sub-contract to the project or via the provision of in-kind support.

Applicants may submit no more than one proposal as the lead Principal or a Co-Investigator, and one further proposal as a Co-Investigator at a lead Research Organisation or non lead Principal Investigator at a component Research Organisation in a joint application.

Applicants may request up to £0.9M over three years for a standard research grant award. This limit applies to the **total cost to NERC** of the project (i.e. 80% FEC). The total cost should include the Impact Plan, data management and any major facility costs, but exclude the cost of high performance computing.

Standard NERC research grant terms and conditions will apply to the award, but in this case the grant must be started within three months of the announced start date.

In addition to NERC funding, support may be obtained under this call through collaboration with STFC and/or DSTL under the terms of the Technology Partnership schemes described in Sections 3.7.1 and 3.7.2. It is the responsibility of applicants to initiate contact directly with STFC and/or DSTL to discuss potential agreements on a joint application. In all other respects partnership arrangements with STFC and/or DSTL should be regarded as any other project partner. This should not be seen as “bolt on” to an existing project and any STFC and/or DSTL contribution should therefore be fully integrated into any project proposal.

3.7 Technology Partnerships

In a new initiative, STFC and DSTL have agreed to make available additional in-kind contributions to projects funded under this call through support for relevant STFC and DSTL co-applicants. However, there is no requirement on applicants to this call to enter into a Technology Partnership agreement.

3.7.1 STFC-NERC Technology Partnership Scheme

As part of the Networks of Sensors Programme, NERC and the Science & Technology Facilities Council (STFC) are running a pilot programme to enable academic researchers to access technology, facilities and expertise within the STFC’s own laboratories.

The purpose of this scheme is to stimulate collaboration between the NERC community and the STFC laboratories through a small number of collaborative projects of up to three years duration by providing additional support to projects submitted under this call.

[14] http://www.nerc.ac.uk/research/themes/technologies/events/sensor-networks.asp
[15] http://www.nerc.ac.uk/funding/available/researchgrants/eligibility.asp
[16] http://www.nerc.ac.uk/funding/application/researchgrants/grantshandbook.doc

Projects submitted to this optional Partnership Scheme should be led by researchers eligible to apply for NERC grant funding with a track record in environmental science or technology, and *must* include an STFC-employed co-investigator.

The STFC contribution is in addition to the maximum support that can be sought directly from the NERC. The amount of additional support provided to any individual project will depend on the level of demand for the scheme from the community and the agreement reached between the applicants and the STFC.

In the first instance applicants should contact STFC directly (contact details below) in order to establish these partnerships.

Additional support from the STFC may not be appropriate for all projects, and applicants will need to explain clearly the added value of the STFC contribution. All applications will be assessed on their individual merits following NERC's normal assessment processes and criteria.

Potential STFC Involvement

The STFC operates four UK laboratory sites; these are Chilbolton Facility for Atmospheric and Radio Research, Daresbury Laboratory, Rutherford Appleton Laboratory and the UK Astronomy Technology Centre. At all of these sites are expert staff and facilities that may be made available to collaborative projects through direct funding from the STFC.

Examples of how the STFC could contribute to the Network of Sensors programme include:

- provision and integration of existing STFC sensor technologies
- fabrication; including precision machining, micro and nano technology facilities
- electronic systems; front-end amplification and processing, data acquisition and digitisation
- optical and millimetre wave system design and fabrication
- software for user interface, control and acquisition
- computer modelling of sensor materials and systems
- data handling, assimilation and archive systems
- exploitation and deployment of Sensor Web standards
- adaptation and integration of commercial systems
- provision of specialist clean rooms and electrostatic discharge protected areas, and
- sensor calibration, validation and provision of environmental testing facilities.

Partnerships

One of the objectives of this joint programme is to stimulate collaboration between the environmental science community and the STFC. This pilot scheme will be used to assess the level of demand for and effectiveness of NERC-STFC joint programmes. While it is expected that projects will be led by Higher Education Institutes (HEIs) or NERC Research and Collaborative Centres, collaboration with private sector companies and/or public sector organisations are encouraged where appropriate and these form part of the project team (see Section 3.6. for rules on eligibility and funding).

STFC financial contribution

The total amount of funding available from STFC for the programme will be up to £900k spread over three years. Depending on demand, it is anticipated that the STFC contribution to any individual project will be around £180k. The STFC contribution should include:

- all direct and indirect STFC staff costs (at 100% full economic cost (FEC)
- travel and subsistence costs incurred by STFC staff, and
- all STFC facility running costs associated with the project.

The cost of equipment and materials that will form part of the project deliverables should be included in the costs requested from NERC, as should the travel and subsistence costs of all non-STFC employees who visit STFC laboratory sites.

Application Procedure

Submission of applications will be to the NERC via Je-S and will utilize the standard NERC grants pro forma (see Section 4 below). A breakdown of the contribution from the STFC should be attached to the Je-S document using a separate pro forma available from the STFC co-ordinator. Contributions from STFC should also be summarized in the project partner section of the Je-S pro forma. In addition, a letter of support from the appropriate STFC Department Head countersigned by the relevant Resource Officer is required to confirm the availability of staff, facilities and other resources.

Review

All projects will be reviewed by the same independent panel appointed by the NERC. The primary criteria for assessment of projects will be scientific excellence and fit to programme requirements (see Section 5). As fully integrated components of any proposal STFC will be treated as any other partner on a project application and will be bound by the peer review process.

Contact

Administrative and technical enquiries regarding STFC involvement should be directed in the first instance to the STFC co-ordinator, Ms Ruth Jeans (ruth.jeans@stfc.ac.uk). The main STFC website is www.stfc.ac.uk.

3.7.2 DSTL-NERC Technology Partnership Scheme

As part of the Networks of Sensors Programme, the Defence Science & Technology Laboratory (DSTL), which is part of the MOD, is supporting this call in order to enable DSTL to build truly enduring relationships that add considerable value to defence. Closer engagement with academia is required to ensure the best use of scientific and engineering expertise on Government business.

In the first instance applicants should contact DSTL directly (contact details below) in order to establish these partnerships.

Additional support from the DSTL may not be appropriate for all projects, and applicants will need to explain clearly the added value of the DSTL contribution. All applications will be assessed on their individual merits following NERC's normal assessment processes and criteria.

Potential DSTL Involvement

DSTL researches and evaluates a range of sensors for air, land and sea military platforms. It specialises in integrated threat evaluation to support military tactics by studying the electronic signatures of hostile systems and platforms and providing an integrated countermeasure capability to survive engagement and protect lives.

DSTL provides the MoD and Other Government Department's with a focus for expert advice in individual and multiple sensor systems at sea, on land, in the sky and space. It evaluates and exploits sensor technology and expertise to develop sub-system concepts through advanced sensor integration, processing and fusion. In doing so an advantage is gained in protecting UK interests.

The nature of the work undertaken in the Sensors and Countermeasures Department means its people come from a wide range of scientific disciplines and technical backgrounds.

DSTL financial contribution

The total amount of funding available from DSTL programme is limited to contribution in kind through the provision of sensor network expertise. Where the proposal aligns with the existing DSTL programmes, opportunities for use of facilities and exploitation of joint field trials can be exploited.

Application Procedure

Submission of applications will be to the NERC and will utilize the standard NERC grants pro forma (see Section 4 below). A breakdown of the contribution from the DSTL should be included as an attachment to these documents. In addition, a letter of support from the appropriate DSTL Department Head is required to confirm the availability of staff, facilities and other resources.

Review

All projects will be reviewed by the same independent panel appointed by the NERC. The primary criteria for assessment of projects will be scientific excellence and fit to programme requirements (see Section 5). As fully integrated components of any proposal DSTL will be treated as any other partner on a project application and will be bound by the peer review process.

Contact

Administrative and technical enquiries regarding DSTL involvement should be directed in the first instance to the DSTL co-ordinator, dstlsensors@dstl.gov.uk. The main DSTL website is www.dstl.gov.uk.

4.0 Application Process

Outline Proposals

All applicants must also submit a brief **Outline Proposal** no later than **25th March 2010**. This should be a maximum of 1 side of A4 in single-spaced typescript of minimum font size 11 point, with margins of at least 2cm. This should include:

- the names of the Principal Investigator, Co-Investigators and Project Partners
- a description of the project, and
- recommendations for up to six scientific and/or technological experts able to review the application including potential international assessors.

Please see below for a template of an outline proposal:

Outline Proposal Template

The purpose of the Outline Proposal is to assist NERC in identifying potential panel members in advance of receipt of full proposals, in order to ensure the quality of proposal assessment and to reduce the length of the assessment process. The Outline Proposal will not be assessed for Science and Technological Excellence, and applicants will not be penalized for alterations to their proposed plan of work. No feedback will be given on the Outline Proposal.

Outline Proposals should be emailed to Rachel Leader at rul@nerc.ac.uk, no later than **4.00pm on 25th March 2010.**
Please note any projects submitted to the call for which NERC did not receive an Outline Proposal by the 25th March will not be reviewed.

The closing date for submission of full proposals is **4pm on Thursday 15th April 2010**. Proposals should be submitted via the Je-S system under scheme name '**Directed'** and call name **'Network of Sensors.**

To use the Je-S system, the applicant's Research Organisation must be registered as a Je-S user. Full details are available on the Je-S website. Further information can also be obtained by contacting the Je-S Helpdesk by email at JeSHelp@rcuk.ac.uk or by telephone on 01793 44 4164. Applicants must ensure that their application is received by NERC by 4pm on the closing date. Applicants should leave enough time for their application to pass through their organisation's Je-S submission route before this date. Any application that is incomplete, does not meet NERC's eligibility criteria or is received after the closing date will be returned to the applicant and will not be considered.

In addition to the standard Je-S proforma, applicants will be expected to provide a Case for Support and other attachments detailing the work to be undertaken. All attachments submitted through the JeS system must be completed in single-spaced typescript of minimum font size 11 point, Arial font, with margins of at least 2cm.

The following documents are required.

- CV for each PI and Co-I in the research team not exceeding 2 sides of A4
- Description of the proposed work (Case for Support), not exceeding 8 sides of A4 (including all necessary tables, references and figures)
- Project Management Plan, not exceeding 2 sides of A4, detailing project and data management, the costs of which should be included in the total project cash limit of £0.9 million
- Impact Plan not exceeding 2 sides of A4. All research proposals submitted to NERC should be accompanied by an impact plan that will detail those who may benefit from, or make use of, the research; how they might benefit and/or make use of the research; and methods for disseminating data, knowledge and skills in the most effective and appropriate manner. More details at: http://www.nerc.ac.uk/funding/application/impactplans.asp. Costs for the Impact Plan should be included in the research grant and are part of the £0.9 million cash limit.
- Justification of Resources up to 2 sides of A4 submitted as a separate attachment in the Je-S system by each organisation. It should include justification for all Directly Incurred Costs, Investigator effort, use of pool staff resources and any access to shared facilities and equipment being sought. No justification for Directly Allocated Estates and Indirect Costs is required. It should be noted that if resources are not fully justified, they will be subject to reduction, and
- Letters of support from any named Project Partners (up to 2 sides A4 each).

If you are submitting under one of the optional Partnership schemes, please **also** provide the following information:

STFC:

- In addition to the 8 page description of the proposed work, a separate pro forma available from the STFC co-ordinator should be submitted as an attachment and details also summarized in the project partner section of the Je-S pro forma.
- A letter of support from the appropriate STFC Department Head countersigned by the relevant Resource Officer is required to confirm the availability of staff, facilities and other resources.

DSTL:

- In addition to the 8 page description of the proposed work, a separate breakdown of the DSTL contribution should be submitted as an attachment and details also summarized in the project partner section of the Je-S pro forma.
- A letter of support from the appropriate DSTL Department Head is required to confirm the availability of staff, facilities and other resources.

For further details and instructions on the information that should be submitted by lead and non-lead organisations in joint applications, please refer to the NERC Research Grants Handbook[17] and the guidelines for standard grant applications.

5. Assessment Process

Research grant proposals will be assessed against the following criteria:

- Scientific Excellence (primary),
- Fit to Programme Requirements (primary),
- Risk-Reward (secondary),
- Cost Effectiveness (secondary),
- Quality of Impact Plan (secondary).

To meet NERC's strategic objectives for the Network of Sensors programme, proposals will be subject to rigorous international expert peer review. Applicants may have an opportunity to respond to the comments received. Final assessment will be by a Moderating Panel, comprised of independent experts and at least one NERC Peer Review College member, who will assess each proposal for scientific and technological excellence and fit to programme requirements, including relevance to other NERC Strategy Themes and Research Programmes. Feedback to applicants will be available on request. Full details[18] of NERC assessment criteria are available on the NERC website.

Timetable

Community meeting and AO published together: 23rd February 2010
Outline Proposal Closing date: 25th March 2010
Full Proposal Closing date: 15th April 2010
Estimated time of decisions to applicants: July-September 2010
Projects start: Within 3 months of announced start date or by 1st January 2011

Contact information

Main contact:

Rachel Leader
Tel: 01793 411595
Email: rul@nerc.ac.uk

Alternative contact:
Blanche Coleman
Tel: 01793 442635
Email: blle@nerc.ac.uk

For queries about Je-S registration or technical submission of proposals, please contact the Je-S Helpdesk by email at JeSHelp@rcuk.ac.uk or by telephone on 01793 44 4164.

[17] http://www.nerc.ac.uk/funding/application/researchgrants/grantshandbook.pdf
[18] http://www.nerc.ac.uk/funding/assessment/assesscriteria.asp