

Call for Expressions of Interest
to Participate in the 2020-2026 Core Research Programme of the
UK Research Centre in Non-Destructive Evaluation

Closing date: 17:00 on 17 April 2019

SUMMARY

Expressions of Interest (EOIs) are invited from research groups wishing to participate in the next phase of the UK Research Centre in Non-Destructive Evaluation (RCNDE). Selected research groups will co-develop the detailed collaborative workplans for the final EPSRC grant application.

BACKGROUND

RCNDE is an industry-academic collaboration for NDE research founded in 2003, co-funded by the Engineering and Physical Sciences Research Council (EPSRC) and its industrial membership. The industrial membership has grown from five members at the outset to fourteen members today, covering the aerospace, power generation, nuclear, oil & gas, defence, and manufacturing sectors. These industrial members are collectively represented by a not-for-profit company, the NDE Research Association (NDEvR), which manages the affairs of RCNDE. In 2010, NDEvR formally agreed a strategic partnership with EPSRC with the purpose of furthering longer-term NDE research and refreshing and building the UK NDE research and skills base. This reflects the recognition that NDE is an essential enabling technology to help with company and national goals for industrial growth.

NDEvR is preparing a full proposal for submission to EPSRC for funding the next RCNDE activities from April 2020 to April 2026. NDEvR is seeking to form a consortium of academic research groups in advance of the preparation of the full proposal for a new RCNDE programme. It has been agreed that Professor Paul Wilcox (University of Bristol) should be the Principal Investigator for the proposal. Academic members of the future RCNDE are expected to contribute to broader activities surrounding RCNDE, including attendance at board meetings and the annual review, the internal peer review of ideas for future proposals, technology readiness & other workshops, horizon scanning and outreach. Academic members also benefit from RCNDE networking opportunities to develop additional collaborations directly with individual NDEvR industrial members on research activities of specific interest.

THE RCNDE RESEARCH PROGRAMME

Building on the NDEvR Vision document¹ drawn up by the industrial members, a workshop involving the current RCNDE academic and industrial members was held in January 2019. The workshop identified the priority research topics and enabled the creation of the thematic structure described in Annex A. This structure will form the basis of the RCNDE 'Core Research' programme for 2020-26. In parallel to the Core Research programme, a smaller 'Beyond the Vision' programme of investigator-led projects will be created. These highly innovative projects will explore radical approaches to addressing future NDE challenges likely to be beyond those explicitly identified in the NDEvR Vision or where it is too early to identify potential applications.

The expected scale of RCNDE 2020-26 is for around 85 FTE-years of Post-Doctoral Research Assistant effort over 6 years. Hence it is expected that at any one time there will be 2 researchers working in each of the 6 main themes in the Core Research programme plus 2 researchers working on Beyond the Vision projects.

¹P. Thayer, "Enabling the Fourth Industrial Revolution (4IR) and the role of NDE and monitoring", *Insight*, 59(9), 2017.

SUBMITTING AN EXPRESSION OF INTEREST

EOIs should be submitted using the pro-forma in Annex B and be no more than 3 pages in length. As well as outlining the relevant track record of the research group and the proposed research, the EOI should clearly state either 1) the theme to which the research is aligned, and the specific topic(s) addressed, or 2) the justification for the research to be considered as Beyond the Vision, including the most likely beneficiary themes. At this stage, separate EOIs for each potential project are requested (thus the same research group may submit multiple EOIs). Applicants may use the EOIs to suggest possible collaborative partners. It is expected that groups offering relevant expertise outside a current NDE focus will collaborate with NDE-focused groups to ensure full consideration of NDE requirements and understanding of the NDE industry.

Expressions of interest should be submitted by email to Peter Thayer (p.thayer@ndevr.org.uk)

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ASSESSMENT PROCESS

First Stage (EOI Assessment)

The development of the RCNDE Core and Beyond the Vision Programmes will be undertaken by a panel comprising:

- the RCNDE Director, Prof. Robert Smith at the University of Bristol;
- the Principal Investigator, Prof. Paul Wilcox at the University of Bristol;
- the NDEvR Board of Directors representing the industrial membership of RCNDE.

The panel will select a subset of EOIs for peer review by the RCNDE International Advisory Group (comprising 4 recognised NDE experts from outside the UK) and other industrial or academic experts as required. The peer reviews and votes from NDEvR industrial members will then be used to inform the second stage of the process.

The assessment criteria for EOIs are:

- quality and novelty of proposed research;
- alignment of the proposed research to themes and topics of the Core Research Programme in the diagram in Annex A, or suitability for the Beyond the Vision programme;
- balance of the programme in terms of content, risk and academic career stage (allowing access for early-stage through to established researchers);
- academic research track record;
- track record of collaborative research and engagement with relevant partners (e.g. industry, the NDE community, catapult centres).

Second Stage (Collaborative Proposal Development)

Applicants who reach this stage will be asked to co-develop collaborative workplans within each theme based on the work proposed in their EOIs. The proposed workplans will then be considered for inclusion in the final RCNDE proposal for funding from 2020-26.

During the 6-year RCNDE core research programme, the ongoing allocation of resources to individual groups, including any awards of additional resources in the latter years, will be contingent on satisfactory progress. This will be assessed at stage gates that must be defined in the workplan.

Unsuccessful applicants who nonetheless offered relevant expertise will be invited to join a new RCNDE university network and will be kept informed of future funding opportunities.

RCNDE PARTICIPANT COMMITMENT

The success of RCNDE is built around a collaborative and collegiate community of academia and industry. Essential to maintaining this community is the pro-activity of all participants in RCNDE activities. Therefore, research groups who participate in the RCNDE Core Programme must commit to activities, including:

- attendance at 3 board meetings/year;
- presentation of work at annual review;
- timely production of annual reports;
- engagement with industry, including hosting 1-day visits from the RCNDE Industrial Working Group typically once every 2 years;
- peer-reviewing of internal proposals;
- participation (e.g. providing desktop demonstrations) in annual Technology Transfer day when appropriate;
- interaction with RCNDE International Advisory Group;
- support for postgraduate students in the associated Centre for Doctoral Training in Future NDE.

Note: applicants must accept the RCNDE collaboration agreement with NDEvR, which includes a separate confidentiality agreement, and which is common to all academic and industrial members of RCNDE. This is available on request from Peter Thayer (p.thayer@ndevr.org.uk).

CONTACTS

For enquiries related to this call please contact:

- Peter Thayer, peter.thayer@ndevr.org.uk, 0141 942 5398
- Robert Smith, Robert.smith@bristol.ac.uk, 0 117 33 15934
- Paul Wilcox, p.wilcox@bristol.ac.uk, 0117 33 15906.

A list of example applications provided by the RCNDE industrial members to provide additional context is currently in preparation. To request a copy of this document when it is available, please contact Peter Thayer.

Annex A – RCNDE Core Research Programme Structure 2020-26

The diagram below shows the 2020-2026 Core Research Programme structure, which comprises 6 thematic areas. Within each theme are priority research topics identified by the RCNDE industrial membership. The 3 vertical themes are associated with technique development for different applications (*Inspection at manufacture, In-service Inspection, Permanent monitoring*), and 3 horizontal ones (*Data science, Automation, Modelling and Reliability*) are associated with cross-cutting activities that impact across all applications. The grey bars indicate the mapping of the themes onto the EPSRC Prosperity Outcomes².

PRODUCTIVE NATION		RESILIENT NATION	
Inspection at manufacture <ul style="list-style-type: none"> • Online tomographic inspection • Online and offline measurement of material properties to aid design and development of new products • Online and offline inspection of additively-manufactured, near-net-shape and 3D-printed components with complex geometries • Online inspection methods that do not impact on production rate and match offline inspection performance 		In-service inspection <ul style="list-style-type: none"> • Improved defect characterisation and sizing • Measurement and use of material properties to improve inspection performance • Inspection of new (e.g. metamaterials) or difficult (anisotropic, heterogeneous) materials • Inspection in complex geometries, multiple layers • Ultrasonic methods to replace radiographic inspections • Rapid, long-range, non-contact, wide-area inspection 	
		Permanent monitoring <ul style="list-style-type: none"> • Wide-area monitoring for targeting inspection • Hot-spot and defect growth monitoring • Localised monitoring in inaccessible areas • Connected monitoring networks for plant at 10-100km length scales • Material degradation monitoring in harsh environments • Self-calibrating sensors and systems for monitoring 	
CONNECTED NATION	Data science <ul style="list-style-type: none"> • Common, open data formats, data reduction methods, data management • Integration of inspection, monitoring and other operating data into digital twin • Integration of inspection models and integrity models in digital twin • Automated data processing, artificial intelligence and assisted decision making • Use of digital twins for plant operation optimisation and cradle-to-grave integrity evaluation 		
	Automation <ul style="list-style-type: none"> • Automated deployment tools to replace manual inspection • Automated deployment tools for harsh environments and/or limited access • High-accuracy, automated inspection of large, complex-shaped components • Universal automated deployment tools 		
	Modelling and reliability <ul style="list-style-type: none"> • Improved and more realistic models of inspection and methods of experimental validation • Methods for determining inspection performance (e.g. probability of detection, probability of false alarm) using physical models • Methods for assessing and quantifying human factors • Methods of using models to optimise inspection 		

It is recommended that research into technique development (i.e. in the vertical applications themes) should consider how the technique will integrate with the cross-cutting themes, for example:

- How will inspection data feed into future digital twins?
- How can the deployment of the technique (if not permanent monitoring) be automated?
- How will performance and reliability be quantitatively measured?

For a list of example industrial applications, please contact Peter Thayer (peter.thayer@ndevr.org.uk).

² EPSRC Prosperity Outcomes, <https://epsrc.ukri.org/about/plans/deliveryplan/prosperityoutcomes/>

Annex B – Expression of Interest Application Form

It is recommended to use this document as a template for the EOI by deleting the preceding pages. Please also replace the heading above (“Annex B – Expression of Interest Application Form”) with a short descriptive title of the proposed activity. If creating a new document, please use at least 11-point Calibri or Arial font and 2 cm margins. The total length of the EOI should not exceed 3 pages.

APPLICANT DETAILS AND TRACK RECORD (1 PAGE)

Academic lead(s), research group and institution

Provide the full name and position of the academic(s) who will lead the research, the name of the research group, the organisational unit (e.g. department, faculty) and the institution.

Applicants’ track record

The track record should cover:

- the personal track record of the academic lead(s);
- the track record of the academic lead(s) and research group in the area of the proposed research and any related disciplines;
- track record of collaborative research and engagement with relevant partners (e.g. industry, the NDE community, catapult centres).

DETAILS OF PROPOSED RESEARCH (2 PAGES)

Thematic fit

State either 1) the theme in the Core Research Programme to which the research is aligned, and the specific topic(s) addressed, or 2) the justification for the research to be considered for inclusion in the Beyond the Vision programme, including the most likely beneficiary themes.

Objectives

State the specific objectives of the proposed research.

Methodology

Describe the approach, explaining why it has been chosen and why it is novel. Outline the content of the major research strands.

Expected annual outcomes

Progress on RCNDE Core Projects is reported annually. Please indicate the expected outcomes at the end of each year of the proposed research.

Indicative resources requested

A detailed costing is not required at this stage. Instead, indicate the total number of Research Assistant (RA) years’ effort requested to undertake the research and the proposed duration. Consumables, travel and subsistence, and technical support costs will be allocated *pro rata* per RA-year. In general, it is expected that the research will be performed in well-equipped laboratories and no further resources for major equipment will be required. If this is not the case, estimate the cost of equipment or facilities that are required.

Collaboration (optional)

If the proposed work is expected to be in collaboration with another research group, please state the group and justify the collaboration. All groups should submit separate EOIs making their individual contributions and expertise clear.