Department of Energy & Climate Change

Nuclear R&D High Temperature Materials Testing Suite

Call For Proposals

December 2014

URN **14D/454**

Any enquiries regarding this publication should be sent to us at innovation@decc,gsi.gov.uk;

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1. Introduction

The Department of Energy and Climate Change (DECC) is responsible for all aspects of UK energy policy, and for tackling global climate change on behalf of the UK.

UK Government is working together with industry and academia to implement the Nuclear Industrial Strategy (NIS)[1]. The Strategy sets out the Government's clear expectation that nuclear energy will play a significant role in the UK energy mix in the future, recognising that investment in R&D infrastructure is necessary in a number of areas to provide state-of-the-art facilities that will underpin our skills and knowledge base. The Nuclear Innovation and Research Advisory Board (NIRAB) has provided advice to Government on priority R&D programmes that need to be put in place in order to meet the high level objectives set out in the NIS and in order to deliver an integrated, overarching Nuclear Innovation Programme for the UK. The first stage of this programme is to develop an integrated network of facilities and novel laboratory conditions in which further research into accident tolerant fuel, materials testing and advanced nuclear fuel recycling and waste management can be carried out.

Effective design and manufacture of advanced reactor systems requires the development of components that will perform reliably at high temperatures and in high radiation fields throughout the life of a reactor. In order for the UK to establish itself on a global footing and actively participate in international programmes addressing advanced reactor systems, a generic reactor technology capability needs to be established. Research programmes to address this requirement would need to consider materials/manufacturing; reactor coolant chemistry; thermal hydraulic flow; and importantly, the interaction between all three in future reactor systems.

Existing UK infrastructure supports materials performance testing related to the safe operation of the current UK fleet, but, for future reactor systems which could include SMRs and Gen IV systems, there is both a capacity and capability issue, particularly with respect to component design and testing/analysis in high temperature reactor environments.

An Advanced Reactors Research Programme has been proposed by NIRAB which aims to address this shortfall by building a network of open access facilities with the infrastructure needed to deliver the capability for the UK to gain IP, develop new understanding and generate data to underpin the design and simulation of advanced reactor systems.

The programme has the following medium term (within 10 years) objectives:

- For the UK to be a key partner in the development and demonstration of an advanced reactor system;
- For the UK to be a supplier of selected significant reactor components.

To underpin delivery of this programme DECC is looking to support the development of a facility to test primary and secondary circuit structural component and weld materials at temperatures up to 1000ºC in a range of environments representative of VHTRs, HTRs and where possible SFRs under relevant loading conditions (cyclic and static) with the capability to extract data on stress, strain, crack initiation and growth, to inform and validate design and predictive models.

[1] https://www.gov.uk/government/publications/nuclear-industrial-strategy-the-uks-nuclear-future

2. Required outcomes of competition

Expected outputs of this work include:

1. Established high temperature materials testing suite which meets the specification requirements by March 2016;
2. Launch event for stakeholders;
3. Final publishable report detailing:
    a. Fully detailed specification of the facility;
    b. Exploitation plan detailing how the facility will be operated and used and made available to stakeholders external to the contractor, including a cost operating model.

3. Capability requirements

This grant will support the establishment of a High Temperature Materials Testing Suite that will enable the UK to carry out world-leading research into advanced reactor component material performance typical of VHTR, HTR and SFR reactor environments. The facility should be able to evaluate material performance to international testing standards (e.g. BS, European and ASTM). Testing capability should include as a minimum:

- Tension
- Fracture toughness
- Creep
- Creep-fatigue
- Crack initiation and growth

The material properties need to be tested across a range of temperatures up to 1000°C, with the ability to assess environmental factors at pressures and in environments relevant to the core, primary and secondary cooling circuits of advanced reactors that will provide sufficient material characterisation.

The facility must be sized to accept standard size material coupons and not for complete reactor components.

Measurement and Recording

During testing it must be possible to make extensometer and crack growth measurements while the test sample is at temperature, under static and cyclic loads in relevant test environments.

A data logging facility must be provided that can record the temperature, pressure and mechanical measurements during testing. Facilities must be provided to enable data logging to

be carried out at sampling rates appropriate to environmental transients and loading frequencies.

Control of the environment conditions within the laboratory should be considered to ensure quality assurance and repeatability of long-term tests. Novel approaches for enhancing the mechanistic understanding of material performance should be considered, e.g. the use of digital image correlation for surface strain mapping.

4. Terms of competition

DECC is considering offering a grant of up to £2m to a suitable organisation to establish a High Temperature Materials Testing Suite that will enable the UK to carry out world-leading research into advanced reactor component material performance typical of VHTR, HTR and SFR reactor environments.

The funding covers equipment and necessary set-up costs, including commissioning trials. There are no specific research requirements required to be completed as part of this tender. This tender is to provide a research facility that can be utilised by a range of research projects as part of a strategic UK R&D programme.

It is important that any grant funding complies with EU state aid rules. These rules apply where applicants are operating as an undertaking by providing goods or services to a market. If the grant constitutes a state aid, the grant can only be awarded if the grant falls within one of the narrow exemptions permitted under EU state aid rules and we propose to award such a grant as aid for industrial research under 25 (aid for research and development projects) of the EU General Block Exemption ("GBER")[2].

Therefore before any application can be accepted or any offer made, the applicant must satisfy DECC as to either one of the following:

a) The applicant is not an undertaking

The position of the European Commission is set out in section 2.1 (Research and knowledge dissemination organisations and research infrastructures as recipients of State aid) of the Commission's RD&I Framework[3], which can be found here.

Accordingly, if the grant is awarded on a non-aid basis you must satisfy DECC that:

i. the funding is being used for a *non-economic activity* in accordance with paragraph 19 of that section; and

[2] Commission Regulation (EU) No. 651/2014 of 17 June 2014 declaring certain categories of aid compatible with the internal market in application of Articles 107 and 108 of the Treaty (OJ L 187, 26.06.14, p.1).

[3] Framework for State aid for research and development and innovation (OJ C 198, 27.06.14. pg. 1).

ii. either the applicant does not pursue any other activities being economic activities or that if the applicant does pursue economic activities that the non-economic activities funded by the grant will not cross-subsidise those economic activities.

b) The applicant meets the requirements of GBER

If the applicant considers themselves an undertaking DECC will award a grant under GBER. In order to be awarded a grant, the applicant must:

i. Specify the category of research project for which the grant is sought (i.e. *fundamental research*, *industrial research*, *experimental development* or a *feasibility study*; these terms are defined in Article 2 of GBER);

ii. specify the costs that the grant will be used to fund, and satisfy DECC that these fall within the categories of eligible cost under Article 25.3 or Article 25.4;

iii. satisfy DECC that the grant does not exceed the aid intensity limits (i.e. the proportion of the eligible costs funded by state aid) under Articles 24.5 to 24.7; please note that these limits will include any other public funding awarded;

iv. satisfy DECC that the applicant is eligible for an award under the EU Block Exemption; in particular, the grant cannot be awarded if the applicant is subject to an outstanding recovery order following a previous Commission decision declaring a state aid illegal or if the applicant is an undertaking in difficulty (see Article 1).

For state aid and other reasons, the applicant must **declare any other public funding** (i.e. funding provided by or on behalf of any other UK public authority or European institution) that they have been awarded (or are applying for) in relation to the project or relevant costs.

Please note that failure to comply with the requirements of EU law relating to state aid may mean that the grant will be withdrawn or (if paid) be repayable (with interest).

The successful applicant will be expected to carry out a requirements capture exercise with relevant stakeholders, including the NIRAB community to ensure that the facility will support the objectives of the Nuclear Industrial Strategy.

The facility will be incorporated into the national infrastructure for nuclear R&D and must be ‘open access’, enabling and encouraging researchers from outside of the host organisation to conduct research as appropriate. The successful vendor will be expected to engage fully with potential end users and operators of other facilities which, collectively, form a national network, including attendance at relevant National Nuclear User Facility (NNUF) meetings and NIRAB sub-groups.

Applicants should be in a position to complete the delivery of all aspects of any grant by the end of March 2016.

Funding is only available for capital items, and not research and development costs.

5. Format and Deadline

Reponses should be made using the template at Annex A, and including the declarations at Annex B by midday on 30/01/2015. Please use Arial 11 font.

Responses should be submitted to the following email address with the subject heading 'Nuclear Research and Development: High Temperature Materials Testing Suite competition':

innovation@decc.gsi.gov.uk

6. Evaluation criteria

DECC will evaluate eligible bids in accordance with the evaluation criteria set out below. Please note that DECC will treat as ineligible, and exclude, any bids which do not comply with:

a) the requirements set out in this Call for Proposals;

b) the requirements of EU law relating to state aid (see above).

DECC may also treat as ineligible, and exclude, any bid on the grounds in regulation 23 of the Public Contracts Regulations 2006.

Bids will be assessed based on the following criteria:

1. **Cost:** Applicants should set out the cost for the facility proposed, including a breakdown of costs for labour, materials, travel & subsistence, other costs, and VAT where applicable. Include an invoicing profile detailing dates, values and associated deliverables.

2. **Technical Specification:** Applicants must set out how their bid meets the required outcomes specified in section 2, and capability requirements in section 3. Details should be given of:
    a. The equipment to be installed including detailed specifications and how this will address the R&D requirements and objectives of the Advanced Reactor programme outlined in section 1 and the overarching Nuclear Industrial Strategy;
    b. The potential capacity for the throughput of research programmes;
    c. The facility's size, scale and measurement/analysis capability;
    d. The details of the proposed data measurement and recording techniques and
    e. The testing parameters, including:
        - Applied load range;
        - Test environmental conditions (e.g. Pressure, gaseous environments);
        - Test specimen size.

    Applicants should highlight the benefits of the proposed siting of the laboratory including any supporting facilities and infrastructure and availability of space. They should also

clearly indicate any existing arrangements that cover Health, Safety, Environment and Quality assurance.

3. **Skills, Experience and Expertise:** Applicants should set out the expertise and skills of the organisation and staff, to cover:
    a. Capabilities and track record in research and development activities relevant to the programme of work;
    b. Development of the facility to time, cost and quality;
    c. Operational management of the facility after commissioning.

4. **Delivery Plan:** Applicants must show how they intend to deliver the facility by March 2016. Please include:
    a. A procurement plan;
    b. A commissioning plan;
    c. Key performance indicators and milestones;
    d. Risk management plan, detailing key risks and mitigating actions;
    e. Plans for ensuring appropriate Health, Safety, Environment and Quality requirements are in place where they do not already exist.

5. **Exploitation:** Applicants should set out how they intend to utilise and operate the facility including:
    a. Details of research projects that they, or other stakeholders, are already undertaking or planning to undertake that will utilise this facility, and setting out how these will support the objectives of the Advanced Reactor programme outlined in section 1 and the overarching Nuclear Industrial Strategy;
    b. Sources of funding to enable R&D related to this facility, including international collaboration opportunities where possible;
    c. Estimated annual operating and maintenance costs for the facility, and how these will be funded post March 2016;
    d. How they will manage use of the facility by other UK research organisations, ensuring ‘open access’ and identifying other potential users already engaged in the project;
    e. How this facility will interact with the wider network of laboratories, from both a management and technical perspective and how they will engage fully with potential end users and operators of other facilities which, collectively, form a national network, including attendance at relevant National Nuclear User Facility (NNUF) meetings and NIRAB sub-groups.
    f. Public engagement strategy for the facility, including plans for communications that will ensure other stakeholders are aware of the opportunity presented by the facility, and research councils / funding agencies take it into account when future R&D in this area is commissioned.

7. Further Details

Any specific queries related to this call can be emailed with the subject line ‘Nuclear Research and Development: High Temperature Materials Testing Suite competition’ to:

innovation@decc.gsi.gov.uk

This request for proposals does not commit DECC to proceeding with awarding the grant. DECC reserves the right not to award any grants, in particular if DECC is not satisfied by the proposals received or if the funding assigned to the scheme is required for other, unforeseen, purposes. DECC will not, under any circumstances, make any contribution to the costs of preparing proposals and applicants accept the risk that they may not be awarded a grant. **Please note that any grant award will be subject to the applicant's agreement to, and compliance with, the terms and conditions that DECC will set out in a grant offer letter.**

Annex A - Template for Responses (30 page limit)

Name		
Contact Details	E:	T:
Organisation		
Proposal Summary	• Briefly set out how your bid intends to meet the requirements of the call.	
EU State aid	• Provide us with the information required under section 4 to demonstrate either that you: a) are not an undertaking; or b) comply with the EU Block Exemption [(specifying the category of R&D in respect of which you apply for the grant)].	
Other public funding	• Provide us with information about any other public funding awarded for the project (including the identity of the relevant public body awarding the funding and amount of the funding). • OR confirm that you are receiving no other public funding.	
Technical Specification (35%)	(refer to section 6 for guidance)	
Skills, Experience and Expertise (20%)	(refer to section 6 for guidance)	
Delivery Plan (20%)	(refer to section 6 for guidance)	
Cost (10%)	(refer to section 6 for guidance)	

Exploitation (15%)	(refer to section 6 for guidance)

Annex B – Questions for tenderers

In some circumstances the Department may exclude you from participating further in a tender process. If you cannot answer 'no' to every question in this section it is very unlikely that your application will be accepted, and you should contact us for advice before completing this form.

Please state 'Yes' or 'No' to each question.

Has your organisation or any directors or partner or any other person who has powers of representation, decision or control been convicted of any of the following offences?	**Answer**
(a) conspiracy within the meaning of section 1 or 1A of the Criminal Law Act 1977 or article 9 or 9A of the Criminal Attempts and Conspiracy (Northern Ireland) Order 1983 where that conspiracy relates to participation in a criminal organisation as defined in Article 2 of Council Framework Decision 2008/841/JHA;	
(b) corruption within the meaning of section 1(2) of the Public Bodies Corrupt Practices Act 1889 or section 1 of the Prevention of Corruption Act 1906; where the offence relates to active corruption;	
(c) the offence of bribery, where the offence relates to active corruption;	
(d) bribery within the meaning of section 1 or 6 of the Bribery Act 2010;	
(e) fraud, where the offence relates to fraud affecting the European Communities' financial interests as defined by Article 1 of the Convention on the protection of the financial interests of the European Communities, within the meaning of:	
(i) the offence of cheating the Revenue;	
(ii) the offence of conspiracy to defraud;	
(iii) fraud or theft within the meaning of the Theft Act 1968, the Theft Act (Northern Ireland) 1969, the Theft Act 1978 or the Theft (Northern Ireland) Order 1978;	
(iv) fraudulent trading within the meaning of section 458 of the Companies Act 1985, article 451 of the Companies (Northern Ireland) Order 1986 or section 993 of the Companies Act 2006;	
(v) fraudulent evasion within the meaning of section 170 of the Customs and Excise Management Act 1979 or section 72 of the	

Value Added Tax Act 1994;	
(vi) an offence in connection with taxation in the European Union within the meaning of section 71 of the Criminal Justice Act 1993;	
(vii) destroying, defacing or concealing of documents or procuring the execution of a valuable security within the meaning of section 20 of the Theft Act 1968 or section 19 of the Theft Act (Northern Ireland) 1969;	
(viii) fraud within the meaning of section 2, 3 or 4 of the Fraud Act 2006; or	
(ix) making, adapting, supplying or offering to supply articles for use in frauds within the meaning of section 7 of the Fraud Act 2006;	
(f) money laundering within the meaning of section 340(11) of the Proceeds of Crime Act 2002;	
(g) an offence in connection with the proceeds of criminal conduct within the meaning of section 93A, 93B or 93C of the Criminal Justice Act 1988 or article 45, 46 or 47 of the Proceeds of Crime (Northern Ireland) Order 1996; or	
(h) an offence in connection with the proceeds of drug trafficking within the meaning of section 49, 50 or 51 of the Drug Trafficking Act 1994; or	
(i) any other offence within the meaning of Article 45(1) of Directive 2004/18/EC as defined by the national law of any relevant State.	

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