



Department
of Energy &
Climate Change

Nuclear R&D - Accident Tolerant Fuel

Grant notification

December 2014

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

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1. Introduction

The purpose of this document is to announce DECCs intention to place two grants, totalling £2.5 million to provide facilities that will support a UK Accident Tolerant Fuel programme.

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.

Accident Tolerant Fuel (ATF) is an important development area within the Nuclear Innovation Programme. Following the incident at the Fukushima Daiichi Nuclear Power Plant in Japan in March 2011, advanced fuels with improved accident tolerance are now being investigated through national and international programmes. New designs of ATF could be used in current nuclear fleets as well as new build reactors, including Small Modular Reactors (SMRs), with current concepts including the development of fuel cladding with greater tolerance to accident conditions, and the development of fuel with higher density and improved thermal properties which result in improved efficiency.

Investment in a leading UK capability for accident tolerant fuel manufacture would strengthen international collaboration opportunities and establish the UK as a centre of expertise for advanced fuel fabrication R&D, and consequently commercial manufacture of such fuels. Fuel is required throughout the 60 year life of a reactor and thus provides the potential to supply a high value product on a continuous basis.

The initial focus of a UK ATF programme would be the development of fuels with improved efficiency, economics and safety factors which can be applied to current and future Gen III and Gen III+ reactors, in addition to SMR concepts. The skills, knowledge and capabilities developed within this area will also provide a basis for the development of nuclear fuels for Gen IV reactors. Medium term objectives for the programme are:

- Within 5 years the UK will have manufactured one or more accident tolerant fuel test pins for irradiation in a materials test reactor.
- Within 10 years accident tolerant and more efficient fuel pins will have been manufactured and tested providing the basis for the UK to be the manufacturer of choice for such fuel on a commercial scale.

DECC are addressing the first stage of this programme by providing capital grants that will build on the recent investment in the Nuclear Fuel Centre of Excellence, enhancing and aligning the capability of the facility with advanced ATF requirements.

2. Terms of the Grants

Capital grant funding will be available from 01/04/15 to 31/03/16.

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

There is an expectation that a requirements capture exercise is carried out by the vendor 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 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.

3. Proposed Grant (1) – Nuclear Fuel Centre of Excellence Accident Tolerant Fuel Equipment – NNL Preston Laboratory

Objective/Budget

DECC is considering offering a grant of up to **£1.5 million** to the National Nuclear Laboratory (Preston Laboratory) to put in place by March 2016 the equipment to fabricate and characterise test fuel pellets, allowing the UK to secure participation in world-leading collaborations to develop Accident Tolerant Fuels.

Specifically, the facility will enable research into the manufacture of fuel pellets with higher density and thermal properties than uranium dioxide which result in improved efficiency, including:

- Additives to current Uranium Dioxide (UO_2) fuels to improve thermal properties.
- Uranium Nitride (U_2N_3) and Uranium Silicide (U_3Si_2) with improved thermal conductivity and higher U^{235} density.

This equipment will enable R&D to be carried out on the feasibility of producing these advanced fuels. In order to do this equipment has to be specified, purchased and installed and work then undertaken on the feasibility of fabrication resulting in technology based deliverables.

4. Proposed Grant (2) - Nuclear Fuel Centre of Excellence Accident Tolerant Fuel Equipment – University of Manchester

Objective/Budget

DECC is considering offering a grant of up to **£1 million** to the University of Manchester to put in place by March 2016 equipment and facilities to manufacture and characterise novel fuel materials and high integrity fuel claddings such as silicon carbide, as dictated by the R&D programme. Specifically, the facility should be able to conduct research into the development of novel fuel materials, fabrication processes, and claddings such as silicon carbide (SiC) composites that are able to withstand accident temperatures without failure or the production of hydrogen.

This equipment will enable R&D to be done on the feasibility of manufacturing advanced fuels and claddings. In order to do this, equipment has to be specified, purchased and installed, and work undertaken on the feasibility of fabrication resulting in technology based deliverables.

5. Further Details

Any specific comments or queries related to these grants can be emailed to:

innovation@decc.gsi.gov.uk

using the subject header 'DECC capital grant for Accident Tolerant Fuels'.

This document does not commit DECC to proceeding with awarding any 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.

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3 Whitehall Place
London SW1A 2AW
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