



## DST Government of India – RCUK

### India-UK Collaborative Research Initiative in Fuel Cells

**Department of Science and Technology (DST), New Delhi, in collaboration with the Research Councils UK, jointly invite proposals for research projects focussing on Fuel Cells.**

**Closing date for proposals: November 25<sup>th</sup> 2010**

#### **Introduction**

The Research Councils UK (RCUK) and the Department of Science and Technology (DST), New Delhi are looking to strengthen collaboration between UK and Indian research institutions. India remains one of the UK Research Councils' priority countries for increasing research collaboration.

This call will focus on Fuel Cells. The area of the call was agreed upon through a dialogue between the UK Research Councils' and the Government of India's Department of Science and Technology (DST). Development of technologies relating to fuel cells was agreed to be of importance to both countries.

#### **Background**

Fuel Cells have been identified by both India and the UK as an area of significance in providing solutions to the problem of meeting future energy needs. The potential for the UK and India to work together in this area was outlined in a publication entitled **Fuel Cells in India: Opportunities for UK-India Collaboration** (<http://ukinindia.fco.gov.uk/resources/en/pdf/SIN/FuelCellReport101208>). The agreement to collaborate on research funding was confirmed at Ministerial level in a meeting between the Indian and UK Science Ministers in July 2010.

#### **Development of call for proposals**

In order to scope the areas for potential collaboration, a workshop to bring together leading fuel cell technology researchers from both the India and the UK was arranged and held in Chennai in September 2010. This call is based around areas identified as themes of common interest during the workshop.

#### **Types of Proposals Sought**

**RCUK and DST expect to support projects from this call which address the 'Challenges' set out below.** In addition to the usual academic requirements for a research project a successful application must:

- be a joint activity involving research groups from both the UK and India,
- involve personnel exchange between the Indian and the UK partners

The Research Councils have committed to a contribution of up to £3M for this call over a three year period with matched resources from DST.

## **Scientific focus for the call**

Within an overarching focus on research relating to fuel cells, the following 'Challenges' were agreed at the workshop to be of mutual interest to both the UK and India and where both countries shared complementary strengths:

### **1. Fundamentals of fuel cell operation**

Key areas were identified as Kinetics and mechanism of oxygen reduction and oxygen evolution reactions, Kinetics and mechanism of fuel oxidation and hydrogen evolution reactions, Corrosion of catalysts, supports, and bi-polar plates, Development of in-situ tools and modelling, Electrode/ electrolyte interface, Development of new catalysts/ supports/ electrolytes/bi-polar plates, Characterising the voltage losses: mass transport, kinetic and ohmic.

### **2. Durability and Degradation**

Key areas were identified as **Ageing tests** (PEM: accelerated aging, real time evaluation, mechanical cycling (electrolyte creep), SOFC: thermal cycling, redox cycling, load cycling), **Mechanism identification** - Understanding degradation (PEM: cold start, start up, shutdown, effect on catalysts and supports, Bipolar plates; SOFC: sealants, catalysts, anode poisoning), **Diagnostic tools** (PEM: non destructive, non intrusive, cell performance post mortem; SOFC: gas analysis, thermal analysis, post mortem analysis, cell performance), **Lifetime and reliability modelling** (Durability of BoP; Test protocols; Develop accelerated life testing; Test on realistic conditions (load profile, environment, start stops, effect of dynamic conditions)).

### **3. System Integration**

Key areas were identified as Air, thermal and water management – mass and energy balance, Buffer in between reformer and FC stack, SOFC start up arrangement, Ease of maintenance/ replacement and Improving system efficiency (Improved efficiency and flexibility of the electrical power converters; CHP in SOFC and PEMFC; Improved thermal efficiency by coupling heat to reformer (SOFC) or hydride store (PEMFC); H<sub>2</sub> recycling strategies to improve reactant efficiency).

### **4. Fuel Flexibility**

Key areas were identified as **Fuel clean-up and mitigation of poisons** (Gas purification e.g. removal of S from natural gas; Reduction of poison content in anode gas), **Poison resistance** (SOFC: S-tolerant/ internal reforming anodes; PEMFC: CO (and other poisons) tolerance; Hydrogen store: poisoning of solid state substrates) and **Fuel storage** (Fuel storage for mixed fuel applications; New storage materials).

**This call invites proposals that address some or more of the challenges listed above – with an emphasis on cost reduction and working with industry as appropriate.**

## **Summary Guidance for applicants**

As this is a joint application to DST and EPSRC<sup>1</sup>, applicants should ensure that identical applications are submitted by the closing date to DST and EPSRC. The UK application should be submitted through the UK Research Councils grant submission system which is known as 'Je-S' (further details on this below). The DST application should be a hard copy of the UK Je-S form and attachments. Applicants are to ensure that **all** documents are submitted to both

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<sup>1</sup> The UK's Engineering and Physical Sciences Research Council (EPSRC) leads on the broader RCUK Energy Programme under which the UK funding for this call falls. EPSRC will therefore act as the administrative co-ordination point for this call.

DST and JeS For further details see the JeS submission guidance on page 3. The costs of the UK Institutions will be met from Research Councils funds, those for the Indian partner institutions will be met by the DST. A **UK based lead partner** and an **Indian based lead partner**, should be identified each of whom will lead on interaction with the funding agency in their respective countries.

The **UK based lead partner** will ensure the application is submitted via the Je-S system. If the UK application comes from multiple institutions then the application should be made on a single Je-S Form from the UK based lead partners host institution. The application must comply with current Research Council guidelines on format and content. Further information is available on the Je-S website ('About Je-S' on this page <https://je-s.rcuk.ac.uk/Jes2WebLoginSite/Login.aspx>) and in the EPSRC Funding Guide on the EPSRC website (<http://www.epsrc.ac.uk>).

The **Indian based lead partner** will submit the identical proposal (10 hard copies of the Je-S form) using the same common proposal format to DST by the stipulated closing date for processing as per requirements of DST India (<http://www.serc-dst.org> & [www.dst.gov.in](http://www.dst.gov.in)). These applications should be submitted to the Department of Science and Technology, Head, Science and Engineering Research Council, Department of Science and Technology, Technology Bhawan, New Delhi. Applications must be completed in all respects and must reach DST by 25<sup>th</sup> November 2010.

Only activities that involve academic collaboration between the UK and India can be considered. The Proposals should include a maximum of 3 UK and 3 Indian partners. Proposals involving industrial collaborators are welcomed but costs for these partners will not be covered by DST/ EPSRC through this call.

#### **Application Procedure – Je-S submission and guidance**

The lead UK partner should submit the application to the EPSRC via the JeS system. Applications are sought from UK institutions eligible to receive research council funding. Eligibility rules can be found at <http://www.rcuk.ac.uk/research/eligibility.htm>.

#### **Application from multiple institutions should be made on a single Je-S Form from the UK based lead partners host institution.**

Those unfamiliar with Je-S should note that it is a pre-requisite of submission that the lead UK investigator's organisation is registered to use Je-S. Applicants should ensure that the registration process is complete as soon as possible, well in advance of the call closing date. A table showing the current status of research organisations registered to use Je-S is available at [http://www.so.stfc.ac.uk/jes/jes1/RODetails\(Web\).pdf](http://www.so.stfc.ac.uk/jes/jes1/RODetails(Web).pdf). Submission of proposals after the closing date will not be accepted due to incomplete Je-S registration. Full details of how to register are available from the Je-S Helpdesk at [JeSHelp@rcuk.ac.uk](mailto:JeSHelp@rcuk.ac.uk).

When adding a new proposal, you should select Council 'EPSRC', document type 'Standard Proposal' and the 'Energy Programme/DST collaborative research in fuel cell technologies' Scheme.

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 ensure you allow sufficient time for your organisation's submission process between submitting your proposal to then and the Call closing date. EPSRC and DST must receive your application by **4:00PM (Greenwich Mean Time) on Thursday 25<sup>th</sup> November 2010**.

The following information and documentation will need to be submitted via Je-S:

- <https://je-s.rcuk.ac.uk/> application form for the relevant call detailing funds requested from the Research Councils.
- Case for support including a track record (up to 2 sides of A4) and a description of the proposed research and its context (up to 6 sides of A4). It is important that this

includes a description of how Intellectual Property is to be shared and managed between UK and India partners.

- A pathways to impact document (up to 2 sides of A4) In this section you should describe how the potential impacts of the proposed research will be realised and this should cover the project as a whole.
- Justification of the resources requested for the collaboration from both EPSRC and DST (up to 2 sides of A4).
- **A Diagrammatic Work Plan** (for example, a PERT or Gantt chart). This should cover the project as a whole, detailing significant milestones and showing how different aspects of the project will link together and be managed. (up to 1 side of A4)
- CVs (up to 2 sides of A4 each) for named UK and Indian researchers, visiting researchers and researcher co-investigators - where applicable
- Statement of support from any project partners (no page limit) - where applicable
- Quotes for equipment (no page limit) - where applicable
- Technical assessment for the use of a major facility (no page limit) - where applicable

Note that costing details entered directly in to the Je-S form should be UK based costs that are requested of the EPSRC. Any Indian based costs that are to borne by DST should be entered on the 'joint proposal format' form (see further detail below) and **uploaded as a mandatory attachment** under 'statements of support' within Je-S.

Additional material is required for India-UK Collaborative Research Initiative in Fuel Cells Technology applications as follows:

- Up to 2 letters of support from the key India institution(s) with whom you are working. One of these must be a Host Organisation Statement from the Pro-VC or equivalent of the lead India institution on the application, indicating their commitment to the partnership and how this will be delivered.
- The joint application form detailing the funding requested from DST; This is available on both DST and EPSRC's website ('**Joint Proposal Format**'). The lead partner(s) in India should be indicated on this document. This should be uploaded with under 'statements of support' within J-eS.

See also: <http://www.epsrc.ac.uk/funding/apprev/preparing/Pages/default.aspx>

**Please note:** We do not require full CVs, supporting technical annexes, letters from UK partners or separate lists of publications. Any excess material will be removed from your application. If you wish to refer to additional supporting information, please use a web-link in your case for support but we cannot guarantee that the reviewers will consider additional web material. Papers for the prioritisation panel (see further detail below) are converted and copied in greyscale/black and white, therefore colour material will not be accurately reproduced. We require the use of minimum 11pt Arial font on A4 pages with 2cm borders on all pages.

### **Submitting Forms to DST**

10 hard copies of the complete JeS form including all attachments must be submitted to DST by the deadline.

### **After submitting your application:**

When we receive your application through Je-S, you cannot make any amendments or additions. Therefore please make sure that all statements of support are secured well in advance of the closing date.

We will contact you if there is a problem with your application. Any delay in your proposal will jeopardise the quantity of reviews we receive on your application which may affect the final panel decision.

**The deadline for receipt of proposals for DST and EPSRC is 4:00PM UK time on Thursday 25<sup>th</sup> November. We will not accept late applications.**

## **Eligibility**

### **UK eligibility**

Applicants who are academic employees of UK universities and resident in the UK are normally eligible to submit research proposals may apply. Current holders of EPSRC Fellowships (excluding Postdoctoral Fellowships) and Royal Society Fellows may also apply. Fixed-term employees of UK universities are eligible to submit proposals under certain conditions, as are employees of the Research Councils' Institutes.

**Applicants must be the principal investigator or co-investigator on a current research council award (at the closing date 25 November 2010).**

Applicants who are unsure about the suitability of their research project are strongly advised to contact EPSRC before submission. In addition to the special requirements set out here, the standard EPSRC eligibility rules and grant conditions apply. Information is available in the [EPSRC Funding Guide](#).

### **Indian eligibility**

**Normal DST eligibility requirements will apply.**

## **Assessment procedure**

Applications submitted to this call will undergo the following peer review process.

Once a joint application has been received at EPSRC and at DST, each funding agency will send the proposal to peer reviewers drawn separately by both UK and India. The reviewers will receive the complete proposal (i.e. including UK and the Indian information). The peer reviewers also receive a covering letter, guidance and a form that they will complete with their comments and return to EPSRC/ DST. There will be an opportunity, during the application process, to nominate potential reviewers of your application.

Proposals that receive highly supportive comments from peer reviewers will be submitted to a joint EPSRC/ DST 'Prioritisation Panel'. Panel members will be drawn from the EPSRC college and DST. Before the prioritisation panel meets, the peer reviewers' reports (made anonymous) will be passed back to the lead investigators from India and the UK to comment on any factual inaccuracies or questions raised before consideration by the Prioritisation Panel. All reviewers' comments received in time will be seen by the Prioritisation Panels, as will the lead investigators' response to the peer review comments, if such a response is made, along with all other documents.

A rank ordered list will be produced by the prioritisation panel and EPSRC and DST will then fund as far down the list as either quality or funds permit.

Funding decisions will be made by March 2011.

### **Assessment criteria**

The proposals will be assessed following a procedure mutually agreed by EPSRC and DST. In particular, the proposals should demonstrate:

- That they promise excellent and innovative research
- That they involve personnel exchange between the Indian and the UK partners.
- How the project will building new or substantially stronger links between UK and Indian research groups.
- Projects should aim to be **true joint partnerships** between the UK and India. This is an important feature of the call; where the project is judged to be one-sided this should be seen as a weakness.
- Projects should be formulated to **demonstrate the added value of active collaboration between partner countries** and not be potentially stand-alone: both sides of the project must be fundable in order for either side to provide funding.

### **Timetable**

September 23 <sup>rd</sup> 2010	<b>Joint Call Issued</b>
November 25 <sup>th</sup> 2010 (16:00 GMT)	<b>Closing date for receipt of applications</b>
March 2011	<b>Joint Prioritisation Panel</b>
March 2011	<b>Decisions announced</b> (formal grant offer to follow)

### **Contacts**

#### **UK**

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#### **India**

Head  
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**DST INDIA - RESEARCH COUNCILS UK  
India-UK Collaborative  
Research Initiative in  
Fuel Cells**

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# **JOINT PROPOSAL FORMAT**

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Reference: (added once submitted)

Please complete the following information as completely as possible. This form should be submitted as part of your application to the DST/RCUK UK India Research Initiative in Fuel Cells as described in the Guidance Notes.

**Indian Organisation where the DST Grant would be held?**

<b>Organisation</b>	
<b>Division or Department</b>	

**Names of India lead partners and co-partners**

<b>Role</b>	<b>Name</b>	<b>Organisation</b>	<b>Division or Department</b>

<b>Name of UK Lead Partner and Co-partners:</b>	
<b>Organisation and Department:</b>	

**Project Title:**

**UK-India Research Initiative on Fuel Cells -**

Summary of Resources Required for Project

**(INDIAN PARTNERS)**

(Rs in Lakh)

Fund heading	Total	1 <sup>st</sup> Yea r	2 <sup>nd</sup> Year	3 <sup>rd</sup> Year
Staff				
Travel & Subsistence				
Equipment				
Other Costs				
a. Contingencies				
b. Consumables				
Sub-total				
Overhead				
Total				

Summary of staff effort requested

	Months
Investigator	
Researcher	
Technician	
Other	
Visiting Researcher	
Student	
Total	

Note:

For Multiple Partnership proposal, please provide Financial Requirements for Each Partners separately.

Other Support

Details of support sought or received from any other source for this or other research in the same field.

Name of awarding Organisation	
Awarding Organisation's Reference	
Title of project	
Decision Made (Y/N)	
Award Made (Y/N)	
Start Date	
End Date	
Amount Sought/Awarded (Rs in Lakh )	

## Related Grants

Provide the DST, DBT, CSIR etc. reference numbers of any current grants held by any of the applicants that are related to this proposal.

Interim reports of these grants should be submitted with this proposal.

Additional Project Partners: details of partners in the project and their contributions to the research. These contributions are in addition to resources identified above.

1	Name of partner organisation	Division or Department	Name of contact		
Direct contribution to project (Rs in lakh)					
	Description	Value		Description	Value
cash			use of facilities/ equipment		
equipment/ materials			staff time		
secondment of staff			other		
other			Sub-Total		
Sub-Total				Total Contribution	

2	Name of partner organisation	Division or Department	Name of contact		
Direct contribution to project (Rs in lakh)			Indirect contribution to project		
	Description	Value		Description	Value
cash			use of facilities/ equipment		
equipment/ materials			staff time		
secondment of staff			other		
other			Sub-Total		
Sub-Total				Total Contribution	

Total Contribution from all Project

**OTHER INFORMATION:**

**Reviewers** (mandatory – at least one of the reviewers below will be contacted by DST)

<b>1</b>	<b>Name</b>	<b>Organisation</b>	<b>Division or Department</b>	<b>Email Address</b>

<b>2</b>	<b>Name</b>	<b>Organisation</b>	<b>Division or Department</b>	<b>Email Address</b>

<b>3</b>	<b>Name</b>	<b>Organisation</b>	<b>Division or Department</b>	<b>Email Address</b>