

**Close Support Unit - Culham**  
Culham Science Centre, Abingdon,  
Oxon OX14 3DB, UK

Tel: +44 (0)1235 46 4400  
Fax: +44 (0)1235 46 4415  
Email: [francesco.romanelli@jet.efda.org](mailto:francesco.romanelli@jet.efda.org)  
Secretariat: Tel: +44 (0)1235 46 4401

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30 June 2010

Heads of Research Units, Contact Persons in New Members States / New Assession Countries

Dear Colleagues,

**Call to the Associations to propose activities within the Task Force Fusion Technology at JET for the implementation of the approved 2011 Work Programme**

The purpose of this letter is to invite you to propose scientific and technical (S/T) activities within the frame of Task Force Fusion Technology at JET (TF-FT) for the implementation of the JET Workprogramme. The proposed activities shall be performed in the year 2011.

The JET Fusion Technology activities in the frame of the EFDA 2011 Work Programme have been approved by the EFDA Steering Committee on 23 June 2010. The details/guidelines are given in the attached extract from the JET 2011 Work Programme, "Programmatic guidelines for JET Fusion Technology Activities in WP 2011".

In line with the above cited guidelines, I would appreciate if you could let me know the type of activities you would like to conduct in your Association within the framework of this programme. Your proposal should include, for each activity, a detailed description of the work to be performed (please, use the attached proposal form). These should be received **not later** than 10 September 2010.

The proposals will be assessed by the EFDA CSU at Culham.

To discuss the technical content of the activities, please contact the Fusion Technology Task Force Leader Paola Batistoni ([batistoni@frascati.enea.it](mailto:batistoni@frascati.enea.it)) or the Deputy Task Force Leader Paul Coad ([Paul.Coad@ccfe.ac.uk](mailto:Paul.Coad@ccfe.ac.uk)). For further information please contact Dominique Barbier ([dominique.barbier@jet.efda.org](mailto:dominique.barbier@jet.efda.org)) at the EFDA JET CSU in Culham.

Yours sincerely,



Francesco Romanelli  
EFDA Associate Leader for JET

**Copy for Information:**

TF-FT Leader	P. Batistoni
TF-FT Deputy Leader	J.P. Coad
EFDA-SC Chairman	G. Hasinger
EFDA STAC Chairman	F. Gnesotto
JOC Senior Manager	M. Cox
European Commission	Y. Capouet, D. Maisonnier
EFDA-CSU Culham	L. Horton, D. Barbier, S. Fuller
Fusion for Energy	M. Gasparotto

**Attachments:**

1. Guidelines for FT Activities in 2011
2. Proposal Form

## **JET 2011 WORK PROGRAMME**

### **PART II- FUSION TECHNOLOGY**

#### **1- Programmatic guidelines for JET Fusion Technology Activities in WP2011**

It is proposed that the 2011 FT programme at JET focuses on issues of relevance to ITER operation and licensing. The programmatic guidelines are proposed to be as follows:

- a) Analysis of selected PFC samples in order to support particle transport studies, erosion deposition studies, and tritium retention studies in support of the ITER-like Wall Project;
- b) Contribution in support of ITER licensing in particular development of in-situ detritiation techniques, in-situ diagnostics for characterization of plasma facing components and dust, and collection of data on the lessons to be learnt from JET;
- c) Methods for measuring T activities and for reducing T inventories in waste;
- d) Neutronics and safety;
- e) Engineering R&D in support of JET operations, to develop components or processes potentially applicable for JET operations;

In view of the financial constraints on the 2011 JOC no use of the test beds for Fusion Technology Tasks is foreseen.

The activities will include the completion of on-going Fusion Technology Tasks launched in 2010 and extending into 2011.

Details on objectives and priorities for the planning of the 2009 FT programme at JET are given in Table II-1.

**Table II-1: Objectives and Priorities 2011, with examples of potential activities**

TASKS	COMMENTS
<p><b>Plasma Facing Components and Tritium in the Tokamak</b></p> <p>Analysis of selected PFC samples in order to support particle transport studies, erosion deposition studies, and tritium retention studies</p> <p>Survey of PFC post-mortem analyses results from JET Carbon wall, and definition of future analyses for JET ILW in view of an accurate comparison</p> <p>Characterization of Mixed Materials in support of the ITER-like Wall Project</p>	<p>As a contribution to the impurity transport and erosion/re-deposition studies and to complete the picture on tritium trapping in the carbon-based JET machine, analyses of PFCs, mirrors and other samples removed in the 2009-2010 shutdown are needed. Topics that might be explored include</p> <ul style="list-style-type: none"> <li>* toroidal variations in erosion/deposition/retention, distribution of retained tritium within the vessel,</li> <li>* plasma-surface interactions at ICRH antennas,</li> <li>* toroidal and poloidal distribution of <sup>13</sup>C from the methane puffing on the last day of the 2009 operational campaign.</li> </ul> <p>For each topic investigated, a summary of the results obtained, the implications for JET operation and lessons to be learnt for ITER shall be reported.</p> <p>After the next 2011 experimental campaign with the ITER like Wall installed on JET, several PFC samples will be available for post mortem analyses whose results will be valuable for ITER. In order to extract the maximum information from the ILW campaign, careful planning for the operational campaign and analysis of these Be/W PFCs is required. This requires an overall analysis of all the available data collected in the previous experimental campaigns at JET with carbon PFCs, as a basis for background and comparison. To this purpose, a survey of PFC post-mortem analyses results from JET carbon wall campaigns shall be produced in a format suitable for comparative analyses. Overall conclusions shall be derived. A proposal for the analysis programme for the first shutdown during the ILW program shall be elaborated as well, bearing in mind that the tiles to be removed for destructive analysis is already determined.</p> <p>The generation of mixed deposited materials has been flagged as a major topic of concern for ITER. JET provides a source of Be-C mixed materials, and in future mixed materials such as tungsten carbides and tungsten beryllides are expected to be generated in JET ILW. Compositional information will already be gleaned from continuing analysis programmes using Ion Beam Analysis techniques, SEM and SIMS. However, these methods do not address other film properties such as chemical states, structure and thermal/electrical properties. Further techniques such as XPS/AES and XRD are needed that may add information on film properties, either for the predominantly carbon-beryllium films present on current JET tiles, or in preparation for surface films that may be expected from the Be/W wall now being installed.</p>

<p><b>Tokamak dust characterisation &amp; diagnostics</b></p>	<p>Development of in-situ diagnostics for the characterisation of deposited layers and/or coatings</p>	<p>Laser Induced Breakdown Spectroscopy (LIBS) has been developed and tested on JET with support from TF FT, but its further exploitation is out of JET-FT scope and might be as a diagnostic procurement (in the case of JET), or through the EFDA Emerging Technologies Task Force (in the case of ITER). Technologies still at the development stage – and therefore eligible to be included in the TF FT programme – include lock-in thermography for deposited layer characterisation and measurement of temperatures on large surfaces (2D). Stages of development should be specified as objectives, including realistic tests applicable to the JET geometry and environment, and the final deliverable should be the outline design of a diagnostic for JET.</p> <p>Samples of dust and flakes from various parts of the JET divertor have been collected during the 2009-2010 shutdown by vacuum cleaning exposed surfaces. These samples will be available in 2011 for analysis for properties that may be of interest for JET/ITER, for example composition, specific surface area, particle size. Tiles that have not been vacuum cleaned are also available for experiments to demonstrate mobilisable dust inventory, or analysis related to dust production.</p>
<p>Characterisation of dust and assessment of in-vessel dust diagnostics and removal methods</p>		
<p><b>Methods for measuring T inventories and for reducing T inventories in waste</b></p>		
<p>Purification of tritiated water</p>		<p>Tritium inventory and its management are among major JET Waste Management activities for which a global strategy must be defined in the short term (2012). Since 2000, the JET FT program has undertaken some essential assessments of processes and its industrial scaling for all the different type of wastes. Concerning purification of tritiated water, potential activities may include:</p> <ul style="list-style-type: none"> <li>o Demonstrate the filtering process for a new set of HTO drums with extended analyses.</li> <li>o Scaling up the design process for JET needs in the current strategy.</li> <li>o Studies on reducing the volume &amp; increasing concentration activity for HTO containers.</li> </ul>
<p>Metal detritiation</p>		<ul style="list-style-type: none"> <li>o Based on feedback experiences, extracting a model of the detritiation factor in case of metallic waste incineration.</li> <li>o In continuation of task JW6-FT-2.28, definition of a method for metal detritiation (including preliminary tests on Be and other metals, safety assessment and cost analysis).</li> </ul>
<p>Tritium monitoring</p>		<ul style="list-style-type: none"> <li>o Characterisation of Tritium content and out-gassing from waste JET material. R&amp;D study for tritium migration from waste boxes (including assessment and test of techniques to limit degassing from JET waste samples).</li> </ul>

### **Neutronics and Safety**

Neutron studies for neutron calibration

In order to provide input from JET experience to ITER neutronics issues and licensing process, the ITER-like Wall shutdown and the new neutron detector calibration to be performed in that occasion should be capitalised on so as to improve the accuracy of the neutron calculation modelling that will be heavily used in the calibration of ITER neutron detectors. In this respect, numerical simulations could be performed and compared with available experimental results to evaluate:

- the effects of a point calibration source
- Be-wall neutron reflection and modelling approximation on the accuracy of neutron detector calibrations.

### **Engineering**

Innovative Database Technologies for Data Mining at JET

Innovative database management tools may allow a more efficient exploitation of JET experimental data. In particular, data mining technologies could be developed for database structuring, data extraction and correlation and statistical forecasting. Such tools could be tested on a sample extracted from the JET database and a demonstration package produced.

Task Title:

Association

<b>Field:</b>		<b>JET Task: Fusion Technology JW11-FT-x.a b</b>		
<b>EFDA reference:</b>		<b>Ass:</b>		
<b>PROJECT STRUCTURE</b>	<b>Name</b>	<b>Telephone</b>	<b>Fax</b>	<b>Email</b>
CSU Responsible Officer at JET:	D.Barbier	+44-1235-46-5346	+44-1235-46-4415	dominique.barbier@jet.efda.org
JET Task Force Leader 1:	P. Batistoni	+39-06-9400-5739	+39-06-9400-5571	batistoni@frascati.enea.it
JET Task Force Leader 2:	P. Coad	+44-1235-46-4478	+44-1235-46-6454	Paul.coad@jet.uk
Ass. Responsible Officer 1	TBD			
Ass. Responsible Officer 2	If Necessary			
Operator Representative	TBD			

**TASK DESCRIPTION**

**Background:**

*(with mention of related previous tasks)*

**Goals:**

**Description of the work :**

*Experimental details (number of samples, experimental conditions...), modelling, time schedule, required input data...*

**Appropriateness for JET:**

Task Title:

Association

Relevance to ITER:

Links with other tasks (past or present):

**TASK MILESTONES** (*interim, final reports and others milestones*)

No	Description	Due Date	Required Deliverables
M1	Semi annual report and presentation to the monitoring meeting (1 <sup>st</sup> )	Jun 11	
...			
Mi	Semi annual report and presentation to the monitoring meeting (2 <sup>nd</sup> )	Dec 11	
...			
Mn	Final Report		

**TASK DELIVERABLES** (*major steps of the work to be performed*)

No	Description	Due Date
D1		
...		
Di		
...		
Dn		



Task Title:

Association

**CONTRIBUTING INSTITUTIONS**

Association	Deliverables	Principal Investigator	Telephone	Fax	Email

**JET OPERATION IMPACT/OPERATOR EFFORT:**

- Machine requirements
- Operator effort (financed under JOC)
- Other JET facility requirements

**TECHNICAL REFERENCE SUPPORTING DOCUMENTS:**

-  
-

In case of a task continuation, please indicate below the related publications of year 2009-2010 (journals & conferences):

-  
-

**COMMENTS:**

Task Title:

Association

**TASK DESCRIPTION**

**FORECAST OF MANPOWER AND EXPENDITURE (one for each involved Association)**

**ANNUAL MANPOWER (in Professional Person Days and Technician Person Days)**

CATEGORIES	2011	2012	Total
Professionals (PPD)			
Technicians (TPD)			
<b>Total</b>			
Missions (#) including 1 for the monitoring meeting			
Total missions duration (days) including 3 days for the monitoring meeting			

**ANNUAL EXPENDITURE<sup>(1)</sup> (Excluding Manpower)(in kEuros)**

CATEGORIES	2011		2012		Total	
	Full costs k€		Full costs k€		Full costs k€	
Irradiations						
Hot cells (including accelerator time for Be- or T-contaminated samples)						
Transport of radioactive materials						
<sup>3</sup> He						
Other expenditures (detailed below)	*		*			
<b>Total</b>						

<sup>(1)</sup>RULES TO FILL THE TABLE:

- Generally, expenditures will be covered by notification (currently 20%)
- The first two categories (Irradiations & Hot Cells) in the table may be eligible for additional 20% funding
- Transport of radioactive materials, <sup>3</sup>He and items needed for the specifically for the execution of the task (detailed under other expenditures) may be eligible for 100% funding
- For “other expenditures”, give hereunder description and breakdown of full costs (put total in cell \*)
  - .....
  - .....