



FUSION FOR ENERGY

The European Joint Undertaking for ITER and the Development of Fusion Energy

THE GOVERNING BOARD

DECISION OF THE GOVERNING BOARD ADOPTING THE 2010 WORK PROGRAMME OF THE EUROPEAN JOINT UNDERTAKING FOR ITER AND THE DEVELOPMENT OF FUSION ENERGY

THE GOVERNING BOARD OF FUSION FOR ENERGY

HAVING REGARD to the Statutes annexed to the Council Decision (Euratom) No 198/2007 of 27th March 2007 establishing the European Joint Undertaking for ITER and the Development of Fusion Energy (hereinafter "Fusion for Energy") and conferring advantages upon it¹ and in particular Articles 6(3)(d) and 11 thereof;

HAVING REGARD to the Financial Regulation of Fusion for Energy² adopted by the Governing Board on 22nd October 2007, last amended on 18th December 2007³ (hereinafter "the Financial Regulation"), and in particular Article 64 thereof;

HAVING REGARD to the Implementing Rules of the Financial Regulation⁴ adopted by the Governing Board on 22nd October 2007 last amended on the 8th July 2008⁵ (hereinafter "the Implementing Rules") and in particular Article 53 thereof;

HAVING REGARD to the Fusion for Energy Project Plan and Resource Estimates Plan adopted by the Governing Board on 26th November 2009;

HAVING REGARD to the comments and recommendation of the Executive Committee on the proposal for the 2010 Work Programme adopted at its meeting of 4-5th November 2009⁶;

HAVING REGARD to the comments and recommendations of the Technical Advisory Panel adopted at its meeting on 4th November 2009,

WHEREAS:

- (1) The Director should, in accordance with Article 8(4)(c), draw up an annual work programme;
- (2) The Governing Board should adopt the work programme.

HAS ADOPTED THIS DECISION:

Article 1

The 2010 Work Programme of Fusion for Energy annexed to this Decision is hereby adopted.

¹ O.J. L 90, 30.03.2007, p. 58.

² F4E(07)-GB03-11 Adopted 22/10/2007

³ F4E(07)-GB04-06 Adopted 18/12/2007

⁴ F4E(07)-GB03-12 Adopted 22/10/2007

⁵ F4E(08)-GB06-06a Adopted 08/07/2008

⁶ F4E(09)-EC17-Summary Adopted 05/11/2009

Article 2

This Decision shall have immediate effect.

Done at Barcelona, 27th November 2009

For the Governing Board

A handwritten signature in black ink that reads "C. Varandas". The signature is written in a cursive style with a large initial 'C'.

Carlos Varandas
Chair of the Governing Board

ANNEX I

FUSION FOR ENERGY WORK PROGRAMME 2010 (WP2010)

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PART I - INTRODUCTION, ASSUMPTIONS AND OVERALL OBJECTIVES

1.1. INTRODUCTION

The European Joint Undertaking for ITER and the Development of Fusion Energy ('Fusion for Energy' or F4E) is a Joint Undertaking created under the Euratom Treaty by a decision of the Council of the European Union.

Fusion for Energy was established for a period of 35 years from 19th April 2007 and is located in Barcelona, Spain. The objectives of 'Fusion for Energy' are threefold:

- Providing Europe's contribution to the ITER International Fusion Energy Project as the designated Domestic Agency for Euratom;
- Implement the Broader Approach agreement between Euratom and Japan as the designated Implementing Agency for Euratom;
- Prepare in the longer term for the construction of demonstration fusion reactors (DEMO).

In accordance with the Financial Regulation, this Work Programme lays down the activities of F4E that are to be implemented and financed through the 2010 budget.

1.2. ASSUMPTIONS

The 2010 F4E Work Programme (WP2010) for ITER is based on the following assumptions:

- The European schedule is based on the "modified" Scenario 1. This scenario was used as basis for this document;
- F4E will receive on time from IO the necessary inputs foreseen in the ITER Quality Management process deposited with the Nuclear Safety Authorities and in accordance with Build-to-Print, Detailed Design and Functional Specification status agreed in 2001;
- The necessary inputs from IO will be provided in time to allow the associated PAs to be signed according to the foreseen schedule;
- WP2010 is in line with the Additional Direct Investments and the revised sharing agreed with IO and other Domestic Agencies. The specific activities related to the modified baseline in the Blanket and Neutral Beam areas will be initiated after the ITER Council approval;
- The planning of the activities and the corresponding delivery of components by the other ITER Domestic Agencies will be respected;
- A current understanding of the ITER Design and that some modifications might be required in 2010 to adjust it to the possible ITER developments;
- F4E will continue active management of and involvement in the ongoing tasks signed under EFDA, results of which are required to initiate certain F4E activities;
- Technically and commercially complex procurements will be implemented whenever appropriate through the *Competitive Dialogue* procedure or through the negotiated procedure, in order to improve the alignment of supply chain response to F4E needs

and to proactively adopt cost containment measures. This will be done in compliance with our Implementing rules;

- Grants related to recurring and sequential R&D activities, with a well defined development path eventually leading to a EU procurement package, will be implemented whenever appropriate through the *Framework Partnership Agreement* (FPA) procedure, in order to streamline and channel R&D funding, improve its effectiveness and reduce administrative burden to beneficiaries and F4E alike. In consideration of the transitional period for starting implementation of FPA, modifications may occur in the foreseen scheduling of grant activities included in WP2010;
- Procurements which encompass scope within the domain of both F4E and contracting authorities, or for which a very close coordination between F4E and other entities is needed, will be implemented whenever appropriate through the *Joint Procurement* procedure.

Regarding WP2010 for Broader Approach, the main assumptions are:

- The project plans presented in this document are those approved by the Broader Approach Steering Committee;
- The Work Programmes for the projects IFMIF/EVEDA, IFCRC and the Satellite Tokamak Programme will be approved by the Broader Approach Steering Committee.

1.3. ITER CREDITS FOR PREPARATORY ACTIVITIES

This WP2010 includes an extensive programme of R&D and preparatory activities that have to be carried out prior to signing the Procurement Arrangement for the Procurement Packages agreed to be at Build-to-Print level. Recognising that F4E is carrying out work that should have been completed by the IO, additional credit from the IO is being requested by F4E through ITER Task Agreements (ITAs). The activities indicated in this WP2010 as receiving additional (ITA) credits may be cancelled in the event that the IO would not make the requested credits available.

1.4. MAIN OBJECTIVES

1.4.1. ITER

With respect to activities related to ITER, the main objectives are:

- The negotiation and signature of the ITER Procurement Arrangements, proposed by the ITER Organisation (IO), according to the present schedule;
- The signature of procurement contracts for those components on the critical path (in particular buildings, magnets and vacuum vessel);
- The continuation of design and R&D activities in areas including Remote Handling, Heating and Current Drive, Vacuum System, Tritium System, Diagnostics and Test Blanket Modules;
- The continuation of the preparation of safety and licensing documentation for ITER in Cadarache and related safety studies;
- The investigation of manufacturing methods and non-destructive tests of critical components from the technical point of view with the objective of minimising the cost

and risk of not meeting the technical requirements (radial plates, TF double pancake, divertor, vacuum vessel, blanket and first wall);

- The preparation of new facilities to test prototypes and components during the qualification process and construction respectively;
- The continuation of the activities for the preparation of the ITER site.

The most significant procurements to be initiated within WP2010 are related to:

- Magnets, for which procurement contracts for both TF coils (initially limited to tooling and prototyping) and PF coils (initially limited to tooling) will be signed;
- Vacuum vessel, for which the main vessel procurement contract will be signed (initially limited to non recurring activities and to sector No 5);
- Buildings, for which the main excavation and tokamak complex foundation contract will be signed (completing the activities initiated within WP2009).

Further to provide management and follow-up of contracts signed in direct support of the ITER project, F4E continues to be responsible for the technical follow-up of a number of technology contracts previously managed by EFDA. The outcome of these contracts is an important input for many of the activities that will be initiated by F4E.

1.4.2. Broader Approach

With respect to activities related to the Broader Approach (BA), the main objectives are:

- Regarding JT60SA, important TF coil procurement contracts were initiated within WP2009 and are to be signed in 2010. Activities foreseen in WP2010 are mostly in support of these ongoing procurements;
- Regarding IFMIF-EVEDA, Procurement Arrangements with the Voluntary Contributors will be completed by early 2010;
- Regarding IFERC, the Procurement Arrangement for the supply and maintenance of the CSC supercomputer will be completed during 2010.

1.4.3. DEMO

With respect to activities related to DEMO, in addition those undertaken under the BA IFERC project, no specific activities are foreseen to be implemented during 2010.



PART II - ITER

In the following the activities of Fusion for Energy related to ITER are described according to the agreed Work Breakdown Structure. The tables provided in the text use the following abbreviations:

Abbreviation	Meaning
WP ref.	Work programme reference, univocally identifying WP items. WPxx/yy/zz, where xx are the last two digits of the year in which WP/budget the activity was first financed, yy is a code identifying the ITER WBS element (if available) or the F4E service in charge, zz is a sequential number for the year.
G	Grant
P	Procurement (service, supply or works)
Y	Credited by ITER IO through PA
Y(ITA)	Credited by ITER IO through ITA
N	Non credited

All activities indicated within WP2010 are planned to be committed under the 2010 budget.

During the implementation of the work programme activities, F4E may group more activities in a single call, or split one activity in more calls. This will in any case be performed preserving the scope and objective presented in WP2010.

The foreseen time of publication of calls and invitations is indicative only, and based on the present understanding of the project development.

2.1. WBS 1.1 - MAGNETS

2.1.1. Summary

Activities will focus on the signature of further contracts for the procurement of the ITER magnet components, some minor design/R&D activities and support contracts for quality control and testing.

2.1.2. Procurement Arrangements

System	Title	ITER Credit (kIUA)	Signature due
EU11	1.1.P6A.EU.01 - Toroidal Field Coils Conductors	43.39	Dec 2007
EU11	1.1.P1A.EU.01 - Toroidal Field Coils	89.74*	Jun 2008
EU11	1.1.P6C.EU.01 - Poloidal Field Magnet Conductors	11.23**	May 2009
EU11	1.1.P3A-B.EU.01 - Poloidal Field Coils PF2 to PF6	41.40**	Jun 2009
EU11	Magnet Structures: Pre-compression Rings	0.60***	Jan 2010

* Sum of TF Windings package credit from WBS 1.1.1A plus insertion in the case from Magnet Structures WBS 1.1.2A.

** Updated credit values awarded through PCR-164 for two double pancakes added to PF2 and PF6 coils and bilateral agreement with RF-DA (to be approved by next ITER Council).

*** Does not include DCR-48 changes (increase from 4 to 9 rings), prototype ring and testing, as well as 3 spare rings.

2.1.3. Main Procurements

WBS 1.1.1A – Toroidal Field Magnet Windings

Following the signature of the contracts for two prototypes of the radial plates and the foreseen signature of the TF winding pack supply contract in early 2010, the main work will focus on the start up of the manufacturing activities at the companies for the production of the first mock-ups and prototypes. For the case insertion a small R&D task will be used to assess the welding methods for the case closure and related non-destructive testing. Other tasks will regard characterization of resin or structural materials for the coils. A preliminary study of the cold test facility required for the TF windings at the supplier’s premises will also be carried out.

WBS 1.1.2A – Toroidal Field Magnet Structure

It is foreseen to issues the call for tender and sign the contract for the manufacture of the pre-compression rings.

WBS 1.1.3A + 1.1.3B – Poloidal Field Magnets (PF2 to PF6)

The first stage of the large manufacturing contract for the production of the PF coils at the Cadarache site will be signed and will concentrate on the engineering activities for tooling and qualification processes. A preliminary study of the cold test facility required for the PF coils on-site will also be carried out.

WBS 1.1.6A + 1.1.6C – Toroidal and Poloidal Field Magnet Conductors

In early 2010 the major contract for the manufacture of the conductors for the TF and PF coils will be signed (included in WP2009). Support contracts to perform the characterization of the strand (both standard and extended) and the jacket structural materials during the whole production will be initiated and signed. A new contract with the Sultan facility will also be signed in order to test few conductor samples, as during 2010 the conductor manufacturing will still be at the early stages.

2.1.4. List of Activities

WP ref.	ITER WBS/PBS	Activity Type	Activity Title	Duration of contract (months)	Credit Status	Time of Call
WP09/11/03	1.1.1+1.1.3	P service	Cold Test Facility Preparation for TF & PF Coils	11	Y(ITA)	2009
WP10/11/09	1.1.2	P supply	Procurement of magnet structures: pre-compression rings	58	Y	10Q1
WP10/11/10	1.1.3	P supply	Procurement of Poloidal Field coils PF2 to PF6 (Phase 1)	25	Y	2009
WP10/11/11	1.1.1	P supply	Procurement of Toroidal Field coils (Phase 1)	34	Y	2009
WP10/11/12	1.1.6	P service	Testing of TF Nb3Sn Strands	32	Y	2009
WP10/11/01	1.1.6	P service	Testing and Characterisation of PF strands	36	Y	10Q1
WP10/11/02	1.1.1+1.1.3	P service	Analysis tasks in support of magnet activities	12	Y	10Q1
WP10/11/04	1.1.1	P service	Testing of TF Structural Materials	43	Y	10Q1
WP10/11/05	1.1.1	P service	Procurement for Qualification of Coil Insertion and Case Welding and Definition of Facilities	12	Y	10Q1
WP10/11/06	1.1.6	P service	SULTAN Sample Manufacture & Tests	18	Y	2009
WP10/11/08	1.1.6	P service	Jacket Material Qualification & Testing for TF and PF Coils	49	Y	10Q1

2.2. WBS 1.5 - VACUUM VESSEL

2.2.1. Summary

Following the outcome of the Design Review of the “Alternative VV and Blanket design”, IO has taken the decision to modify the baseline design which demonstrated not fulfilling all the requirements of the project, especially in terms of integration of components. The new design is called MDR-A (Modified Reference Design A).

The 2010 activities will be focused on the first phase of the procurement for the main vacuum vessel “first of a kind” sector (number 5) and will concentrate mainly on the engineering activities for design, validation mock-ups, tooling and materials.

2.2.2. Procurement Arrangements

System	Title	ITER Credit (kIUA)	Signature due
EU15	1.5.P1A.EU.01 - Vacuum Vessel Sectors Production	99.36	Dec 2009

2.2.3. Main Procurements

At beginning of 2010 IO will provide F4E with drawings suitable to issue the call for tender for the EU sectors.

Important F4E commitments in 2010 include sector engineering activities and the material for the first sector manufacturing. Several smaller activities will be signed to support the preparation of technical and contractual documentation for manufacturing studies and mock-ups to speed up the finalization of the main contract for sector 5.

2.2.4. List of Activities

WP ref.	ITER WBS/PBS	Activity Type	Activity Title	Duration of contract (months)	Credit Status	Time of Call
WP10/15/09	1.5.1	G	Support to Material Procurement	11	N	10Q1
WP10/15/10	1.5.1	P service	Consultancy with ANB about expediting and inspection policy	6	N	10Q2
WP10/15/01	1.5.1	P supply	Procurement of Main Vessel (phase 1)	54	Y	10Q3
WP10/15/02	1.5.1	P service	Study for Mock-up Definition for Sectors	4	Y	10Q2
WP10/15/03	1.5.1	P service	Analysis of Welding Distortion for Sectors	3	Y	10Q2
WP10/15/04	1.5.1	P service	Support in preparation of final technical documentation for VV contract	6	Y	10Q1
WP10/15/05	1.5.1	P service	Analysis of VV Loads & Stresses	8	Y	10Q1



WP ref.	ITER WBS/PBS	Activity Type	Activity Title	Duration of contract (months)	Credit Status	Time of Call
WP10/15/07	1.5.1	P service	Study for Concept Manufacture for Sectors	4	Y	10Q1
WP10/15/08	1.5.1	P service	Engineering Support for VV	6	Y,Y(ITA)	2009

2.3. WBS 1.6 - BLANKET

2.3.1. Summary

During 2010, the activities in the blanket area will essentially focus on the FW component. They will consist of the continuation of the key tasks initiated in order to adequately prepare F4E to implement the Procurement Arrangement for the supply of 50% of the FW, planned for 2012.

2.3.2. Procurement Arrangements

None in 2010.

2.3.3. List of Activities

These activities cover 3 main areas as follows:

- Qualification activities, aiming at demonstrating the adequate mastery of the needed technologies for FW fabrication, applied to fully representative geometries; High heat flux testing of semi-prototypes will be a key part of the programme, to formally complete phase 2 of the ITER qualification programme; contracts for the manufacture of full-scale prototypes shall then be signed with Industry which will also include development of repair techniques for series production.
- Supporting R&D tasks, aiming at completing the mechanical characterization of the joint between structural SS and the heat sink copper alloy.
- Engineering design, covering conceptual and detailed design and analyses of the FW panels to support ITER IO in the overall design effort and subsequent preparation of the PA specifications.

WP.ref.	ITER WBS/PBS	Activity Type	Activity Title	Duration of contract (months)	Credit Status	Time of Call
WP10/16/08	1.6.1	P service	Completion of Be/CuCrZr joint repair technique	16	Y	10Q3
WP09/16/02	1.6.1	G	Continuation of Be/CuCrZr HIP joining development	18	Y,Y(ITA)	2009
WP09/16/04	1.6.1	P service	Engineering Support to Blanket	12	N	10Q1
WP09/16/05	1.6.1	G	High heat flux testing of FW mock-ups before and after irradiation, including transportation	23	Y(ITA)	2009
WP10/16/03	1.6.1	G	Continuation of technology development for enhanced first wall design (5MW/m ²)	12	Y,Y(ITA)	10Q3
WP10/16/04	1.6.1	P service	Engineering Support for the detailed Design of ITER blanket shield and FW panels	12	Y,Y(ITA)	10Q1
WP10/16/05	1.6.1	P supply	Manufacture of a ITER higher HF full prototype	18	Y	10Q3



WP ref.	ITER WBS/PBS	Activity Type	Activity Title	Duration of contract (months)	Credit Status	Time of Call
WP10/16/07	1.6.1	P supply	Manufacture of a ITER standard HF full prototype	18	Y	10Q3

2.4. WBS 1.7 - DIVERTOR

2.4.1. Summary

During 2010, the activities in the divertor area will essentially focus on the Inner Vertical Target (IVT).

2.4.2. Procurement Arrangements

System	Title	ITER Credit (kIUA)	Signature due
EU17	1.7.P2B.EU.01 - Divertor Inner Vertical Target	20.20	Jan.2010

2.4.3. Main Procurements

Two main Calls for Tender will be issued: one for the procurement of the IVT full size prototype and one for the procurement of its Carbon Fibre Composite material:

2.4.4. List of Activities

Complementary activities aiming at increasing competition and decreasing fabrication costs, will include: testing of full Tungsten mock-ups and prototypes, as well as mock-ups made from alternative CFC materials and validation of repair techniques on full-scale vertical target poloidal units before start of the series production.

WP.ref.	ITER WBS/PBS	Activity Type	Activity Title	Duration of contract (months)	Credit Status	Time of Call
WP10/17/02	1.7.2	P supply	Manufacturing of Inner Vertical Target Full Size Prototypes	27	Y	10Q2
WP10/17/01	1.7.1	P supply	Manufacture of Carbon Fibre Composite prototypical batch	10	Y	10Q1
WP09/17/05	1.7.2	P supply	Manufacturing of mock ups and prototypes for the full W divertor	18	Y	2009
WP10/17/03	1.7.2	P service	Qualification of repair technologies on full size PFC components	7	Y	10Q2

2.5. WBS 2.3 - REMOTE HANDLING (RH)

2.5.1. *Summary*

In 2010 the various design and R&D activities in the RH field will continue in order to progress with the conceptual design, the preparation of the functional specifications and interface requirements, the finalization of the scope of the supply, and the related R&D activities; all this in view of the preparation of the still-to-come Procurement Arrangements for the four different in-kind RH procurement packages under EU responsibility.

2.5.2. *Procurement Arrangements*

None in 2010.

2.5.3. *List of Activities*

Complementary activities will include system studies and the technological surveys on components (motors, sensors etc.) that are compatible with the ITER environmental constraints, in particular gamma radiation and, in case of the in-vessel viewing system, with vacuum, high temperature baking (~240 C) and, if required, high magnetic field (~8T).

- Divertor RH: The activities in 2010 will go on with the completion of what is covered by the present Grant with TEKES. After this, a new grant will be initiated with still with TEKES related to the completion of the conceptual design of the DIV RH devices and tools, completion of conceptual design for the DTP2 Extension and Upgrade in view of a prototyping and testing phase and continuation of the test campaigns with the existing DTP2 hardware.
- Transfer Cask System (TCS): Design activities, by signing task orders in the frame of the existing engineering support contracts, of a generic cask-pallet system to be integrated later on with the Air Transfer System layout. A Grant is also planned to be signed in 2010 which beneficiary should play the role of design integrator in support of F4E, in view of subsequent PA and industrial procurement preparation.
- In-Vessel Viewing System (IVVS): Activities related to the execution of further R&D activities (further lab tests aiming at increases of the performances of the present proof-of-principle mock-up) and, design integration activities on the whole IVVS are planned.
- Neutral Beam RH: A Grant to review, extend and complete the present NB RH conceptual design is planned. Synergies should be established with the NBTF design activities.
- Radiation Tolerance Programme: The objective is to complete irradiation tests and to define a common strategy with other F4E groups (e.g. Diagnostics) and ITER on this subject.

WP ref.	ITER WBS/PBS	Activity Type	Activity Title	Duration of contract (months)	Credit Status	Unique beneficiary	Time of Call
WP10/23/04	2.3.2	G	DTP2 E&U Follow-up and DTP2 Operation	28	Y(ITA)	TEKES (FI)*	2009
WP09/23/04	2.3.5	G	Gathering of requirements for NBI RH, and feedback to/from NBI design. Start of engineering design of NBI RH	25	Y(ITA)		2009
WP10/23/05	2.3	G	Irradiation of RH components (motors, sensors etc.)	8	Y(ITA)		10Q1
WP10/23/01	2.3.4	G	IVVS Design Finalisation Including Supplementary Lab Tests	29	Y(ITA)		10Q2
WP10/23/02	2.3.7	G	ATS Design Completion & TCS Integration	6	Y(ITA)		10Q1
WP10/23/03	2.3	P service	Engineering Support for RH	22	Y(ITA)		10Q3

* Unique experimental facility (according to art.158.b of F4E Implementing Rules)

2.6. WBS 3.1 – VACUUM PUMPING AND FUELLING

2.6.1. Summary

The close and effective collaboration with the IO in the definition and substantial progress of all pre-procurement activities in the area of vacuum pumping will continue in 2010, with several important procurements and grants being signed.

2.6.2. Procurement Arrangements

None in 2010.

2.6.3. List of Activities

It is intended to sign a new Grant on the finalization of the detailed design of the Cold Valve Boxes (CVB) and Cryojumpers, as well as to initiate a procurement contract on the Manufacture of Pre-Production Cryopump (PPC), its test vessel and related activities. Finally, it is also expected to finalize the design of the Heating Neutral Beam (HNB) Cryopumps and its interfaces to the cryopump in the MITICA facility.

With respect to the very important issue of Leak Detection and Localization (LD&L) in the ITER machine, grants will be signed to support R&D work that ITER IO is recommending in order to define the conceptual design of this system. Different methods will be assessed/tested in order to localize water and/or helium leaks inside the vacuum vessel or cryostat.

WP ref.	ITER WBS/PBS	Activity Type	Activity Title	Duration of contract (months)	Credit Status	Time of Call
WP09/31/01	3.1.1	P service	Detailed design and specification for the CVBs and cryojumpers	17	Y(ITA)	2009
WP10/31/03	3.1.1	P supply	Procurement of PPC and test vessel	20	Y(ITA)	10Q1
WP09/31/04	3.1.3	G	Optimisation and performance studies for leak detection system including proof-of-principle tests. Review of leak localization concepts and their possible realization	37	Y(ITA)	2009
WP10/31/01	3.1.1	P service	Follow up of procurement of PPC and test vessel	20	Y(ITA)	10Q1
WP10/31/02	3.1.3	G	R&D in support of Conceptual design of leak detection system and Leak Localisation systems	29	Y(ITA)	10Q1

2.7. WBS 3.2 – TRITIUM PLANT

2.7.1. Summary

Activities to support ITER IO in the preparation of the Procurement Agreements (PAs) for Isotope Separation System (ISS) and Water Detritiation System (WDS), the two EU in-kind contributions to the ITER Tritium Plant, will continue.

2.7.2. Procurement Arrangements

System	Title	ITER Credit (kUA)	Signature due
EU32	WDS part 1 – Tritiated water holding tanks (storage and emergency)	4.78	Jun 2010

2.7.3. List of Activities

R&D work for specific issues (development of large size and tritium compatible electrolyzers, their demonstration, etc.) as well as detailed designs will be carried out.

In particular, the contract for the detailed design for the tritiated water holding tanks of the WDS (2 large emergency tanks - 300 m3 - and other smaller holding tanks - <20 m3) will be signed.

WP ref.	ITER WBS/PBS	Activity Type	Activity Title	Duration of contract (months)	Credit Status	Time of Call
WP09/32/01	3.2	G	R&D in support of conceptual design for WDS and detail design of the tanks	26	Y(ITA)	2009
WP09/32/04	3.2	G	Preparation of tender specs for WDS Tanks and follow up of production of drawings for manufacturing	4	Y(ITA)	2009
WP10/32/04	3.2	P service	Conceptual and detailed design of WDS	6	Y,Y(ITA)	2009
WP10/32/06	3.2	P service	Conceptual and Detailed design of ISS	22	Y(ITA)	10Q1

2.8. WBS 3.4 - CRYOPLANT**2.8.1. Summary**

The activities to be signed for the cryoplant in 2010 will focus on finalising the engineering design requirements (engineering support contracts), reviewing functional specifications and mitigating the main technical risks in the procurement (R&D on compressor technology).

2.8.2. Procurement Arrangements

System	Title	ITER Credit (kIUA)	Signature due
EU34	LN2, 80 K Loop and Ancillary Equipment	30.12	Dec 2010

2.8.3. List of Activities

WP.ref.	ITER WBS/PBS	Activity Type	Activity Title	Duration of contract (months)	Credit Status	Time of Call
WP10/34/02	3.4	G	Cryoplant Procurement Preparation	5	Y	10Q2
WP09/34/02	3.4	P service	Engineering Support to cryoplant	10	Y	10Q1
WP09/34/03	3.4	P service	Optimization of Cryoplant Design	16	Y	10Q4
WP10/34/01	3.4	P service	R&D on compressor technology	8	Y	10Q1

2.9. WBS 4.1 and 4.3 – POWER SUPPLIES

2.9.1. Summary

Activities will be focusing on the preparation for the procurement of the Pulsed Power electrical network and the Steady State electrical network including: detailed design of ITER electrical distribution system, and qualification of components with respect of operation under magnetic field.

2.9.2. Procurement Arrangements

System	Title	ITER Credit (kIUA)	Signature due
EU41, EU43	4.1.P1A-P8B.EU.01 - Detailed design of the SSEN and PPEN	7.00	Oct 2009
EU41, EU43	Assembly of the SSEN and PPEN, and SSEN cables	13.30	Apr 2010

2.9.3. List of Activities

WP ref.	ITER WBS/PBS	Activity Type	Activity Title	Duration of contract (months)	Credit Status	Time of Call
WP10/43/01	4.3	P service	Engineering support to power supplies	12	Y	10Q2
WP10/43/02	4.3	G	Technical specs of the qualification contract	5	Y(ITA)	10Q2



2.10. WBS 4.5 - CODAC

2.10.1. Summary

The CODAC system, up to the local controllers, will be developed by ITER using Fund, with the help of the Domestic Agencies and with direct help from industry. Fusion for Energy role will be to manage the instrumentation and control functions contained in the procurement arrangements.

2.10.2. Procurement Arrangements

Not applicable.

2.10.3. List of Activities

A service contract related to Instrumentation and Control (I&C) for systems procured by F4E will be signed in 2010. This service contract will produce the design of I&C systems according to IO CODAC standards and support F4E suppliers in the procurement of I&C hardware. A smaller contract will be signed in order to prepare a resource loaded schedule for I&C and to support F4E with the technical specification of the service contract.

WP ref.	ITER WBS/PBS	Activity Type	Activity Title	Duration of contract (months)	Credit Status	Time of Call
WP10/45/04	4.5	P service	Review of ITER I&C specifications	3	N	2009
WP10/45/03	4.5	P service	Support on I&C design and implementation in the frame of EU PAs	12	Y	10Q2

2.11. WBS 5.1.1 – ION CYCLOTRON H&CD ANTENNA

2.11.1. Summary

The IC Antenna procurement type is Build-to-Print, with 100% EU sharing. Critical procurement contracts will be signed in 2010, specifically for the RF vacuum windows and Faraday screens bars.

2.11.2. Procurement Arrangements

None in 2010.

2.11.3. List of Activities

WP ref.	ITER WBS/PBS	Activity Type	Activity Title	Duration of contract (months)	Credit Status	Time of Call
WP10/51/01	5.1	P supply	Faraday Screen R&D	20	Y(ITA)	10Q2
WP09/51/03	5.1	P supply	RF Vacuum Windows R&F	27	Y(ITA)	2009

OE

2.12. WBS 5.2 - ELECTRON CYCLOTRON

WBS 5.2.1B –ELECTRON CYCLOTRON UPPER LAUNCHER

2.12.1. Summary

In 2010 all the major prototype contracts will be signed, in support of the design and for completion before the PAs for the system are signed. The design work will be oriented towards the production of a final detailed design. In addition, support will be provided to the IO on some critical issues on the area of ECH, such as performance analysis update, common component strategy (with JADA), and general integration of the Electron Cyclotron H&CD in the ITER system.

2.12.2. Procurement Arrangements

None in 2010.

2.12.3. List of Activities

WP ref.	ITER WBS/PBS	Activity Type	Activity Title	Duration of contract (months)	Credit Status	Time of Call
WP09/52/07	5.2.1	G	Detailed design, analysis, testing and documentation	18	Y(ITA)	2009
WP09/52/08	5.2.1	P service	Engineering activities in support of EC Upper Launcher	22	Y(ITA)	10Q1
WP09/52/09	5.2.1	P supply	EC UL prototypes	40	Y(ITA)	2009

WBS 5.2.3 ELECTRON CYCLOTRON POWER SOURCES AND WBS 5.2.4 EC POWER SUPPLIES

2.12.4. Summary

The development of the European gyrotron for ITER will continue signing the grant for the test of the first gyrotron prototype which refurbishment, performed on the basis of the results of the first test campaign, will be completed by industry in summer 2010. The tests on the refurbished 2 MW gyrotron prototype will yield essential experimental results for the decision on the future European development programme in this area. In addition, support will be provided to IO on some critical issues on the area of ECH, e.g. space allocation in the RF building, preparation of specification for the PA for the gyrotrons and the EC Power Supplies.

2.12.5. Procurement Arrangements

None in 2010.

2.12.6. List of Activities

WP ref.	ITER WBS/PBS	Activity Type	Activity Title	Duration of contract (months)	Credit Status	Unique beneficiary	Time of Call
WP09/52/02	5.2.4	P service	Engineering Support to EC PS	12	Y		10Q3
WP09/52/03	5.2.4	G	Support to ITER Organization	16	Y(ITA)		2009
WP09/52/05	5.2.3	G	Tests with the refurbished 2MW 1st prototype gyrotron	4	Y	CRPP (CH)*	2009
WP10/52/03	5.2.3	P supply	Mirrors for RFCU	5	Y		2009

* Unique experimental facility (according to art.158.b of F4E Implementing Rules)

2.13. WBS 5.3 – NEUTRAL BEAM SYSTEM

2.13.1. Summary

The substantial support provided by Europe to IO for the development of the NB system will continue in 2010. Several procurement contracts related to the Test Facility will be initiated and signed (cooling and cryo-systems, beam source etc.). The implementation of the PA on the NB Power Supply, signed in 2009, will enter in its most active phase with the signature of the first procurement contracts.

2.13.2. Procurement Arrangements

The second PA in the table below is not included in the PAs already foreseen in the agreed sharing among ITER Parties. The signature of this PA is therefore conditional on the positive decision of the ITER Council to include the NBTF into the ITER baseline and on the subsequent agreement by the EU that this facility will be subject of an in-kind procurement of the EU.

System	Title	ITER Credit (kIUA)	Signature due
EU53	5.3.P6.EU.01 - Procurement of NB power supplies and related systems	19.52	Jul 2009
EU53	The full size ITER injector Ion Source Test Facility and MV Test Facility (SPIDER/PRIMA/MITICA)*	TBD**	Jun 2010

* Depending upon NBTF approval process.

** The credit allocated for the NB test Facility is 60 kIUA. Additionally 8.8 kIUA from the IO R&D Fund have already been agreed by the IC. The sharing amongst DAs is not yet defined.

2.13.3. List of Activities

WP ref.	ITER WBS/PBS	Activity Type	Activity Title	Duration of contract (months)	Credit Status	Unique beneficiary	Time of Call
WP10/53/09	5.3	P supply	Infrastructures of the neutral beam test facility -Cooling system	49	Y		10Q1
WP10/53/10	5.3	P supply	Ion Source Test Facility - Ion Source	21	Y		10Q1
WP10/53/11	5.3	P supply	Ion Source Test Facility - Vessel	16	Y		10Q1
WP09/53/06	5.3	P supply	Ion source test facility (power supplies - HVD and TX Line)	24	Y		2009
WP10/53/12	5.3	G	R&D on very high voltage insulation	24	Y(ITA)	CEA (FR)*	10Q2

EB

WP ref.	ITER WBS/PBS	Activity Type	Activity Title	Duration of contract (months)	Credit Status	Unique beneficiary	Time of Call
WP10/53/02	5.3	P supply	Infrastructures of the neutral beam test facility -High Voltage Deck and Bushing	9	Y		10Q1
WP10/53/04	5.3	P supply	Protoypes for the finalisation of the B-to-P specifications in NB area	8	Y(ITA)		10Q1
WP10/53/05	5.3	P service	Engineering support in the NB area	15	Y		10Q1
WP10/53/07	5.3	P supply	Vacuum and Gas Injection Plants for PRIMA	52	Y		10Q1
WP10/53/08	5.3	P supply	SPIDER Control & DAQ	25	Y		10Q2

* Unique technical competence (according to art.158.c of F4E Implementing Rules)

2.14. WBS5.5 – DIAGNOSTICS

2.14.1. Summary

Contracts to be signed within this work programme will focus on developing system-level designs for the main diagnostics; completing R&D on the critical path for each system; and advancing designs of principal sub-assemblies.

2.14.2. Procurement Arrangements

System	Title	ITER Credit (kUA)	Signature due
EU55	Phase 1 and Phase 2 Diagnostics	35.49	Dec 2010

2.14.3. List of Activities

Systems required for ITER first plasma will see the design of key components progressed beyond Preliminary Design Review level. To facilitate the R&D activities, frameworks will be established for the conduct of necessary irradiation testing and for the procurement of supplies and analytical support, including fabrication of prototypes and provision of test equipment. An independent activity will be initiated to undertake the design integration of diagnostic systems in ports under EU responsibility, including port plug design and/or customisation and integration in the ports of systems to be provided by other Domestic Agencies.

Concerns over the lifetime of optical assemblies close to the plasma, which is an issue common to several diagnostics, will be addressed through specific R&D aimed at identifying design opportunities and providing generic design guidelines. Finally, an activity will be initiated to provide diagnostic-specific technical support for F4E in its negotiations with ITER IO of the Diagnostic Procurement Arrangements, which are due to be signed in 2010 and 2011.

Activities will focus on completion of the designs for the diagnostics and associated port plugs in the nine diagnostic procurement packages for which the EU is responsible, to the level appropriate for a conceptual design review. In a few cases the design may be advanced to a more detailed level. The activities will include design and engineering studies; system-level optimisation to meet measurement requirements to be agreed with ITER IO; prototyping and testing of relevant components; and assessment of the Procurement Arrangement technical specifications.

WP.ref.	ITER WBS/PBS	Activity Type	Activity Title	Duration of contract (months)	Credit Status	Time of Call
WP09/55/02	5.5	G	Complete Design of in-vessel Diagnostics to Conceptual Design Review level	24	Y,Y(ITA)	2009
WP10/55/10	5.5	G	Complete Design of port plug-based Diagnostics to Conceptual Design Review level	24	Y(ITA)	10Q1

02

WP ref.	ITER WBS/PBS	Activity Type	Activity Title	Duration of contract (months)	Credit Status	Time of Call
WP10/55/11	5.5	P service	Engineering Support for diagnostic integration	18	Y	10Q1
WP10/55/12	5.5	G	Irradiation and post-irradiation testing of diagnostic components and assemblies	24	Y	10Q1
WP10/55/13	5.5	G	Port plug design, testing and diagnostic integration	24	Y	10Q1
WP10/55/14	5.5	P supply	Supplies and Support for Design of Diagnostics and Port Plugs	61	Y,Y(ITA)	10Q1
WP09/55/23	5.5	G	Support for Finalization of Technical Specifications for Port-based Diagnostics	24	Y	2009
WP10/55/09	5.5	G	R&D/Design of IVS Joints, Feedthroughs and Connectors	34	Y	10Q1

2.15. WBS 6.1 - SITE and WBS 6.2 - BUILDINGS

2.15.1. Summary

During 2010 the Architect Engineer will develop the design of the buildings from the conceptual design to a design stage detailed enough to allow the issuing of the call for tender for the construction of the civil engineering of the Tokamak complex.

Work programme 2010 activities will prepare the site and the Tokamak pit to allow the beginning of the Tokamak complex civil engineering construction in 2011.

2.15.2. Procurement Arrangements

System	Title	ITER Credit (kUA)	Signature due
EU62	6.2.P2.EU.01 - PF Coil Fabrication Building (B55)	12.80	Nov 2008
EU62	6.2.P2.EU.04 - Tokamak Complex Anti-Seismic Bearings Supply	6.20	May 2009
EU62	6.2.P2.EU.03 - Tokamak Excavation & Support Structure	31.00	May 2009
EU62	6.2.P2.EU.02 - Architectural and Engineering Services	54.70	May 2009
EU62	Construction of all buildings	273.20	Jan 2010

2.15.3. List of Activities

WP ref.	ITER WBS/PBS	Activity Type	Activity Title	Duration of contract (months)	Credit Status	Time of Call
WP09/62/03	6.2	G	Support Study for Accidental Scenarios	12	N	10Q1
WP10/62/03	6.2	P supply	Anti-Seismic Bearings Fabrication	25	Y	2009
WP09/62/07	6.2	P works	Tokamak Complex Foundations (phase 2)	12	Y	10Q1
WP09/62/11	6.2	P service	Global construction insurance	12	Y	2009
WP10/62/01	6.1&6.2	P service	Analysis, design optimization and cost reduction strategies for the ITER building structures	12	Y,Y(ITA)	10Q1
WP10/62/02	6.2	P service	Mandatory and complementary building insurance	73	Y	2009

2.16. MATERIALS DEVELOPMENT

Material development focuses on the further optimization and validation of materials foreseen for ITER TBM modules, in particular on EUROFER, the structural material for the EU reference concepts, and on EUROFER ODS as well as SiC/SiC composites for thermal and electrical insulation (SiC-Dual), both, for dual coolant options that could be tested at a later stage or in collaboration with partners.

Activities foreseen in 2010 are in particular on characterization of EUROFER base material (new heat EUROFER-97/3 fabricated in 2009) and various joints needed in the TBM project (different weld processes, diffusion bonding, solid HIP & different weld-geometries). The activities are complemented by further development on missing design rules including a review by industry, maintenance of the data base and R&D on improvement of the materials.

The SiC-Dual material fabricated by industry shall be characterized and screened by a low dose irradiation campaign.

Furthermore, F4E will continue to develop EUROFER-ODS material. The next steps include further optimization of properties, in particular of the fabrication process, preparation for fabrication at industrial level and multi-ion-beam irradiation.

WP ref.	Activity Type	Activity Title	Duration of contract (months)	Credit Status	Time of Call
WP10/MD/01	G	Characterization and validation of EUROFER and EUROFER welds for TBM use.	24	N	2009
WP09/MD/02	G	Design rules for EUROFER (Creep-fatigue)	18	N	2009
WP10/MD/03	G	Development of SiC-SiC composites (basic characterisation and irradiation campaigns)	36	N	10Q1
WP10/MD/02	G	Development of SiC-SiC composites (characterisation of physical properties)	12	N	10Q1
WP10/MD/04	G	Development: EUROFER and EUROFER ODS [Optimisation of properties and processes] EUROFER ODS [Ion Beam and n-Irradiation campaigns]	24	N	10Q1
WP10/MD/05	G	Development: EUROFER ODS [Optimisation of properties and processes]	18	N	10Q1
WP10/MD/08	G	EUROFER base materials&welding for TBM use: Irradiation campaigns. Characterisation and validation	39	N	2009

WP ref.	Activity Type	Activity Title	Duration of contract (months)	Credit Status	Time of Call
WP09/MD/08	G	EUROFER Qualification of welds for TBM (second batch of material produced with mock-up fabrication). Irradiation campaigns for qualification of welds for TBM (second batch of material produced with mock-up fabrication)	36	N	10Q1
WP10/MD/06	G	EUROFER Data base and design rules	30	N	10Q1
WP09/MD/10	P service	EUROFER TBM design rules: for EUROFER welds. Rules for welds	18	N	2009
WP10/MD/07	P service	EUROFER TBM design rules: High Temperature rules	18	N	2009
WP09/MD/12	G	Qualification of EUROFER for TBM (Maintenance of data base)	12	N	2008

2.17. TEST BLANKET MODULES

The Test Blanket Modules (TBM) will be unique components in ITER as they use the ITER machine as a test facility and are the only components to be installed in ITER which are not part of the EU in-kind commitment.

The activities on the TBMs to be signed in 2010 include the following:

- Continuation of the conceptual design (e.g. TBM re-design in case of limitation on the amount of ferromagnetic materials in ITER, further validation / optimization of He flow in manifolds at the back of the TBMs, etc.)
- Definition of fabrication procedures on the basis of nuclear standards, the fabrication of subcomponents test mock-ups and the transfer to Industry have been initiated in the work program 2009 and will continue in 2010 in the field of assembly of subcomponents by welding to form the TBM box structure
- Integration of TBM Systems into the ITER machine
- Development of materials database and computer codes for TBM safety analyses

WP ref.	ITER WBS/PBS	Activity Type	Activity Title	Duration of contract (months)	Credit Status	Unique beneficiary	Time of Call
WP09/56/02	5.6	P service	Development and supply of qualified TBM box fabrication procedures specifications	22	N		2009
WP09/56/03	5.6	P service	Engineering Support for PrSR of TBM	10	N		2009
WP10/56/06	5.6	P service	Engineering Support to TBM	20	N		2009
WP09/56/06	5.6	G	HCLL/HCPB TBMs Preliminary Safety Report (PrSR)	10	N		2009
WP10/56/07	5.6	G	Completion of DB and definition of EN computed code for TBM	18	N		10Q2
WP09/56/11	5.6	G	Tritium Extraction System (TES) for HCLL-TBM: Test campaign in TRIEX	12	N	ENEA (IT)*	10Q1
WP10/56/01	5.6	G	TBM systems conceptual design	12	N		10Q2
WP10/56/02	5.6	G	TBM conceptual design	12	N		10Q1
WP10/56/05	5.6	P service	TBM fabrication qualification	12	N		10Q1

* Unique experimental facility (according to art.158.b of F4E Implementing Rules)

2.18. PLASMA ENGINEERING

Plasma engineering will continue providing support to ITER-IO for the design and preparation for operation of the ITER machine. The 2010 activities range from optimization of plasma scenarios and systems to the evaluation of the impact of design changes on the machine performance and operation.

These activities are in large part, funded by means of competed ITAs which are published by ITER-IO as open calls to all the DAs and assigned on the basis of the DAs replies.

In 2010, ITAs on the following general areas are expected:

- Plasma Operation & Control;
- Plasma wall interaction and runaway modelling;
- Development of analysis tools.

WP ref.	Activity Type	Activity Title	Duration of contract (months)	Credit Status	Time of Call
WP10/PE/23	G	Run-away electrons characterization and control	12	Y(ITA)	10Q2
WP10/PE/01	G	Edge modelling coordination and simulations (incl dust)	12	Y(ITA)	10Q2
WP10/PE/02	P service	SOLPS code development	12	Y(ITA)	10Q1
WP10/PE/03	G	Evaluation of 3D magnetic field in ITER	24	Y(ITA)	10Q2
WP10/PE/04	G	Plasma control (incl extended RT), control system design, simulation and VDE analysis	18	Y(ITA)	10Q3
WP10/PE/05	G	Development of run-away (RE) code for ITER and simulation of RE (damage) in ITER	12	Y(ITA)	10Q2
WP10/PE/06	G	MHD stability and pedestal - including controlled ELM regimes	18	Y(ITA)	10Q3
WP10/PE/07	G	Engineering models for plasma feedback control.	12	Y(ITA)	10Q2
WP10/PE/08	G	Conceptual design of plasma control and protection system	12	Y(ITA)	10Q2
WP10/PE/09	G	Study of a pulse sequence simulator for tokamak.	12	Y(ITA)	10Q3
WP10/PE/10	P service	Engineering support and analysis for PE	18	Y,Y(ITA)	10Q2
WP10/PE/11	G	ITER scenario and plasma performance analysis	12	Y(ITA)	10Q3
WP10/PE/12	G	Plasma control development & integration	12	Y(ITA)	10Q3
WP10/PE/13	P service	Eng Support and analysis	18	Y(ITA)	10Q3
WP10/PE/14	G	TF and TBM ripple analysis for ITER	24	N	10Q1

WP ref.	Activity Type	Activity Title	Duration of contract (months)	Credit Status	Time of Call
WP10/PE/15	G	Study of plasma start up	12	Y(ITA)	2009
WP10/PE/16	G	The study of control of plasma current, position and shape	12	Y(ITA)	2009
WP10/PE/17	G	Self-consistent simulations of plasma scenarios	12	Y(ITA)	2009
WP10/PE/18	G	Magnetic reconstruction of the plasma boundary	12	Y(ITA)	10Q1
WP10/PE/19	G	Analysis of Resistive Wall Mode control by in-vessel (RMP) coils	12	Y(ITA)	10Q1
WP10/PE/20	G	Self-consistent Transport Simulations of Plasma Scenarios with Fixed-Boundary Equilibria	12	Y(ITA)	10Q1
WP10/PE/21	G	Edge magnetic field structure for ELM control in ITER and associated power/particle fluxes to plasma-facing components	12	Y(ITA)	2009
WP10/PE/22	G	Ripple analysis and characterization of effects in ITER	24	Y,Y(ITA)	2009

* Unique technical competence (according to art.158.c of F4E Implementing Rules)

2.19. SAFETY

Activities will focus on the support of the ITER licensing process, by performing related safety studies and R&D, and to support EU-PA activities by giving on request safety related advice.

To control the dust and tritium inventories inside the vacuum vessel, techniques for their quantification, monitoring and removal are investigated. Supporting safety analyses will include calculations for accident sequences and application of ALARA to occupational radiation exposure for inspection, maintenance and repair activities inside the cryostat and for coil and power supply distribution systems.

Radiological and Environmental Monitoring System

A first activity in this area aims at the development of specific monitoring devices for red zones highly tritiated and irradiated and containing activated Beryllium dust.

Radwaste Treatment and Storage

Concerning storage and disposal of radioactive and tritiated wastes, R&D activities are planned to limit and/or control the tritium out-gassing from the waste packages, to measure their tritium content and to decontaminate tools from the hot cell facility.

WP.ref.	Activity Type	Activity Title	Duration of contract (months)	Credit Status	Time of Call
WP10/SF/05	G	Busbar arc model validation and supporting experiments	18	Y(ITA)	10Q1
WP10/SF/06	G	Combined H2/Dust explosion computer code development	45	Y(ITA)	2009
WP09/SF/04	G	In vessel dust measurement and removal techniques assessment and validation - diagnostics	18	Y(ITA)	2009
WP10/SF/07	G	Metal Waste Detritiation, T outgassing and measurement, and Be Waste Management	42	Y(ITA)	10Q2
WP09/SF/06	G	Supporting safety analysis to follow up ITER design evaluation and licensing process	24	Y(ITA)	10Q2
WP09/SF/07	P service	Support to ORE and Safety analysis in support of ITER licensing	12	Y(ITA)	10Q2
WP10/SF/08	P service	Supporting safety analyses to follow up ITER design evolution and licensing process	12	Y(ITA)	10Q1
WP09/SF/11	G	The ALARA application to Occupational Radiation Exposure based on ITER design evolution	12	Y(ITA)	10Q2
WP10/SF/09	P service	The ALARA application to Occupational Radiation Exposure based on ITER design evolution	12	Y(ITA)	10Q3

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WP ref.	Activity Type	Activity Title	Duration of contract (months)	Credit Status	Time of Call
WP10/SF/02	P service	Waste Management Support	18	Y(ITA)	10Q2
WP10/SF/03	P service	Monitoring Devices for Red Zones	6	Y(ITA)	10Q2
WP10/SF/04	G	In vessel tritium inventory control by laser spectroscopy	24	Y(ITA)	10Q2

2.20. ENGINEERING SUPPORT

Activities listed here are in addition to the ones indicated in each of the previous areas and focus upon Engineering Analyses, Code and Standards and foresees new step of contracts in support of the design of components and systems and their cost optimization. The Codes and Standards activity in 2010 is devoted to the tracking of international codes for analyses and design of mechanical and electrical systems, assess and follow up of notified body, inspection entities, etc.

Most of the engineering support activities will be implemented through specific contracts to be signed within existing Framework Contracts.

WP ref.	Activity Type	Activity Title	Duration of contract (months)	Credit Status	Time of Call
WP09/ES/02	G	Electromagnetic analyses	12	Y,Y(ITA)	2009
WP09/ES/04	G	Mechanical analyses	12	Y,Y(ITA)	2009
WP09/ES/07	P service	Thermo-hydraulic analyses	12	Y,Y(ITA)	10Q2
WP09/ES/08	G	Thermo-hydraulic modeling	12	Y,Y(ITA)	10Q1
WP10/ES/01	P service	Electromagnetic analyses	12	Y,Y(ITA)	10Q1
WP10/ES/02	P service	Neutronic analyses	12	Y,Y(ITA)	10Q1
WP10/ES/03	P service	Mechanical analyses	12	Y,Y(ITA)	10Q1
WP10/MF/02	P service	Material characterization at room/elevated temperatures	12	Y,Y(ITA)	10Q2
WP10/MF/03	P service	Material characterization at cryogenic temperatures	12	Y,Y(ITA)	10Q2
WP10/MF/04	P service	Support for the quality control of components	12	Y,Y(ITA)	10Q2
WP10/MF/05	P service	Joining technologies and qualification	12	Y,Y(ITA)	10Q2
WP10/ES/08	P service	Support on Codes & Standards and review of Structural Design Criteria	12	N	10Q2
WP10/MF/01	G	Corrosion Assessment for water cooled components	12	Y(ITA)	10Q2

2.21. NUCLEAR DATA

This mid term activity for 2010 focuses on the development of tools, improvements and update of Nuclear Data files mainly in support of TBM and Broader Approach (IFMIF) activities. In addition nuclear data experiments for validation have to be pursued and measurement techniques still developed.

WP ref.	Activity Type	Activity Title	Duration of contract (months)	Credit Status	Time of Call
WP09/ND/01	G	Development of tools, improvements of data and validation in support of TBM activities	24	N	10Q1
WP10/ND/01	G	Nuclear Data improvements and development of tools	24	N	10Q1

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2.22. ACTIVITIES OF QUALITY ASSURANCE (QA) AND PROJECT MANAGEMENT

A follow-up of activities at the supplier's premises is necessary to assure the correct execution of the contracts in compliance with the technical and management specifications and the contractual Quality Plans. Assistance to F4E is also requested to prepare such activities, including assessment and risk management for the procurements and advise in the definition of the inspection procedures.

This follow-up is achieved by sending qualified Inspectors from verifying bodies to the suppliers' premises (and their subcontractors) to follow and verify the progress of work on F4E's behalf. The inspectors shall be the witnesses of F4E for the correct execution of the manufacturing sequences, manufacturing procedures, test methods, test performance and test reports during the production of the services and components. They shall report on Quality, Production and Schedule to the F4E Technical Responsible Officer defined in the relevant contract.

For a proper preparation of the inspection procedures to be included into the manufacturing contracts and in order to be ready for the time when manufacture will start, a framework contract is planned to be signed in 2010.

Contracts supporting F4E on project management matters are also planned to be signed in 2010. Professional support (1-2 ppy) on this topic from an engineering company is required for specific tasks such as consultancy for the preparation of technical/management specifications and cost/risk estimates, in the definition of internal processes and in the management of the documentation.

WP ref.	Activity Type	Activity Title	Duration of contract (months)	Credit Status	Time of Call
WP10/PO/08	P service	Support of Project Management	5	N	10Q1
WP09/PO/01	P service	Service of inspectors for ITER project contracts follow-up	12	Y	2009

2.23. CONTRIBUTIONS IN CASH

2.23.1. Contribution to CEA for ITER Site Support

F4E shall contribute through CEA/AIF to certain ITER expenditures, in some cases by reimbursing CEA/AIF of costs incurred to provide site support to the ITER Organization, in accordance with the Annex on Site Support attached to the ITER Agreement. The site support activities to be financed by F4E in 2010 shall include fees to be paid to CEA for the use of some of the existing temporary buildings by the ITER Organization in accordance with the arrangement signed between CEA, the Commission and Fusion for Energy in 2009.

2.23.2. Contribution to the ITER Organization

This corresponds to the annual EU share of the 2011 contributions in cash to the ITER Organisation for its management, to be adopted during the next ITER Council.

2.23.3. Contribution to Japan

This cash contribution to Japan corresponds to the transfer of procurement responsibility from EURATOM to Japan under the supervision of the ITER Organisation.

2.24. EXPERTS FOR TECHNICAL ASSISTANCE TO F4E

F4E has issued a call for expressions of interest for individual experts to provide technical assistance in a number of specific areas related to ITER and the Broader Approach. Provision is included here for a total number of approximately 2800 days for experts in 2010.

2.25. URGENT ACTIVITIES IN SUPPORT OF COST AND RISK ASSESSMENT

Some activities (corresponding to a total of about 5 man-years) may be necessary to be carried out in the estimation of costs and in the assessment of risk during the course of the year. Such activities could be both grants and procurements under the 3.1 or 3.2 budget line.

WP ref.	Activity Type	Activity Title	Duration of contract (months)	Credit Status	Time of Call
WP10/PO/01	P service	Urgent Activities in support of cost and risk assessment	5	Y,Y(ITA)	10Q1
WP10/PO/03	P service	Urgent Activities in support of cost and risk assessment	5	N	10Q1
WP10/PO/04	G	Urgent Activities in support of cost and risk assessment	5	Y,Y(ITA)	10Q1
WP10/PO/06	G	Urgent Activities in support of cost and risk assessment	5	N	10Q1

PART III - BROADER APPROACH

3.1. INTRODUCTION

The European contributions to the Broader Approach Activities are financed to a large extent by contributions in kind from the following Members of F4E: France, Germany, Italy, Spain, Switzerland and Belgium. Only in limited number of cases, where no contribution by these Members is foreseen, the contribution will have to be financed by the F4E budget.

For the contributions to be provided by Members of F4E, Procurement Arrangements will be concluded in late 2009 and 2010 between F4E and the Japanese Implementing Agency, subject to the conclusion of corresponding Agreements of Collaboration between F4E and the Members concerned. The list of procurement arrangements planned and the status of implementation is reported below and in the Project Plan.

In the following the activities of Fusion for Energy related to BA are described. The tables provided in the text use the following abbreviations:

Abbreviation	Meaning
WP ref.	Work programme reference, univocally identifying WP items. WPxx/yy/zz, where xx are the last two digits of the year in which WP/budget the activity was first financed, yy is a code identifying the ITER WBS element (if available) or the F4E service in charge, zz is a sequential number for the year.
G	Grant
P	Procurement

All activities indicated within WP2010 are planned to be committed under the 2010 budget.

During the implementation of the work programme activities, F4E may group more activities in a single call, or split one activity in more calls. This will in any case be performed preserving the scope and objective presented in WP2010.

The foreseen time of publication of calls and invitations is indicative only, and based on the present understanding of the project development.

3.2. JT60SA

3.2.1. F4E Funded Activities

For JT60SA, direct procurement activities in 2010 will be limited to support the TF Conductor procurement under the responsibility of F4E which was issued in 2009, and are listed in the table below.

In addition F4E will conclude Procurement Arrangements with JAEA, backed by corresponding Agreements of Collaboration.

WP ref.	Activity Type	Activity Title	Duration of contract (months)	Time of Call
WP10/BA/01	G	Conductor insert manufacture and tests		10Q3

WP.ref.	Activity Type	Activity Title	Duration of contract (months)	Time of Call
WP10/BA/02	P	SULTAN production sample manufacture and tests		10Q3
WP10/BA/03	P	Strand qualification phase tests		2009
WP10/BA/04	P	Strand production control tests		2009
WP10/BA/05	P	SC dummy conductor manufacturing		10Q1

3.2.2. Procurement Arrangements

In accordance with the EU Project Execution Plan for the JT-60SA project, the following Procurement Arrangements are expected to be signed between F4E and JAEA for components under the responsibility of the EU.

- Cryostat Body (2010 Q2). This will cover the supply of the cylindrical part of the cryostat. This supply will be covered by an AoC with CIEMAT (Spain).
- Power Supplies (2010 Q2). This PA will cover the supply of the power supplies for all superconducting magnets as well as for the in-vessel coils. This supply will be covered by AoCs with ENEA (Italy) and CEA (France).
- ECH Power Supplies (2010 Q2). This PA will cover the supply of 2 EC Gyrotrons power supplies. This supply will be covered by an AoCs with CRPP (Switzerland).
- Cryogenic System (2010 Q2). This PA will be for the supply of the entire cryogenic system for the magnet. This supply will be covered by an AoCs with CEA (France).
- Sector Coils power supplies (2010 Q2). This PA will cover the supply of the power supplies for the sector coils. This supply will be covered by an AoCs with CNR-RFX (Italy).

3.3. IFMIF

3.3.1. F4E Funded Activities

In terms of direct contributions from F4E, as part of F4E contributions to the IFMIF/EVEDA BA Project, “cash contributions to the common expenses of the Project Team” are to be foreseen in the 2010 budget for an expected total of 260 k€, this budget will cover the missions outside Japan of the EU members of the Project Team.

In addition F4E will conclude a Procurement Arrangements with JAEA, backed by corresponding Agreements of Collaboration.

3.3.2. Procurement arrangements

Most procurement arrangements for IFMIF/EVEDA are planned to be signed in late 2009. Only a remaining PA for diagnostics is expected for 2010 (Q3) to be backed by an Agreement of Collaboration with CEA (France).

3.4. IFCRC

3.4.1. F4E Funded Activities

No activities for the IFCRC projects are foreseen to be directly funded by F4E in 2010.

3.4.2. Procurement Arrangements

The main procurement arrangement for the IFCRC project, for the supply and maintenance of the Supercomputer for the CSC Subproject, is planned to be signed in the second quarter of 2010. This PA will be backed by a corresponding Agreement of Collaboration with CEA (France).

**APPENDIX I -
TABLE OF ACRONYMS AND ABBREVIATIONS**

A/E	Architect Engineer
AGPS	Accelerator Power Supplies
ALARA	As Low As Reasonably Achievable
ANB	Authorized Notification Body
ANS	Analytical System
AVDEs	Asymmetric Vertical Displacement Event
ATS	Air Transfer System
BSM	Blanket Shield Module
BTP	Build-to-Print
C&I	Control and instrumentation
CFC	Carbon Fibre Composites
CMM	Cassette Multifunctional Mover
CVB	Cold Valve Boxes
CVD	Chemical Vapour Deposition
CXRS	Core Plasma Charge-Exchange Recombination Spectroscopy System
DA	Domestic Agency
DACS	Data Acquisition and Control System
DCLL	Dual Coolant Lithium Lead
DCR	Design Change Request
DEMO	Demonstration Fusion Reactors
DGEBF	Di-Glycidyl Ether of Bisphenol F (impregnation resin)
DIV	Divertor
DNB	Diagnostic neutral beam
DTP	Divertor Test Platform
EAF	European Activation File
EB	Electron Beam
EBBTF	European Breeding Blanket Test Facilities
EC	Electron Cyclotron
EC UL	Electron Cyclotron Upper Launchers
ECH	Electron Cyclotron Heating
EFDA	European Fusion Development Agreement
EFF	European Fusion File
ELM	Edge Localized Mode
EPC	Engineering Procurement Contract
F4E	Fusion for Energy
FS	Functional Specification
FW	First Wall
FWP	First Wall Panel
HAZOP	Hazard Operability studies
HCLL	Helium-Cooled Lithium-Lead

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HCPB	Helium Cooled Pebble Bed
H&CD	Heating & Current Drive
HIP	Hot Iso-static Pressing
HNB	Heating Neutral Beam
HV	High Voltage
HVAC	Heating Ventilation & Air Conditioning
HVD	High Voltage Deck
HW	Hardware
IC	Ion Cyclotron
I&C	Instrumentation and Control
ICH	Ion Cyclotron Heating
IFMIF	International Fusion Materials Irradiation Facility
INB	Installation Nucleaire de Base
IO	ITER Organization
IR	Infra Red
ISEPS	Ion Source and Extraction Power Supplies
ISS	Isotope separation system
ITA	ITER Task Agreement
IVT	Inner Vertical Target
IVVS	In-Vessel Viewing System
LD&L	Leak Detection and Localization
LFS-CTS	Low Field Side – Collective Thomson Scattering
MAR	Materials Assessment Report
MDR	Modified Design Reference
MHB	Material Handbook
MHD	Magneto-Hydro-Dynamic
MIG	Metal Inert Gas
MV	Medium Voltage
NB	Neutral Beam
NBI	Neutral Beam Injector
NBPS	Neutral Beam Power System
NBTF	Neutral Beam Test Facility
ODS	Oxide Dispersion Strengthened
ORE	Occupational Radiation Exposure
P&ID	Process and Instrumentation Diagram
PA	Procurement Arrangement
PF	Poloidal Field
PFC	Plasma Facing Components
PFD	Process Flow Diagram
PIE	Post Irradiation Examination
PMU	Prototypical Mock-Up
PP	Procurement Package
PPC	Pre-Production Cryopump

PrSR	Preliminary Safety Report
PTC	Prototype Torus cryopump
10Q(1,2,3,4)	Quarter 1,2,3,4 2010
QA	Quality Assurance
R&D	Research & Development
RAFM	Reduced Activation Ferritic Martensitic
RF	Radio Frequency
RFCU	Radio Frequency Control Unit
RH	Remote Handling
RMP	Resonant Magnetic Perturbation
RNC	Radial Neutron Camera
RWM	Resistive Wall Mode Control
SDC	ITER SDC (Structural Design Criteria/Code)
SHPC	Safety and Health Protection Coordination
SiC-Dual	SiC/SiC composite material for electrical and thermal Insulation
SS	Steady State
SW	Software
TBM	Test Blanket Module
TCS	Transfer cask System
TES	Test Extraction System
TF	Toroidal Field
TH	Thermal Hydraulical
UT	Ultrasonic
VS	Vertical Stability
VV	Vacuum Vessel
WAVS	Wide Angle Viewing System
WBS	Work Breakdown Structure
WDS	Water Detritiation System
WP	Work programme

**APPENDIX II -
SUMMARY OF THE WP2010 BUDGET**

Ref.	Budget Line	Activity Title	2010 Budget (M€)		
			Grants	Procurements	Cash
	3.1+3.5	Expenditure in support of ITER, credited by ITER IO through PA	11.06	276.18	-
	3.1	Expenditure in support of ITER through host organization	-	0.5	-
	3.1+3.5	Contribution in cash in support of ITER	-	-	60.00
	3.1+3.5	Contribution in cash for transfer of procurements to Japan	-	-	17.70
	3.1+3.5	Design and R&D in support of ITER, credited by ITER IO through ITA	17.88	14.07	-
	3.6	Expenditure budgeted against other revenue	-	-	-
<i>Subtotals</i>			<i>28.94</i>	<i>290.75</i>	<i>77.70</i>
3.1+3.5+3.6		Total ITER construction	397.39		
	3.2	Design and R&D in support of ITER, not credited by ITER IO (incl. materials, TBM, nuclear data)	7.43	6.46	-
3.2		Technology for ITER	13.89		
	3.3	Expenditure in support of Broader Approach	-	0.36	-
	3.3	Contribution in cash in support of IFMIF-EVEDA Project Team	-	-	0.26
<i>Subtotals</i>			<i>-</i>	<i>0.36</i>	<i>0.26</i>
3.3		Technology for Broader Approach and DEMO	0.62		
	3.4	Appointment of experts for Technical assistance to F4E	-	-	1.30
3.4		Other expenditure	1.30		
3		Total operational expenditure	413.20		
<i>Total expenditure by type</i>			<i>36.37</i>	<i>297.57</i>	<i>79.26</i>

Notes

- A table showing the indicative budget for grants to be awarded in this Work Programme, both credited and non-credited by ITER, is provided in Appendix III.
- Figures corresponding to items to be credited by IO through ITA are provisional, and are based on the present understanding of the share of work to be assigned to F4E by IO

**APPENDIX III -
SUMMARY OF THE AVAILABLE BUDGETS FOR GRANTS**

	WBS	CREDITED (in M€)	NOT CREDITED (in M€)
1.1	Magnets	-	-
1.5	Vacuum Vessel	-	0.05
1.6	Blanket	2.10	-
1.7	Divertor	-	-
2.3	Remote Handling	2.84	-
3.1	Vacuum Pumping & Fuelling	1.01	-
3.2	Tritium Plant	0.43	-
3.4	Cryoplant	0.12	-
4.1/4.3	Power Supplies	0.06	-
4.5	CODAC	-	-
5.1	Ion Cyclotron	-	-
5.2	Electron Cyclotron	1.77	-
5.3	Neutral Beam System	0.50	-
5.5	Diagnostics	11.31	-
6.2	Buildings	-	0.15
	Material Development	-	4.51
	Test Blanket Module	-	1.51
	Plasma Engineering	5.11	0.36
	Safety	2.63	-
	Engineering Support	0.56	-
	Nuclear Data	-	0.60
	Urgent activities in support of cost and risk assessment	0.50	0.25
	Broader Approach	-	0.06
	Total	23.94	7.49

NB: Figures shown in this table are the currently estimated values. Modifications may occur within the budget limits.

**APPENDIX IV -
ESSENTIAL SELECTION AND AWARD CRITERIA FOR GRANTS**

As regards grant actions referred to in this work programme, the essential selection and award criteria, in accordance with Articles 165 and 166 of the Implementing Rules of the Financial Regulation, are:

Essential Selection Criteria

- The applicants' technical and operational capacity:
professional, i.e. scientific and/or technological competencies, qualifications and relevant experience required to complete the action.
- The applicants' financial capacity :
stable and sufficient sources of funding in order to maintain the activity throughout the action.

Essential Award Criteria

- Relevance and quality of the proposal with regard to the objectives and priorities set out in this work programme and in the relevant call for proposals.
- Efficiency of the implementation as well as of the management structure and procedures in relation to the proposed action.
- Budget and cost-effectiveness in particular with regard to the objectives and the respected results.

With regard to the specific action, more details will be provided in the call for proposals. Evaluation thresholds and weighting will also be given in the call for proposals.

A proposal which does not fulfil the conditions set out in the work programme or in the call for proposals shall not be selected. Such a proposal may be excluded from the evaluation procedure at any time.

The timetable and indicative amounts for the actions are defined in this Work Programme.

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**APPENDIX V -
MAXIMUM REIMBURSEMENT RATES FOR GRANTS**

The upper limits for the reimbursement of eligible costs for grants are laid down in Article 153 of the Implementing Rules of the Financial Regulation of the Joint Undertaking and are summarised in the following table.

Research, technological development and demonstration activities	40%
Coordination and support actions	100%
Management, audit certificates and other specific activities	100%

