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 2009 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 27 March 2007 establishing the European Joint Undertaking for ITER and the Development of Fusion Energy (hereinafter "Fusion for Energy") and conferring advantages upon it[1] and in particular Articles 6(3)(d) and 11 thereof;

Having regard to the Financial Regulation of Fusion for Energy[2] adopted by the Governing Board on 22 October 2007 (hereinafter "the Financial Regulation") and in particular Article 64 thereof;

Having regard to the Implementing Rules of the Financial Regulation[3] adopted by the Governing Board on 22 October 2007 (hereinafter "the Implementing Rules") and in particular Article 53 thereof;

Having regard to the Fusion for Energy 2008 Work Programme adopted by the Governing Board on 18 December 2007[4] last amended on 31 October 2008[5];

Having regard to the comments of the Executive Committee on the proposal for the 2009 Work Programme at its meeting of 13 November 2008[6];

Having regard to the comments and recommendations of the Technical Advisory Panel provide by written procedure on the proposal for the amended 2008 Work Programme at its meeting on 12-13 November 2008,

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 2009 Work Programme of Fusion for Energy annexed to this Decision is hereby adopted.

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1 O.J. L 90, 30.03.2007, p. 58.
2 F4E(07)-GB03-11 Adopted 22/10/2007
3 F4E(07)-GB03-12 Adopted 22/10/2007
4 F4E(07)-GB04-12 Adopted 18/12/2007
5 F4E(08)-GB07-05 Adopted 31/10/2008
6 F4E(08)-EC10-03 Adopted 13/11/2008

Article 2

This Decision shall have immediate effect.

Done at Barcelona, 4th December 2008

For the Governing Board

Carlos Varandas
Chair of the Governing Board

ANNEX

FUSION FOR ENERGY WORK PROGRAMME 2009 (VERSION 1)

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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 situated 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 addition, F4E is technically managing the technology tasks previously launched by EFDA and that are ongoing.

In accordance with the Financial Regulation, this Work Programme lays down the activities of F4E that are to be implemented and financed through the 2009 budget.

1.2. Assumptions

The 2009 F4E Work Programme (WP2009) is based on the following assumptions:

- The European schedule, agreed with IO, for the procurement of the ITER components was used as basis for this document with a date for the first plasma on 31st July 2018;
- 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 the IO will be provided in time to allow the associated PAs to be signed according to the foreseen schedule;
- 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 2009 to adjust it to the possible ITER developments;
- No additional delays in the ongoing tasks launched under EFDA for which the results may be required to launch certain F4E activities;
- To launch preparatory actions for the Heating and Current Drive systems according to the agreed procurement sharing of ITER components, taking due consideration of the assessment conducted by F4E on the current heating systems mix in the ITER Baseline Design and the possible consequences for the achievement of the ITER scientific goals of optimising the H&CD schemes;

And regarding the Broader Approach activities,

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

1.3. ITER Credits for Preparatory Activities

This WP2009 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 WP2009 as receiving additional (ITA) credits may be cancelled in the event that the IO would not make the requested credits available.

1.4. Overall 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 launch of the procurements for those components on the critical path;
- The continuation of design and R&D activities in areas including Remote Handling, Heating and Current Drive, 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 (divertor, vacuum vessel, shield modules);
- 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.

F4E also 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 launched by F4E.

1.4.2. Broader Approach

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

- The re-baselining of the JT60SA device has been completed in 2008 and is expected to be approved by the BA Steering Committee in Dec 2008. In 2009 procurement on some long lead items will commence while the design will be detailed further in all areas. Most of the procurements will be undertaken through Arrangements with the Voluntary Contributors with the exception of the TF coil conductor which will be carried out directly by F4E;

- The IFMIF-EVEDA project includes four main lines of activity:1) the engineering design of the IFMIF facility; 2) the design, construction, commissioning and operation of an accelerator which is the low energy prototype of the two IFMIF accelerators; 3) the engineering design and validation activities for the Target Facility and 4) the engineering design and validation activities for the Test Facility.. All these activities will be undertaken through Arrangements with the Voluntary Contributors and the PAs for lines 2, 3 and 4 are under preparation.Activity 1 has not started yet due to the lack of staff in the Project Team in Rokkasho;
- For the IFERC Project, to initiate the building of the centre, to continue the DEMO R&D activities and report though joint workshops, with the aim of converging on DEMO design issues, and to prepare the suit of benchmark codes which will be used to prepare the procurement of the super computer. All these activities will be undertaken through Arrangements with the Voluntary Contributors.

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 2009.

Summary of the WP09 Budget (in M€)

Ref.	Budget	Activities	2009 Budget		
			Grants	Procurement	Cash
	3.1+3.5	Procurement in support of ITER	-	180.340	-
1.27	3.1+3.5	Contribution in cash in support of ITER	-	-	25.000
1.27	3.1+3.5	Contribution in cash for transfer of procurements to Japan	-	-	29.200
	3.1	Design and R&D in support of ITER, Credited by ITER	7.300	5.100	-
	3.6	ITER task agreements, Credited by ITER	22.900	39.200	-
1.19	3.1	Site preparation Not Credited by ITER	-	9.000	-
3.1+ 3.5 + 3.6		**Total ITER Construction**	**318.040**		
	3.2	Design and R&D in support of ITER, Not credited by ITER	3.900	10.300	-
3.2		**Technology for ITER and DEMO**	**14.200**		
1.30	3.3	Activities in support of Broader Approach	-	10.000	-
1.31	3.3	Contribution to the Common Expenses of the IFMIF-EVEDA Project Team	-	-	0.210
3.3		**Technology for Broader Approach**	**10.210**		
1.28	3.4	Appointment of Experts for Technical Assistance to F4E	-	-	0.750
3.4		**Other Expenditure**	**0.750**		
3		**Total operational expenditure**	**343.200**		

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 annex II.
- The Work Programme describes activities globally committed under the 2008 budget and for which the contract will be signed in 2009 (not being part of this financing decision).
- Priority 2 items in this Work Programme amount to around MEUR 210 and are intended to be launched in 2009 but committed against the 2010 budget.
- If budget should become available, priority 2 items may be financed via the 2009 Budget using e.g. global commitments or options in agreement with the Executive Committee.

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
WBS	Work Breakdown Structure
PP	Procurement Package
G/P	Grant (G) or Procurement (P)
Title	Title of the Contract
Deliverable	Deliverable of the Contract
ToC	Time of Call
Prio	Priority
DoC	Indicative Duration of Contract (years)
Credit	ITER Credit allocation for that contract: • N: not credited • Y: credited as part of the PA • Yes (ITA): additional credit via ITA

Activities marked with an asterisk (*) and in italics are have been globally committed under the 2008 Budget but the individual commitment and contract is to be signed in 2009.

Activities indicated with Priority 1 are planned to be launched in 2009 and committed in 2009.

Activities indicated with Priority 2 are planned to be launched in 2009 and individually committed in 2010.

In case Priority 2 activities are committed under the 2009 Budget, either individually or globally, this will be done in consultation with the Executive Committee.

1.5. WBS 1.1 -MAGNETS

1.5.1. Summary

Activities will focus on the procurement of the ITER magnets and associated design and R&D to validate the design or assess the manufacturing/testing procedures.

1.5.2. Procurement Arrangements

WBS	Title	ITER Credit (kIUA)	Signature due
1.1.3A+ 1.1.3B	Poloidal Field Coils PF2 to PF6	40.4	Jan 2009
1.1.2A1	Magnet Structures: Pre-compression Rings	0.6	May 2009

1.5.3. Main Procurements

WBS 1.1.1A – Toroidal Field Magnet Windings

Actions are proposed in order to reduce the risk and cost of the manufacture. In particular:

- The radial plates have been kept separate from the main TF winding supply. Due to their large cost, estimated to be about half of the winding pack manufacture, it is proposed to launch a separate call for tender to manufacture one or two full scale prototypes with the goal to demonstrate the manufacturing feasibility and find the cheapest fabrication route. This activity should be carried out in parallel with the JA Domestic Agency.
- For the winding it has been decided to proceed with the full scale production, which includes two years of R&D and preparation to be completed with the manufacture of a full-scale dummy double pancake, to check again the feasibility and reduce risks & costs.

WBS 1.1.2A – Toroidal Field Magnet Structure

Actions include the procurement of twelve fibreglass composite rings (six to be installed in the machine and six spares) for the pre-compression system of the TF coils.

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

Actions include the manufacture of the 5 Poloidal Field coils. The design and specifications of the coils are being finalized. The activities foreseen include the preparation of the procurement contracts and the launch of the procurement of the tooling and the fabrication of the five PF coils.

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

The unit conductor lengths for the TF and PF conductors will be produced. Procurement contracts have been launched in 2008 following the signature of the PAs for the TF conductors in December 2007 and the PF conductors (expected in 2008). The production will be carried out with the following contracts:

- One or two contracts (depending upon the production rate which the suppliers can achieve) for the supply of the Nb_3Sn wire for the TF conductors.
- A contract for cabling and jacketing of all TF and PF conductor lengths, including dummy copper lengths, in order to reduce the equipment, tooling and facility costs. This supply will also include the manufacture of the stainless steel tubes for these conductors. F4E is also investigating the possibility for the fabrication of the conductor lengths which should be produced by the Russian Federation for PF1 (jacketing only) and PF6 (cabling + jacketing) in return for NbTi strand, which will not be purchased by F4E. Negotiations with the Russian Federation DA are in progress.

WBS	Title	Priority	Indicative Number of Contracts	Call Launch	DoC (years)
1.1.1A	Procurement of TF coils: Phase 1: Manufacture of a full-scale dummy double pancake and preparation of tooling for the TF coils	1	1 (Supply)	Launched 2008	3 (phase I of contract)
1.1.1A	Radial Plate Prototypes	1	1-2 (Supply)	Q1	2

1.1.2A1	Magnet Structures: Pre-compression Rings	2	1 (Supply)	Q3	5
1.1.3A1 1.1.3B	Poloidal Field Coils PF2 to PF6 -Tooling and fabrication	2	1 (Supply)	Q3	5
1.1.6A	*Supply of 95 tons of Nb3Sn wire**	*1*	*1-2 (Supply)*	*Launched 2008*	*44 months*
1.1.6C	Cabling and jacketing of TF & PF conductor lengths	1	1 (Supply)	Q1	4
1.1.6C	Chromium-plated Cu strand for TF conductor*	1	1 (Supply)	Launched 2008	2

1.5.4. Design and R&D Activities

WBS 1.1.1A – Toroidal Field Magnet Windings

The R&D activities in support of the F4E procurement strategy include:

- Development of the closure welding techniques in order to assess the feasibility of a joint made by laser welding + horizontal SAW (Submerged Arc Welding). This is a critical activity in preparation for the insertion of the winding pack into the casing. Development of semi-automatic non-destructive inspection techniques, to be applied to the TF coil radial plates and case closure welds, as well as the PF jacket base material and welds;
- Qualification tests on samples of the proposed DGEBF epoxy resin + cyanate ester blend, which is proposed to withstand the integrated irradiation fluence estimated on the TF coils;
- Preliminary design/analysis and cost estimates of the cold test facilities for the TF and PF coils;
- Analysis work to support the design and procurement of the coils, the analysis of the operational and fault electrical conditions to determine the high voltage test values and suggested testing techniques.

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

A support contract is foreseen to be placed in the course of 2009 to perform an independent test of the strand characteristics.

WBS	G/P	Title	Deliverable	ToC	Prio	DoC (years)	Credit
1.1.1A	P (Service)	TF Coil Case Closure Welding	Development of welding procedure and NDE procedures	Q1	1	2	N
	G	Irradiation-Resistant Resin	Independent qualification of proposed high-irradiation resin for TF coils	Q3	2	2	Y
	G	Cold Test Facility Preparation for TF & PF Coils	Detailed design of test facility Testing plan Cost Estimate	Q3	2	2	Yes (ITA)

	G	Analysis Work to Support Magnet Procurement (Engineering Support)	1) Electrical simulations 2) Electromagn. and structural 3) Thermo-hydraulic 4) Error fields	Q2	1	2	Yes (ITA)
1.1.6A & C	G	Extended Charact. of ITER Strands	Definition of the required characteristics of the strand to be qualified for ITER	Q2	1	4	Y

1.6. WBS 1.5 -VACUUM VESSEL

1.6.1. Summary

According to IO decision of early October 2008, the design of VV will evolve on two parallel tracks: one which is the Baseline design, whose maturity is not yet completely assessed as concerning interfaces impact and manufacturing issues, and a new design proposed by EU-DA (and as well by IO) which will be maintained as back-up solution.

1.6.2. Procurement Arrangements

WBS	Title	ITER Credit (kIUA)	Signature due
1.5.1.A	Vacuum Vessel Sector Production	99.36	Jan 2009

1.6.3. Main Procurements

In order to reduce risk of multiple sector rejection and ensure consistency of production, the Procurement of the 7 Sectors will be split into phases, the first of which will include the manufacturing design and fabrication of sector no. 5. Activities such as UT inspection and EB local system, will be implemented during the first Stage Contract to provide the manufacturer with the tools necessary to expedite the production.

The following tasks are necessary to prepare the manufacturing phase and to guarantee the achievement of the technical requirements and possibly reduce costs.

- Procurement of the stainless steel material for the first sector to maintain the manufacturing on the planned schedule.
- Sector 5 procurement, with the engineering and manufacturing design for all Sectors production and including the further development activities shown below:
  - i. Qualification of Ultrasonic Testing (UT) Inspection Procedures one-side butt welds for ITER VV for RCC-MR. The full qualification for use under the RCC-MR Code on the VV sectors will be produced.
  - ii. Local Vacuum EB weld system development.
  - iii. Weld Distortion Control of VV segment manufacture

WBS	Title	Priority	Indicative Number of Contracts	Call Launch	DoC (years)
1.5.1.A	Material for VV Sector no. 5 fabrication	2	1 (Supply)	Q3	2 (Phase I of contract)
1.5.1.A	Vacuum Vessel Sector no. 5 fabrication	2	1 (Supply)	Q3	5 (Phase I of contract)

1.6.4. Design and R&D Activities

Actions are necessary to prepare the manufacturing phase and to guarantee the achievement of the technical requirements:

- Consultancy with ANB about testing and expediting policy during the manufacture of VV sectors;
- Design, FEM analysis and concept design, for VV modified EU-DA proposal and finalization of drawings for manufacturing contract use, for both VV modified and Baseline design;
- Consultancy in support to material procurement.

WBS	G/P	Title	Deliverable	ToC	Prio	DoC (years)	Credit
15.1A	P (service)	Consultancy with ANB about expediting and inspection policy	Study with VV ANB	Q3	2	1	N
	P (service)	Engineering Support	Engineering analysis for EU-DA VV proposal design CAD Models & Drawings for main sector manufacturing	Q1	1	2	Y (ITA)
	G	Corrosion Issues	Results of experiments and tests on rig with different geometries	Q1	1	1	N
	G	Consultancy in support to material procurement	Report on material definition	Q1	1	1	N

1.7. WBS 1.6 BLANKET

1.7.1. Summary

Activities in relation to the Shielding Blanket are:

- to perform the conceptual design of the revised ITER First Wall (FW) and Shield concept for the modules to be procured by EU,
- to further improve the Be/CuCrZr joint performance to cope with the expected new higher power handling requirements,
- to prepare industry for the future blanket procurement.

1.7.2. Procurement Arrangements

None in 2009

1.7.3. Main Procurements

None in 2009

1.7.4. Design and R&D Activities

The main activities are:

- high heat flux and thermal fatigue testing of FW mock-ups fabricated with improved Be/CuCrZr joints, of irradiated FW mock-ups and of FW mock-ups fabricated for the definition of acceptance criteria for the FW series production;
- Be/CuCrZr joining development aiming at improving the performance of the joints and at developing repair techniques;
- CuCrZr power-solid HIP development to make easier the fabrication route of complex FW panels as those next to the NBI openings;
- irradiation and testing of blanket material and joints;
- pre-industrialisation of the HIP fabrication process for the FW and Shield components;
- Be waste disposal from FW mock-ups after destructive examination;
- manufacture of qualification prototypes for the ITER FW and Shield;
- performance of design and analysis work for the conceptual design of the blanket components to be procured by the EU DA.

WBS	G/P	Title	Deliverable	ToC	Prio	DoC (years)	Credit
1.6.1A	G	High heat flux testing of FW mock-ups before and after irradiation, including transportation	Test report	Q4 (2008)	1	2	Yes (ITA)

	G	CuCrZr powder-solid HIP development	Test report	Q1	1	2	Yes (ITA)
	G	Be/CuCrZr HIP joining development	Test report	Q2	1	2	Yes (ITA)
	P (supply)	Be/CuCrZr joint repair technique	Manufacture of mock-ups Study report	Q3	1	2	Yes
	G	Irradiation and testing of powder HIPped 316L SS material and joints	Test report	Q1	1	4	Yes (ITA)
	G	Mechanical characterisation of irradiated and unirradiated CuCrZr alloy	Test report	Q1	1	4	Yes (ITA)
	P (supply)*	*Procurement of CuCrZr alloy material*	*Material for testing*	*Q4 (2008)*	*1*	*5 months*	*Yes (ITA)*
	P (supply)	Pre-industrialisation of the HIP fabrication process for the FW	Manufacture of mock-ups Study and fabrication report	Q3	2	2	Yes
	P (supply)	Manufacture of a ITER FW qualification panel prototypes	Manufacture components Fabrication report	Q1	1	2	Yes (ITA)
	P (supply)*	*Ultrasonic testing of Be-coated FW mock-ups*	*Test Report*	*Q4 (2008)*	*1*	*2*	*Yes (ITA)*
1.6.1B	P (supply)	Pre-industrialisation of the HIP fabrication process for the Shield	Manufacture of mock-ups Study and fabrication reports	Q3	2	2	Yes
	P (supply)	Manufacture of an ITER qualification Shield prototype	Manufacture components Fabrication report	Q1	1	2	Yes (ITA)
	P (supply)	Engineering Support	Conceptual design of ITER Shield and FW panels	Q1	1	3	Yes (ITA)

1.8. WBS 1.7 DIVERTOR

1.8.1. Summary

The main objective is to complete the R&D activities aiming at increasing competition among possible material suppliers and decreasing manufacturing cost. In addition, R&D to develop the full W divertor will be performed.

1.8.2. Procurement Arrangements

WBS	Title	ITER Credit (kIUA)	Signature due
1.7.2B	Divertor Inner Vertical Target	20.2	Feb.2009
1.7.1	Divertor Cassette and Integration	11.2	July 2009

1.8.3. Main Procurements

The following contracts are planned to be launched in 2009:

WBS	Title	Priority	Indicative Number of Contracts	Call Launch	DoC (years)
1.7.2B	Carbon Fibre Composite Materials for the inner vertical target prototype.	2	1 (Supply)	Q2	18 months
1.7.2B	Inner Vertical Target Prototype	2	1 (Supply)	Q3	21 months

1.8.4. Design and R&D Activities

Actions include:

- qualification of an alternative CFC grade with the characterisation and manufacture of representative mock-ups to promote supplier competition;
- placement of a service contract for the follow up of the inner vertical target manufacture;
- manufacturing of small mock ups and medium scale prototypes for the full W divertor;
- qualification of repair techniques on full size plasma facing units to allow the manufacturing cost to be reduced by reducing the scrape rate during series production.

WBS	G/P	Title	Deliverable	ToC	Prio	DoC (years)	Credit
1.7.2 B	G	Characterization of alternative CFC material	Material properties	Q1	1	12 months	Yes (ITA)

	G	Destructive examination of EU qualification prototypes and mock-ups	Interim report on cutting plan Final report	Q1	1	1	Yes (ITA)
	*G**	*Preparation of high-heat flux testing of CFC and W mock-ups: IR examinations and test set up*	*Interim report on infra red testing* *Final Report*	*Q4 (2008)*	*1*	*21 months*	*Yes (ITA)*
	P (service)*	*High-heat flux testing of CFC and W mock-ups (testing execution)*	*Initial report on test set up* *Final Report*	*Q4 (2008)*	*1*	*18 months*	*Yes (ITA)*
	P (supply)	Manufacturing of mock ups with alternative CFC grade	Mock ups	Q1	1	2	No
	P (service)	Monitoring of Inner Vertical Target procurement	Follow up	Q2	1	6	Yes
	P (supply)	Manufacturing of mock ups and prototypes for the full W divertor	Mock up and prototypes	Q1	1	2	No
	P (supply)	Qualification of repair technologies on full size PFC components	Mock ups	Q1	1	2	Yes

1.9. WBS 2.3-REMOTE HANDLING (RH)

1.9.1. Summary

Design and R&D activities will focus on:

i) the development of functional specifications and interfaces, and of the reference design, for the various RH packages allocated to Europe;
ii) development of facilities and prototypes for R&D on the EU RH packages

1.9.2. Procurement Arrangements

WBS	Title	ITER Credit (kIUA)	Signature due
2.3.5	Neutral Beam Remote Handling	6	Nov. 2009

1.9.3. Main Procurements

None in 2009

1.9.4. Design and R&D Activities

Actions will focus on complementing the functional specifications by the definition of a set of interface requirements, in particular the geometrical interfaces of the components to be handled, the VV ports and ducts, hot cell, building etc. The following activities will be implemented for all the WBS's:

- Engineering support activities for studies in general areas such as RH pipe tooling, ATS and IVVS.
- Qualification of radiation hard components (motors, sensors, electronics etc.)

WBS 2.3.2. Divertor Remote Handling:

- Preparation and start of future DTP2 upgrades: 53° toroidal extension of the platform, new end-effectors for CMM, updates on the cassette mock-up, and Cassette Toroidal Mover prototype(including manipulator and tooling)

WBS 2.3.3. Transfer Cask System (TCS):

- Manufacturing of ATS prototype and facility components.

WBS 2.3.4. In-Vessel Viewing System (IVVS):

- Manufacturing of IVVS mock-ups and facility components.

WBS 2.3.5. NB RH:

- Design activities in view of the PA signature (procurement to begin in 2010).

WBS	G/P	Title	Deliverable	ToC	Prio	DoC (years)	Credit
	G	Irradiation of RH components (motors, sensors etc.)	Database on components suitable for use in ITER RH devices	Q1	1	3	Yes
	P (service)	Engineering Support	Studies in areas like: RH pipe tooling and interfaces, Air Transfer System Prototype and IVVS layout studies	Q1	1	1	Yes (ITA)
2.3.2	P (supply/service)	DTP2 extension and upgrades with new prototypes	Manufacturing drawings and construction of DTP2 hardware (movers, manipulator, tooling, platform etc.)	Q3	2	3	Yes (ITA)
2.3.3	*G**	*Studies on transfer cask path in the ITER building and on rescue scenarios; start of preparation of tender packages for ATS prototype*	*Reports*	*Q4 (2008)*	*1*	*2*	*Yes (ITA)*

	P (supply/service)	ATS prototype and related test facility hardware	Manufacturing drawings and construction of ATS prototype and related test facility	Q3	2	3	Yes (ITA)
2.3.4	*G**	*Gathering of requirements for final IVVS;* *Specification of IVVS prototype and start of preparation of tender package* *Lab-test new series*	*Report and drawings* *Test report*	*Q4 (2008)*	*1*	*2*	*Yes (ITA)*
	P (supply/service)	IVVS prototype and related test facility hardware	Manufacturing drawings and construction of IVVS prototype system and related test bed	Q3	2	4	Yes (ITA)
2.3.5	G	Gathering of requirements for NBI RH, and feedback to/from NBI design. Start of engineering design of NBI RH	Report and drawings on the final NB RH System in view of its procurement	Q1	1	2	Yes (ITA)

1.10. WBS 3.1 – VACUUM PUMPING AND FUELLING

1.10.1. Summary

Actions will focus on validation of the design of components via the manufacture and testing of prototypes, e.g. for the torus cryopump (PTC) and heating neutral beam (HNB) cryopanels. In order to determine the gas flow through the divertor, the conductance through ducts with divertor relevant cross-sections will be measured.

1.10.2. Procurement Arrangements

None in 2009

1.10.3. Main Procurements

None in 2009

1.10.4. Design and R&D Activities

WBS 3.1.1 – Cryopumps

Actions are described in the table below:

WBS 3.1.3 - Leak Detection

Actions are described in the table below:

WBS	G/P	Title	Deliverable	ToC	Prio	DoC (years)	Credit
3.1.1	*G**	*Completion of final design for the PTC and testing of PTC in TIMO-2 to qualify design. Up-grading of TIMO-2 facility7.*	*Design for PTC and technical specs for manufacturing. Upgraded TIMO-2 facility*	*Q1*	*1*	*4*	*Yes (ITA)*
	*G**	*Development/ design of vacuum/ cryopump instrument.*	*Design of instrument. needed for vacuum components*	*Q1*	*1*	*8 months*	*Yes (ITA)*
	P (supply/ service)	Manufacture of the PTC and Follow-up contract	PTC available at testing facility	Q3	1	20 months	Yes (ITA)
	G	Experimental validation of the conductance code for ITER piping[8]	Additional conductance data in the transitional flow range through divertor and duct	Q3	2	1	Yes (ITA)
	G	Impact of disruption mitigation gas flows on the vacuum pumping system. Fatigue tests on bellows for the HNB cryopanels.	Quantify the limitations of the pumping system to cope with disruption mitigation events and time varying loads	Q3	2	1	Yes (ITA)
	G	Optimisation study on flow distribution and pressure loss in manifolds in HNB cryopumps	Determine pressure loss in HNB cryopump	Q3	1	6 months	Yes (ITA)
	G	Activities for final design of NB cryopump mockup and validation via pumping tests, etc. in TIMO-2[9]	Final design of NB cryoump mockup	Q2	1	20 months	Yes (ITA)
	P (supply)	Manufacture of prototype mockup of the NB cryopanels.	Prototype mock-up of NB cryopanels available at testing facility	Q2	1	6 months	Yes (ITA)

[7] Unique Beneficiary (FZK): Unique facility: TIMO-2 for testing purposes – monopoly situation
[8] Unique Beneficiary (FZK): Unique facility: TRANSFLOW for testing purposes – monopoly situation
[9] Unique Beneficiary (FZK): Unique facility: TIMO-2 for testing purposes – monopoly situation

	G	Conceptual design for the CVBs.	Supply of material	Q1	1	10 months	Y (ITA)
3.1.3	G	Optimisation and performance studies for leak detection system including proof-of-principle tests (part 1). Review of leak localization concepts and their possible realization.	Study on performance and optimisation of leak detection system and plan for Leak Localisation system concept	Q2	1	1	Y (ITA)
	G	Conceptual design of leak detection system with update of PFDs and P&IDs. Optimisation and performance studies for leak detection system including proof-of-principle tests (part 2).	Conceptual design of leak detection system and study on performance and possible optimisation	Q3	2	2	Y (ITA)
	P (service)	Engineering Support	Production of PFDs and P&IDs for Leak Detection System	Q3	2	4 months	Y (ITA)

1.11. WBS 3.2 – TRITIUM PLANT

1.11.1. Summary

i) Finalisation of system studies for the ITER Isotope Separation System (ISS) and Water Detritiation System (WDS), including Process Flow Diagrams (PFD), Process and Instrumentation Diagrams (P&ID), Hazard and Operability (HAZOP) studies and technical specification for the fabrication of WDS-tanks;

ii) A cost assessment for the procurement of the Analytical System (ANS) (covered by 100% ITER Fund) is also planned in order to evaluate the possibility for F4E to participate to a future possible Call for Interest by ITER

1.11.2. Procurement Arrangements

None in 2009

1.11.3. Main Procurements

None in 2009

1.11.4. Design and R&D Activities

WBS 3.2.3 + 3.2.5 - Hydrogen Isotope Separation System and Water Detritiation System

Actions are described in the table below:

WBS 3.2.5 - Water Detritiation System

Actions are described in the table below:

WBS	G/P	Title	Deliverable	ToC	Prio	DoC (years)	Credit
3.2.3 + 3.2.5	G	Finalization of the system capacity and enhancements studies for ISS and WDS (Part 1)	Conceptual Design	Q1	1	10 months	Yes (ITA)
	G	Finalization of the system capacity and enhancements studies for ISS and WDS (Part 2)	Conceptual Design	Q3	2	10 months	Yes (ITA)
	P (service)	Engineering Support	Production of PFDs & P&IDs for ISS and WDS	Q3	2	4 months	Yes (ITA)
	*G**	*Test of a further type column packing (CY)*[10].	*Determine of hydrogen (tritium) hold-up*	*Q1*	*1*	*6 months*	*Yes (ITA)*
	G	Studies on overpressure and over-temperature protection for ISS and WDS	Description of a system to control over-pressure/ temperature situations	Q3	2	6 months	Yes (ITA)
3.2.5	G	Safety studies (HAZOP) for WDS	HAZOP study of the system	Q3	1	6 months	Yes (ITA)
	G	Preparation of tender specs for WDS-Tanks	Technical specs and drawings for the proc. of the tritium holding tanks	Q2	1	6 months	Y
	P (service)	Engineering Support	Production of drawings for the procurement of WDS tanks	Q2	1	3 months	Y
3.2.6	P (service)	Engineering Support	Cost assessment of the ANS package	Q3	2	4 months	N

[10] Unique beneficiary (FZK). Unique facility: Tritium Laboratory.

1.12. WBS 3.4 -CRYOPLANT

1.12.1. Summary

Actions will focus on the optimisation of cryoplant procurement sub-packages directly under F4E responsibility and in strategic activities like flow-dynamic analysis, operational modes analysis and test program.

1.12.2. Procurement Arrangements

None in 2009

1.12.3. Main Procurements

None in 2009

Design and R&D Activities

Actions are described in the table below:

WBS	G/P	Title	Deliverable	ToC	Prio	DoC (years)	Credit
3.4.1	P (service)	Optimization of Cryoplant Design	LN2 and 80K loop optimization	Q1	1	1	Y
	P (service)	Engineering support	Cryoplant Process Design Analysis	Q1	1	1	Y
	G	Cryoplant Design Review	Optimization of the integrated conceptual design of all cyoplant sub-systems	Q2	1	1	Y
	G	Cryogenic Test Loop	Detailed engineering, procurement follow up and installation	Q3	2	2	Yes (ITA)
	G	Numerical flow-dynamic analysis	Numerical flow-dynamic analysis of operation and transient modes	Q3	2	1	Yes (ITA)

	G	Cryoplant Procurement Preparation	Preliminary Functional Specs for Cryoplant sub-systems	Q3	2	3	Y

1.13. WBS 4.1 and 4.3 – POWER SUPPLIES

1.13.1. Summary

Actions to prepare for the procurement of the Pulsed Power electrical network and the Steady State electrical network including:

i) direct support to PA activities as requested by IO (finalization of the technical requirements for the PA);
ii) qualification of components with respect of operation under magnetic field;
iii) refinement of costs and schedule analysis.

1.13.2. Procurement Arrangements

WBS	Title	ITER Credit (kIUA)	Signature due
41.1A; 43.8A; 43.8B; 43.8C (EU25%)	Pulsed Power & Steady State Power Supply	31	Sep 2009

1.13.3. Main Procurements

None in 2009

1.13.4. Design and R&D Activities

Actions are described in the table below:

WBS	G/P	Title	Deliverable	ToC	Prio	DoC	Credit
4.1.1.A 4.3.8 A/B/C	P (service)	Finalization of the technical requirements for the PA	Functional specs	Q3	2	9 months	Yes (ITA)
	P (service)	Engineering Support	Cost and schedule analysis and electrical simulations	Q3	2	6 months	N

	G	Technical specs of the qualification contract	Tech specs for the qualification program	Q3	2	6 months	Yes (ITA)

1.14. WBS 4.5 - CODAC

1.14.1. 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. The Fusion for Energy contributions will be credited by ITER Task Agreements and will be implemented through Grants and Service Contracts.

1.14.2. Procurement Arrangements

Not applicable

1.14.3. Main Procurements

Not applicable

1.14.4. Design and R&D Activities

The ITER CODAC Work Plan is still a preliminary development phase which limits the level of detail here. F4E will respond positively in 2008 to an ITER call for "Technical Specification and Statement of Work for developing a Plant System Simulator and a prototype Fast Control Plant System" and the corresponding Grant and Procurement will be launched in 2009. In addition, during F4E will support ITER in a number of tasks. As soon as a detailed ITER CODAC Workplan is received a strategy for the F4E responses to Calls will be drawn up.

WBS	G/P	Title	Deliverable	ToC	Prio	Credit
n/a	G	Specify and Develop a Plant System Simulator and a prototype Fast Control Plant System	(i) Design and implement a Plant System Simulator. (ii) Prototype technology for a fast high performance Plant System.	Q1	1	Yes (ITA)
	P (supply/ service)	ditto	Hardware required for prototype plant system simulator and High Performance Plant System.	Q1	1	Yes (ITA)
	G	Technical support for the definition and design of CODAC.	Grants in response to ITER Calls	Q2	1	Yes (ITA)
	P (service)	Technical support for the definition and design of CODAC.	Designs and Technical Specifications	Q1	1	Yes (ITA)

1.15. WBS 5.1.1 – ION CYCLOTRON H&CD ANTENNA

1.15.1. Summary

The IC Antenna procurement type is Build-to-Print, with 100% EU sharing. The original PP included the ICH antenna port plug with an internal matching system, a spare antenna and parts of a testing facility. The procurement arrangement is foreseen in 2011. The antenna design is at conceptual level and two years of design and R&D work are necessary to produce the built to print design. The scope of WP 2009 is to launch contacts and grants to progress towards the built to print design: basic R&D, prototyping and design analysis.

1.15.2. Procurement Arrangements

None in 2009.

1.15.3. Main Procurements

None in 2009.

1.15.4. Design and R&D Activities

Actions include:

- The antenna mockup electrical measurements and the detailed design of an ICH antenna, which will incorporate the results of the following R&D:
- For the vacuum window – materials compatible with long-pulse operation and water cooling at high temperature; BeO properties, characterization of bonding methods, braze qualification/optimization, H embrittlement of Ti alloys, vacuum compatibility of Ti and other tests as needed.
- Faraday screen bar (fabrication technology similar to the first wall but the attachment of the bar is specific to this design) with test at high power density; qualification of the screen protection bars, validate thermal capability of the bars. Evaluate industrial capability for plating and test small prototypes.
- Specify the RF grounding and the diagnostics (RF voltage probes, arc detection system, reflectometer, and study other possible diagnostics)
- Upgrade the existing test stand to connect to hot water cooling system and other modifications in preparation for RF tests.

WBS	G/P	Title	Deliverable	ToC	Prio	DoC (years)	Credit
5.1.1	G	Detailed design of the ITER ICH antenna	Report on antenna mockup measurements Detailed design of the ICH antenna Incorporation the R&D results in the design as a start of BtP	Q1	1	2	Yes (ITA)

	P (service)	R&D of RF windows and Faraday shield	Characterisation of window materials, bonding methods, braze qualification/ optimisation, H embrittlement of Ti alloys, and plating Ti. Validation of construction of FS protection bars (with and without Be) in preparation for tests. Technical specifications, follow up of R&D and report of the results	Q1	1	2	Yes (ITA)
	P (service)	R&D Faraday shield (with Be) plating	Validation of thermal capability of FS protection bars Evaluate industrial plating capability and test small prototypes, etc Technical specifications, follow up of R&D and report of the results	Q1	1	2	Yes (ITA)
	P (service)	Diagnostics and grounding	R&D on diagnostics and grounding as determined by the evolution of the design Technical specifications, follow up of R&D and report of the results	Q3	2	2	Yes (ITA)
	P (service)	Upgrade RF test facility for test of RF components	Upgrade test stand in preparation for RF tests Technical specifications, follow up of R&D and report of the results	Q1	1	2	Yes (ITA)

1.16. WBS 5.2 ELECTRON CYCLOTRON

WBS 5.2.1B –ELECTRON CYCLOTRON UPPER LAUNCHER

1.16.1. Summary

Actions to launch contacts and grants to finalize the design, substantially progress prototyping and analysis, and prepare documentation in accordance with the schedule for the 4 Upper Electron Cyclotron Upper Launchers (EC UL), for MHD mode control in ITER. The procurement will be carried out based on two PAs between IO and F4E.

1.16.2. Procurement Arrangements

None in 2009.

1.16.3. Main Procurements

None in 2009.

1.16.4. Design and R&D Activities

Actions include:

- Procurement of a prototype of the First Wall Panel and Blanket Shield Module, joining technique with a mock-up First Wall Panel, others and required instrumentation for testing.
- Procurement of mm-wave components for testing including: steering mechanisms, mirrors, tapers and instrumentation required for testing.
- Procurement of CVD window, isolation valves, auxiliaries and required instrumentation for testing.
- Procurement of some components for dummy launcher tests, including; dummy side plates, closure plate and required instrumentation for testing
- Independent verification of cost estimates, analysis and maintenance concepts
- Produce final design of the launcher, carry out and document testing, analyse performance and control, produce documentation (including that required for the first PA for windows, isolation valves and related components)

WBS	G/P	Title	Deliverable	ToC	Prio	DoC (years)	Credit
5.2.1B	P (supply)	EC UL prototypes	Prototype FWP, BSM, joining technique with (mock) FWP, others and instrumentation Steering mechanisms, mirrors, tapers, other mm-wave components and instrumentation. CVD window, isolation valves, auxiliaries, others and instrumentation.	Q1&2	1	2	Yes (ITA)
	P (supply)	Components for dummy launcher tests (part 1)	Dummy side plates, closure plate, others + required instrumentation for testing	Q2	1	2	Yes (ITA)
	P (service)	Engineering analysis	Independent verification of cost estimates, analysis and maintenance concepts	Q1	1	2	Yes (ITA)
	G	Detailed design, analysis, testing and documentation	Final design of the launcher, Carry out and document testing, analysis (including performance and control) documentation	Q2	1	2	Yes (ITA)

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

1.16.5. Summary

Actions to continue the development of the European gyrotron for ITER will continue with the tests on the refurbished first prototype aimed at demonstrating the 2MW coaxial cavity concept for ITER. In parallel, investigations for the improvement of some internal components of the tube will be pursued in view of the 2nd ITER prototype. These steps will provide essential information for the decision between the 2MW coaxial concept and the more traditional 1MW cylindrical one, planned for the end-2009/ start-2010. In addition, support will be provided to the IO on some critical issues on the area of ECH, e.g. space

allocation in the RF building, preparation of specification for the PA and the EC Power Supplies will be provided. The procurement of a 2MW, continuous operation (CW) dummy load will be launched based on specifications from the prototype loads used in the tests with the 1st prototype gyrotron.

1.16.6. Procurement Arrangements

None in 2009.

1.16.7. Main Procurements

None in 2009.

1.16.8. Design and R&D Activities

Actions are described in the table below:

WBS	G/P	Title	Deliverable	ToC	Prio	DoC (years)	Credit
5.2.3	G	Tests with the refurbished 2MW 1st prototype gyrotron	Execution of experiments .Final Report	Q2	1	1	Yes
	G	Support for ITER Organization (Task agreement)	Preparation of the PAs for the gyrotrons and power supplies, and analysis of the design and performance of the gyrotron and PS system Final Report	Q3	2	2	Yes (ITA)
	*G**	*Design and development of the EU gyrotron*	*Technical reports with results of the design activities*	*Q4 (2008)*	*1*	*1*	*Yes*
	P (supply)	2MW, CW, dummy load and other auxiliaries for the CRPP EC Test Facility	Procurement of a 2MW, CW, dummy load for the 2nd prototype Additional power supplies for the gyrotron magnet	Q1-Q3	1	2	Yes
	P (supply)	CVD gyrotron window	Procurement of a spare CVD window for the EU gyrotron prototype	Q2	1	1	Yes

	P (service)	Engineering Support and Analysis	Cost and schedule, He-free magnets	Q2	1	1	Yes
	P (supply)*	*Refurbishment of the 1st prototype of 2MW coaxial gyrotron*	*Supply of the item*	*Q4 (2008)*	*1*	*1*	*Yes*
	P (supply)*	*Supply of extra consumables for gyrotron testing*	*Supply of liquid helium*	*Q4 (2008)*	*1*	*1*	*Yes*
5.2.4	P (service)	Design and verification of the PS system	Final specifications of the PS system and verification of the preliminary design	Q3	2	1	Yes

1.17. WBS 5.3 – NEUTRAL BEAM SYSTEM

1.17.1. Summary

Actions for the development of the NB system and the preparation of the technical specifications of NB components, including the construction of Elise, the conclusion of procurement contracts to meet the EU obligations foreseen in the ITER Agreement and progress the Design and R&D covering the NB components. As concerns the Neutral Beam Test Facility, F4E will engage into construction of the Facility if and when Euratom takes this obligation.

1.17.2. Procurement Arrangements

WBS	Title	ITER Credit (kIUA)	Signature due
5.3.x	The full size ITER injector Ion Source Test Facility and MV Test Facility	60 + 8.8 (from IO R&D budget)	TBD

This PA is specific and 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 the subject of an in-kind procurement of the EU.

1.17.3. Main Procurements

None in 2009.

1.17.4. Design and R&D Activities

WBS 5.3.2 - NB-Beam Source and HV Bushing & WBS 5.3.3 - NB-Beam Line Components

Actions on the NB source, the HV bushing and the beamline components:

- The development of the ITER half-size source with extraction at IPP, Garching, will be implemented with the preparation of the test facility ELISE.
- Use of ultra-high voltage facilities for experiments on insulation in vacuum and conditioning techniques.
- R&D on manufacturing techniques for NB components and preparation of technical specifications.

WBS 5.3.4 - NB-Pressure Vessel and Magnet Shielding & WBS 5.3.5 - NB-Active Correction and Compensation Coils

Actions on the NB pressure vessel, the magnetic shielding and the correction and compensation coils

- Design of the "NB components outside the scope of the NB Test Facility", which include the beam line and beam source vessels, the passive magnetic shield, the drift duct, the active correction and compensation coils and the fast shutter.
- R&D will be carried out on the large metallic seal required for the beamline absolute valve.

WBS 5.3.x – Neutral Beam Test Facility (NBTF)

Actions for the Neutral Beam Test Facility are as follows:

- The detailed design and technical specification of the components and infrastructure of the NBTF will be undertaken
- Procurement of hardware for the Ion Source Test Facility will commence
- Procurement of infra-structure for the NBTF will commence
- Industrial cost and scheduling. Technical consultancy including assessment of technical documents.
- procurements under 5.3.x related to NBTF construction are subject to the conditions described above in §1.17.1.

WBS	G/P	Title	Deliverable	ToC	Prio	DoC (years)	Credit
5.3.2	P (service)	ELISE experiment preparation[11]	ELISE test facility ready for operation Final Report	Q1	1	2	N
	*G**	*Continuation of the development of RF ion source*	*Technical report on the outcome of the activities*	*Q4 (2008)*	*1*	*1*	*N*
	G	R&D on existing facilities	Reports on experiments	Q3	2	3	Yes (ITA)

[11] Unique beneficiary (IPP): Unique facility – ELISE – Monopoly situation

	P (service)	Specific R&D on manufacturing technologies	Hardware and tests. Final Report	Q3	2	2	Y
5.3.4 + 5.3.5	G	Components outside the scope of the NB test facility	Complete Design	Q1	1	2	Yes (ITA)
	P (service)	R&D on large metallic seal	Test Final Report	Q3	2	2	Yes (ITA)
5.3.x	G	Components and infrastructures of the NBTF[12]	Detailed design/technical specifications and procurement follow-up	Q1	1	2	Y
	G*	Design, development and specifications of the NBTF system.[13]	Details of the design	Q4 (2008)	1	1	Yes (ITA)
	P (supply)	Ion source test facility	Hardware	Q1	1	3	Yes (ITA)
	P (supply)	Infrastructures of the neutral beam test facility	Hardware	Q1	1	3	Yes (ITA)
	P (service)	Engineering Support and Analysis	Industrial cost and scheduling Technical consulting	Q1-Q3	1	1	Yes

1.18. WBS5.5 – DIAGNOSTICS

1.18.1. Summary

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

[12] Unique beneficiary (Consorzio RFX): Unique facility – NBTF – Monopoly situation
[13] Unique beneficiary (Consorzio RFX): Unique facility – NBTF – Monopoly situation

and testing of relevant components; and assessment of the Procurement Arrangement technical specifications.

Most of the diagnostic procurement packages include a mixture of functional specification components and detailed design specification components (primarily in the vacuum vessel). These procurement packages do not follow the functional WBS of the ITER systems, but are nevertheless expected to form the basis of the Procurement Arrangements issued by ITER IO. WBS elements associated with the principal diagnostic systems or components in each package are indicated.

The diagnostic Procurement Packages for which the EU is responsible are:

i. Diagnostic Procurement Package 1, including low field side Plasma Position Reflectometer (WBS 55 F.03)

ii. Diagnostic Procurement Package 2, including Core Plasma Charge-Exchange Recombination Spectroscopy system (CXRS) (WBS 55 E.01)

iii. Diagnostic Procurement Package 11, including Equatorial Visible/IR Wide-Angle Viewing System (WAVS) (WBS 55 G.01) and Radial Neutron Camera (RNC) (WBS 55 B.01)

iv. Diagnostic Procurement Package 14, including Core Thomson Scattering system (LIDAR) (WBS 55 C.01)

v. Diagnostic Procurement Package 21, including Bolometers (WBS 55 D.01) and Pressure Gauges (WBS 55 G.03)

vi. Diagnostic Procurement Package 22, including Magnetics Diagnostic (in-vessel and ex-vessel) (WBS 55 A.01-A.06)

vii. Diagnostic Procurement Package 26, includes Thermocouples (in-vessel and inner-divertor target) (WBS 55 G.11)

viii. Diagnostic Procurement Package 30, In-vessel Services (Cables, Conduits, Feedthroughs and Connectors) (WBS 55 N.01)

ix. Diagnostic Procurement Package 34, including enabling of Low Field Side Collective Thomson Scattering system (LFS-CTS) (WBS 55 C.07)

The EU will be responsible for supply, or enabling, of diagnostics in the nine procurement packages listed above. Two of these packages (11 and 21) contain more than one diagnostic system and four packages (1, 2, 11 and 14) include responsibility for provision of port plugs and diagnostic radiation shielding modules, together with the design activities to integrate all diagnostics using these ports (which include those of other ITER Parties).

1.18.2. Procurement Arrangements

WBS	Title	ITER Credit (kIUA)	Signature due
5.5	All Procurement Arrangements for diagnostics (not yet defined)	35.487	July 2009

1.18.3. Main Procurements

None in 2009.

1.18.4. Design and R&D Activities

Actions are described in the table below:

WBS	G/P	Title	Deliverables	ToC	Prio	DoC (years)	Credit
1 21 22 26 30	G	Complete Design of in-vessel Diagnostics to Conceptual Design Review level	Recommendations for diagnostic system-level optimisations Synthesis of R&D and evaluation of diagnostic prototypes Proposals for the design of optimised diagnostics Assessment of diagnostic measurement requirements in context of design status Quantification of impact of QA and RAMI requirements	Q1	1	3	Y Yes (ITA)
22	*G**	*R&D on ex-vessel magnetics and construction of a magnetics test facility*	*Design report and test facility*	*Q4 (2008)*	*1*	*1*	*Yes (ITA)*
	P (supply)	Supplies and support for design of Magnetics Diagnostic	Prototypes including magnetic sensors, sensor casings, electrical platform and electronics	Q2	1	2	Y Yes (ITA)
1	P (supply)	Supplies and support for design of Plasma Position Reflectometer	Components for mock-up of in-vessel transmission lines Prototypes including specialist waveguide, vacuum window and quasi-optical components Computing resources	Q3	1	2	Y Yes (ITA)
21	P (supply)	Supplies and support for design of Bolometers and Pressure Gauges	Prototypes including bolometer and pressure gauge elements and assemblies	Q3	1	3	Y Yes (ITA)

30	P (supply)	Supplies and support for design of In-vessel Services Components	Prototypes including cables and conduits	Q2	1	3	Y
2 11 14 34	G	Complete Design of port plug-based Diagnostics to Conceptual Design Review level	Recommendations for diagnostic system-level optimisations Synthesis of R&D and evaluation of diagnostic prototypes Proposals for the design of optimised diagnostics Assessment of diagnostic measurement requirements in context of design status Quantification of impact of QA and RAMI requirements	Q3	2	3	Y Yes (ITA)
11 14	G	Complete designs of generic equatorial port plug and representative internal shield modules	Design of generic equatorial port plug and internal shielding CATIA models and 'draft' engineering drawings	Q1	1	1	Y Yes (ITA)
1 2 11 14	G	Port plug design, testing and diagnostic integration	Design of generic upper port plug and internal shielding, including models and 'draft' engineering drawings Preliminary design integration for diagnostics in upper, equatorial and divertor ports Proposals for port plug and payload testing strategies	Q3	2	3	Y
	P (supply)	Supplies and support for design of equatorial and upper port plugs	Prototype port plug components and assemblies	Q3	2	2	Y
	P (service)	Engineering Support for diagnostic integration	Analysis of remote handling compatibility for diagnostic port plug integration Mechanical engineering analysis for diagnostic port plug integration	Q3	2	2	Y

All	G	Irradiation and post-irradiation testing of diagnostic components and assemblies	Neutron and Gamma irradiated samples Results of post-irradiation testing Development and popultation of radiation effects database	Q3	2	3	Y Yes (ITA)
2 11 14	G	Development of design solutions for optimising first mirror lifetime	Strategy for identifying solutions for first mirrors on affected EU diagnostics Tests of identified damage mitigation strategies	Q3	2	2	Y

1.19. WBS 6.1 SITE and WBS 6.2 BUILDINGS

1.19.1. Summary

Actions include bringing the ITER building design from conceptual to preliminary. The approved changes, since 2001, and safety requirements contained in the Preliminary Safety Report (now submitted to the Licensing Authorities) needed also to be systematically included in the design

The outcome of the activity will be the preparation of the input data to launch the contract for the Architect Engineer (A/E) of the Tokamak complex. The procurement contract shall include the following main topics:

- General support to F4E on tender preparation, follow-up of A/E and construction contracts;
- Health and Safety Coordination Protection related to F4E responsibility (general rules and follow-up);
- Architectural and Engineering Services covering the preparation of the detailed specifications (1st part: study) for all buildings and the support to the tender;
- PF Coil Winding Building: the design and construction, including follow-up, of this building;
- Tokamak pit excavation and drainage: for the early works of excavation of the time critical buildings in anticipation of the final detailed design of the complex;
- Seismic Isolation: covering a fundamental topic on the critical path for nuclear building;
- Value engineering for ITER buildings;
- Amendment of the existing contract with CEA/Agence ITER France (AIF).

  In addition F4E will finance together with CEA/AIF other site and support activities of Euratom as the ITER Host Party in accordance with the Annex on Site Support attached to the ITER Agreement and Arrangement between F4E, CEA/AIF and the Commission setting out the detailed site support activities and the attribution of the financial responsibility to be signed among the parties."

1.19.2. Procurement Arrangements

WBS	Title	ITER Credit (kIUA)	Signature due
6.2.P2.EU.02**	Architectural and Engineering Services	54.92	Jan 2009
6.2.P2.EU.03**	Tokamak pit excavation and drainage	7.85	Jan 2009
6.2.P2.EU.04**	Seismic Isolation Pads & Assembly Hall Cranes	19.22	Jan 2009
6.2.P2.EU.05**	Tokamak Complex basemat and sub-basemat	15.30	Oct 2009
6.2.P2.EU.06**	East Buildings	228.71	Oct 2009
6.2.P2.EU.07**	West Buildings	36.48	Oct 2009
6.2.P2.EU.09**	ITER Office Building	14.12	Jan 2009

** F4E and IO have tentatively agreed a new subdivision of the Procurement Arrangements related to the ITER building construction (still to be formalised).

1.19.3. Main Procurements

WBS	Title	Priority	Indicative Number of Contracts	Call Launch	DoC (years)
6.1	Actualization of Value of existing contract with AIF	1	1 (service)	Dec 2008	3
6.1	Contract with AIF on pre-excavation activities	1	1 (service)	Dec 2008	6 months
6.2	General Support-to-the-Owner Contract for the procurement of ITER Buildings	1	3 or 5 (service)	Nov 2008	7
6.2	General Safety and Health Coordination Protection for ITER Buildings	1	2 or 3 (service)	Q1	7
6.2	Architect Engineer for the procurement of ITER Buildings (studies part)	1	1 (service)	Dec 2008	2
6.2	PF Coil Fabrication Building Design-and Build: Phase 1 : design Phase 2: construction	 1 2	2 or 3 (service/works)	Dec 2008	1 (Phase 1)
6.2	Excavation and drainage of the Tokamak Complex Foundations: Phase 1: up to -10 m Phase 2: from -10 m to the bottom	 1 2	1 or 2 (works)	Q1	0.5 (Phase 1)
6.2	Tokamak Complex Seismic Isolators Fabrication	1	1 (supply)	Q1	1
6.2	Buildings value Engineering	1	1 or 5 (service)	Q1	1

6.2	Revision of cost estimates and construction schedule of ITER building*	1	1 (service)	Q4 (2008)	3 months

1.19.4. Design and R&D Activities

Actions are described in the table below:

WBS	G/P	Title	Deliverable	ToC	Prio	**DoC** (years)	Credit
6.2	**P (service)**	Analysis, design optimization and cost reduction strategies for the ITER building structures.	**Models and reports**	**Q1**	**1**	**1**	**N**
	G	Participation of F4E in European and international benchmarks for civil engineering codes in support to the design and assessment of the ITER building structures.	**Models and reports**	**Q1**	**1**	**1**	**N**

1.20. MATERIALS DEVELOPMENT

The activities in 2009 include EUROFER, EUROFER ODS (oxide dispersion strengthened) EUROFER and SiC-Dual composite material. Actions are described in the table below:

WBS	**G/P**	**Title**	**Deliverable**	**ToC**	**Prio**	**DoC (years)**	**Credit**
N/A	G	EUROFER base materials & welds for TBM use: Irradiation campaigns Characterization and validation	Stage-1a to complete data base for design analyses and licensing process and qualification program for base and weld material..	Q1	1	4	N
	G	EUROFER and EUROFER welds Characterization and for TBM use.	Stage-1b to complete data base for design analyses and licensing process Focus to characterize under fusion environment	Q1	2	2	N
	G	EUROFER Qualification of welds for TBM Irradiation campaigns for qualification of welds for TBM	Stage-2 to complete data base for design analyses and licensing process; (second batch of material produced from mock-up fabrication)	Q3	2	4	N

	P (service)	EUROFER TBM design rules Rules for welds	Stage-1 Industrial assessment. Strategy for future cooperation with Associates	Q1	1	2	N
	P (service)	EUROFER TBM design rules High Temperature rules	Stage-1: Review by industry. Evaluation of current proposals. Definition of future steps	Q2	2	2	N
	G	EUROFER design rules (Creep-fatigue)	Stage 1- Draft design rules for creep-fatigue. Justification from accompanying tests	Q1	1	2	N
	*G**	*Qualification of EUROFER for TBM*	*Maintenance of database. Design code development*	*Q4 (2008)*	*1*	*1*	*N*
	G	EUROFER data base and design rules	Maintenance and upgrade of data base and design allowables for TBM design	Q3	2	2	N
	G	Development: EUROFER ODS [Optimisation of properties]	Stage-1: Improvements of properties	Q1	1	2	N
	G	Development of EUROFER and EUROFER ODS [Optimisation of properties and processes] EUROFER ODS irradiation on Beam and n-Irradiation campaigns]	Improvement of EUROFER towards low activation Optimisation of ODS properties Stage-2: Improvement of fabrication processes and preparation for procurement Study stability of nano-clusters under irradiation	Q2	2	2	N
	G	Development of SiC-SiC composites	Qualification of SiC-Dual material fabricated by industry in 2008, Stage-1: Basic physical properties.	Q1	1	2	N
	G	Development of SiC-SiC composites Basic characterisation and irradiations	Stage-2: Basic characterisation and first screening of degradation of properties under irradiation	Q3	2	3	N

1.21. TEST BLANKET MODULES

Acitons include the development of TBM box fabrication procedures and feasibility/test mock-ups of TBM box components, delivery of the HCLL/HCPB TBMs Preliminary Safety Reports, experimental activities in support of selection/qualification of tritium extraction technologies, development of predictive tools and of supporting experimental activities, development and characterization of functional materials (breeder, neutron multiplier), conceptual design of Dummy TBMs Plug and support to upgrade test facilities.

Actions are described in the table below:

WBS	G/P	Title	Deliverable	ToC	Prio	DoC (years)	Credit
N/A	G	Tritium Extraction System (TES) for HCLL-TBM: Test campaign in TRIEX[14]	Report on the result of experimental activities	Q2	1	2	N
	G	TBMs functional materials (Be, ceramic pebbles, PbLi) development/qualification	Development/characterization/procurement plan for functional materials (Be, ceramic, PbLi) Development of an alternative production route/capacity for Be/Be-alloy pebbles PIE of Be materials irradiated in HIDOBE-01 campaign	Q1	1	1 2 3	N
	P (supply)	Development and supply of qualified TBM box fabrication procedures specifications	Development of fabrication procedures specifications. Fabrication of TBM box components feasibility/test mock-ups EUROFER semi-finished products EUROFER steel billets	Q2	1	2.5	N

[14] Unique beneficiary ENEA (TRIEX test facility in ENEA/Brasimone)

	G	H/D sensor / technology development for HCLL-TBM: Construction of a lab-scale test device	Delivery of a lab-scale device and report on the acceptance tests	Q2	1	2	N
	G	Development / validation of predictive tools and their TBM diagnostics systems	Development of predictive tools & diagnostic system for TBM application and DEMO relevancy analyses in the field of EM, thermal-hydraulics, MHD, pebble beds, tritium transfer & cycle, He/T behaviour in Be	Q3	1	2	N
	G	HCLL/HCPB TBMs Preliminary Safety Report (PrSR)	Follow-up and support to PrSR; complementary conceptual safety studies	Q2	1	1	N
	G	Support Test Facilities: Upgrade of DACS for EBBTF[15]	Integrated software/ hardware delivery for EBBTF and report on the acceptance tests	Q2	1	2	N
	G	Study of the TF ripple induced by EU TBMs	Sensitivity study to the TBMs design and positioning in Port	Q1	1	1	N
	P (service)	Engineering Support	Engineering support to Preliminary Safety Report	Q2	1	1	N
	P (service)	Engineering Support	Industry support for the design of TBM mock-ups Engineering support to TBMs / dummy plugs design/ fabrication, systems integration in ITER, (RH) support equipment, etc.	Q2	2	2	N
	G	Dummy TBM Plugs	Conceptual design	Q1	2	2	N

[15] Unique beneficiary ENEA (EBBTF test facility in ENEA/Brasimone)

	G	Be coating on EUROFER First Wall	Preliminary design and technical specifications	Q2	2	1	N
	G	Development / validation of predictive tools and their TBM diagnostics systems	Development of neutronics predictive tools and diagnostic system Design/ construction/ experiments for validation of predictive tools	Q3	2	2	N
	G	Development, validation and application of computer codes for safety assessment of EU Test Blanket Modules	Report on validation of computer codes and on EU-TBM safety assessment	Q3	2	1	N

1.22. PLASMA ENGINEERING

Actions here are ground on the draft 2009-2011 ITER Physics R&D Workplan including those associated with WBS 4.7 (plasma poloidal field control), in particular analysis, modelling and optimization of magnetic configuration and PF scenarios, plasma position and shape control, plasma scenarios, TF ripple and 3D magnetic effects (TF coils, TBMs, etc.), plasma properties (including disruptions, PFC loads, etc.), Resistive Wall mode analysis & control, ELM control. Plasma Engineering activities also include specific studies related to plasma-wall interaction and plasma facing components. Plasma engineering analysis provides support to several other WBS, with the analysis of design changes, specification requirements, interfaces with plasma and operation. Preparation for installation & commissioning (without and with plasma) will continue.

Actions are described in the table below:

WBS	**G/P**	**Title**	**Deliverable**	**ToC**	**Prio**	**DoC (years)**	**Credit**
N/A	*G**	*PF System analysis & compatibility with plasma control (TF part not included)*	*Analysis of PF coils and PS performance against requirements*	*Q4 (2008)*	*1*	*1*	*Yes (ITA)*
	G	Ripple analysis and optimisation and 3D magnetic analysis	Develop and produce 3D ITER equilibria Ion transport and loss simulation in 3D, plasma effects and power loads to PFCs	Q1	1	3	Yes (ITA)

	G	ELM coil analysis	Modelling of ELM control with RMP, impact on plasma parameters and loads in PFCs.	Q1	1	3	Yes (ITA)
	G	Scenario development and optimization	Analysis of ITER operational space and support to PF coils system optimization. Analysis and optimization of ITER scenarios	Q1	1	1	Yes (ITA)
	G	Simulation of ITER pulses	Self consistent simulation of ITER pulses.	Q1	1	3	Yes (ITA)
	G	Control system design and analysis	Non linear code coupling a 2D plasma model to a 3D model of the eddy and halo currents Analysis and optimization of the ITER plasma control system including RWM	Q2	1	2	Yes (ITA)
	G	Diagnostic modelling and optimization	Plasma shape and position reconstruction code with a 2D and 3D model of passive structures.	Q3	1	3	Yes (ITA)
	G	Disruption Studies	Study of plasma disruptions and evaluation of loads in support to components design. Computation of forces due to AVDEs with assigned halo currents path	Q1	1	3	Yes (ITA)
	G	Runaway electron characterisation and control	Run-away electrons characterisation and calculation of loads on PFCs Requirements for run-away suppression with ELM control coils Study control of run-away beams with in vessel VS coils	Q1-2	1	2	Yes (ITA)
	G	First Wall and Materials	Calculate plasma loads on specified locations	Q3	2	2	Yes (ITA)

	P (service)	Engineering Support[16]	3D models of the passive structures in support to the plasma control and diagnostics activities.	Q2	1	1	Yes

1.23. SAFETY

Actions on ITER related R&D activities will continue in support of the ITER Preliminary Safety Report (RPrS). Actions are described in the table below.

Actions are described in the table below:

WBS	G/P	Title	Deliverable	ToC	Prio	DoC (years)	Credit
N/A	*G**	*Combined hydrogen and dust explosion model development and validation*	*Report on code development*	*Q4 (2008)*	*1*	*17 months*	*Yes (ITA)*
	P (service)	Be-air reaction rate characterisation	Final report on Be dust explosion experiments	Q1	1	2	Yes (ITA)
	G	Combined H2/dust explosion & mitigation experiments and computer code validation	Final report on H2/dust explosion/ mitigation experiments and on computer code validation	Q4	1	1	Yes (ITA)
	G	In-vessel dust measurements and removal techniques assessment and validation	Report on diagnostic and removal techniques and on design of a prototype	Q1	1	2	Yes (ITA)
	P (service)	In vessel dust measurement and removal techniques validation	Design report for a validation mock-up	Q3	1	1	Yes (ITA)
	G	Metal waste detritiation, T out-gassing and measurement, and Be waste management	Report on detritiation, T outgassing, measurement methods and Be waste management	Q3	2	2	Yes (ITA)

[16] The activity is coordinated by Plasma Engineering as it spans over multiple WBS (15, 16, 17 and 55)

	G	The ALARA application to Occupational Radiation Exposure based on ITER design evolution.	Report on ORE assessments	Q3	2	1	Yes (ITA)
	P (service)	The ALARA application to Occupational Radiation Exposure based on ITER design evolution.	Report on ORE assessments	Q3	2	1	Yes (ITA)
	G	Supporting safety analyses to follow up ITER design evolution and licensing process	Report on Supporting safety analyses	Q1 + Q4	1	2	Yes (ITA)
	P (service)	Supporting safety analyses to follow up ITER design evolution and licensing process	Revision of accident sequences, development and validation of computer codes	Q2	1	1	Yes (ITA)
	G	Busbar arc model validation and supporting experiments	Report on busbar arc model validation	Q3	2	1	Yes (ITA)
	P (service)	Engineering Support	Support to occupational exposure and safety analysis in support of ITER licensing	Q2	1	1	Yes (ITA)

1.24. ENGINEERING SUPPORT

Actions 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 the launch of contracts in support of the design of components and systems and their cost optimization.

The Codes and Standards activity 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.

1.24.1. Detailed Programme

Actions are described in the table below:

WBS	G/P	Title	Deliverable	ToC	Prio	DoC (years)	Credit
N/A	P (service)	Thermo-hydraulic analyses: development of computer codes and their benchmarks for the analysis and assessment of the integrated system made by the superconducting magnets, thermal shield, cryostat, cryo-lines and refrigeration system.	Models, codes and reports	Q1	1	1	Yes (ITA)
	G	Thermo-hydraulic modeling: Analysis and assessment of the main cryogenic and water cooling system performances as well as their thermodynamic and hydraulic transients.	Codes and reports	Q1	1	1	Yes (ITA)
	P (service)	Neutronic analyses. Evaluation of radiation fields in tokamak complex, shielding capacity required, streaming through gaps, requirements for components qualification under ionizing radiation, evaluation of radiation doses for operators, etc	Models and reports	Q3	2	1	Yes (ITA)
	P (service)	Electromagnetic analyses: (i) Development of computer codes for the integrated electromagnetic and electromechanic analysis of plasma driven transients (e.g. plasma disruptions, VDEs and Halo currents). (ii) Analysis of static and transient electromagnetic events in the basic tokamak machine as well as in the main tokamak building (e.g. stray field mapping).	Models and reports	Q3	2	1	Yes (ITA)
	G	Electromagnetic analyses: see above	Models and reports	Q2	1	1	Yes (ITA)
	P (service)	Mechanical analyses: • Stress analysis of main machine components. Support to the analysis of alternative design options leading to cost and/or risk reduction is also foreseen. Also analysis and support to specific aspects of components manufacturing. • Computational tools for the study and optimization of manufacturing processing	Models and reports	Q3	2	1	Yes (ITA)

	G	Mechanical analyses: see above	Models and reports	Q2	1	1	Yes (ITA)
	P (service)	Structural design criteria for in-vessel components	Revision of the code	Q1	1	1	Yes (ITA)

1.25. NUCLEAR DATA

1.25.1. Summary

Actions will be mainly focused 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 implemented and measurement techniques developed.

1.25.2. Detailed Programme

Actions are described in the table below:

WBS	G/P	Title	Deliverable	ToC	Prio	DoC (years)	Credit
N/A	*G**	*Development of tools, improvements of data and validation in support of ITER, TBM and DEMO activities*	*Reports of calculations and assessment of experimental data*	*Q4 (2008)*	*1*	*1*	*N*
	G	Nuclear Data improvements and development of tools: • Further development and upgrade of European Fusion File (EFF) and European Activation File (EAF) as a source of nuclear data. • Benchmarking of updated and extended nuclear data evaluations. Development and validation of advanced numerical methods and computational tools, mainly in the field of the co-variances and uncertainties.	Updated libraries and software tools	Q2	1	2	N
	G	Nuclear Data experiments and measurement techniques: (i) Detailed evaluation and assessment of neutronic experiments on the TBM mock-ups as well as design and implementation of new experiments; (ii) Integral activation experiments covering materials relevant to TBM and IFMIF.	Assessment and benchmarking reports	Q2	1	2	N

1.26. Activities of Quality Assurance (QA) and Quality Control (QC)

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 launched in 2009.

WBS	G/P	Title	Deliverable	ToC	Prio	DoC (years)	Credit
n/a	P (service)	Service of Inspectors (Production and Quality Assurance) for the ITER project contracts follow-up.	follow-up reports	Q1	1	2	N

1.27. Contributions in Cash to the ITER Organisation and to Japan

1.27.1.1. Cash Contributions to the ITER Organisation

This corresponds to the annual EU share of the 2010 contributions in cash to the ITER Organisation for its management, to be adopted during the next ITER Council.

1.27.1.2. Transfer of procurement responsibilities from Euratom to Japan

This corresponds to the transfer of procurement responsibility under the supervision of the ITER Organisation.

1.28. Appointment of Experts for Technical Assistance to F4E

F4E has launched 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 1400 days for experts in 2009.

BROADER APPROACH

1.29. 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. Where no contribution by these Members is foreseen, the contribution will have to be financed by the F4E budget.

For the contributions set out below to be provided by Members of F4E, Procurement Arrangements will be concluded in 2009 between F4E and the Japanese Implementing Agency, subject to the conclusion of corresponding back-to-back procurement arrangements between F4E and the Member concerned.

1.30. JT60SA

1.30.1. Overall Outlook

The re-baselining activity of the JT60SA design is complete and has led to the preparation of the IDR (Integrated Design Report) which has been reviewed and found to be in accordance with its aims. The sharing, within the EU, for the contributions from the Voluntary Contributors has also been reviewed by the Contact Persons and is in its final stage with most long lead items agreed. The IDR is therefore expected to be agreed by the BA Steering Committee in Dec 2008 and the procurement of some long lead items will follow after.

1.30.2. Procurement Arrangements in 2009

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.

- Toroidal Field Coils (Q1) including the delivery of 18 coils complete of conductor, windings, casings, and related structures. Back to Back Agreements will be signed with CEA (France) and ENEA (Italy) for the detailed design and the supply of most of the hardware. In accordance with the revised sharing within the EU, the Conductor for the coils will be provided by F4E (see below).
- TF Coils Test Facility and Testing (Q1). A PA will be signed for the scope of the testing of the TF Coils. In accordance with the revised sharing, the Test Facility will now be taken care of by France at the Cadarache site. Additional contributions to this effort will be from ENEA(Italy), SCK-CEN (Belgium) and possibly from CRPP (Switzerland).
- High Temperature Current Leads (Q1). This Procurement Arrangement will cover the delivery of all High temperature Current Leads for all superconducting coils, including the PF Coils. A Back to back Arrangement will be signed at the same time with FZK (Germany).
- Cryostat Base (Q1). This Procurement Arrangement will cover the supply of the lower part of the cryostat (needed early on in the assembly) and will be taken over by CIEMAT (Spain).
- Quench Protection Circuit (Q4). This activity will cover the supply of the coil protection discharge circuit needed for all TF and PF coils. This supply will be covered by a Back to back Agreement with Consorzio-RFX (Italy).

1.30.3. Calls for Tender Expected to be launched in 2009 by F4E

In accordance with the revised sharing agreed with the Voluntary Contributors F4E will now take over the supply of the TF Conductor while the originally foreseen effort on the TF Test Facility will be taken over by CEA. A total of 10ME are budgeted for this effort where its procurement is expected to start in 2009.

Scope	Indicative Number of Contracts	Type of Contract	Date to Launch Calls	Credits in kBAUA Total	Credits in kBAUA accrued in 2009
TF Coils Conductor SC and Copper Strands	1	Supply and Follow Up	Q1		
TF Coils Conductor Cabling and jacketing	1	Supply and Follow Up	Q1		
Total	2			14.75	0

1.31. IFMIF

1.31.1. Overall outlook

The sharing of activities amongst the Voluntary Contributors has been agreed by the Contact Persons at their last meeting in September. In 2009 most, if not all, the Procurement Arrangements, in which the IFMIF project activities are split, and the corresponding Back to Back Arrangements with the Voluntary Contributors, are planned to be signed in order to provide a formal reference to the activities already being conducted in the delegated national agencies.

1.31.2. Procurement arrangements in 2009

- **Accelerator**: the decision to adopt a superconducting accelerating structure of the Half Wave Resonator type for the Drift Tube Linac, to be matched to the normal conducting RFQ by a Matching Section, has been taken by the Broader Approach Steering Committee at its May meeting this year. While the design activities of the other components of the accelerator have already being going on since the beginning of the BA Agreement, the adoption of the new type of structure, mainly due to technical advantages and the future potential reduction in the IFMIF operation costs, will probably determine some delay in the overall construction time of the accelerator. A revision of the time schedule presented in the Project Plan, which already looked rather optimistic, has been requested by the SC. The revised time schedule will be presented at the Project Committee in spring 2009. On the basis of the present advancement of the design of the different components of the accelerator, all the related PAs and BtB Arrangements, with the exception of the PA concerning the Installation, Check out, Start-up & Commissioning of the accelerator, should be signed during 2009. The assembly of the Injector, which design is already well advanced, on the basis of an existing similar unit, will start during 2009.
- **Lithium Target**: the PAs covering the construction and operation of the Lithium Test Loop in Oarai, a model 1 to 3 scale of the IFMIF loop, and the Erosion-Corrosion tests of

flowing lithium on structural materials are ready to be signed. In case of an early signature of the PAs, construction of the loop will start during 2009 and the corrosion experiments in the Lifus 3 facility at Brasimone are planned to start before the end of 2008. All the other PAs concerning the Target Facility will be ready to be signed during 2009.

- **Test Facilities**: also in this case all the related PAs are under preparation and will be ready to be signed during 2009. The high flux test module rig (vertical European arrangement), which design is well advanced, after signature of the PA will be manufactured and be ready for irradiation tests in a fission reactor. These tests will start either end of 2009 or beginning of 2010. Also planned, during the first half of 2009, are tests of the fission microchamber to measure the neutron flux.

1.31.3. Calls for Tender Expected to be launched in 2009 by F4E

No calls for tender will be issued for IFMIF/EVEDA in 2009 by F4E.

3.2.4 Cash contribution to the common expenses of the Project Team in 2009 by F4E

The contribution foreseen for the common expenses of the IFMIF-EVEDA Project Team will cover the missions outside Japan of the EU members of the Project Team for a total credited amount of 0.18kBAUA in 2009.

1.32. IFERC

1.32.1. Overall Outlook

The activities regarding the construction of the IFERC buildings in Rokkasho will proceed under Procurement Arrangements for tasks performed by JA. The DEMO activities are restricted to coordination by the Project Team and R&D activities. In the EU, these will be performed by the Voluntary Contributors. The credits accrued in 2009 for these activities will be 7.88kBAUA. The Computer Simulation Centre activities will consist of preparatory work by the Special Working Group 1 created by the BA Steering Committee to select the suit of computer codes that will be used to benchmark the performance of the supercomputer. No activities are foreseen for the Remote Experimentation Centre in 2009.

1.32.2. Procurement Arrangements in 2009

In accordance with the 2009 IFERC Work Programme, no Procurement Arrangements are expected to be signed between F4E and JAEA for activities under the responsibility of the EU (unless the Procurement Arrangement on the supply of DEMO R&D Activity for IFERC, due to be signed end of 2008, is delayed).

1.32.3. Calls for Tender Expected to be launched in 2009 by F4E

No calls for tender will be issued for IFERC by F4E in 2009

ANNEX I
TABLE OF ACRONYMS AND ABBREVIATIONS

A/E	Architect Engineer
AGPS	Accelerator Power Supplies
ALARA	As Low As Reasonable 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
DEMO	Demonstration Fusion Reactors
DGEBF	*Di-Glycidyl Ether of Bisphenol F* impregnation resin
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
FZK	Forschungszentrum Karlsruhe
HAZOP	Hazard Operability studies
HCLL	Helium-Cooled Lithium-Lead
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
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
LFS-CTS	Low Field Side – Collective Thomson Scattering
MAR	Materials Assessment Report
MHB	Material Handbook
MHD	Magneto-HydroDynamics
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
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
PrSR	Preliminary Safety Report
PTC	Prototype Torus cryopump
$Q_{1/2/3/4}$	Quarter
QA	Quality Assurance
R&D	Reasearch & Development
RAFM	Reduced Activation Ferritic Martensitic
RF	Radio Frequency
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 (for use in Dual Coolant Breeder Blankets)
SS	Steady State
SW	Software
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

ANNEX II
SUMMARY OF THE AVAILABLE BUDGETS FOR GRANTS

	WBS	CREDITED (in M€)	NOT CREDITED (in M€)
1.1	Magnets	**1.00**	**0.00**
1.5	Vacuum Vessel	**0.00**	**0.25**
1.6	Blanket	**2.25**	**0.00**
1.7	Divertor	**0.36**	**0.00**
2.3	Remote Handling	**0.24**	**0.00**
3.1	Vacuum Pumping & Fuelling	**0.38**	**0.00**
3.2	Tritium Plant	**0.31**	**0.00**
3.4	Cryoplant	**0.12**	**0.00**
4.1/4.3	Power Supplies	**0.00**	**0.00**
4.5	CODAC	**0.54**	**0.00**
5.1	Ion Cyclotron	**1.29**	**0.00**
5.2	Electron Cyclotron	**1.67**	**0.00**
5.3	Neutral Beam System	**9.92**	**0.00**
5.5	Diagnostics	**6.96**	**0.00**
6.2	Buildings	**0.00**	**0.15**
	Material Development	**0.00**	**1.71**
	Test Blanket Module	**0.00**	**1.12**
	Plasma Engineering	**2.40**	**0.00**
	Safety	**1.61**	**0.00**
	Engineering Support	**1.10**	**0.00**
	Nuclear data	**0.00**	**0.60**

ANNEX III
ESSENTIAL SELECTION AND AWARD CRITERIA FOR PROPOSALS

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.

ANNEX IV
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 and technological development activities	40%
Demonstration activities	40%
Coordination and support actions	100%
Management, audit certificates and other activities	100%