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 PROJECT PLAN (EDITION 2011) OF FUSION FOR ENERGY

THE GOVERNING BOARD:

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] (hereinafter "the Statutes") and in particular Article 6(3)(d) and Article 11 thereof,

HAVING REGARD to the Financial Regulation of Fusion for Energy[2] adopted by the Governing Board on 22nd October 2007, last amended on 18th December 2007[3] (hereinafter "the Financial Regulation"), and in particular Article 30 thereof;

HAVING REGARD to the comments and recommendations of the Administration and Finance Committee on the proposal for the Project Plan at its meeting of 10th October 2011;

HAVING REGARD to the comments and recommendations of the Executive Committee on the proposal for the Project Plan at its meeting of 11th October 2011;

HAVING REGARD to the comments and recommendations of the Technical Advisory Panel on the proposal for the Project Plan provided during its meeting of 13th October 2011,

Whereas:

(1) The Director should, in accordance with Article 8(4)(c) of the Statutes, draw up the Project Plan for a period of five years;

(2) The Project Plan should include (a) a statement on the aims and activities of the Joint Undertaking for the following five years and (b) a description of the status of the activities and projects of Fusion for Energy containing the necessary information on changes occurred since the previous version;

(3) The Executive Committee should in accordance with Article 7(3)(b) of the Statutes comment on and make recommendations to the Governing Board on the proposal for the Project Plan;

(4) The Governing Board should adopt the Project Plan.

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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)-GB04-06 Adopted 18/12/2007

HAS ADOPTED THIS DECISION:

Article 1

The Project Plan (Edition 2011) of Fusion for Energy annexed to this Decision is hereby adopted.

Article 2

This Decision shall have immediate effect.

Done at Barcelona, 25th November 2011

For the Governing Board

Stuart Ward
Chair of the Governing Board

ANNEX

FUSION FOR ENERGY PROJECT PLAN
(EDITION 2011)

TABLE OF CONTENTS

INTRODUCTION

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

F4E was established for a period of 35 years from 19th April 2007 and its offices are situated in Barcelona, Spain. The objectives of F4E are three fold:

- Providing Europe’s contribution to the ITER International Fusion Energy Organisation (IO) as the designated EU Domestic Agency for (DA) Euratom;
- Implementing the Broader Approach Agreement between Euratom and Japan as the designated Implementing Agency for Euratom;
- Preparing in the longer term for the construction of demonstration fusion reactors (DEMO).

In accordance with the Financial Regulation of F4E and its Implementing Rules, this Project Plan lays down an indicative programme of activities that are foreseen to be implemented in the period 2009-2019. This information is complemented by the Resource Estimates Plan.

The legal basis and organization of Broader Approach Agreement and the role of F4E in its implementation differ from ITER case. As a consequence the part of F4E for the Broader Approach Agreement activities is presented in a separate section with a format appropriate to the nature of the activities.

All F4E activities presently planned for DEMO are covered under the Broader Approach Agreement and presented in the BA section of the Project Plan.

The information presented in this Project Plan which is intended to be adopted by the Governing Board is complemented by five annexes provided for information: annex 1 provides a detailed Work Breakdown Structure of the European in kind contributions to ITER, annex 2 provides the technical risk assessment of the European in-kind procurements for ITER, while annexes 3-5 provide the Project Plans for each of the Broader Approach projects.

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OVERALL SCENARIO

The current ITER baseline was approved at the 7th ITER Council in July 2010. It is the scenario considered in this document and the reference for the F4E activities for ITER. It foresees a first plasma (FP) in November 2019.

The schedule for the activities encompassed by the adopted baseline was confirmed at the time of the adoption by F4E to be in line with the request of the Governing Board to mitigate the costs and risks for the delivery of the EU components on the critical path The F4E decision was based on the progress achieved up to that time on its activities and on investigations carried out in collaboration with both industries and experts on the further development of the procurements, with special emphasis on the fabrication procedures, to allow meeting the given date of first plasma. F4E always assumed that all input (e.g. design, subcomponents) from IO and other Parties would arrive on time, according to the F4E schedule. The constraint of a agreed dates for the delivery of the EU components to ITER International Organization (IO) could be fulfilled by accelerating the delivery of the critical items thanks to specific manufacturing plans.

Since a few months ITER IO started an exercise, triggered by the catastrophic tsunami that hit Japan in March 2011, to define a new baseline that takes into account both the impact of this event on the capability of Japan to deliver on time their in-kind procurements and the slippages accumulated in the meanwhile in the design and fabrication of the components in the critical path.

A top-down Level 0 schedule has been proposed by IO and it is being discussed with the DAs. This new scenario foresees a delay in the date of the first plasma of approximately 1 year.

In addition, some negotiations are also being carried out by ITER IO with all DAs to identify both de-scoping and deferrals of in-kind procurements to the operation phase. This exercise would allow ITER IO to receive additional cash during the construction phase, while still keeping the cost ceiling in the construction phase and the machine objectives throughout the D-T phase.

Such actions have not been taken into account in this current version of the F4E Project Plan and will be incorporated only once a final decision is adopted by the ITER Council.

The current F4E schedule is characterized by the following main dates for the components in the critical path as of August 2011(Fig.1). The impact of the delays wrt the date of FP is being analysed and it is also part of the exercise currently carried out with ITER IO and the other DAs:

Buildings:	
Assembly Hall and Cleaning Facility (Ready For Equipment – RFE- 1A)	June 2015
Partial Access to Tokamak Pit (RFE 1B)	September 2015
Tokamak Building Ready for Equipment (RFE 1C)	November 2015
Completion Tokamak Building	January 2018
Delivery Date for the first EU TF Coil	July 2015
Delivery Date for PF Coil #5	September 2015
Delivery Date for first EU Vacuum Vessel Sector	November 2015
Delivery Date for last EU TF Coil (but spare)	January 2017
Delivery Date for last EU Vacuum Vessel Sector	April 2017
Delivery Date for PF Coil #3	July 2018

The dates in the schedules of the main critical components have been supported by the contractors working in these areas. The large manufacturing contracts in the critical areas already in place, as well as the Architect Engineer, allow a real-time analysis of the impact of any variations of the design due either to a delay of input data or to a modification of design.

Risks are being evaluated internally of F4E for all critical components in order to put in place the necessary mitigation actions to avoid any impact that would cause a delay on the date of first plasma.

On top of the initial three components on critical path (TF coils, vacuum vessel and buildings), also the PF coils are now critical, due to delays in placement of the manufacturing contract.

The slippage in the schedule of critical components such as vacuum vessel and buildings, due to the delay of IO in supplying the necessary data opens a compatibility issue of the current F4E schedule with the date of FP in November 2019. In addition, it should be noted that IO has not yet provided their detailed schedule for the preparation of input data, design reviews and PA signatures.

However, the F4E schedule takes into account the following assumptions:

- the Procurement Arrangements (PAs) between F4E and the ITER International Organisation (IO) are concluded on time and according to the agreed level of design;
- the required input data (i.e. 3D models/2D drawings, load distribution data, etc.) are provided on time by ITER IO;
- the planning of the activities and the corresponding delivery of components, by the other ITER Domestic Agencies will be respected, according to the official schedule input provided by the Parties;
- F4E has the appropriate level of resources, both financial and manpower, to carry out the necessary activities according to the agreed baseline schedule.

The schedules from the F4E suppliers, taking into account the agreed fabrication routes and showing the real development of the work, are being reviewed every month and the main data integrated into the overall F4E schedule in Primavera.

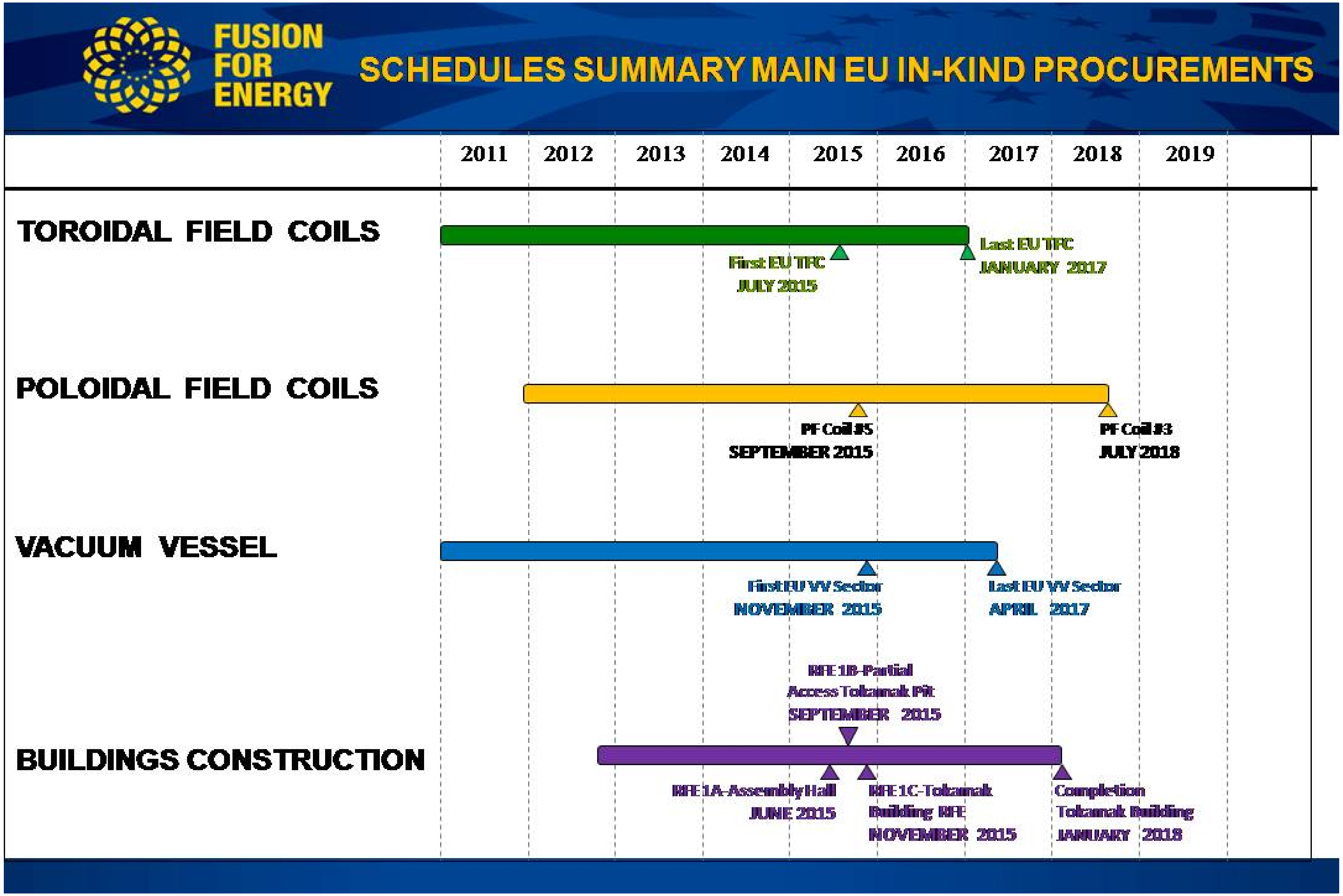

FIG. 1 – SCHEDULES SUMMARY OF THE MAIN EU IN-KIND PROCUREMENTS (STATUS: AUGUST 2011)

THE WORK BREAKDOWN STRUCTURE (WBS)

F4E has progressed in the definition of its own Work Breakdown Structure (WBS), a common basis across the whole organization to allow the integration of scheduling, estimating, procurement and finance systems. The WBS is focussed on the PAs. The development is taking into account the boundary conditions given by the necessity to be aligned with the ITER WBS and to be close to the approach followed in the Primavera schedules to avoid a major change that could lead to difficult readjustments. Once the main top 4 F4E WBS levels are approved by the management, the development of the lower levels is left to the Project Team Leaders owning the relevant PAs, provided that precise guidelines are followed and the result is accepted.

The WBS is a formal document that will be part of the F4E Baseline and, as such, under configuration control.

The table I below shows, according to the currently proposed (not yet approved) F4E WBS, the associated ITER credit, taking into account the Project Change Requests (PCRs) and the Additional Direct Investments (ADIs) approved by the ITER Council.

At the 8th meeting of the ITER Council (June 2011) a new set of guidelines for the evaluation of the ADI credit was endorsed and they are now used in the definition of the eligible credits.

WBS	Description	kIUA
EU.01.02	Magnets (20% of the conductor for the TF conductor, Winding Packs for 10 TF Coils, 10 Case-winding pack insertion, 5 PF coils – PF2-PF6),	186.36
EU.01.03	Vacuum vessel (7 sectors of the main vessel)	92.19
EU.01.04.01 and EU.01.04.02	Blanket Cooling Manifold and Blanket First Wall (48.4% of the first wall)	48.04
EU.01.04.03, EU.01.04.04 and EU.01.04.05	Divertor (cassette body and integration, inner vertical target and divertor rail)	33.78
EU.01.05	Remote Handling (RH) (divertor RH, cask and plug RH system, in vessel viewing system, and NBI RH)	42.22
EU.01.06	Vacuum Systems (8 torus and 2 cryostat cryopumps, panel cryopumps for the neutral beam system, valve boxes and associated cryolines, and leak detection/localisation system)	15.22
EU.01.07	Tritium plant (consisting mainly of the Water Detritiation System (WDS) and the Hydrogen Isotope Separation System (ISS))	18.216
EU.01.10	Cryoplant system (50%) - LN2 Plant and Auxiliary Systems	30.677
EU.01.16	Electrical Power Supply & Distribution Systems (shared with other parties)	31
EU.01.12	ICRH (2 equatorial port plugs incorporating 1 IC antenna each)	14.73
EU.01.13	ECRH (four upper port plugs incorporating EC launchers each fed by 8 waveguides + 32% gyrotron sources + 66% power supplies)	37.245

EU.01.14	Neutral beam Heating System (100% assembly and testing/and active correction and compensation coils/Beam Line components + ~41% beam source and high voltage bushing, ca 76% pressure vessel, magnetic shielding, ca 31% power supplies) and Neutral Beam Test Facility (64.7%)	83.4
EU.01.11	Diagnostics (roughly 25% of all diagnostic systems)	35.487
EU.01.15	Buildings (all concrete and steel frame buildings incl. Office building)	454.67
EU.01.09	Waste treatment and storage	10.1
EU.01.08	Radiological protection	4.2
	Total	**1137.535**

Table I - ITER credit for EU In-Kind procurements taking into account PCRs and ADIs approved by the ITER Council.

The table below shows a summary of the EU Procurement Arrangements with the dates of signatures (yellow shading for those already signed). The forecasted dates provided in Project Plan 2010 are also shown on the table. Shifting of PA signature dates could be due to: longer PA negotiations (e.g. on credit distribution, detailed PA schedule, etc.), lack of data from IO to reach the right level requested by the PA, delayed PA from another Party, etc.

PA Title	PA Signature Date (Project Plan 2010)	PA Signature Date (F4E forecast)
Magnets - Toroidal Field Coils	June 2008	June 2008
Magnets - Poloidal Field Coils	June 2009	June 2009
Magnets - Pre-Compression rings	May 2010	May 2010
Magnets - PF Conductor	May 2009	May 2009
Magnets - TF Conductor	December 2007	December 2007
Vacuum Vessel Sectors	November 2009	November 2009
Blanket Cooling Manifolds	-	April 2013
Blanket First Wall	July 2012	April 2013
Divertor Cassette Integration	June 2011	December 2011
Divertor – Inner Vertical Target	March 2010	March 2010
Divertor Rails	-	July 2014
Divertor Remote Handling	July 2011	October 2011

Remote Handling –Cask and Plug RH System	May 2012	July 2012
Remote Handling - In-Vessel Viewing System	December 2011	September 2012
Neutral Beam Remote Handling	May 2012	September 2012
Torus and Cryostat Cryopumps and Cold Valve Boxes	June-July 2013	July 2014
Neutral Beam Cryopumps	TBD	November 2015
Leak Detection Systems	December 2013	June 2014
Water Detritiation System - 1st part: Tritiated water holding tanks (storage and emergency)	April 2011	October 2011
Water Detritiation System – 2nd part: residual WDS system (process components without tritiated water holding tanks)	December 2013	December 2013
Isotope Separation System	February 2015	February 2015
Cryoplant: LN2 Plant and Auxiliary Systems	December 2010	June 2011
Detailed design of the Steady-State Electrical Network (SSEN) and Pulsed Power Electrical Network (PPEN)	October 2009	October 2009
Installation and Commissioning of the Steady-State Electrical Network (SSEN) and Pulsed Power Electrical Network (PPEN) and SSEN cables	February 2011	November 2011
Material procurement for SSEN	October 2011	April 2012
Material procurement for SSEN Emergency Power Supply	October 2011	April 2012
Ion Cyclotron Heating Antenna	September 2013	September 2013
Electron Cyclotron Upper Launcher – Primary Confinement System	September 2013	June 2014
Electron Cyclotron Upper Launcher – Plug	January 2015	July 2016
Electron Cyclotron Radio-Frequency Power Sources	August 2011	June 2012
Electron Cyclotron Radio-Frequency Power Supplies	December 2011	December 2011
Neutral Beam – Assembly and Testing	June 2014	June 2014
Neutral Beam -Beam sources and high voltage bushings	January 2019	October 2018
Neutral Beam -Beam line components	September 2017	September 2017
Neutral Beam –Pressure Vessel and Magnetic Shielding	June 2013	June 2013
Neutral Beam –Active Correction and	November 2013	November 2013

Compensation Coils		
Neutral Beam Power Supplies and Related Systems	July 2009	July 2009
Neutral Beam Test Facility	October 2010	October 2010
Diagnostics	Possible TBD in 2011	November 2011
Poloidal Field Coil Manufacturing Building	November 2008	November 2008
Architectural and Engineering Services	May 2009	May 2009
Excavation and Support Structure	May 2009	May 2009
Anti-seismic Bearings	May 2009	May 2009
Construction (Reinforced Concrete Buildings and Steel Frame Buildings)	July 2010	May 2010
Radiological and Environmental Monitors System	June 2012	June 2012
Waste Treatment System	2015-2024	November 2013

A detailed description of each PA is provided in Annex I.

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The progress in the signature of the EU PAs is shown in Fig.2 to 4.

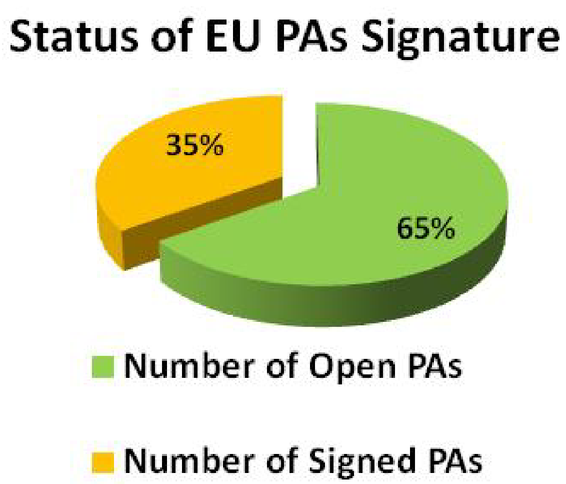


Fig. 2 – Percentage of Signed/not Signed EU PA (status Aug 2011)

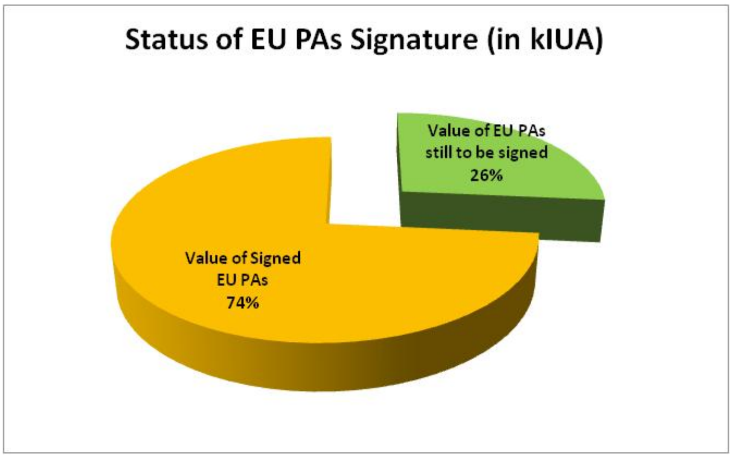


Fig. 3 – Percentage of Signed/not Signed EU PA according to the value (Status Aug 2011)

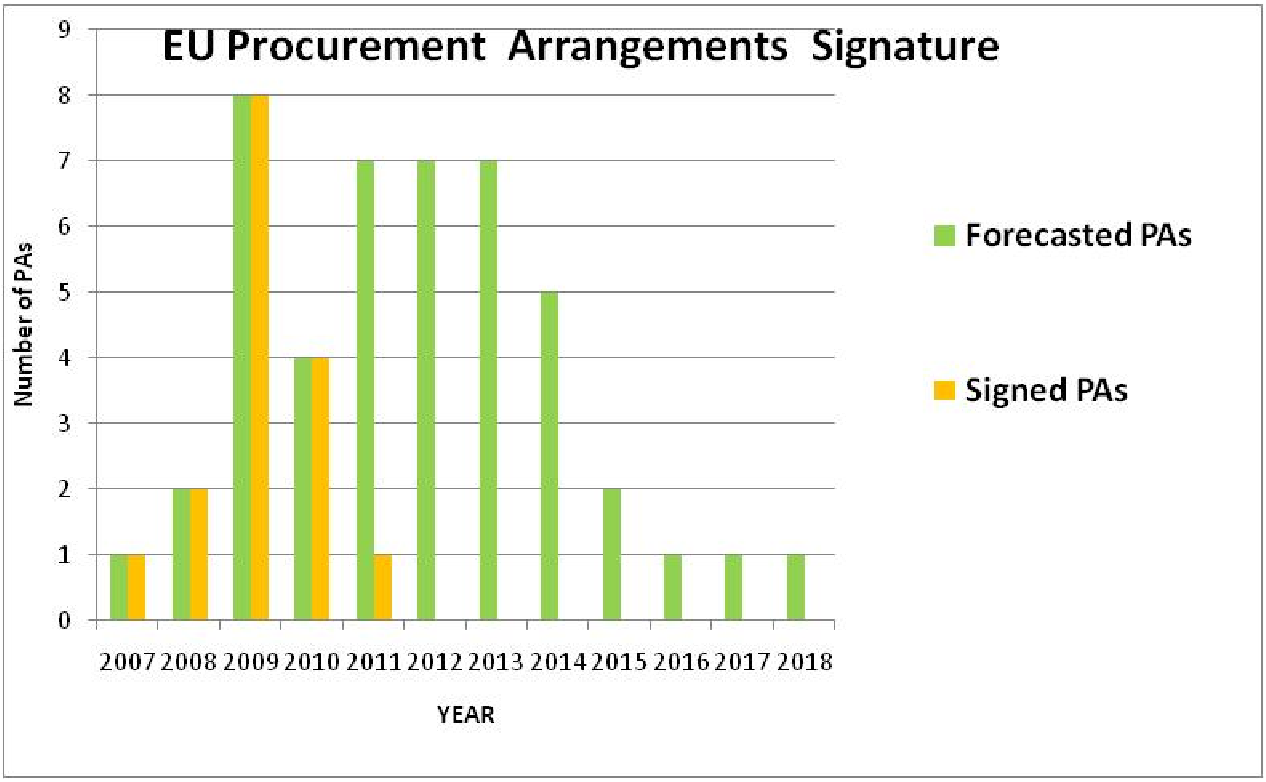


Fig. 4 – Signed and Forecasted EU PA according to number (F4E Forecast - Status Aug 2011)

Based upon the milestones agreed in the signed PAs and according to a preliminary assumption on the credit distribution over the years made by IO on the ones still to be signed, the estimated total amount of ITER credit that is foreseen to be awarded to the EU in the period 2010-2019 is given in Fig. 5. In the same figure, the credit already earned by EU for in-kind procurements is shown. It should be mentioned that credits are linked to deliverables and therefore credits at the beginning of the activities are only minor ones. Credit distribution is more peaked toward the end of the PA. Details on the single systems are available in the Annex of the Project Plan on EU In-kind procurements. Note that both credit curves do not include the additional amount of ITER credit that will be allocated to EU/F4E for ITER Task Agreements (ITAs) and Seconded EU Staff.

CASH CONTRIBUTION TO JAPAN

According to the ITER Agreement, there is a transfer of procurement responsibility from EURATOM to Japan under the supervision of the ITER Organisation. This happens through a cash contribution from EU to Japan paid by F4E according to the PA milestones reached by JA and validated by IO. The initial allocation of the milestones with relative EU payments is agreed at the time of the signature of the relevant Japanese PA. The table here after shows the percentage and the value (in kIUA) of the EU contribution. In green are the Japanese PAs already signed.

System	Description	Percentage of System financed by EU through cash contribution to JA	Value of Cash Contribution (kIUA)	EU Actual Contribution (status Sep 2011) (kIUA)
Magnets	Toroidal Field Magnet windings	9.4%	**7.736**	**-**
	Toroidal Field Magnet Structure 2A	90%	**46.26**	**-**
	Toroidal Field Magnet Structure 2B	7%	**3.101**	**0.0178**
	Toroidal Field Magnet Conductors	10%	**21.500**	**10.905**
	Central Solenoid Magnet Conductors	100%	**90.000**	**11.7**
Blanket system	Blanket First Wall	10%	**8.700**	**-**
Tritium Plant	Atmosphere Detritiation	50%	**15.100**	**-**
Neutral Beam H&CD	Beam Source and High Voltage Bushing	50%	**4.750**	**-**
	Beamline components	50%	**1.950**	**-**
	Pressure Vessel, Magnetic Shielding	50%	**5.950**	**-**
	Power Supply for Heating Neutral Beam	62%	**38.750**	**-**

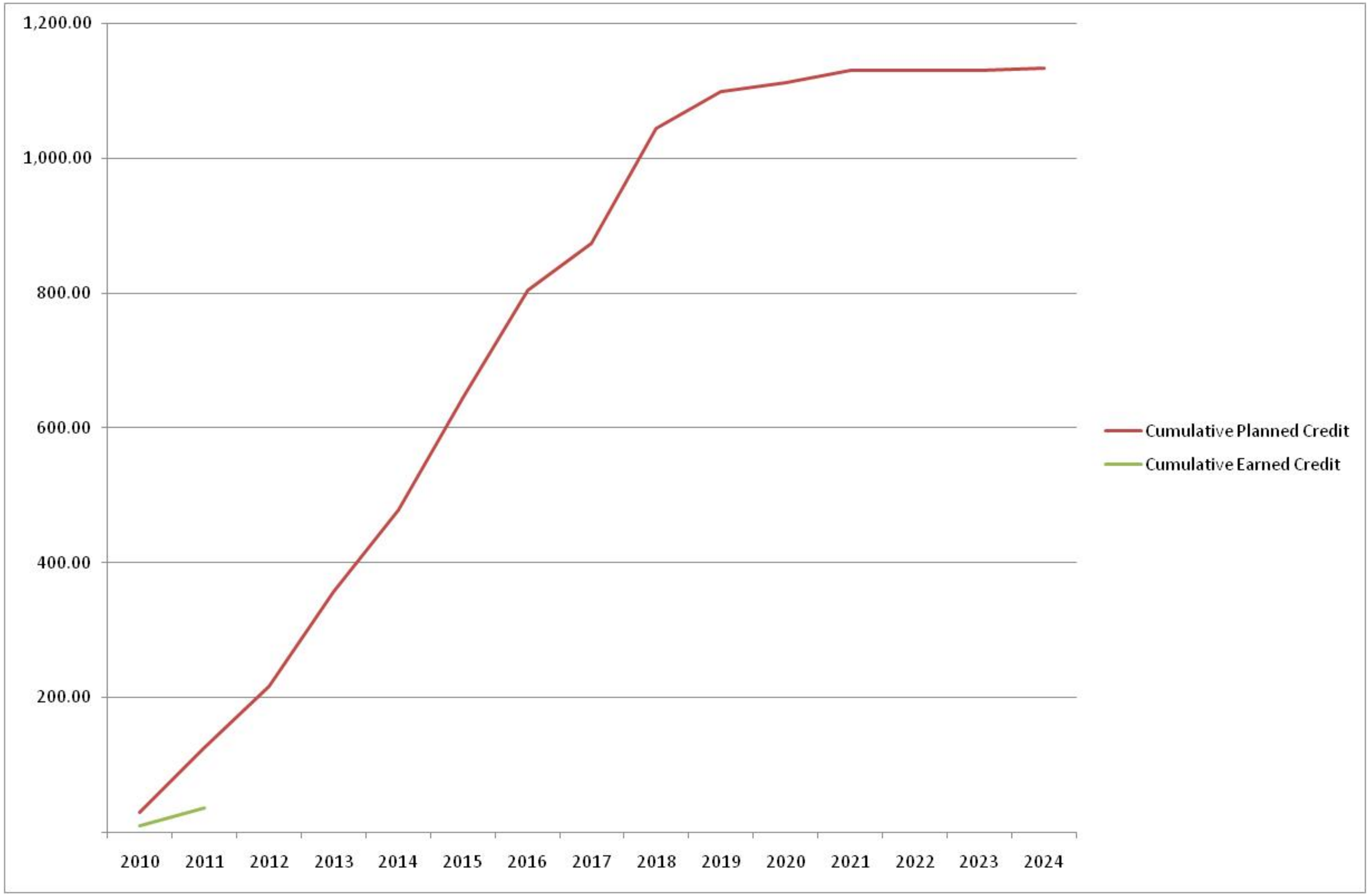


Fig. 5 Cumulative Credit Planned and Earned for the EU Procurement Agreements (Status as of end July 2011)

Main Milestones

The main short-term (up to end 2013) milestones **(taking into account the baseline date of a First Plasma in November 2019)** extracted from the Annexes are presented in table II (**status as of August 2011**). While the "Baseline Date" refers to the agreed 2010 ITER Baseline, the "New Date" is what is in the F4E Primavera schedule transmitted to ITER IO early August 2011. More details until the end of ITER construction phase are available in the Annexes together with the individual detailed descriptions according to the proposed F4E Work Breakdown Structure (WBS).

TABLE II – SHORT TERM MILESTONES (UNTIL END 2013) – **STATUS AS OF AUGUST 2011**

F4E WBS	Milestone Title	Baseline Date	New Date
EU.01.02.01.01 Magnets – Toroidal Field	Qualification mock-ups for TF coils	Aug 2011	Sep 2011
	Radial plate prototypes completed	Nov 2011	Nov 2011
	Contract signature for Radial Plate procurement	Mar 2012	Mar 2012
	Contract Signed for Cold Test and Assembly of TFWP into Coil Cases	Mar 2012	May 2012
	Dummy double pancake completed	Jan 2013	May 2013
	Start Manufacture & Testing of TFWP10 (first one)	June 2013	June 2013
EU.01.02.02.02 Magnets – Pre-Compression Rings	Contract signature for pre-compression rings	June 2011	Dec 2011*
	Qualification (excluding option for the manufacturing and testing of first-of-the-kind ring)	Oct 2012	Nov 2013
EU.01.02.03.03 Magnets – Poloidal Field	Contract signature for PF coils	Mar 2011	Nov 2011*
	Qualification mock-ups for PF coils	Dec 2012	Sep 2013
EU.01.02.04.01 and EU.01.02.04.02 Magnets – TF and PF Conductors	TF & PF Conductor Manufacture Phase 2: Process Qualification	June 2011	TF: Mar 2012 PF: May 2012
	TF & PF Conductor Manufacture Phase 3: TF Production Readiness, PF Production	TF: July 2011 PF: Feb 2013	TF: June 2012 PF: Jan 2014
	Deliverables of 69 tons of Nb_3Sn strand for TF conductor	Feb 2011 to May 2013	Sep 2011 to May 2013
	Supply of TF Nb_3Sn dummy conductor	Oct 2011 to Nov 2011	Nov 2011 to

			Dec 2011
	Supply of TF conductors for ITER	July 2012 to Aug 2014	Feb 2012 to Apr 2014
	Supply of PF NbTi dummy conductor	Apr 2012	May 2012
	Supply of PF conductors for ITER	Aug 2012 to May 2015	Aug 2012 to Sep 2015
EU.01.03.01.01	Mockups Completed (Documentation for information)	26-Aug-11	24-Jan-12
	F4E, IO approval of Detailed Design – Vacuum Vessel Sector 5	12-Aug-11	17-Apr-12
Vacuum Vessel	F4E, IO approval of Detailed Design - Vacuum Vessel Sector 4	28-Oct-11	28-May-12
	F4E, IO approval of Detailed Design - Vacuum Vessel Sector 3	3-Feb-12	07-Aug-12
	F4E, IO approval of Detailed Design - Vacuum Vessel Sector 2	11-May-12	16-Oct-12
	F4E, IO approval of Detailed Design - Vacuum Vessel Sector 9	3-Aug-12	12-Dec-12
	F4E, IO approval of Detailed Design - Vacuum Vessel Sector 8	5-Oct-12	19-Feb-13
	F4E, IO approval of Detailed Design - Vacuum Vessel Sector 7	4-Jan-13	15-Apr-13
EU.01.04.01.01	Complete final analyses (EM loads, thermo-mechanical, pressure, seismic)	3-May-12	
	Final Design Review (FDR)	30-Nov-12	
Blanket Cooling Manifolds	Signature of PA	Apr 13	
EU.01.04.02.01	Contract for Test Facility signed	28-Mar-2012	

Blanket – First Wall	Contract for fabrication of full-scale prototypes signed	02-Nov-2012	
	Contract for HHF testing of full-scale prototypes signed	Mar 2013	
	Signature of PA	Apr 2013	
EU.01.04.04.01 Divertor Inner Vertical Target	Contract Signed for Pre Production Qualification	Jan 2012	
	Process Qualification	July 2012	
	Manufacturing of Full CFC-W Plasma-Facing component prototype	Jan 2013	
	Pack and Ship of Full CFC-W Plasma-Facing component prototype from EU-DA to Test Facility PROTO1	Dec 2013	
EU.01.04.03.01 Divertor Cassette Body & Assembly	Signature of PA	Dec 2011	
	Contract Signed for Cassette Body Prototype	July 2012	
	Qualification of Manufacturing Processes	May 2013	
	Start Manufacture & Testing of Cassette Body Prototype	June 2013	
EU.01.05.01.01 Divertor Remote Handling	Signature of PA	July 2011	Oct 2011
	Contract signature	Oct 2012	Oct 2012
EU.01.05.02.01	Conceptual Design review completed	Dec 2011	July 2012

Cask & Plug Remote Handling (CPRH)	Signature of PA	May 2012	Aug 2012
	Contract signature for CPRHS	May 2013	May 2013
EU.01.05.03.01 In-Vessel Viewing System (IVVS)	Conceptual Design Review completed	Sep 2011	July 2012
	Signature of PA	Dec 2011	Sep 2012
	Contract award	June 2013	July 2013
EU.01.05.04.01 Neutral Beam Remote Handling	Conceptual Design Review completed	Jan 2012	May 2012
	Signature of PA	May 2012	Sep-2012
	Contract signature for NB RH	June 2013	Jun 2013
EU.01.06.01.02 Vacuum Systems / Cryopumps and Cold Valve Boxes (CVB)	Completion of the design of the Cold Valve Boxes	Nov 2011	June 2013
	Start manufacture of Pre-Production Cryopump	Jan 2011	Mar 2012
	Completion of Pre-Production Cryopump manufacture	June 2012	Apr 2013
	Start installation and Engineering tests of Pre-Production Cryopump at TIMO-2	July 2012	June 2013
	Torus & Cryostat Cryopumps and Cold Valve Boxes PA Signature	June 2013	July 2014
EU.01.06.02.01 Vacuum Systems / Leak Detection Systems	Completion of R&D on Leak Localization in the Tokamak Cooling Water System (GRT158)	Mar 2012	
	Technical Specification Ready for Phase 2/3 R&D Support	Feb 2012	
	Completion of Phase 2/3 R&D Support	May 2013	

	Signature of PA	Dec 2013	June 2014
EU.01.06.01.03	Complete the design of the HNB and MITICA cryopumps	Sep 2011	Mar 2012
Vacuum Systems / NB Cryopumps	Place contract for the MITICA cryopump	Mar 2012	Sep 2012
EU.01.07.01.01	Contract signed for procurement of Conceptual Design for ISS	28-Mar-2012	
	Experimental characterisation of the distillation column packing completed	09-Jan-2013	12-Sep-2013
Tritium Systems / Isotope Separation System (ISS)	Conceptual design approved for ISS	26-Jul-2013	21-Nov-2013
EU.01.07.02.01 and EU.01.07.02.02	Conceptual Design entire Water Detritiation System (WDS) approved by IO	16-May-2011	04-Nov-2011
	PA for procurement of tanks signed	27-Apr-2011	05-Oct-2011
Tritium Systems / Water Detritiation System (WDS)	Preliminary Design of “Large Tanks” completed and approved by IO	30-Aug-2011	07-Dec-2011
	Contract signed for procurement of preliminary design for WDS (excluding Tanks)	19-Mar-2012	06-Apr-2012
	Contract signed for procurement of WDS tank final design, manufacturing, testing and delivery to ITER sites	15-May-2012	01-Oct-2012
	Preliminary design review of Main WDS completed and approved by IO	Dec 2013	

	PA for Main WDS signed	Dec 2013	
EU.01.10.01.01 Cryoplant	Call for Tender for LN2 Plant & Auxiliary Systems	Sept 2011	Oct 2011
	Contract for LN2 Plant & Auxiliary Systems	May 2012	May 2012
	Preliminary Design Review & Launch of Long Lead Items	Jan 2013	Jan 2013
	Final Design Review	May 2013	May 2013
EU.01.16.01.03, EU.01.16.01.04, EU.01.16.01.05 and EU.01.16.01.06 Power Supplies	Architect Engineer Tender design complete for 400 kV part	Mar 2011	Oct 2011
	Architect Engineer Tender design complete for High Voltage and Medium Voltage distribution except 400kV part	Sep 2011	Nov 2011
	Architect Engineer Tender design complete for High Voltage, Medium Voltage and Low Voltage distribution. Emergency Power Supply except 400kV part	Sep 2011	Mar 2012
	Architect Engineer Assembly and Installation Design	Sep 2012	Dec 2012
	TB06 Electrical Power Distribution (EPD) Contract signature	June 2012	Sep 2012
EU.01.12.01.01 H&CD / Ion Cyclotron Antenna	Preliminary design review of the antenna	30-Mar-2012	30-May-2012
	Final design review of the antenna	03-Dec-2012	Mar 14
	Signature of PA	Sep 2013	June 2014
EU.01.13.02.01	Decision to Continue on the Coaxial Cavity Gyrotron Programme		Jan 2012

H&CD / Electron Cyclotron Power Sources	Signature of PA		June 2012
EU.01.13.03.01 H&CD / Electron Cyclotron Power Supplies	Signature of PA		Dec 2011
	Main Contract for Main and Body PS Signed		Dec 2012
	Manufacturing design of the HV power supply for the EC system completed		June 2013
EU.01.13.01.01 and EU.01.13.01.02 H&CD / Electron Cyclotron Upper Launcher	Window design ready for final prototype	01-June-2012	
	Isolation Valve Prototype design ready for prototype	01-June-2012	
	Blanket Shield Module and First Wall design ready for prototype	Mar 2013	
	Final design review of the PCS of the EC Upper Launcher & design Grant II signed	Sep 2013	
EU.01.14.01.01, EU.01.14.02.01, EU.01.14.03.01, EU.01.14.04.01, EU.01.14.05.01, EU.01.14.06.01 and EU.01.14.07.01 H&CD – Neutral Beam	Signature of NBTF Back to Back agreement		Oct 2011
	Signature of SPIDER Beam Source and Vessel contract	Feb 2011	Jan 2012
	Signature of PRIMA Cooling plant	May 2011	Mar 2012
	PRIMA buildings available (RFI)	Apr 2012	May 2013
	PA signature for Confinement & Shielding	June 2013	Nov 2013
	Completion of MITICA Design	July 2013	
	PA signature for ACC Coils	Nov 2013	Nov 2013
	Start of SPIDER integrated commissioning	Nov 2013	Nov 2014

	Ion Source and Extraction Power Supplies Start of manufacturing	06-Jun-2011	Dec 2011
	Ion Source and Extraction Power Supplies Start of factory Test	14-Nov-2011	Oct 2012
	Ion Source and Extraction Power Supplies SPIDER ISEPS delivered at Padua site	16-Mar-2012	Mar-2013
	Ion Source and Extraction Power Supplies SPIDER ISEPS ready for Site Acceptance Test	20-Jul-2012	Sep 2013
	Ion Source and Extraction Power Supplies MITICA ISEPS delivered at Padua site	Apr 2013	Apr 2013
EU.01.11. Diagnostics	Signature of PA	Aug 2011	Nov 2011
EU.01.15.02.03, EU.01.15.02.04, EU.01.15.02.05, EU.01.15.02.06, EU.01.15.02.07 Buildings	PF Coils Manufacturing Building -Final acceptance of the works	Dec 2011	
	Excavation and support structure - Final acceptance of the works	Mar 2012	
	Architectural and Engineering services : Construction design complete	Dec 2012	
	Contract Signed for Cask Lift & Assembly Hall Cranes (TB02)	Aug 2012	
	Contract Signed for Civil Works Buildings 11,13-17,36,42-47,51-53,61,71-75 & PCD (TB03)	Sep 2012	
	Contract Signed for Design & Build Buildings 32, 33, 38, 39, 41 (TB05)	Jul 2012	
	Contract Signed for Site Infrastructure (TB08)	Aug 2012	
	Contract Signed for HVAC, Elec&Flu Net & Hand'g 11-17,36,42-47,51-53,61,71-75 (TB04)	Jan 2013	
	Contract Signed for Design & Build Buildings 67, 68, 69 (TB07)	Jan 2013	
	Start of Tokamak Building Construction	Sep 2012	

	Contract Signed for Civil Works & Finishing Blgs 21, 23, 24, 34, 37 (TB09)	Dec 2013	
	Anti-seismic bearings - Final acceptance	June 2012	
EU.01.15.01.01 Site	Handover of ITER Headquarters to IO	Jun 2012	Jul 2012
EU.01.08.01.01 Radiological Protection (REMS)	REMS Conceptual design review meeting	May 2012	
	Signature of PA	Jun 2012	

* Assumed date.

NB: All delays highlighted in Orange (with impact on the date of First Plasma), with the exception of the ones related to the PF coils, are due to late input of data from ITER IO.

RISK MANAGEMENT

The risk management activity for the project includes three main parts: (i) the analysis of event risks, (ii) the risks assessments for the different systems, (iii) the schedule uncertainty analysis.

Items (i) and (iii) have to be assessed at project level, as input of IO and the other DAs is important to reach an overall analysis. No recent analysis was carried out at ITER project level by ITER IO on the two items.

Risk Assessment for In-Kind Procurements

As far as the EU in-kind procurements are concerned, F4E risk analysis has progressed through in-house analysis, external contracts and feedback from the suppliers (whenever a manufacturing contract was in place).

The analysis concentrated primarily on the components on the critical path, but also extended to other ones and it reflects the major issues that F4E is facing at the moment.

At the moment, the following PAs have been analysed from a risk point of view, with the aim to extend the analysis to all EU procurements in the forthcoming months:

- EU.01.02.01 TF Coils Magnet Windings
- EU.01.02.02 Pre Compression Rings
- EU.01.02.03 PF Coils 2,3,4, 5 & 6
- EU.01.02.04.01 TF Magnet Conductors
- EU.01.02.04.02 PF Conductors
- EU.01.03 Vacuum Vessel
- EU.01.04.02 Blanket First Wall
- EU.01.04.03.01 Divertor Cassette Body and Integration
- EU.01.04.04.01 Divertor Inner Vertical Target
- EU.01.10.01 LN2 Plant and Auxiliary Systems
- EU.01.13.02 EC-RF Gyrotrons
- EU.01.15 Site and Buildings

In the following months other PAs will be included in the F4E risk register and in the future versions of the Project Plan.

Following F4E Risk management process, the following Probability/ Impact matrix (PID matrix) has been used for the risk level ranking in order to define the priorities of the risk events.

PID Matrix		Impact				
		Very Low	Low	Medium	High	Very High
Probability	Very Likely	5	20	45	80	125
	Likely	4	16	36	64	100
	Not Likely	3	12	27	48	75
	Unlekely	2	8	18	32	50
	Not Creditable	1	4	9	16	25

Level	Actions
VERY LOW	They are included in the risk file and reviewed by WPM concerned. Actions are evaluated in order to reduce the risk.
LOW	They are included in the risk file and reviewed by WPM concerned. Actions are evaluated in order to reduce the risk.
MEDIUM	An owner is appointed to monitor the risk evolution and report to the WPM concerned. Actions are evaluated in order to reduce the risk.
HIGH	Same as level MEDIUM plus definition of specific mitigation actions. These actions are defined by the WPM concerned with the risk, which identifies also possible trigger events to start them. The owner monitors the risks and these trigger events.
VERY HIGH	Planned mitigation actions are started as scheduled. The risk owner is designated directly by the PM, who closely monitors the effectiveness of the mitigation actions at each project review meeting

Closed Events

During 2011 the following risks, identified in the Project Plan (2010 version) have been closed (list is by PA):

Closed risks since 2010 PP	Triggering event for closing
Managed	6
EU.01.02.01 TF Coils Magnet Windings	
TF Coils- Lack of competition for Winding Pack contract	Winding Pack contract signature
TF Coils- Monopoly situation for the PA	Change in Procurement Strategy, splitting in 3 contracts
EU.01.03 Vacuum Vessel	
Vacuum Vessel - No offer available / technically or economically acceptable for the main contract	VV contract signature
EU.01.04.02 Blanket First Wall	
Blanket-design issues	Design modified and detailed definition of the scope
Blanket-overlapping of responsibilities	
EU.01.15 Site and Buildings	
Site & Building- Objections from the consortia	AE contract signature
Impacted	5
EU.01.02.04.01 TF Magnet Conductors	
TF Conductors- TF conductors Lack of competition	TF conductors Contract signature
EU.01.02.04.02 PF Conductors	
PF Conductors- PF Conductors Lack of competition	PF conductors Contract signature
EU.01.03 Vacuum Vessel	
Vacuum Vessel - Delayed product and shop qualification of the (sub) supplier of Forgings material	Declared delay in monthly

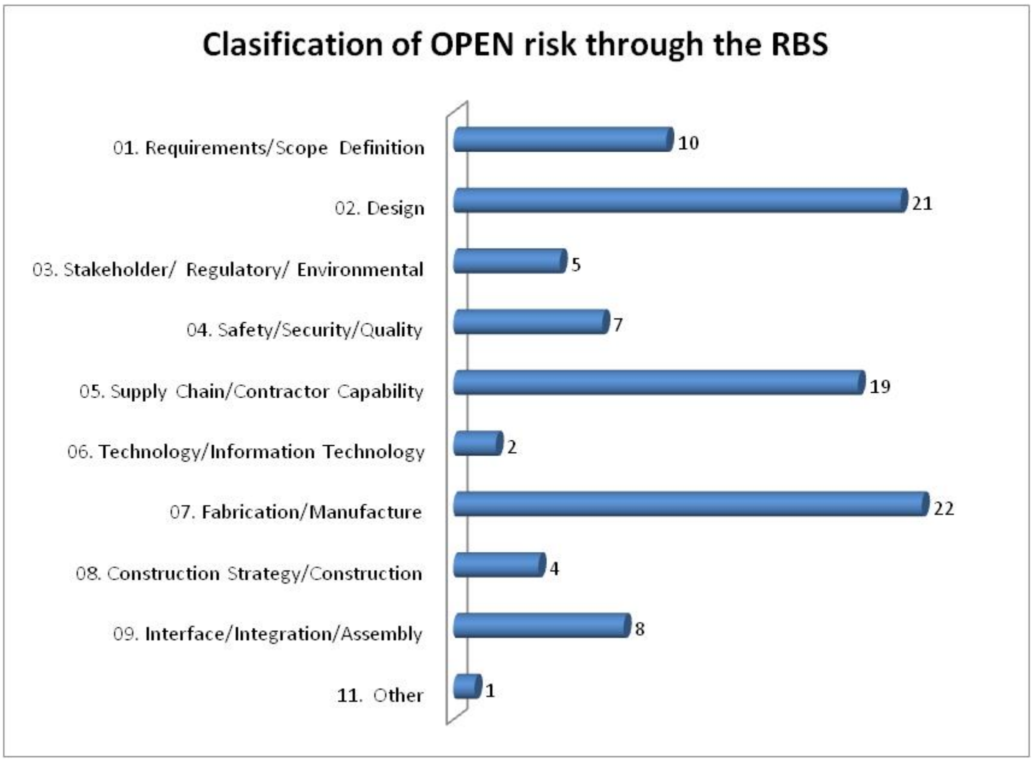
Vacuum Vessel - Delayed product and shop qualification of the (sub) supplier of Plates material	updates
Vacuum Vessel -Delayed finalization of the VV Sectors Concept design for the first Sector	
Grand Total	**11**

Open Events

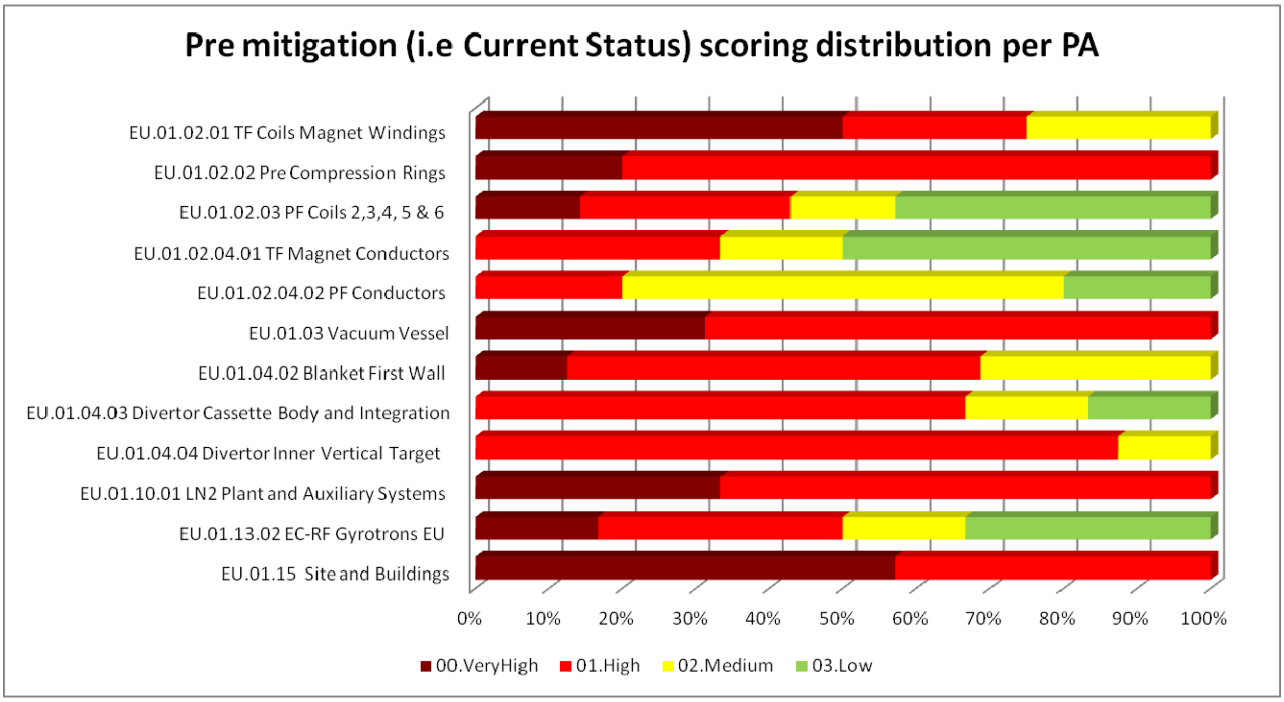
The still open events per PA are listed here after.

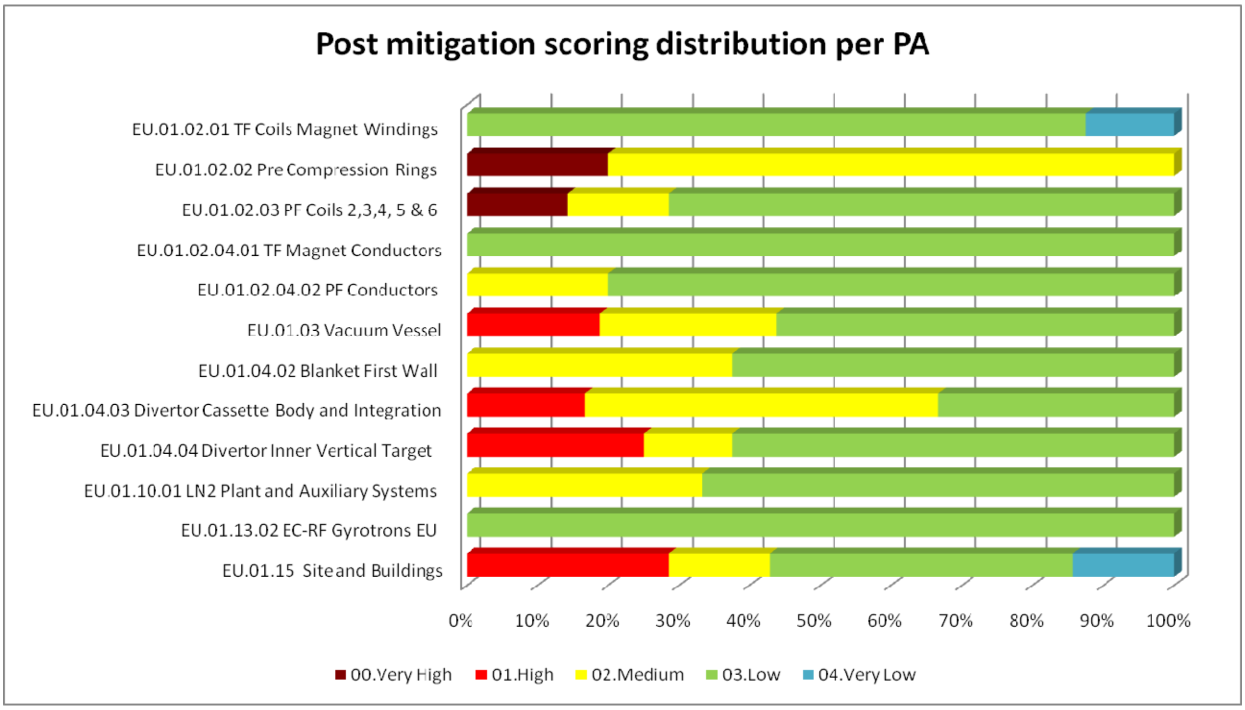
Procurement arrangements	Number of relevant risk events
EU.01.02.01 TF Coils Magnet Windings	8
EU.01.02.02 Pre Compression Rings	5
EU.01.02.03 PF Coils 2,3,4, 5 & 6	7
EU.01.02.04.01 TF Magnet Conductors	6
EU.01.02.04.02 PF Conductors	5
EU.01.03 Vacuum Vessel	16
EU.01.04.02 Blanket First Wall	16
EU.01.04.03.01 Divertor Cassette Body and Integration	6
EU.01.04.04.01 Divertor Inner Vertical Target	8
EU.01.10.01 LN2 Plant and Auxiliary Systems	9
EU.01.13.02 EC-RF Gyrotrons EU	6
EU.01.15 Site and Buildings	7
Total	**99**

The distribution of open events through the Risk Breakdown Structure (a categorization of the risks provided by ITER IO) is shown in the following chart. The classification of the risk events shows that the majority of risk events belongs to the **Fabrication/Manufacture and Design phases** of the project and that none are under category 10 (Testing/Operation), due to the early phase of the PAs.

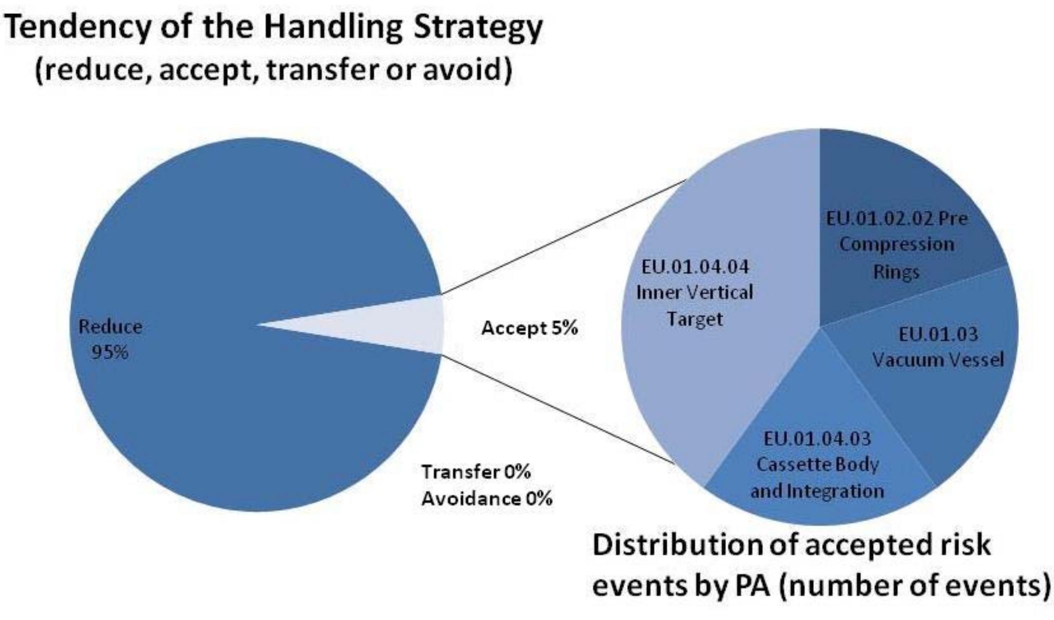


The distribution of the **risk level per PA in percentage** (with comparison pre- and post- mitigation) is shown here after. For a better clarity, pre-mitigation corresponds to the present status. Most of the events categorized as *High* and *Very High* have a mitigation plan that reduces the residual risk to an acceptable level.





The tendency in F4E for the risk handling strategy is to decrease the risk level of the event by using a mitigation plan. This is the reason why the following table of the type of risk response used (reduce, accept, transfer or avoid) shows only 5% of the risk events as accepted. In the right chart is shown the PA's that is referred to this small percentage of accepted risk events. Accepted risks are mainly due to the fact that mitigation actions are outside F4E responsibility and control, such as unforeseen changes of either physics or engineering requirements or design data not yet frozen by ITER IO.



Risk events with High or Very High Risk Level

Out of the 99 open events previously analysed there are 10 risk events that remains with *High* or *Very High* risk level after the handling strategy has taken place. The main two reasons are that either the risk has been accepted or that the risk mitigation carries a residual risk still very high without any possibility to perform additional actions.

QUALITY ASSURANCE (QA)

F4E-RELATED QA

The development and establishment of a Quality System in F4E is part of its overall management strategy and is included among the obligations as an items provider to the ITER and Broader Approach Projects.

The F4E Quality Management System implements, for safety relevant components and activities, the requirements of the 'Order of August 10 – 1984' (French Republic *'Arrêté du 10 Août 1984'*) and, in general, uses as a basis the IAEA Safety Requirements GS-R-3 (2006) and ISO 9001 as applicable.

QUALITY MANAGEMENT SYSTEM

The F4E Quality Management System (QMS) is composed of:

Management System Manual:
a description of the QA system for F4E operations

Specific Project Quality Assurance Programs:
a description of the technical QMS and systems integration / interface harmonization management for Broader Approach and ITER procurement items

Processes:
documents that provide information about how to perform the Organisation activities and processes consistently (part of the process approach to quality management)

Procedure, Instructions and Checklists
documents that provide information about how to perform the task activities and processes consistently.

Forms, Templates and Records

External Documentation

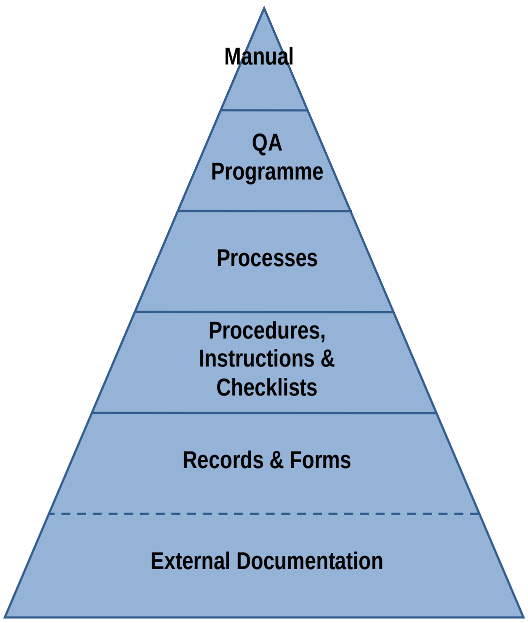


Figure 6 – QA Documentation

QUALITY FRAMEWORK MANUALS

F4E is establishing and documenting all its quality, operational and administrative methods of working. These are documented in 3 manuals:

- Management System Manual – top level manual
- Operational Procedures Manual – manual of operational procedures and instructions
- Administrative Procedures Manual - manual of administrative procedures and instructions

The Management System Manual encapsulates the overall management of F4E:

- Quality Assurance Policy, F4E Governance;
- F4E Organisation (OBS, Distribution of Responsibilities, Management Meetings);
- Planning, QA Management, Implementation (WBS, ITER and BA Projects, QA, Resources);
- Documentation (Quality Documents, Management System) ;
- Monitoring and Reporting (Internal Control Standards, Audits, Risk Management., Strategic Reviews, Reporting through the Annual Activity Report, Management reports, etc.);
- Improvement (Assessment, Configuration Management and Continual Improvement).

Process Approach

An expected result is achieved more efficiently when the corresponding actions and resources are managed as processes ('process approach'). Processes are being defined for all the identified processes needed for achieving the intended organization outputs. For each process all the actions, documentation, appropriate review and approval, reporting and records are defined.

The current processes interaction in F4E is represented in Fig. 7.

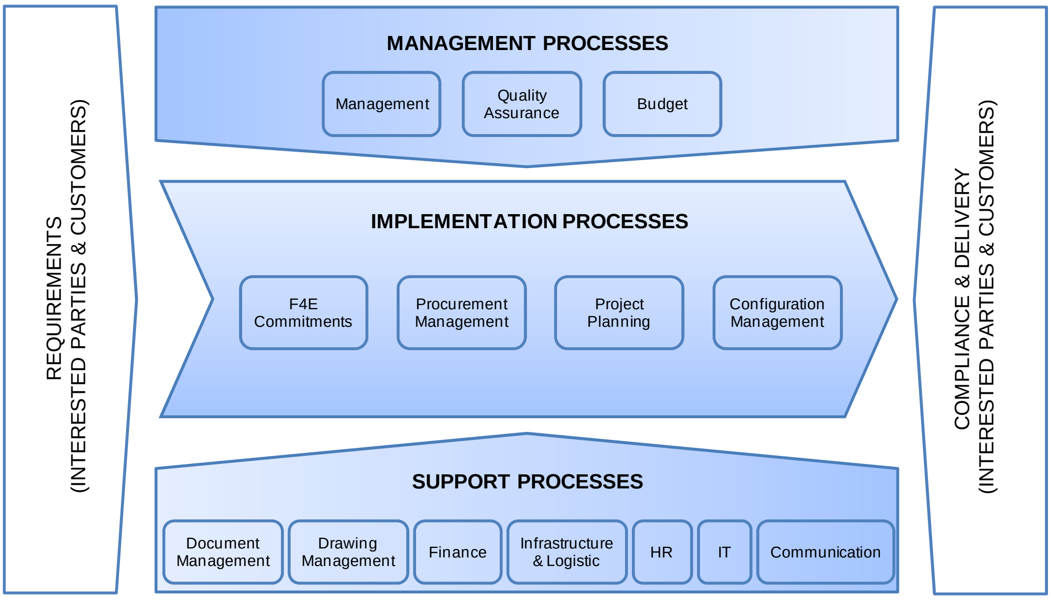


Figure 7 – Overall F4E Process

Most of the implementation and management processes have already been defined and are being implemented. These include processes (and sub processes) to deal with F4E Commitments (Procurement Arrangements, Task Agreements), Procurement Management and Configuration Management (nonconformities, deviations and project changes).

Part of the support processes is simultaneously being defined with the development of software tools to manage the Human Resources, Missions and internal requests (IT, logistics, etc.).

QA related to ITER Procurements

PROJECT QUALITY ASSURANCE

Within the scope of the specific project QA Programs of the quality system, F4E has developed a specific QA Program for the ITER Project to establish the overall framework to achieve the quality criteria for items and services provided by F4E to the ITER project. This QA Program (for the procurement of the EU in-kind components) has been approved by ITER IO.

As part of the formalisation and approval of the F4E commitments toward the ITER Project, F4E develops a Strategy Proposal for each project. Based on this strategy, F4E issues a Project Management Plan describing and defining:

- the provisions implemented to comply with the customer requirements and the project reporting rules;
- all interfaces within the project and in particular those between F4E responsible officers;
- the division of the project in the various work packages that have to be contracted with economic operators.

The supplier quality and management requirements are defined in the 'Supplier Quality Requirements' instruction. For each work package, F4E issues a management specification (that refers to that instruction, as a base for requirements) at the time of the call for tender and the selected supplier needs to provide a thorough quality plan following the different points raised by F4E in their specifications.

Supplier certification according to a specific international standard is not usually required (but recommended). The quality level is accomplished through the compliance with the F4E Management Specification.

Supplier compliance to the requirements is assured by a close follow-up and monitoring by the F4E, including regular visits, scheduled quality audits and follow-up of the specific work package control plan.

The integration of the F4E Configuration Management processes with the ITER Configuration Management is dealt by a dedicated 'F4E-ITER Project Configuration Management Plan' developed within the framework of the F4E quality system.

BROADER APPROACH ACTIVITIES

Fusion for Energy is the Implementing Agency for the EU contribution to the 3 BA projects, designated by Euratom to discharge its obligations as defined in the BA Agreement. In particular, F4E is the organisation delegated to agree and conclude Procurement Arrangements (PAs) with the Japanese Implementing Agency (JAEA).

Nevertheless, with few exceptions, most of the activities to be undertaken in the frame of the BA agreement are to be carried out in-kind by the EU-Voluntary Contributors. These are some of the members states represented in the Governing Board of F4E which pledged to contribute to the BA projects, namely Belgium, France, Italy, Germany, Switzerland and Spain. In turn, each VC will channel its contributions through the procurement arm of "Designated Institutions" (VC-DIs). F4E concludes Agreements of Collaboration (AoC) with the VC-DI, to secure delivery of the EU contributions to meet the requirements of each Procurement Arrangement.

Each of the BA Projects, while having some important differences, share the common feature of being based on a collaboration in which the Parties contribute both to the definition of the overall integrated design and to the detailed design and realisation.

JAEA and Fusion for Energy (F4E), nominated as Implementing Agencies (IA) by the Japanese Government and the European Commission, are the entities entitled to agree and sign any official document regarding the implementation of the BA agreement and in particular Procurement Arrangements.

The implementation of the projects is supervised by the Parties through the Broader Approach Steering Committee and its advisory bodies: the Project Committees for each project. In the case of the Satellite Tokamak Program and IFMIF/EVEDA, the organization put in place for their implementation includes at technical/operative level an "Integrated Project Team" which executes the project. It is formed by the union of a) the Project Team (with a very small number of staff), b) the EU-Home Team, and c) the JA-Home Team. The implementation of a similar structure for the IFERC DEMO design activities project is in progress and involves the collaboration between F4E and EFDA on this matter. The IPT for each project operates under a Common Quality Management System (CQMS). This regulates the collaboration of the IPT members, identifying the common templates and procedures, for example for configuration and procurement management. Each project's CQMS has the same basic structure, with some additional tailoring to the specific needs of each project. At the European level each project has its own QMS, which defines how the project operates with the VCs, and how it interfaces with F4E QA Management.

PROJECT IMPLEMENTATION PLANS

For each BA project, individual Project Plans covering the whole duration of the project and that include both European as well as Japanese activities are prepared by the Project Leaders and submitted annually to the BA Steering Committee (BASC). A summary is given below and further details and the project plans themselves are provided in annex 2 and the three sub-annexes 2.1-2.3.

The schedule of submission of the project plans now differs somewhat between the projects.

The STP project plan was approved by written procedure (due to Great Eastern Japan Earthquake and consequent cancellation of the Project Committee and Steering Committee Meetings) in March 2011 and will be updated again in April 2012.

The IFMIF project plan was revised in October 2010 and approved in December 2010 integrating recommendations of the IFMIF Project Committee. The F4E Project Plan to manage the European contribution to BA activities is constrained by these individual project plans endorsed by the BASC.

SATELLITE TOKAMAK PROGRAMME

Background

The mission of the JT-60SA project is to contribute to the early realization of fusion energy by supporting the exploitation of ITER and research towards DEMO by addressing key physics issues associated with these machines, in particular by designing , constructing and operating a device:

- capable of confining break-even equivalent class high-temperature deuterium plasmas lasting for a duration longer than the timescales characteristic of plasma processes;
- pursuing full non-inductive steady-state operation with high plasma beta close to and exceeding no-wall ideal stability limits.
- establishing ITER-relevant high density plasma regimes well above the H-mode power threshold.

The initial design was revised extensively in 2008, and this “re-baseline” forms the basis for the current procurements.

Work is in progress to revise the Overall Construction Schedule as a consequence of the delayed placement of the contracts for the TF coils manufacturing. A new schedule is foreseen as part of the next issue of the STP Project Plan in March 2012.

Overall Construction Schedule

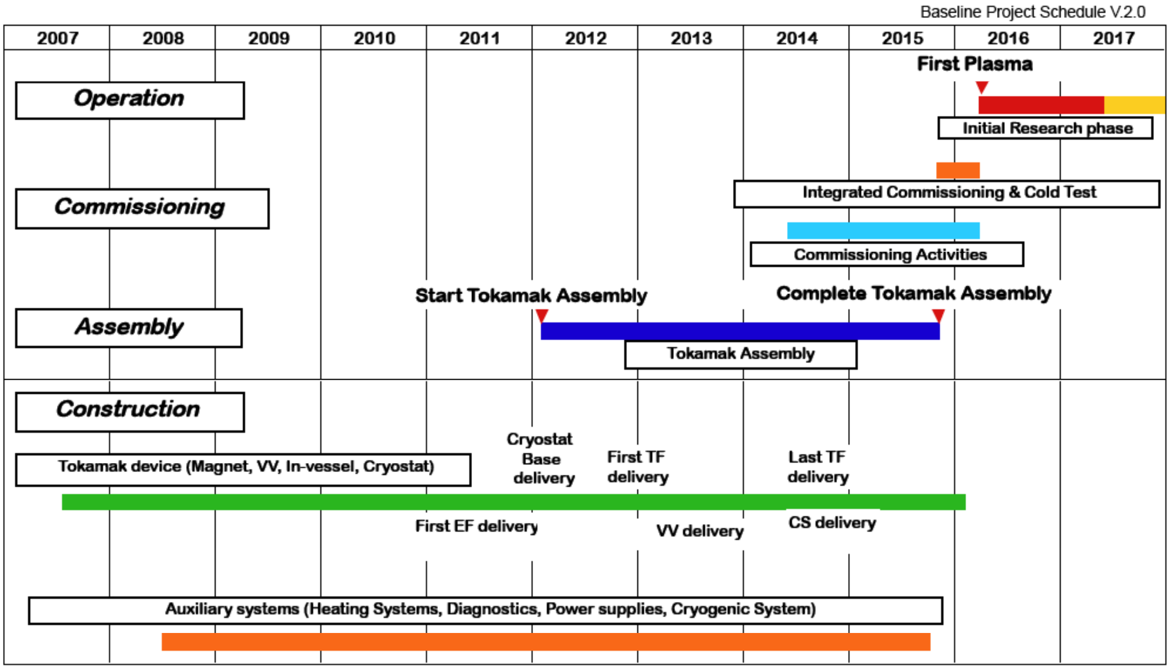


Fig.8: STP Baseline Project Schedule (approved at the SC-4 December 2008)

Status of EU Contributions

EU Procurement Arrangements on-going:

Toroidal Field Coil (STP-EU-PA-TFC): the TF magnet PA was signed in July 2010 with half a year delay with regard to the expected date. The contracts for the conductor cabling and jacketing and the superconducting strands was signed in late 2010. The kick-off meetings for both contracts were held in January 2011. The strand and conductor fabrication are now running well in schedule, with qualification of strand completed and conductor cabling/jacketing lines ready to start qualification. The first production lengths of SC and copper strands were delivered to the cabling company in July 2011. The first unit lengths of conductor are expected in February 2012.

The call for tender for the coils to be provided by France was launched by CEA at the end of 2010 and the contract was signed in July 2011. Contractual activities started immediately with formal kick-off meeting on 28th July 2011. For the coils to be provided by Italy, negotiations between ENEA and industry to sign the contract have been concluded and the contract has been signed the 20th September 2011 with formal kick-off meeting on 14th October 2011.

The first request of the Credit Accrued Value for the TF coils PA (1.260 kBAUA) was released by the PL on 18 April 2011on the basis of the advancement of the TF coils design and readiness for construction.

The technical specification of the casing was issued in July 2010. The contract is expected to be placed by ENEA within April 2012.

The design of OIS and Gravity support was reviewed at the end of 2010. Partial mock-ups of gravity support and OIS and associated tests are performed at CEA to qualify the design of the two structural components at the end of 2011 (in particular the spherical bearings of the gravity supports and the friction joints of the OIS).

High Temperature Superconducting Current Leads (STP-EU-PA-HTSCL): as for the HTS CL, following the successful test of the two prototype HTS current leads for the W7-X project, the design of the JT-60SA current leads is being finalized. A design review meeting has been successfully held on 31st March 2011. The interfaces between the current leads, the coil terminal boxes and the warm and cold feeders are designed in detail. Meanwhile about 55% of the HTS material has been delivered.

Quench Protection Circuit (STP-EU-PA-QPC): the PFC & TFC QPCs procurement contract has been awarded. The activities started with the contract kick-off meeting held in December 2010 though the formal signature of the contract was done on 4th March 2011. The QPC contractual Detailed Design Phase has been completed, on time, in July 2011, with the approval of the First Design Report. The corresponding first request for credit (for 1.915 kBAUA) was approved in July 2011 The first type-tests on the prototypes of two QPC main components i.e. the pyrobreaker and the by-pass switch, respectively planned in June and August 2011, have been successfully completed. The present contract schedule is in line with the procurement due time (end of July 2015).

Switching Network Units (STP-EU-PA-SNU): The SNU PA has been signed on 28th December 2010. The related call for tender is expected to be launched during the fourth quarter of the year 2011. The start of the contractual activities is presently estimated to take place within April 2012.

Superconducting Coils Magnet Power Supplies (**STP-EU-PA-SCMPS):** was concluded on 16th February 2011 and the start of contractual activities is expected within April 2012.

Cryostat (STP-EU-PA-CB01): CIEMAT succeeded to restart the industrial fabrication of the cryostat base. Stainless steel plates have been delivered and machining is largely completed and welding operations are ongoing. An updated schedule has been produced which foresees the completion of the Cryostat Base fabrication by end October 2012 and delivery in Japan within December 2012.

Cryostat Vessel Body (STP-EU-PA-CB02): The PA for the Cryostat Vessel Body Cylindrical Section was signed on the 25th July 2011. F4E has established an Agreement of Collaboration with the CIEMAT covering the full scope of supply (with the exclusion of transport which remains to be handled and paid by F4E). EU (CIEMAT) is expected to start tendering in September 2011 with the objective to place the contract at the beginning of 2012.

EU Procurement Arrangements to be placed:

Cryogenic system (STP-EU-PA-CRYO): The technical specification for the call for tender has been finalized and the call for tender has been issued mid of July. First offers from interested European companies are expected by November 2011. These offers will be discussed with the bidder companies and final offers are expected in March 2012. Placement of contracts is expected within June 2012. The conditions for on-site work of the EU supplier have been defined between JAEA, F4E, and CEA.

TF coil testing (STP-EU-PA-TFCTF): At the beginning of 2010 Switzerland indicated they were no longer able to provide the previously agreed contribution (cryogenic refrigerator, current leads) to the TF coil test facility. As a consequence, the review process of the Procurement Arrangement was stopped and the share of work was re-discussed. CEA has meanwhile decided to install the test facility at its premises in Saclay, where several existing facilities, which were used for the cryogenic tests of the W7-X coils can be made available for the test of the TF coils. The infrastructure at the new site for the test facility (Saclay) is being prepared. Tests with an existing refrigeration plant showed that its capacity is sufficient for the coil test and that only minor modifications are required to meet the test requirements. The Belgian Voluntary Contributor has continued construction of the cryostat. Delivery of the cryostat and the valve box vessel is scheduled for February 2012.

Power Supply to control Resistive Wall Modes-(STP-EU RPS): the functional specification is still to be issued by JA HT. The overall delay can be evaluated only after the definition of the technical specification.

Joint exploitation plan: it is foreseen that the JT-60SA machine will be upgraded step by step according to a phased operation plan consisting of an Initial Research Phase, an Integrated Research Phase, and an Extended Research Phase. Exploitation within the Broader Approach (BA) period is planned to be in the first part of the Initial Research Phase which includes HH operation for plasma commissioning. In the hydrogen phase of the initial research phase, the main aim will be the integrated commissioning of the system with and without plasma operation, as well as the preparation of the deuterium operation at full plasma current and high heating power up to 23 MW, including 10MW of positive ion source NB, 10MW of negative ion source NB and 3MW of ECRF at 110GHz. A lower single null divertor with partial mono-block target is planned in this phase. This should be followed by 1) DD operation for identification of issues in preparation for full DD operation. 2) an integrated research phase, and 3) an extended research phase as shown in Table III. A collaboration between F4E and EFDA is ongoing in order to work together with JAEA for the preparation of the research plan and the joint exploitation phase of the device.

Table III: STP Operation phases and availability of key components

<table>
<tr><th></th><th>Phase</th><th>Expected Duration</th><th></th><th>Annual Neutron Limit</th><th>Remote Handling</th><th>Divertor</th><th>P-NB</th><th>N-NB</th><th>ECRF</th><th>Max Power</th><th>Power x Time</th></tr>
<tr><td rowspan="2">Initial Research Phase</td><td>phase I</td><td>1-2y</td><td>H</td><td>-</td><td rowspan="3">R&D</td><td rowspan="2">LSN partial monoblock</td><td>10MW</td><td rowspan="5">10MW</td><td rowspan="2">1.5MW x100s + 1.5MW x5s</td><td>23MW</td><td rowspan="4">NB: 20MW x 100s 30MW x 60s duty = 1/30
ECRF: 100s</td></tr>
<tr><td>phase II</td><td>2-3y</td><td>D</td><td>4E19</td><td rowspan="3">Perp. 13MW
Tang. 7MW</td><td>33MW</td></tr>
<tr><td rowspan="2">Integrated Research Phase</td><td>phase I</td><td>2-3y</td><td>D</td><td>4E20</td><td rowspan="2">LSN full-monoblock</td><td rowspan="3">7MW</td><td rowspan="2">37MW</td></tr>
<tr><td>phase II</td><td>>2y</td><td>D</td><td>1E21</td><td rowspan="2">Use</td></tr>
<tr><td>Extended Research Phase</td><td></td><td>>5y</td><td>D</td><td>1.5E21</td><td>DN</td><td>24MW</td><td>41MW</td><td>41MW x 100s</td></tr>
</table>

IFMIF/EVEDA

The original objective of the Engineering Validation and Engineering Design Activities (EVEDA) of IFMIF was “to produce a detailed, complete, and fully integrated engineering design of the International Fusion Materials Irradiation Facility (hereinafter “IFMIF”) and all data necessary for future decisions on the construction, operation, exploitation and decommissioning of IFMIF and to validate continuous and stable operation of each IFMIF subsystem”. The initial duration of the project was set for 6 years, starting from June 2007.

Four main lines of activity were foreseen:

- The engineering design of the IFMIF facility, which is the principal objective of the EVEDA phase in view of preparing the construction of IFMIF;
- The design, construction, commissioning and operation of an accelerator prototype which is the low energy prototype of the two IFMIF accelerators, which represents a ambitious project to demonstrate full beam current performance and reliability;
- The engineering design and engineering validation activities for the Target Facility, which depends in particular on the design, the construction and the operation of the Li Test Loop;
- The engineering design and engineering validation activities for the Test Facility.

The last two lines form two sets of R&D programmes to provide the data bases needed to proceed to the engineering design of the IFMIF facility integrating the accelerator design with the Target Facility and the Test Facility designs.

Since the above concept was formulated, the context changed to some extent:

- Influenced by the ITER budget situation, the 8th Framework Programme (2014-2020) currently does not foresee a budget line for the construction of IFMIF.
- ITER will not operate in DT before 2026, delaying the need to launch IFMIF construction.
- DEMO design work is consequently also delayed, so the IFMIF users are not clearly identified today.
- Conversely, the ITER Test blanket community is increasingly interested in IFMIF as a data source, due to ITER delay.
- Due to the overall economic crisis and the consequent reduction in research budgets, it is difficult for potential hosts to register their interest.

- Nevertheless, the construction and experimental programme of the Accelerator Prototype is exceptional and challenging, and has strong interest from the worldwide accelerator community, so deserves a high priority.

As a result, the countries involved in the IFMIF-EVEDA made a detailed re-evaluation leading to the following conclusions:

- Higher priority is now given to the validation activities, and in particular to the Prototype accelerator.
- conversely the engineering design of IFMIF, to be provided at the end of the current EVEDA phase (i.e. June 2013) will not be at the level of detail originally envisaged, in particular all Conventional Facilities will be at a preliminary design level (since the site is unknown), enabling nevertheless a reasonable estimate of the plant value;
- it is expected that all major technological deadlocks of IFMIF will have been solved**,** meaning that it will be possible subsequently to prepare all technical specifications of industrial contracts for its construction with the possibility for the companies to commit on performances at a reasonable cost**.**

The result is a revised project plan, thoroughly analysed with both IAs and currently being recommended to the BASC, as shown in Figure 9.

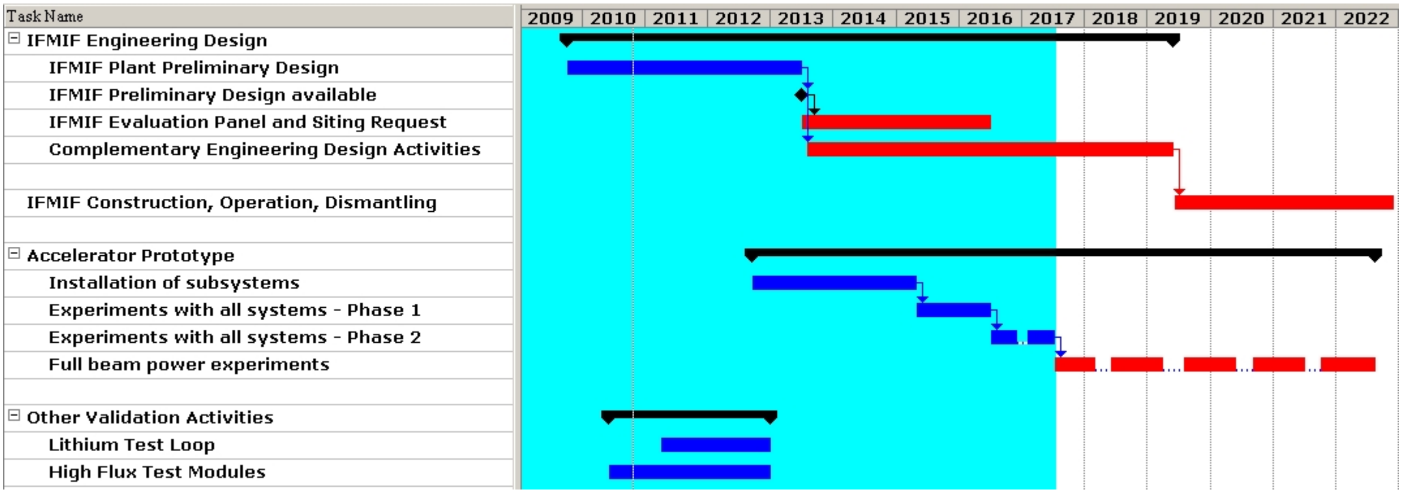


Figure 9 Revised Project Plan Proposal for IFMIF, also beyond the EVEDA

In this scheme:

- the blue area corresponds to the duration of the BA Agreement; the experiments on the Accelerator Prototype are conservatively considered only until its end, with a hold point one year after the start of experiments on the whole accelerator;
- blue lines are financed in the framework of the BA agreement;
- red lines are today not financed;
- the date of site decision is today unknown.

The four main milestones in the proposed extended EVEDA are the following:

- **June 2013**: Delivery of the IFMIF Preliminary Design Report;
- **June 2015**: Start of the experiments of the whole Accelerator Prototype;

- **June 2016**: Hold Point after one year of experiments on the Accelerator Prototype; evaluation of performances and of potential further effort needed to reach full specifications;
- **June 2017**: End of the studies in the framework of the Broader Approach agreement.

Status of the Rokkasho team

The Project Leader left the project for personal reasons in June 2011. An Interim Project Leader was nominated and the process to find the new leader started. Engineering design activities are being reorganised as a consequence.

Status of EU Contributions

Li Target Facility & Test Facilities: All PAs related to the Li Target validation tasks signed. The approval process of the text of European PAs for Test Facilities design and validation is completed and the related PA and AoC signature process have come to completion or are close completion. The concluding delivery of diagnostic components from ENEA to JAEA for the Lithium Test Loop at Oarai has been intermitted to await the finalisation of the inspection and recommissioning period after the Tohuku earthquake.

Prototype Accelerator (LIPAc): The Injector successfully demonstrated first ion extraction in Saclay in 2011. With the signature of the PA for the superconducting RF linac, for the Medium Energy Beam Transfer line and for the High Energy Beam transfer line all key subsystems are now fully committed. A new organization of the project was introduced with a stronger involvement of F4E.

Engineering Design: Work in progress to reorganise the activities in light of the change which have occurred in the Project Team in Rokkasho. Thus a revised structure of the Project Team that reflects more an integrated approach to the accelerator prototype and the engineering design activities has been worked out by the interim Project Leader and approved by the BASC on 25th October 2011.

IFERC

Background

The IFERC activities include three sub projects - DEMO Design and R&D activities, establishment and operation of a Computer Simulation Centre, and establishment and operation of a Remote Experimentation Centre - as well as the construction of the buildings to house all these activities.

Overall Schedule

The high level schedule is shown in Figure 10

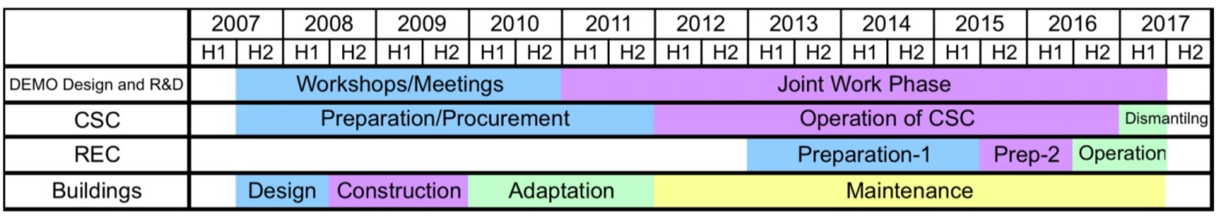


Figure 10 IFERC High Level Project Schedule

Status of EU contributions for DEMO Design Activities

The activity had been defined two phases:

Phase One: Analyse common elements for DEMO (2007-2010)

Phase Two: Develop Potential DEMO Designs (2011 - mid 2017)

Phase One activities have so far been conducted by a number of workshops/meetings. At the end of Phase One a major review took place to recommend specific goals for Phase Two, and a small group of experts outlined a proposal for Phase Two joint activities. Proposed Terms of Reference for DEMO Design Activities (DDA) were approved at the BASC in December 2010, and the DDA activities were stated according to the planning as follows:

Phase Two-A, *Jan 2011 – Dec 2012:* Consolidation of knowledge, to define a sound common basis for DEMO design, definition of priorities for R&D tasks

a. Definition of design criteria and cost models
b. Analysis of key design issues and options and launch preliminary work
c. Preparation and start implementation of system design code;

Phase Two-B, *Jan 2013 – Dec 2014*: Detailed studies

d. Follow-up work on key design issues and options and narrow down design options on which concentrate further analysis work
e. Adjustment of Design Criteria, Design Equations, and cost models
f. Evaluation of sets of DEMO parameters as a function of uncertainties
g. Preparation of intermediate documentation.

Phase Two-C, *Jan 2015 – Jun 2017:* Development of pre-conceptual design options for DEMO

h. Develop integrated conceptual design/ work final review and
i. Preparation of final documentation.

It is expected that this design activity will also suggest specific R&D activities, some of which would be carried out on ITER, or on the Satellite Tokamaks (JT-60SA) and other facilities.

EU Procurement Arrangements on-going :

IFERC-DDA-PA : Procurement Arrangement for the Phase Two DEMO Design Activities (DDA) for the IFERC Project: This is a joint EU-JA PA, signed in 2011 for all the activities described above, until 2017. In Europe it is backed by the activities agreed annually in the Power Plant Physics and Technology (PPPT) component of the EFDA Work Programme.

Status of EU contributions for DEMO R&D Activities

The DEMO R&D activities aim at establishing a common basis for a DEMO design from the technology point of view. Five R&D tasks were identified at the time of the signature of the BA Agreement

- T1: SiCf/SiC Composites
- T2:Tritium Technology
- T3: Materials Engineering for DEMO Blanket
- T4: Advanced Neutron Multiplier for DEMO Blanket
- T5: Advanced Tritium Breeders for DEMO Blanket

In 2012, a peer review of the DEMO R&D activities will be performed, in order to review the results obtained so far and take into account the input from the DEMO design activities.

EU Procurement Arrangements on-going:

- ***IFERC-T1PA01-EU.CIEMAT: Procurement Arrangement for the R&D activities on SiC/SiC composites for the DEMO R&D.*** This PA is concerned with R&D activities in the field of physical/chemical properties of SiC/SiC composites and ceramics under irradiation. This PA was signed in December 2010 and covers activities from 2008 to 2016. The total credit is 2.849 kBAUA, and the deliverables are reports.

- ***IFERC-T1PA01-EU.ENEA: Procurement Arrangement for the R&D activities on SiC/SiC composites for the DEMO R&D.*** This PA is concerned with R&D activities in the field of mechanical and physical/chemical properties of SiC/SiC, in particular thermal conductivity and modelling. This PA was signed in January 2011 and covers activities from 2008 to 2011. The total credit is 0.442 kBAUA, and the deliverables are reports.
- ***IFERC-T3PA01-EU.CRPP: Procurement Arrangement for the DEMO R&D activities in DEMO Blanket for the IFERC Project:.*** This PA is concerned with R&D activities in the field of RAFM steels for the DEMO blankets. This PA was signed in December 2010 and covers activities from 2008 to 2013. The total credit is 0.51 kBAUA, and the deliverables are reports.
- ***IFERC-T3PA01-EU.SCK.CEN: Procurement Arrangement for the DEMO R&D activities in DEMO Blanket for the IFERC Project:.*** This PA is concerned with R&D activities in the field activities on RAFM steels for the DEMO blankets. This PA was signed in December 2010 and covers activities from 2010 to 2013. The total credit is 0.885 kBAUA, and the deliverables are reports.
- ***IFERC-T3PA01-EU.KIT: Procurement Arrangement for the DEMO R&D activities in DEMO Blanket for the IFERC Project:.*** This PA is concerned with R&D activities in three fields: activities on RAFM steels for the DEMO blankets, advanced neutron multipliers for DEMO blankets, and advanced tritium breeders for DEMO blankets. This PA was signed in December 2014 and covers activities from 2008 to 2013. The total credit is 2.647 kBAUA, and the deliverables are reports.

In addition,

IFERC-T1PA02-EU.ENEA: Procurement Arrangement for the R&D activities on SiC/SiC composites for the DEMO R&D. This PA is concerned the procurement of an apparatus to measure corrosion of SiC/SiC in liquid metals. This PA will be signed in November 2011 covers activities from 2008 to 2013. The total credit is 1.032 kBAUA, and the deliverable will be the equipment, to be installed in the DEMO R&D building in Rokkasho.

EU Procurement Arrangements planned:

Two or three PAs may be considered if necessary in the future to cover the delivery of samples produced in Tasks T3, T4 and T5 to Rokkasho DEMO R&D laboratory.

Status of EU contributions to the Computer Simulation Centre (CSC) Activities:

The objective is to provide and exploit a super-computer located in Rokkasho for large scale simulation activities to analyse experimental data on fusion plasmas, prepare scenarios for ITER operation, predict the performance of ITER, and contribute to the DEMO design physics basis and BA activities.

During Phase One (July 2007 - December 2011), the goal was to set up the supercomputer and the associated peripheral equipment in the CSC/REC Building located in the Rokkasho BA site and to commission it.

A user-based special working group (SWG1) was set-up in 2008 to define the system requirements and assist the procuring IA in determining selection criteria, supplier selection, and acceptance requirements. The PA for the supply of a supercomputer and peripheral equipment was signed in

2010, and the contracts for procurement, operation maintenance and dismantling were concluded by CEA with Bull in March 2011. This is the main task of the EU-IA. The main task of JA-IA is to prepare interfaces for the installation of the equipment and to contribute to the seamless integration of the IT equipment and services in the International Fusion Research Centre, in particular by providing support for the interface with the users. For this purpose, the two agencies have conducted intensive preparation work, and the computer is being assembled in the second semester of 2011 according to schedule.The supercomputer has been named "Helios".

In Phase Two (January 2012 - December 2016), the activity will be to effectively operate the system and to coordinate the time-sharing for users. It is also important to involve early in the process the fusion community, in order to ensure that the appropriate codes are developed for the simulation and modelling of ITER, of the other fusion experiments, and for the design of DEMO and future fusion power plants.

A second special working group (SWG2) met in 2011 to make recommendations on project selection procedures, user utilisation rules, and the role of an advisory committee to preside over the process. The group drafted the Terms of Reference for a Standing Committee, which were approved by the BASC in July 2011. The Standing Committee will be nominated by BASC in October 2011, and start its work immediately conducting a call for proposals for projects in 2012. The first three months of operation will be used for "light-house projects", demonstration runs with the codes selected for the benchmarking of the supercomputer.

EU Procurement Arrangements on-going:

- ***IFERC-CSCPA01-EU.CEA : Procurement arrangement for the supply of the supercomputer and peripheral equipment for the IFERC project (CSC activity)*:** This PA covers the supply of a supercomputer and peripheral equipment by December 2011, the operation and maintenance of the supercomputer for five years (2012-2016) and the dismantling of the equipment in 2017. The PA was signed in 2010 and lasts until June 2017. The total credit associated is 91.5kBAUA, of which 62.4 kBAUA for equipment.

EU Procurement Arrangements planned:

- ***IFERC-CSCPA02-EU.CEA : Procurement arrangement for enhancements and others for the IFERC project (CSC activity)*:** This PA will cover such enhancements as found necessary during the first year(s) of operation of the supercomputer. These may consist of hardware or software and will be defined at a later stage. The PA is tentatively planned for the end of 2012. The total credit associated is 6.1kBAUA.

Status of EU contributions to the Remote Experimentation Centre (REC)

The Remote Experimentation Centre is planned to operate in the last two years of the BA Agreement, and will aim to facilitate broad participation of scientists into ITER experiments. Remote experimentation techniques will be tested on existing machines, such as JT60-SA. Preparatory activities will start in 2012, with the creation of a working group by the Implementing agencies to review the requirements for ITER and JT60-SA remote experimentation and the schedule. The future use of the REC on ITER will be discussed with the ITER Parties and IO.

IFERC Site

Site activities within the scope of the BA Agreement include the construction of the IFERC buildings and preparation of site infrastructure, and contribution to the management of the site, office equipment, insurance, and utilities (including data networks). The construction of the Administration and Research Building, CSC and REC Building, and the DEMO R&D Building was completed in March 2010. PAs for further adaptations of these buildings were completed in 2011, before installation and operation of the computer. PAs have been prepared in 2011 regarding site management, etc.

APPENDIX I: TABLE OF ACRONYMS AND ABBREVIATIONS

A/E	Architect Engineer
AGPS	Accelerator Ground Power Supplies
ALARA	As Low As Reasonably Achievable
ANB	Authorized Notification Body
ANS	Analytical System
ASN	Autorité de Sûreté Nucléaire
AVDEs	Asymmetric Vertical Displacement Event
ATS	Air Transfer System
BA	Broader Approach
BSM	Blanket Shield Module
BtP	Build-to-Print
CD	Current Drive
CFC	Carbon Fibre Composites
CMM	Cassette Multifunctional Mover
CVB	Cold Valve Boxes
CVD	Chemical Vapour Deposition
CXRS	Core plasma charge-eXchange Recombination Spectroscopy
DA	Domestic Agency
DACS	Data Acquisition and Control System
DCLL	Dual Coolant Lithium Lead
DCR	Design Change Request
DEMO	Demonstration fusion reactor
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
EUDA	EUropean Domestic Agency
EURATOM	The European Atomic Energy Community
F4E	Fusion for Energy
FS	Functional Specification
FW	First Wall
FWP	First Wall Panel
HAZOP	HAZard Operability
HCLL	Helium Cooled Lithium-Lead
HCPB	Helium Cooled Pebble Bed
H&CD	Heating & Current Drive

HHF	High Heat Flux
HIP	Hot Iso-static Pressing
HNB	Heating Neutral Beam
HV	High Voltage
HVAC	Heating Ventilation &Air Conditioning
HVD	High Voltage Deck
HW	Hardware
HXR	Hard X-Ray
IC	Ion Cyclotron
I&C	Instrumentation and Control
ICH	Ion Cyclotron Heating
IFERC	International Fusion Energy Research Center
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
ITER	International Thermonuclear Experimental Reactor
IVT	Inner Vertical Target
IVVS	In-Vessel Viewing System
JAEA	Japan Atomic Energy Agency
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
NHF	Nominal Heat Flux
ODS	Oxide Dispersion Strengthened
ORE	Occupational Radiation Exposure
P&ID	Process and Instrumentation Diagram
PA	Procurement Arrangement
PBS	Product Breakdown Structure
PE	Plasma Engineering
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
QA	Quality Assurance
R&D	Research & Development
RAFM	Reduced Activation Ferritic Martensitic
REM	Radilogical Environmental Monitoring
RF	Radio Frequency
RFCU	Radio Frequency Control Unit
RH	Remote Handling
RMP	Resonant Magnetic Perturbation
RNC	Radial Neutron Camera
RWF	RadWaste Facility
RWM	Resistive Wall Mode
SC	Super Conductor
SDC	Structural Design Criteria/Code
SHPC	Safety and Health Protection Coordination
SiC-Dual	SiC/SiC composite material for electrical and thermal Insulation
S-NHF	Standard Normal Heat Flux
SOLPS	Scrape Off Layer Plasma Simulation
SS	Steady State
STP	Satellite Tokamak Programme
SW	Software
TBM	Test Blanket Module
TCS	Transfer cask System
TES	Test Extraction System
TF	Toroidal Field
TFC	Toroidal Field Coils
TFWP	Toroidal Field Winding Pack
TH	Thermal Hydraulical
TO	Technical Officer
UT	Ultrasonic
Vis	Visible
VS	Vertical Stability
VV	Vacuum Vessel
WAVS	Wide Angle Viewing System
WBS	Work Breakdown Structure
WDS	Water Detritiation System