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 (2013 EDITION) 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], and in particular Article 6(3)(d),

Having regard to the Financial Regulation of Fusion for Energy[2] adopted by the Governing Board on 22 October 2007, last amended on 25 November 2011[3] (hereinafter "the Financial Regulation"), and in particular Article 30 thereof;

Having regard to the Implementing Rules of the Financial Regulation[4] adopted by the Governing Board on 22 October 2007, last amended on 11 December 2013[5] (hereinafter "the Implementing Rules");

HAVING REGARD to the comments and recommendations of the Administration and Finance Committee, Executive Committee, Technical Advisory Panel and the Bureau;

WHEREAS:

(1) The Director should, in accordance with Article 8(4)(c), draw up and regularly update the Project Plan;

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

HAS ADOPTED THIS DECISION:

Article 1

The Project Plan (2013 Edition) of Fusion for Energy annexed to this Decision is hereby adopted.

Article 2

This Decision shall have immediate effect.

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[1] OJ L 90, 30/03/2007, p.58.
[2] F4E(07)-GB03-11 Adopted 22/10/2007
[3] F4E(11)-GB21-10c Adopted 25/11/2011
[4] F4E(07)-GB03-12 Adopted 22/10/2007
[5] F4E(13)-GB28-14.2 Adopted 11/12/2013

Done at Barcelona, 11 December 2013

For the Governing Board

Stuart Ward
Chair of the Governing Board

For the Secretariat of the Governing Board

Digitally signed by (SIGN) RAYMOND MONK
DN: c=ES, o=FUSION FOR ENERGY. EUROPEAN AGENCY FOR ITER PROJECT, cn=(SIGN) RAYMOND MONK
Date: 2013.12.19 15:42:49 +01'00'

Raymond Monk
Secretary of the Governing Board

FUSION FOR ENERGY PROJECT PLAN
(EDITION 2013)

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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 within the period 2009-2020. 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's 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.

ITER

OVERALL SCENARIO

At the 9th ITER Council (IC-9) in November 2011 the latest developments of the ITER schedule were presented and it was noted that the estimated first plasma (FP) date of November 2020 is within the baseline approved in July 2010.

The F4E Detailed Work Schedules (DWS), on which this Project Plan is based, provide the schedule for the ITER components with special emphasis on those on the critical path for the machine construction.

The F4E schedule used for the preparation of this document is as of **October 2013** (submitted to ITER IO on 27th September 2013). This schedule has been recently revised following the F4E corporate objectives to have a realistic Work Programme 2014. A further revision is in progress in order to implement modifications to reach a realistic schedule for the whole construction also taking into account the resources availability. This work is done in parallel at F4E as well in ITER IO and the other Domestic Agencies (DA).

The references schedules for the elaboration of the report have been:

> **Strategic Management Plan (SMP) Baseline date:** IO's latest baseline (July 2012).
>
> **Detailed Work Schedule (DWS) current date:** F4E's current dates (submitted to IO on 27th September 2013).

In parallel to this activity, the most significant short-term milestones are being selected together with ITER IO to be included into the ITER Annual Work Plan and to represent the progress of the project forecasted in the year 2014.

After every DWS submission, at the beginning of each month, ITER IO carries out an integration of the DWSs received from all DAs and derives an integrated project schedule that takes into account all declared delays and readjusts the dates to take into account possible delays in supplies also between DAs. Therefore further adjustments to the overall schedule can happen after the integration work.

At the moment, due to the delays declared by F4E and by the other DAs, there is a consistent misalignment between milestones as declared in the DWS vs. the dates included in the current Strategic Management Plan (SMP) baseline. Following the scheduling work in progress to achieve a more realistic planning, it is assumed that the ITER Council will have to take a decision in June 2014 (or in 2015 as recommended by MAC during its last October meeting-MAC16) to revise the date of First Plasma accordingly.

Negotiations are still in progress with ITER IO and all DAs to identify both de-scoping and deferrals of in-kind procurements to the operation phase and also to define the Additional Direct Investments eligible to additional credits according to the guidelines agreed at the MAC-10 in 2011 and further discussed during 2013.

Cost containment and cost reduction measures are also the topic of on-going discussions at ITER Project level and inside F4E. Some proposals have been tabled for discussions at the Governing Board in June 2013 and a further analysis is in progress.

Fig. 1 and Table I shows a summary of the *key* delivery dates for components on the critical path. Table I shows the variance in calendar days between the F4E DWS versus the SMP Baseline. Table II shows the same key milestones comparing the dates of the SMP Baseline, the former dates in the Project Plan 2012 and those in the F4E DWS.

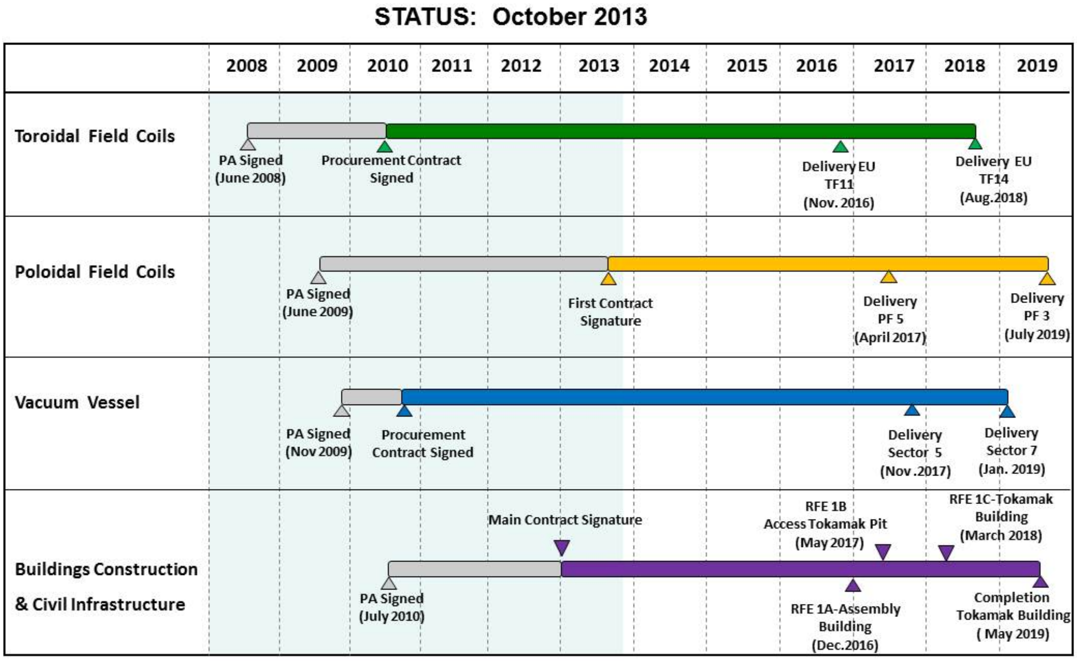


Fig 1. Summary of Key Milestones for main Systems

Milestone Name	SMP Baseline Date	DWS Date	Variance (Days)
Toroidal Field Coils			
IPL > Delivery of TF11 (EU 01) by EU-DA to ITER Site	30/04/2016	24/11/2016	208
IPL > Delivery of TF14 (EU 10) by EU-DA to ITER Site	31/10/2017	06/08/2018	279
Poloidal Field Coils			
IPL > Delivery of PF3 Coil by EU-DA to IO	28/10/2018	26/07/2019	271
IPL > Delivery of PF5 Coil by EU-DA to IO	07/03/2016	28/04/2017	417
Main Vessel			
IPL > Delivery of Sector 5 by EU-DA to ITER Site	20/03/2016	17/11/2017	607
IPL > Delivery of Sector 7 by EU-DA to ITER Site	28/08/2017	16/01/2019	506
Buildings and Civil Infrastructures			
IPL > Assembly Building (13) RFE 1A (RFE #1)	15/12/2015	26/12/2016	377
IPL > Construction of Tokamak Building (11) Completed	11/07/2018	10/05/2019	303
IPL > Tokamak Building (11) RFE 1B (RFE #2)	23/02/2016	03/05/2017	435
IPL > Tokamak Building (11) RFE 1C (RFE #2)	12/05/2016	12/03/2018	669

Table I – Summary of Key milestones variance.

Milestone Name	SMP Baseline Date	PP-2012 Date	DWS current Date

IPL > Assembly Building (13) RFE 1A (RFE #1)	December 2015	February 2016	December 2016
IPL > Tokamak Building (11) RFE 1B (RFE #2)	February 2016	April 2016	May 2017
IPL > Tokamak Building (11) RFE 1C (RFE #2)	May 2016	July 2016	March 2018
IPL > Construction of Tokamak Building (11) Completed	July 2018	July 2018	May 2019
IPL > Delivery of TF11 (EU 01) by EU-DA to ITER Site	April 2016	August 2016	November 2016
IPL > Delivery of PF5 Coil by EU-DA to IO	March 2016	April 2017	April 2017
IPL > Delivery of Sector 5 by EU-DA to ITER Site	March 2016	August 2017	November 2017
IPL > Delivery of TF14 (EU 10) by EU-DA to ITER Site	October 2017	February 2018	August 2018
IPL > Delivery of Sector 7 by EU-DA to ITER Site	August 2017	December 2018	January 2019
IPL > Delivery of PF3 Coil by EU-DA to IO	October 2018	April 2019	July 2019

Table II – Comparison amongst delivery dates for EU components on the Key milestones as in the SMP Baseline, former Project Plan 2012 and F4E DWS current date).

The dates in the schedules of the main critical components have either been supported by contractors working in these areas or by an analysis carried out within F4E. The large manufacturing contracts in the critical areas already in place allow a real-time analysis of the impact on variations of the design due to either, a delay of input data or to a modification of design.
Risks are being evaluated internally in F4E for all critical components in order to put in place, where possible, the necessary mitigation actions to avoid any impact that would cause a delay on the date of first plasma.
The exercise currently in progress in F4E to update the schedule to make it more realistic takes into account:

- the latest input and developments of the schedules from the F4E suppliers;
- the most realistic assumption of PA signature dates based on the current status of the design of components and on the forecasted dates of the required design reviews prior to the PA signature;

- the available manpower in F4E to take into account bottlenecks in specific areas where staffing is not sufficient to grant a prompt process of the work;
- the available yearly budget for the work on the EU in-kind procurements;
- the most realistic assumptions on the data availability from ITER IO to take into account the existing delays and the agreed dates of data delivery;
- the information provided by the other DAs through their monthly DWS to take into account any possible delay in the delivery of items to F4E that can cause delays to the EU in-kind procurements;

In order to achieve an improvement of the quality of the PAs that are signed, an effort is in progress in F4E to better identify the requirements that are linked to each specific procurement. ITER IO has also been called to contribute to this effort by propagating the requirements from the project level down to the level of the PA, where they interface with the DAs. Then F4E will take over for the propagation of the PA requirements down into the different procurement contracts.

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, once analysed, integrated into the overall F4E schedule in Primavera.

THE WORK BREAKDOWN STRUCTURE (WBS)

F4E has defined its own Work Breakdown Structure (WBS), a common basis across the whole organization to allow the integration of scheduling, estimating, procurement and finance systems. Some minor adjustments are still in progress. The WBS consists of 7 levels, where the 4th is at PA/ITA level and the 6th one is the level of the contract execution.

The development has taken 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. The WBS is now implemented across F4E and it is the basis which is used by the F4E reporting tool in order to extract the standard reports to monitor the evolution of the work and the progress of the project.

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

Table III shows, according to the current 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 translated into a practical set of rules to be used in the definition of the eligible credit.

Table IV shows the PA credit breakdown and the comparison between its signature dates, Baseline and current.

In some specific areas negotiations are still in progress on additional modifications.

WBS	Description	Current kIUA	kIUA PP'2012
EU.01.11.03	Magnets (20% of the conductor for the TF and PF coils, 10 TF	185.8188	185.829

WBS	Description	Current kIUA	kIUA PP'2012
EU.01.11.02 EU.01.11.04 EU.01.11.01	Coils, 5 PF coils – PF2-PF6)		
EU.01.15.01	Vacuum vessel (7 sectors of the main vessel)	92.19	92.19
EU.01.15.02 and EU.01.16.01	Blanket Cooling Manifold and Blanket First Wall (48.4% of the first wall)	46.172	46.752
EU.01.17.01, EU.01.17.02 and EU.01.17.03	Divertor (cassette body and integration, inner vertical target and divertor rail)	33.78	33.78
EU.01.23. 02 EU.01.23.03 EU.01.23.04 EU.01.23.05	Remote Handling (RH) (Divertor RH system, Cask and Plug RH system, In-vessel Viewing system, and NBI RH system)	39.73337	40.72
EU.01.31.01 EU.01.31.02	Warm Regeneration lines and Front-End Cryodistribution with Seven torus and two Cryostat Cryopumps with its Cold Valve Boxes (CVBs) , Cryopumps for the Neutral Beam system and leak detection and localisation	12.966	14.286
EU.01.32.01 EU.01.32.02	Tritium plant (consisting mainly of the Water Detritiation System (WDS) and the Hydrogen Isotope Separation System (ISS))	7.316	18.216
EU.01.34.01	Cryoplant system (50%) - LN2 Plant and Auxiliary Systems	30.677	30.677
EU.01.41.01	Electrical Power Supply & Distribution Systems (shared with other parties)	36.70284	31.0
EU.01.51.01	Ion Cyclotron Resonance Heating (ICRH) System (Equatorial port plug incorporating1 IC antenna)	3.96	3.96
EU.01.52.01 EU.01.52.02 EU.01.52.03	ECRH (four upper port plugs incorporating EC launchers each fed by 8 waveguides + 32% gyrotron sources + 67% power supplies)	32.32	31.12
EU.01.53.01	Neutral beam Heating System (Neutral Beam Heating System (100% assembly and testing,	83.40	83.40

WBS	Description	Current kIUA	kIUA PP'2012
EU.01.53.02 EU.01.53.03 EU.01.53.04 EU.01.53.05 EU.01.53.06 EU.01.53.07	100% Beam Line Components, 100 % of compensation and active correction coils, around 50% of the remaining components)		
EU.01.55.15 EU.01.55.13	Diagnostics (roughly 25% of all diagnostic systems)	24.63367	31.74517
EU.01.62.01 and Office Building	Buildings (all concrete and steel frame buildings incl. IO 's Annex Office building)	456.88647	454.87
EU.01.66.01	Waste treatment and storage	10.10	10.10
EU.01.64.01	Radiological protection	4.20	4.20
	Total	**1100.8601**	**1112.845**

Info. note:

Brief explanation on largest variance, in credit, from last year's Project Plan, PP 2012.

- Tritium Plant: from 18.216kIUAs to 7.316kIUAs; PCR 444. Water installation system construction and installation deferral.
- Diagnostics: from 31.74517 kIUAs to 24.63367 kIUAs; PCR 450. Deferral of Vessel back-end components and joint DA Port Plug Procurement.
- Electrical Power Supply and Distribution System: from 31kIUAs to 36.70284kIUAs. PCR481. Cable tray supply and installation inclusion.

Table III- Associated ITER credit, according to the current F4E WBS.

PA Title	Credit (kIUA)	PA Signature Date (SMP Baseline)	PA Signature Date (DWS current)
Magnets - Toroidal Field Coils	89.74000	June 2008	June 2008
Magnets - Poloidal Field Coils	40.86000	June 2009	June 2009

PA Title	Credit (kIUA)	PA Signature Date (SMP Baseline)	PA Signature Date (DWS current)
Magnets - Pre-Compression rings	0.60000	May 2010	May 2010
Magnets - PF Conductor	11.22880	May 2009	May 2009
Magnets - TF Conductor	43.39000	December 2007	September 2007
Vacuum Vessel Sectors	92.19000	November 2009	November 2009
Blanket Cooling Manifolds	4.65200	March 2014	May 2015
Blanket First Wall	41.5200	October 2012	December 2014
Divertor Cassette Integration	11.20000	December 2011	April 2012
Divertor – Inner Vertical Target	20.20000	March 2010	March 2010
Divertor Rails	2.38000	September 2014	September 2014
Divertor Remote Handling System	9.62000	September 2012	October 2012
Cask and Plug Remote Handling System	17.31337	July 2013	May 2014
In-Vessel Viewing System	6.80000	June 2013	May 2014
Neutral Beam Remote Handling System	6.00000	January 2013	June 2013
Torus and Cryostat Cryopumps and Cold Valve Boxes	4.82200	July 2014	October 2015
Neutral Beam Cryopumps	2.46400	November 2015	March 2016
Leak Detection Systems	4.40000	June 2014	May 2015
Front End Cryopump Distribution	1.08000	December 2013	December 2014
Warm Regeneration Lines	0.20000	September 2012	September 2013
Water Detritiation System - 1st part: Tritiated water holding tanks (storage and emergency)	2.55200	September 2012	December 2012

PA Title	Credit (kIUA)	PA Signature Date (SMP Baseline)	PA Signature Date (DWS current)
Water Detritiation System – 2nd part: residual WDS system (process components without tritiated water holding tanks)	3.1080	December 2014	February 2016
Isotope Separation System	1.6560	September 2016	April 2017
Cryoplant: LN2 Plant and Auxiliary Systems	30.67700	June 2011	June 2011
Detailed design of the Steady-State Electrical Network (SSEN) and Pulsed Power Electrical Network (PPEN)	7.00000	October 2009	October 2009
Installation and Commissioning of the Steady-State Electrical Network (SSEN) and Pulsed Power Electrical Network (PPEN) and SSEN cables	19.00284	December 2011	December 2013
Material procurement for SSEN	5.00000	July 2012	November 2013
Material procurement for SSEN Emergency Power Supply	5.70000	December 2012	November 2013
Ion Cyclotron Heating Antenna	3.96000	April 2016	November 2016
Electron Cyclotron Upper Launcher – Primary Confinement System	5.05200	November 2014	November 2015
Electron Cyclotron Upper Launcher – Plug	5.7800	November 2016	November 2017
Electron Cyclotron Radio-Frequency Power Sources	9.86000	December 2013	December 2015
Electron Cyclotron Radio-Frequency Power Supplies	11.62800	March 2011	May 2012
Neutral Beam – Assembly and Testing	3.80000	December 2014	May 2015
Neutral Beam -Beam sources and high voltage bushings	3.89300	July 2018	July 2018
Neutral Beam -Beam line components	3.90000	July 2018	July 2018
Neutral Beam –Pressure Vessel and Magnetic Shielding	9.02500	July 2015	January 2015
Neutral Beam –Active Correction and Compensation	4.40000	January 2015	February 2015

PA Title	Credit (kIUA)	PA Signature Date (SMP Baseline)	PA Signature Date (DWS current)
Coils			
Neutral Beam Power Supplies and Related Systems	31.38200	July 2009	July 2009
Neutral Beam Test Facility	27.00000	October 2010	October 2010
Diagnostics* –Magnetics, Electronics and Software	1.13968	November 2011	December 2011
***Diagnostics Systems	23.4939	-	-
Poloidal Field Coil Manufacturing Building	12.80000	November 2008	November 2008
Architectural and Engineering Services	55.10283	May 2009	May 2009
Tokamak Excavation and Support Structure	31.00000	May 2009	May 2009
Anti-seismic Bearings	6.20000	May 2009	May 2009
Construction (Reinforced Concrete Buildings and Steel Frame Buildings)	337.93364	July 2010	May 2010
New ITER Headquarters Building	13.85000	-	October 2012
Radiological Protection and Environmental Monitors Sys design	0.600	October 2012	September 2013
Radiological and Environmental Monitors Sys procurement	3.600	October 2012	TBA
Waste Treatment System	10.1	September 2014	April 2015

Total "Diagnostics Systems PA" credit is 24.63367kIUAs. The PA and related quantity right above (1.13968 kIUAs), is the signed quantity out of such Total, 24.63367kIUAs. The rest of the credit is not signed and computed as such in the pie charts below.

Table IV- EU Procurement Arrangements updated credit value and date comparison (Signed PAs shown as shaded)

ITER CREDIT

The current status in the signature of the EU PAs is shown in Fig.2 and 3.

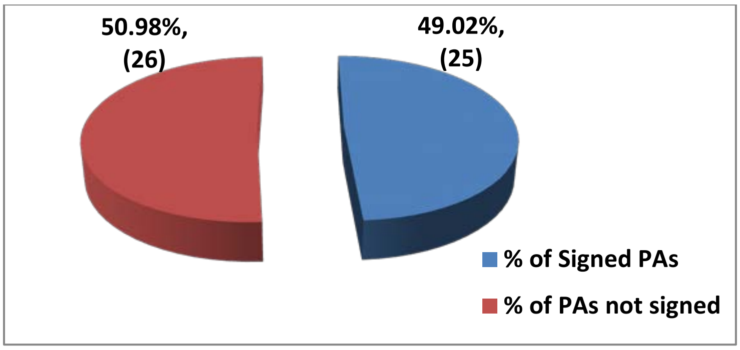


Fig. 2.Number of Signed/not Signed EU PA (status October 2013)

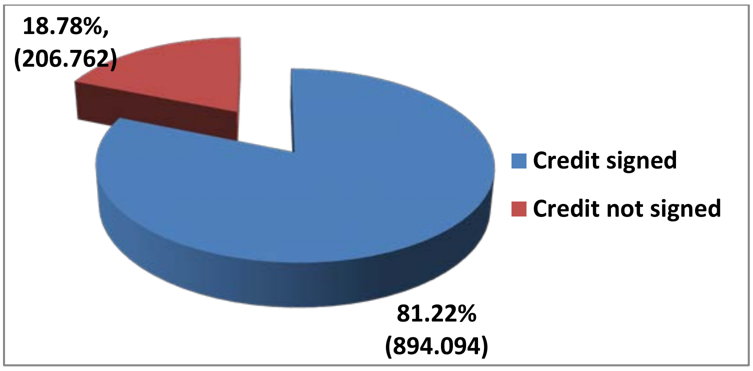
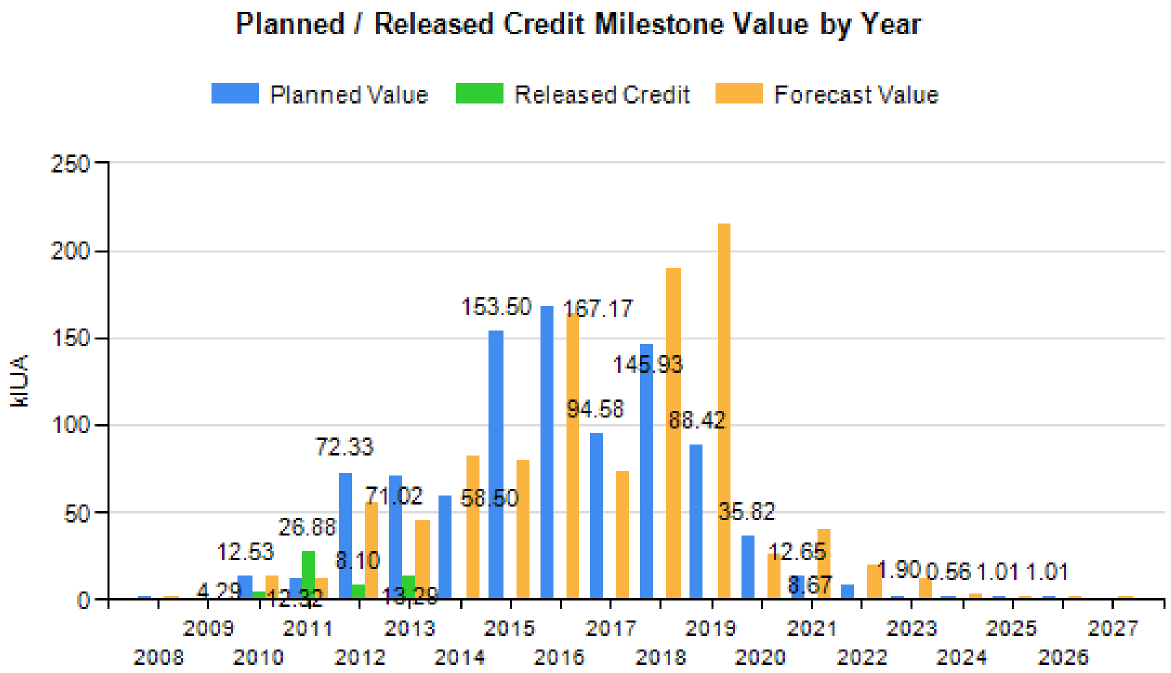


Fig. 3.Value of Signed/not Signed EU PA (Status October 2013) **

** Diagnostics: *Signed credit amount= 1.13968 kIUAs, non-signed credit amount= 23.4939 kIUAs.*

Fig. 4 shows the amount of credit released by ITER IO up to October 2013 for the EU in-kind procurements. After a milestone is declared as "achieved" in the F4E DWS, a formal credit request has to be issued to ITER IO and, following an internal procedure, the correspondent amount is credited. It should be mentioned that credits, as they are in the PAs, are linked and weighed according to the deliverables and therefore credits at the beginning of the activities are low. Credit distribution is more peaked toward the end of the PA.



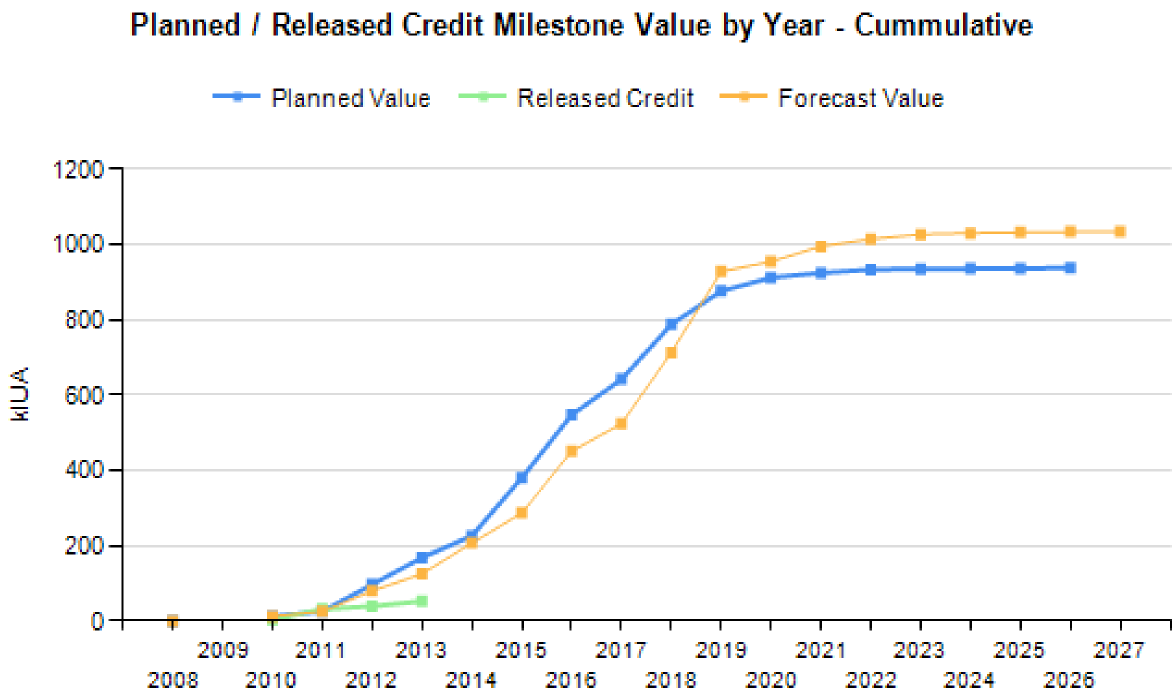


Fig. 4.Planned and Released ITER Credit for EU In-Kind Procurements (Status October 2013) (Source: ITER IO)

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 in specific PAs 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, but it can shift due to delays in the progress of the contract. The table here after, Table V, shows the percentage and the value (in kIUA) of the EU contribution together with the F4E payments from the signature date of the Japanese PA until end of October 2013 (also in kIUA). In orange are the Japanese PAs already signed.

System	Description	Percentage of System financed by EU through cash contribution to JA (approximate %)	Value of Cash Contribution (kIUA)	F4E Payments until October 2013 (kIUA)
Magnets	Toroidal Field Magnet windings 1B	9.4%	**7.7362**	**0.1343**
	Toroidal Field Magnet Structure 2A	90%	**46.2600**	**0.00**
	Toroidal Field Magnet Structure 2B	6.5%	**3.1005**	**0.4496**
	Toroidal Field Magnet Conductors	10%	**21.5000**	**17.8841**
	Central Solenoid Magnet Conductors	100%	**90.000**	**11.70**
Tritium	Atmosphere Detritiation	50%	**15.100**	**0.00**
Neutral Beam H&CD	Beam Source and High Voltage Bushing	21.8%	**2.0750**	**0.1038**
	Magnetic Shielding	24.2%	**2.8750**	**0.00**
	Power Supply for Heating Neutral Beam	57.7%	**42.9180** (20.296 out of total kIUA not yet signed)	**1.1311**

Table V- Percentage in value and in kIUA of the EU contribution together with the F4E payments from the signature date of the Japanese PA until end of October 2013

Main Milestones

The main short-term milestones are in Appendix II. It shows the date of achievement according to both the SMP baseline and the F4E DWS current date (submission to ITER IO on 27th September 2013). Monthly variations are reported by F4E and are based on the monthly DWS submission.

RISK MANAGEMENT

The Risk Management at F4E currently consists of two different levels: Corporate and Project Level. The Project Risk management implementation started in 2011 and will continue in the following years, while the Corporate Risk Management was implemented in the second part of 2012, and will be updated and monitored in the following years.

PROJECT RISK ASSESSMENT FOR IN-KIND PROCUREMENT

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

The analysis has initially concentrated on the components on the critical path thus reflecting the major issues that F4E is facing at the moment. During 2012, 23 Procurement Arrangements were analysed from a risk point of view, and in 2013 the analysis has been extended to 26, with the aim to extend the analysis to all EU Procurement Arrangements in the forthcoming months. In the following months other PAs will be included in the F4E risk register.

Following the 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.

Risk metrics details are provided in Appendix III.

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 TPO concerned. Actions are evaluated in order to reduce the risk.
LOW	They are included in the risk file and reviewed by TPO concerned. Actions are evaluated in order to reduce the risk.
MEDIUM	An owner is appointed to monitor the risk evolution and report to the TPO 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 TPO 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

Fig.5 – Risk metrics.

OPEN RISKS AND EVOLUTION 2012-2013 OF THE CURRENT RISK LEVEL

For the Open risks, here below is the distribution of the **risk level per system (number of risks)** with comparison between the current and the residual ones. Most of the events categorized as *High* and *Very High* have a mitigation plan that reduces the expected residual risk to an acceptable level.

Also is included, for comparison, the current value of last year. As already mentioned, 26 systems are included at the moment.

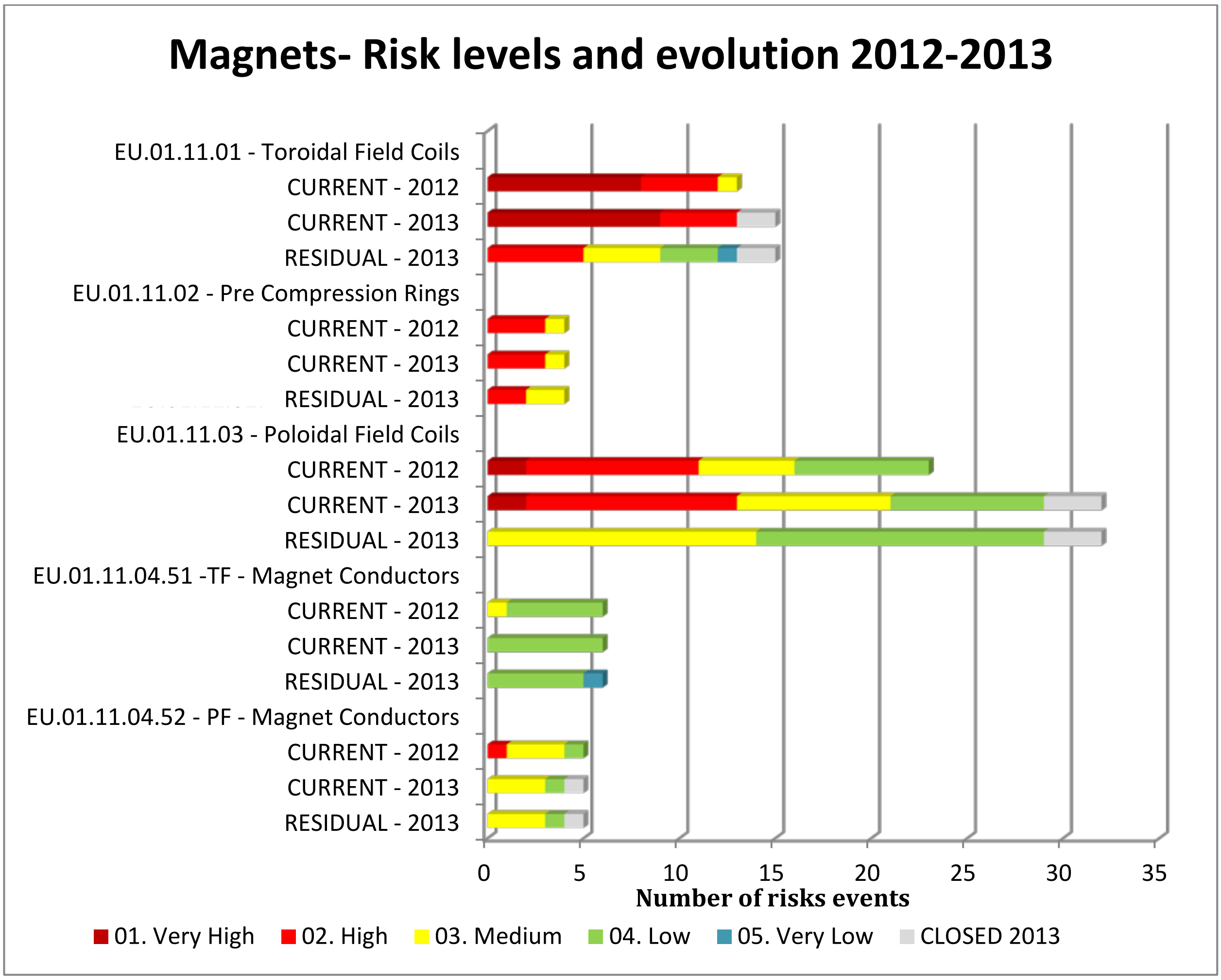


Fig 6. Magnets Risk Levels and their evolution.

- EU.01.11.01 - Toroidal Field Coils→ Following the signature of the procurement contract for the radial plates, the relevant risks for the lack of competition of the contract have been closed without impact. Interfaces with other DA's are key in this package. Regular updates with new technical risks have been carried out as the project detail was increasing.
- EU.01.11.02 - Pre Compression Rings → the contract was signed with no relevant changes from the risk point of view
- EU.01.11.03 - Poloidal Field Coils → in this case, the new procurement strategy has been analysed in detail regarding the implication of splitting the scope within several contractors. The risks on the management of the interfaces have been increased while those on a monopoly situation have been decreased. Some risks were rejected as not relevant to the new strategy. The decision of the manufacturing of the PF6 out of Europe also identified more risks(transportation and bureaucracy issues) and the opportunity to improve the schedule
- EU.01.11.04.51 TF - Magnet Conductors→ the risk level has been decreased as some activities have been finished and the risk probability and exposure have been reduced.
- EU.01.11.04.52 PF - Magnet Conductors→ the risk level has been decreased as some activities have been finished and the risk probability and exposure have been reduced.

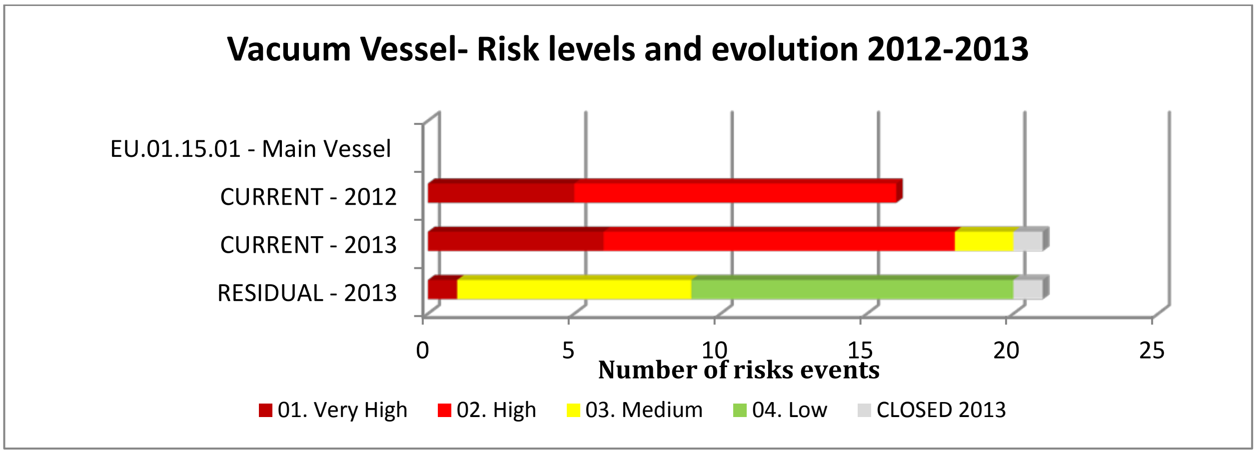


Fig 7. Vacuum Vessel Risk Levels and their evolution.

- EU.01.15.01 - Main Vessel → for this component, the contract is on-going and there are some recurrent risks that have been closed and reopened as they are still valid (i.e. delayed product and shop qualification of Plates materials and delayed finalization of the concept design. More details have been included due to a review carried out with the new project information and input provided by the supplier.

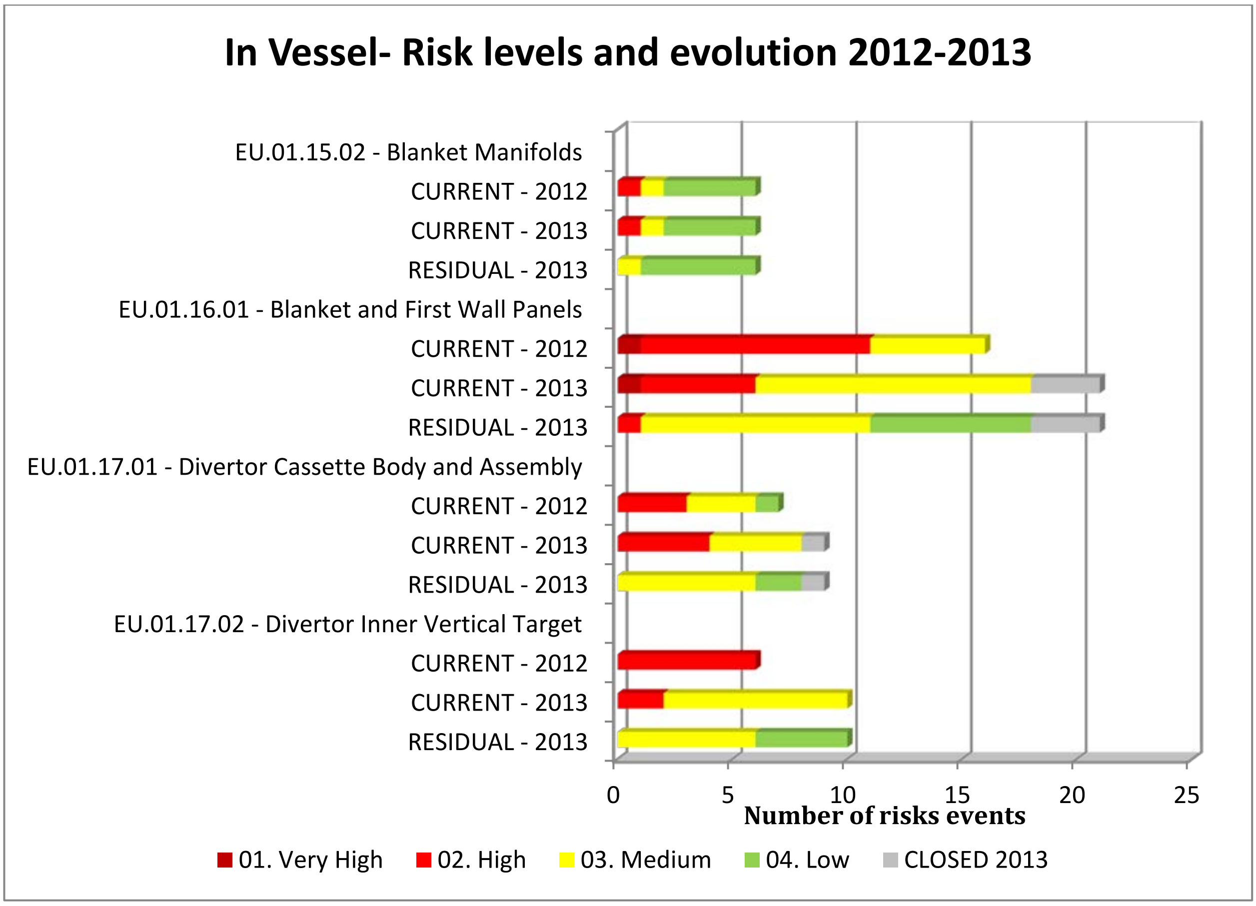


Fig 8. In-Vessel Risk Levels and their evolution.

- EU.01.15.02 - Blanket Manifolds → no relevant changes from risk point of view
- EU.01.16.01 - Blanket and First Wall Panels →a deep review has been performed introducing a few new lines. The level of some risks has been decreased due to completion of mitigation actions.
- EU.01.17.01 - Divertor Cassette Body and Assembly → one risk, concerning the expected price of the material, has been closed due to the performance of a market survey. New risks concerning the new schedule and the integration with other components have been identified.
- EU.01.17.02 - Divertor Inner Vertical Target →more details have been introduced and the level of some risks has been decreased as the mitigation actions have been completed.

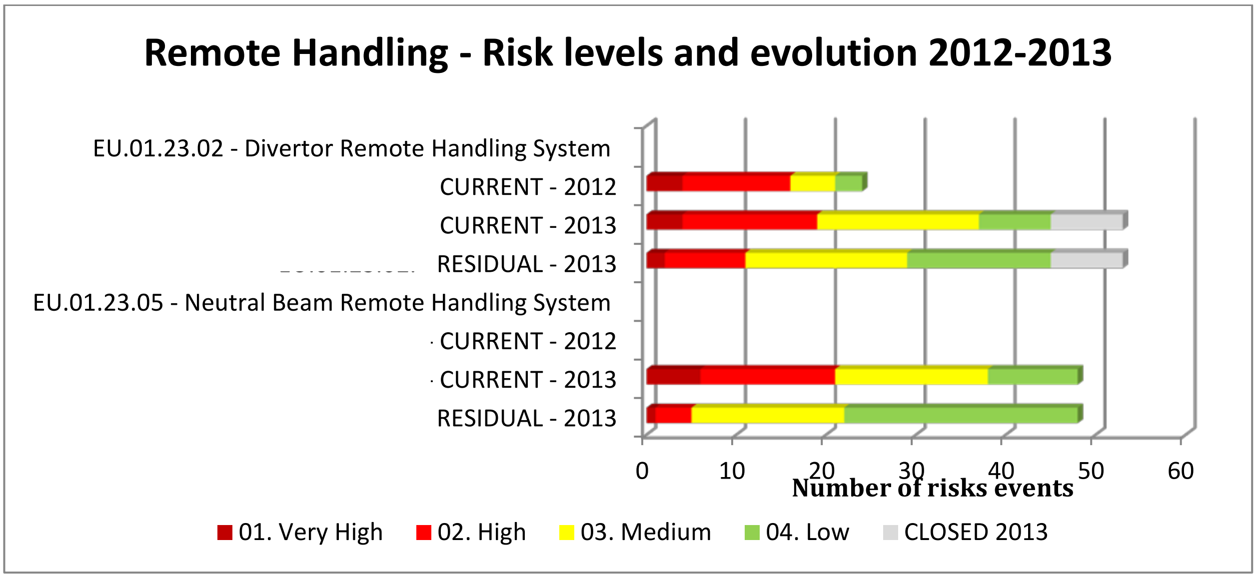


Fig 9. Remote Handling Risks Levels and their evolution.

- EU.01.23.02 - Divertor Remote Handling System → the risk analysis of this PA was completed during this year and more details were added. During the year some risks regarding pre PA activities have been closed without any impact. Some scope issues have been clarified with ITER IO (i.e. agreed in the PA) and the absence of competitors for the contract was also closed.
- EU.01.23.05 - Neutral Beam Remote Handling System *(NEW)→ As this is a new analysis, a comparison with the previous one is not possible.*

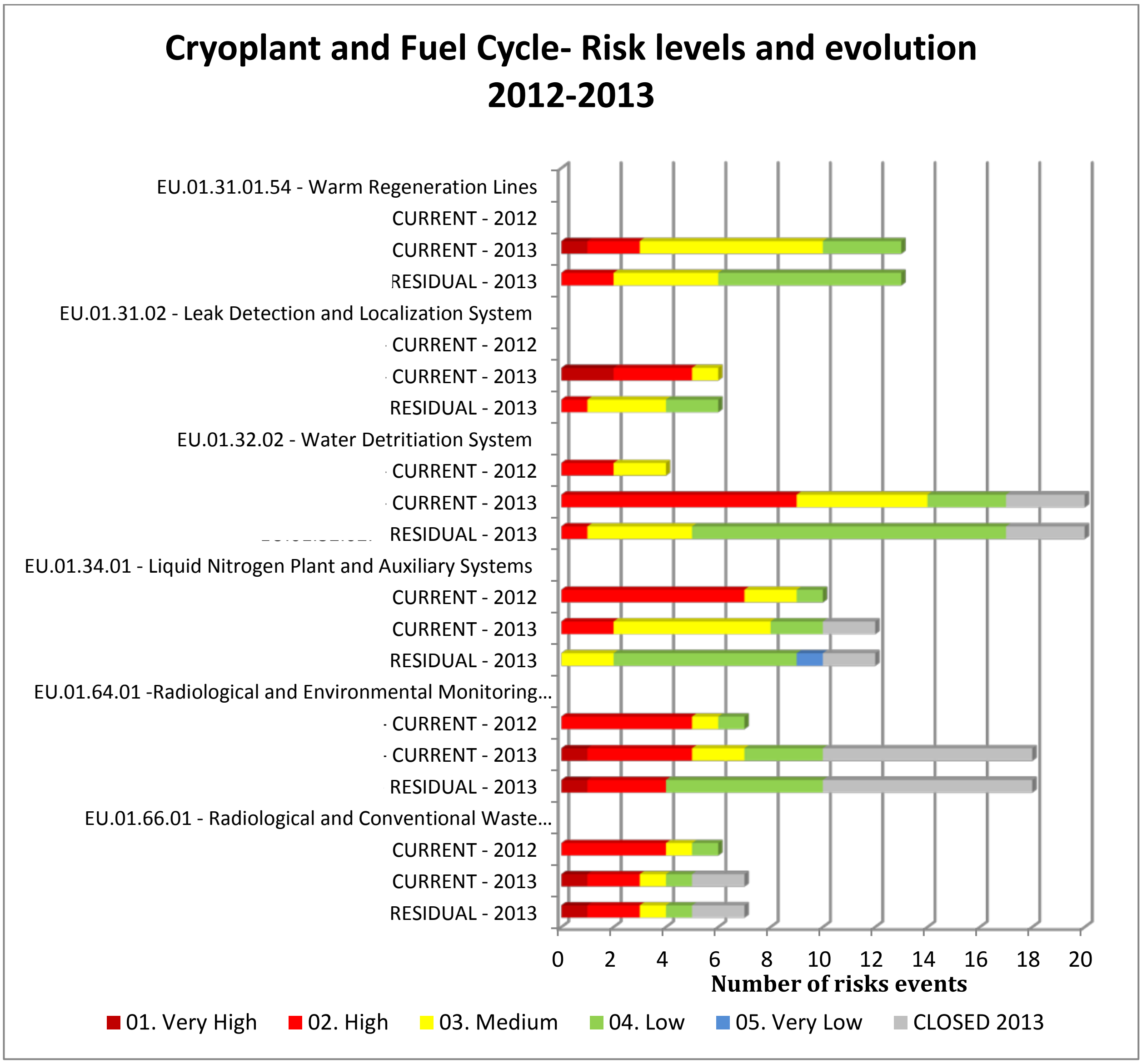


Fig 10. Cryoplant and Fuel-Cycle Risk Levels and their evolution.

- EU.01.31.01.54 - Warm Regeneration Lines *(NEW)→ As this is a new analysis, a comparison with the previous one is not possible.*
- EU.01.31.02 - Leak Detection and Localization System *(NEW) As this is a new analysis, a comparison with the previous one is not possible.*
- EU.01.32.02 - Water Detritation System→ More details have been added after the signature of the preliminary design of WDS.
- EU.01.34.01 - Liquid Nitrogen Plant and Auxiliary Systems→ with the implementation of many of the planned mitigation actions, the risk level for most of the critical risk events has been decreased.
- EU.01.64.01 - Radiological and Environmental Monitoring System → in this case all the closed risks have impacted the project, thus increasing mainly the expected cost and the scope of the PA. An analysis of the new situation for the signature was done with the identification of many new risks that may affect from the signature.
- EU.01.66.01 - Radiological and Conventional Waste Treatment and Storage→ since last year there is one risk that has increased the risk level. This moved to Very High after the negotiations carried out with ITER IO with a Very High impact on cost.

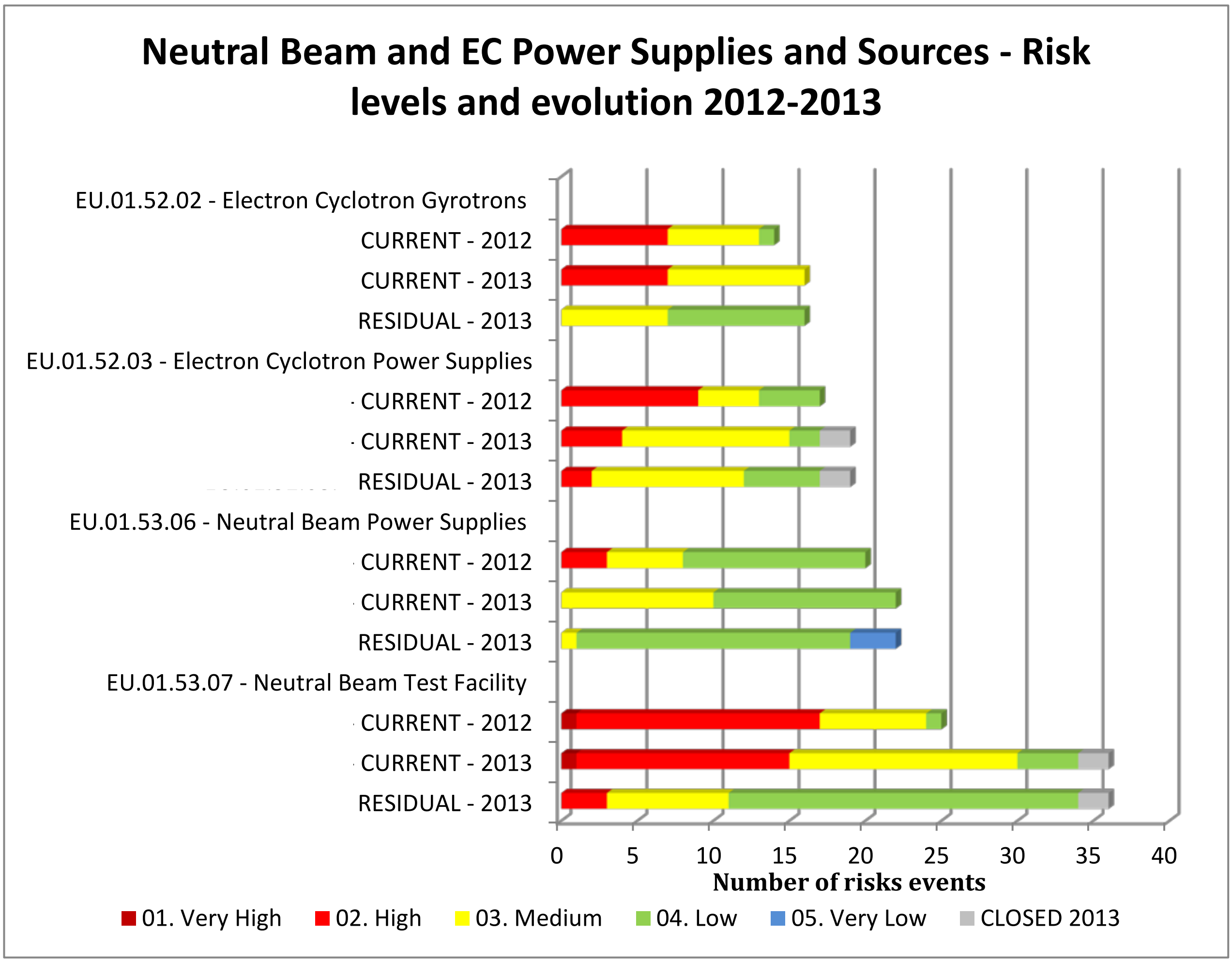


Fig 11. Neutral Beam EC Power Supplies Sources Risks Levels and evolution.

- EU.01.52.02 - Electron Cyclotron Gyrotrons → A new Risk identified regarding the general policies (IPR).
- EU.01.52.03 - Electron Cyclotron Power Supplies → with the implementation of many of the planned mitigation actions, the risk level for most of the critical risk events has been decreased.
- EU.01.53.06 - Neutral Beam Power Supplies → with the implementation of many of the planned mitigation actions, the risk level for most of the critical risk events has been decreased.
- EU.01.53.07 - Neutral Beam Test Facility → New additional risks have been included

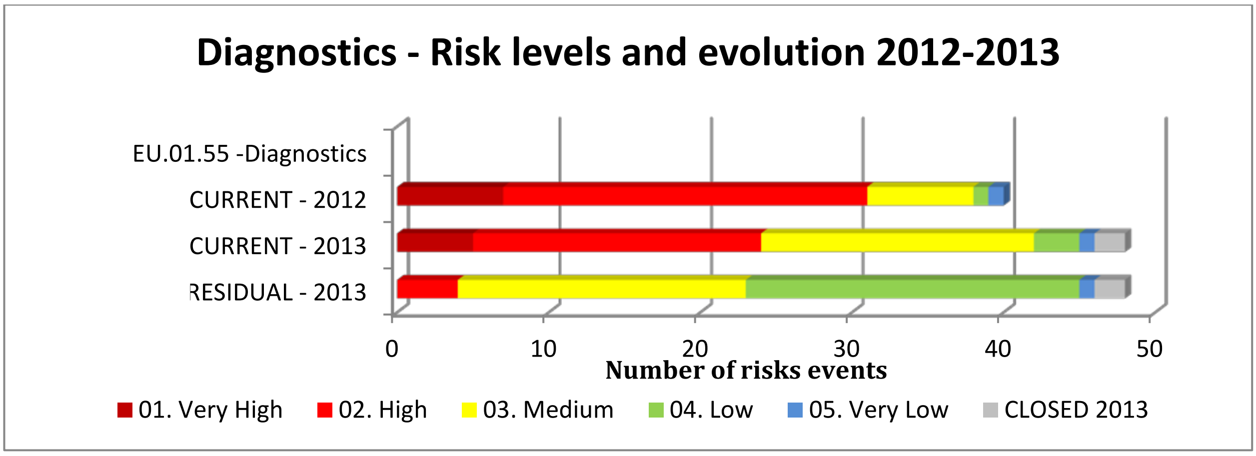


Fig 12. Diagnostics Risk Levels and their evolution.

- Diagnostics (General Risk Log) → additional risks were identified with the increase of the project information. Threat closed concerning the agreement with IO on the responsibilities on the area of port plugs and the standardization

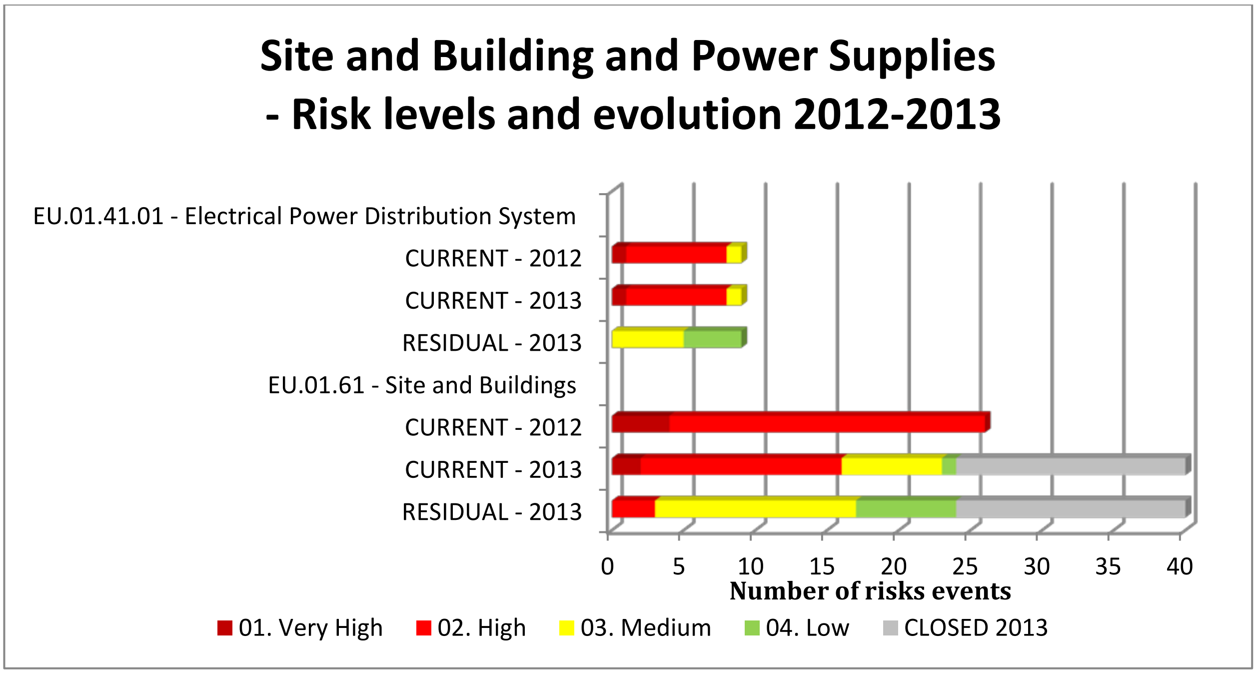


Fig 13. Site and Buildings Risk Levels and their evolution.

- EU.01.41.01 - Electrical Power Distribution System → no relevant changes from risk point of view
- EU.01.61 - Site and Buildings → for buildings the signature of TB04 and TB03 have closed some of the risks and decreased the risk level analysed last year. The move to a realistic schedule has decreased the current risk level. The late, incomplete and changing input date from IO for buildings remains a major risk for the SBPS project in terms of schedule and cost.

Distribution of open Risks per Categories

The current Risk Breakdown Structure (RBS) is a categorization of the risk proposed by ITER IO, and it consists of the following categories:

1. *Requirement/Scope Definition*: risk regarding the definition and maturity of the requirements and the understanding of the scope of the project
2. *Design*: Risk regarding the design complexity, maturity, development and integration
3. *Stakeholder/Regulatory/Environmental*: Risk regarding 3 different categories, such as stakeholder (EU, ITER IO, F4E), Regulations and possible environmental risks.

4. *Safety/Security/Quality*: safety, security and Quality risks
5. *Supply Chain/Contractor Capability*: Risk regarding the supplier situation, such as e.g. lack of competition or unavailability of facilities
6. *Technology/Information Technology*: risk regarding the status of the technology (R&D), IPR, and possible risks on IT or specific software
7. *Fabrication/Manufacture*: risk regarding mainly uncertainties in the manufacturing
8. *Construction Strategy/Construction*: Risk regarding the construction strategy or the construction itself
9. *Interface/Integration/Assembly:* Risk regarding the management of the interfaces both within this project or with other projects (DA's)
10. *Testing/Operations*: Risk that can arise during the testing or operation phase. In most of the cases the operation is out of the scope of F4E projects.
11. *Other:* Free category

The distribution of open risk events for 2013 through the Risk Breakdown Structure is shown in the following chart.

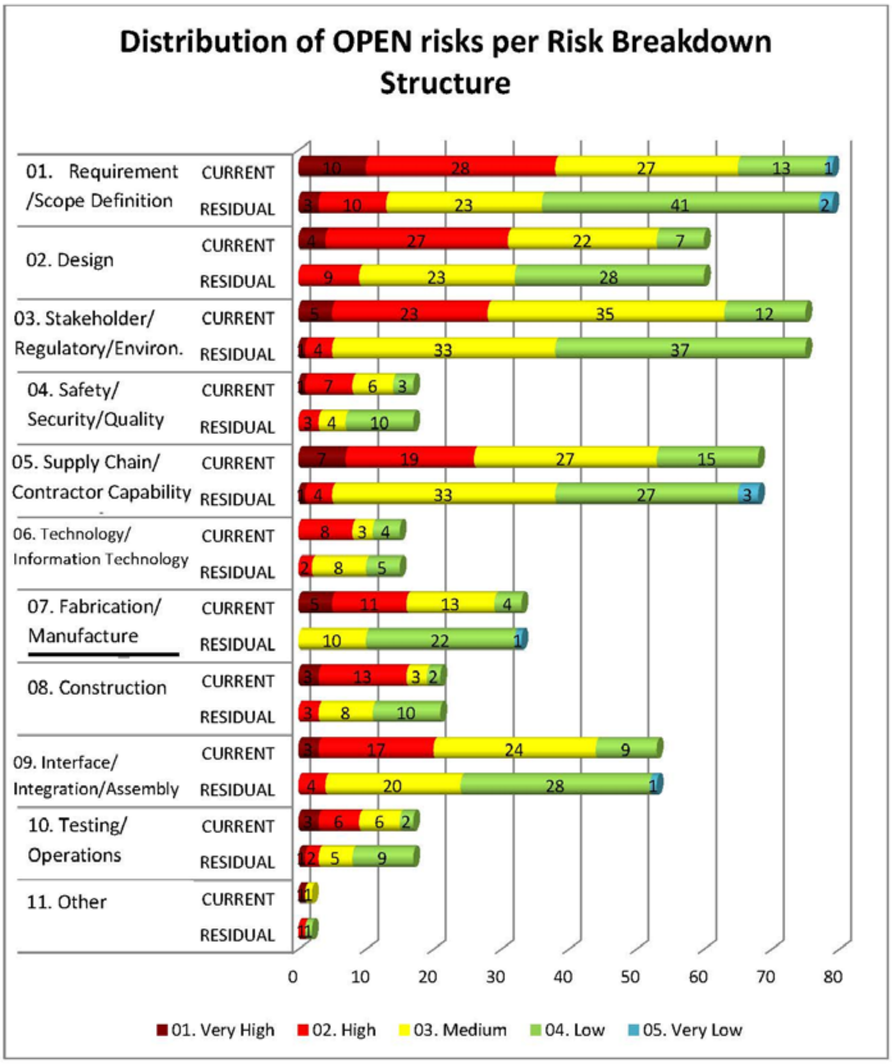


Fig 14. Distribution of Risk per Risk BDS

Quality Management

Quality System

The F4E Quality Management System provides the overall framework to establish, to execute, to evaluate and to continuously improve the quality management system following the same approach as outlined in ISO 9001 and in IAEA Safety Requirements GS-R-3 (2006) in order to ensure the quality of the in-kind items and services which relates to the business executed in F4E.

Within the quality system, F4E developed specific Project Quality Assurance Programmes - a description of the technical quality management system and systems integration / interface harmonization management for Broader Approach and ITER procurement items.

Quality Management in F4E follows a PDCA cycle: Plan (plan quality) > Do (quality assurance) > Check (quality control) > Act (quality improvement).

Fig. 15 - Overall Quality Process

The purpose of each phase is:

- Quality Planning: to determine or identify the quality requirements and standards that will be applicable to the project, the deliverables of the project and how the requirements and standards will be met based on the project objectives (including establishment of policies and processes),
- Quality assurance: to review the deliverables and the project. It includes all processes, tools, procedures, techniques and resources necessary to meet quality requirements
- Quality control: to determine whether the established requirements (project objectives, quality requirements and standards) are being met and to identify causes of, and ways to eliminate, unsatisfactory performance
- Quality Improvement: the activities focused on increasing the ability to fulfil quality requirements (including effectiveness, efficiency or traceability)

Quality Framework

In the Integrated Management System was approved, merging the requirements of the two control environments in which F4E operates since the beginning: - the (ISO-based) ITER-wide Quality System, which is intended to ensure the performance of ITER and the compliance with the nuclear safety requirements, and the (COSO-based) Internal Control Standards as implemented by the European Commission.

This system is implemented through Quality Management which provides an effective and efficient method to perform the tasks, a perspective on the organisation and its risks. It allows F4E to continually improve the way of working and to reinforce the F4E corporate culture towards the stakeholder's expectations.

Fig. 16 - F4E Integrated Management System

QA and QC related to ITER Procurements

The F4E Quality Management System implements, for safety relevant components and activities, the requirements of the INB Order of the 07 February 2012 (replaced from the 01 July 2013 the Quality Order of 10 August 1984), emphasising putting the application of quality to assure safety.

The overall framework to achieve the quality criteria for items and services provided by F4E to the ITER project is established in the F4E QA Programme for the ITER Project (a specific project QA Programs of the quality system). This QA Programme (for the procurement of the EU in-kind components) is approved by the F4E Director and 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.

Suppliers are bound to follow a Quality System for their work. They provide a dedicated Quality Plan that describes the quality provisions to be implemented in order to comply with the F4E *Supplier Quality Requirements* as defined in the call and contractual documentation. Once approved by F4E, it can be used and is physically transferred to F4E at the end of the collaboration in order to ensure traceability of the delivered products over the whole project life.

QUALITY ASSURANCE (QA) AND THE QUALITY REQUIREMENTS

Quality Assurance encompasses several tasks, including:

- Support Project Teams in preparation and implementation of ITAs and PAs, ensuring compliance with the F4E QA Programme;

- Support Project Teams in preparation and implementation of Contracts and Grants, ensuring compliance with the F4E QA Programme;
- Ensure that quality processes and procedures are complied with, and in particular the configuration control and configuration management activities;
- Training on QA and Nuclear Safety to all the operational officers and main SIC Suppliers;
- Verification of the Suppliers Quality Plans and all the contract implementation quality documentation, including supplier quality audits and surveillance;
- Coordination of Nonconformities raised and registered in F4E.
- Support to and liaison with the management in all topics involving QA;

The quality and management requirements are defined in the 'Supplier Quality Requirements' (F4E-QA-115) – a contractual Annex. The contract's Management Specification refers to that specification, as a base for requirements, defining the project organisation and the dispositions implemented to ensure a proper monitoring of the contract or grant agreement. It governs the relationship between F4E and the supplier. It requires a 'Quality Plan' from the supplier/tenderer describing the provisions it will implement in order to ensure that the contractual requirements will be met and maintained.

QUALITY CONTROL (QC)

Quality Control is applied during the whole project life cycle and includes the following:

- monitoring the quality of the deliverables and processes is being met and detecting defects by using the established tools, procedures and techniques;
- analysing possible causes of defects;
- determining the preventive actions and deviation requests;
- communicating the corrective actions and deviation requests to the appropriate project organization members.

The Quality Control of the contracts/grants implementation is performer by the Project Teams with the technical support and guidance of the Quality Officers, ensuring the adequate monitor and surveillance of the contract/grant implementation by the Supply chain. This includes regular visits, scheduled quality audits and follow-up of the specific work-package control plan.

The supplier monitoring and surveillance is being supported by a framework contract of inspectors for manufacturing follow-up.

The Supplier shall maintain a divergence management system to monitor and record the quality of the work performed by the Supplier in comparison to the original specification for the Works.

As per QA-115, the Supplier's Quality Requirements document, F4E demands to the supplier that any divergence from the original specification for the Works must be documented and approved by F4E in accordance with the provisions set out in the Contract.

Nonconformity is a non-fulfilment of a requirement. This requirement might come from the procedures, the items and services specifications or from the stakeholder. F4E has defined a procedure for handling all aspects of the detected nonconformities.

All F4E personnel are responsible for the identification and reporting of any detected nonconformity.

Any deviation (or modification) to a specified requirement identified by F4E or the supplier shall be handled by the dedicated deviation procedure and the F4E configuration management process. A detailed process exists at F4E for the management of deviations.

The supplier's deviation procedure shall be described in the contract Quality Plan as required by the Management Specification.

Deviations and Nonconformities are assessed in F4E taking into account their impact on customer's requirements (ITER IO), F4E Requirements and the cost impact. The F4E classification is as follows:

Impact	Nonconformity	Deviation
on customer critical requirements	Major	Level C
on customer non-critical requirements	Minor	
on F4E contract, but not on customer requirements	Relevant	Level B
no impact on F4E contract or customer requirements	Technical Exception	Level A

All raised nonconformities, to be accepted, have to be presented with the correspondent remedial action (correction of the specific situation). For the closure, both the result of that action and the corrective action to be implemented to avoid repetition of the same problem have to be available.

All Deviations are assessed for impact on performance, cost and schedule before a decision is taken whether to accept them or not.

Here is a table with the number of registered Deviations and Nonconformities at F4E.

Deviation level	2010		2011		2012		2013 (<Nov)	
A	21	9%	15	5%	10	3%	5	2%
B	127	52%	180	62%	161	51%	149	44%
C	84	34%	67	23%	124	39%	127	37%
Cancelled	13	5%	30	10%	22	7%	59	17%
total	245	-	292	-	317	-	340	-

Nonconformity level	2010		2011		2012		2013 (<Nov)	
Major	11	11%	33	36%	34	20%	48	32%
Minor	3	3%	17	19%	16	9%	28	19%
Relevant	47	48%	34	38%	107	61%	73	48%
Exception	38	38%	6	7%	17	10%	2	1%
total	99	-	90	-	174	-	151	-

Table VI – Statistics on Deviation Requests (DR) and Nonconformities (NC)

In F4E the Sign-Off Authority (review and approval) for each Deviation and Nonconformity document is defined considering the significance of the document and the impact on related activities to ensure technical adequacy, completeness of document, and appropriateness of quality.

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.

QUALITY AUDIT

Quality audits are performed to verify the state of the Quality System and Quality Plans in accordance with the quality criteria and stakeholder requirements. The methodology regarding the planning, preparation, implementation and recording of internal and external quality audits is defined in a documented process.

The objective of the Quality Audits is to:

- Assure the conformity of the implemented quality system,
    1. Internal: Relative to defined Internal and/or stakeholder requirements;
    2. External: Relative to the Quality Plan;
- Verify the effectiveness of the quality system implemented and its maintenance;
- Supply the necessary suggestions to the adequate functioning of the quality system.

The quality audit results are recorded and analysed, and may trigger corrective actions, arising from nonconformities, or preventive actions, arising from comments. The reports of internal quality audits are one of the main inputs of the quality improvement.

BROADER APPROACH ACTIVITIES

Fusion for Energy is the Implementing Agency for the EU contribution to the 3 BA projects, designated by the European Commission 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, Spain, and Switzerland (who has now withdrawn) . 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, reporting status as of October 2013, 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 updated STP project plan (sub-annexes 2.1) was approved by the BA Steering Committee in its 12th Meeting on the 23rd April 2013 and will be updated again in March/April 2014.

The updated IFMIF project plan (sub-annexes 2.2) was endorsed by the BA Steering Committee in its 12th Meeting on the 23th April 2013 and will be updated again in March/April 2014.

The updated IFERC project plan (sub-annexes 2.3) was endorsed by the BA Steering Committee in its 12th Meeting on the 23th April 2013 and will be updated again in March/April 2014..

The F4E Project Plan to manage the European contribution to BA activities is constrained by these individual project plans endorsed by the BA SC.

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.

In response to the request of the Steering Committee at the 9th meeting in 2011, the schedule rebaselining for JT-60SA has been developed jointly between EU and JA Home Teams. The values of the concluded PAs reached more than 90% in total for components at beginning of 2013. In line with these PAs, the revised schedule has much higher credibility than the previous one at the rebaselining in 2008 as it is largely based on contracts placed with industry, and with industry commitment to the dates of component delivery. The assembly schedule is being developed in interaction with industries.

The new schedule is part of the STP Project Plan (ref. BA SC 10-7.7) endorsed by the BA Steering Committee on its 10th Meeting on 24th April 2012.

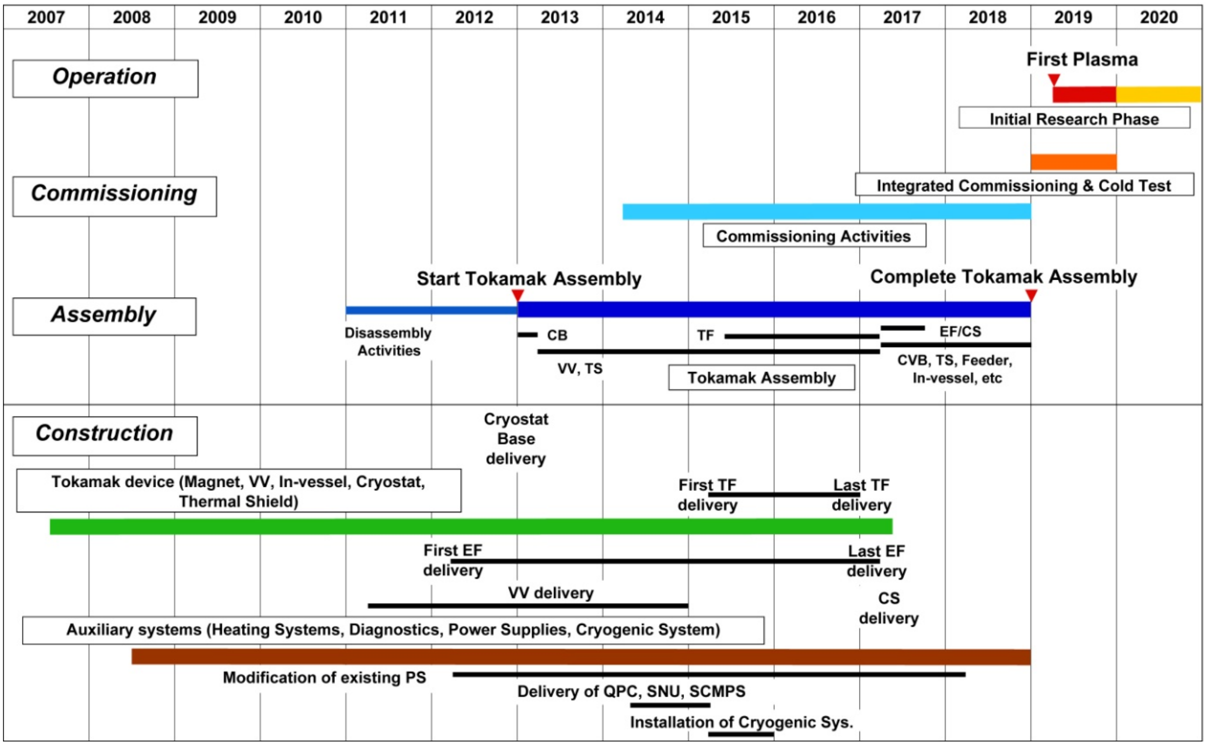


Fig.17 - High-level Project Schedule (as endorsed by the BA Steering Committee on its 10th Meeting on 24th April 2012)

Status of EU Contributions

EU Procurement Arrangements on-going:

PA reference	PA title	Planned credit BAUA
EU-TFC	Supply of the Toroidal Field Magnet	88940
EU-HTSCL	Supply of HTS Current Leads for the TF, CS and EF coils	3420
EU-TFCTF	Setup of a Cryogenic Test Facility and the Performance of Tests of the TF coils	18603
EU-QPC	Supply of the Quench Protection Circuits for Poloidal and Toroidal Field Coils	19150
EU-SCMPS	Supply of Toroidal Field, Poloidal Field, and Fast Plasma Position Control Coils Power Supplies	20080
EU-SNU	Supply of the Switching Network Units for Central Solenoids	7080
EU-CB01	Supply of Cryostat Base	4348
EU-CB02	Supply of Cryostat Vessel Body Cylindrical Section	13042
EU-CRYO	Supply of the Cryogenic System	35250
	Total JT-60SA	209913

EU Procurement Arrangements to be placed:

TF coil pre-assembly (STP-EU-PA-ASSY): A study will be completed by the EU-HT to understand if it would be possible to complete the pre-assembly in Europe. Japan is also to complete a study of the ramifications of assembly in Japan. In any case it is intended to decide the issue by the end of 2013 with a view to signing the PA for this work by mid-2014, and implementing it by F4E contract by Q3 of 2014, in time for the first coil testing in Saclay.

Power Supply to control Resistive Wall Modes-(STP-EU RPS): After the conceptual design of the RWM control coils proposed by JAEA in July 2012, the detailed analyses to evaluate the impact on the rating of the PS have been performed during 2013, and in parallel the development of a prototype PS has been started by Consorzio RFX. A contract for the development, manufacturing and testing of a prototype has been signed by Consorzio RFX in May, and the detailed design is presently on-going. Those activities are expected to lead to the PA definition and signature in the first months of 2014.

EC Power Supplies:. According to the BA sharing table with JA, Euratom is committed to provide 3 ECH power supplies for gyrotrons. While this was foreseen to be procured by Switzerland, as a consequence of their withdrawal from BA activities in 2012 and the need to timely proceed with the project it is now likely that procurement will have to proceed in 2014 by F4E. Alternatives are also being investigated.

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 VII. A collaboration between F4E and EFDA is ongoing with JAEA for the preparation of the research plan and the joint exploitation phase of the device. A "JT-60SA Research Plan" was established at the end of 2011 and a new version is in the process of evolution.

<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>

Table VII: STP Operation phases and availability of key components

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.

At the BASC meeting of December 2012, a rescoped Project Plan was proposed by the countries involved in the IFMIF/EVEDA project based on 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 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.

In the BASC meeting of April 2013, the last revision to the Project Plan was approved. The main points of the IFMIF/EVEDA Project Plan for years 2013 and later can be summarized as follows:

- Among the activities of IFMIF/EVEDA**,** the highest priority was given to the Linear IFMIF Prototype Accelerator (LIPAc) validation activities**.** All available allowable resources of the Project Team are being assigned to it; the new organization of the Project Team approved by the BA SC-11 included a new LIPAc Installation and Commissioning (LIC) Unit.
- Three main phases were identified for the LIPAc experiments which will be with:
    - the injector alone;
    - the Injector + RF Quadrupole + Medium Energy Beam Transport line;
    - the whole accelerator, for which about one year of operation is planned, from mid-2016 to mid-2017, the end of the IFMIF/EVEDA project under the BA agreement.
- The delivery of the “Intermediate IFMIF Engineering Design Report” was scheduled by mid-2013 (and actually achieved).
- Sound technological response to major technological barriers of IFMIF were planned to be given by Mid 2013 such as the now reached achievement of the high velocities (20 m/s) of the lithium jet, the operation of cold traps for purifying the liquid Li, the filling of the HFTM (high flux test module) capsules with the NaK eutectic, with the exception of:
    - the Accelerator Facility;
    - studies of critical components for Test Facilities: HFTM in the HELOKA loop and capsule prototypes irradiation in the BR2 reactor;
    - the Lithium Target Facility: free surface diagnostics, erosion/corrosion tests and remote handling for bayonet backplate,
    - the Lithium Target Facility: hot trapping of N and H impurities in the Oarai EVEDA Li Test Loop (ELTL) and manufacturing of a EUROFER removable backplate.

  While the items in the first three bullet points above will be validated by the end of the IFMIF/EVEDA project, the items in the last bullet point will remain to be validated.

The IFMIF/EVEDA Master Schedule is available in Fig. 18, the main project milestones being bulleted below:

- **March 2013: Start of LIPAc Integration at Rokkasho**
- **June 2013: Delivery of the first set of Engineering Validation Reports**
- **June 2013: Delivery of the Intermediate IFMIF Engineering Design Report (IIEDR)**
- **July 2014: Delivery of the second set of Engineering Validation Reports**
- **July 2014: Completion of validation activities related with ELTL presently running in Oarai**
- **June 2016:** Start of operation of LIPAc in Rokkasho.
- **Mid 2017:** End of the studies in the framework of the BA Agreement

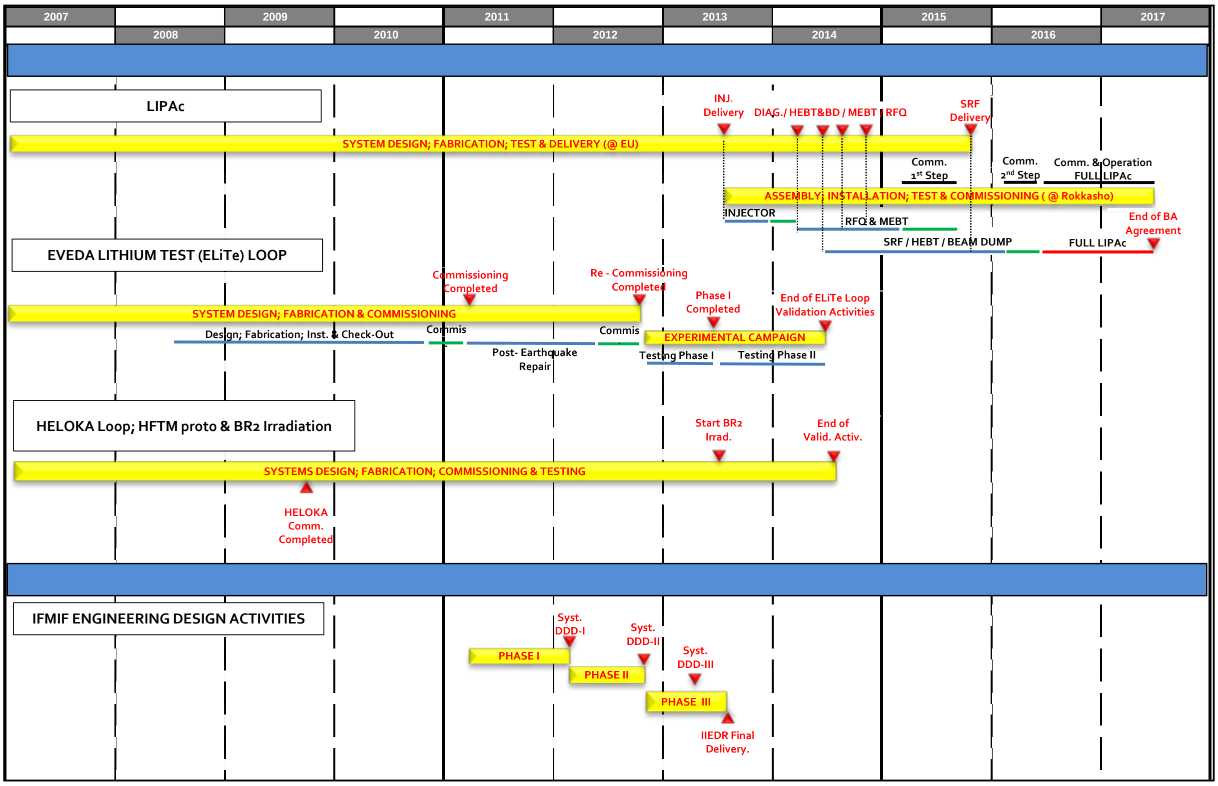


Fig. 18 - IFMIF/EVEDA Master Schedule

<u>Status of the Rokkasho team</u>

In the document *“LIPAc Installation and Commissioning Unit”*, which was approved in BA-SC 12, this "LIC" Unit is described as follows:

> *The LIC Unit will be formed by the members seconded from F4E and JAEA and by PA AF #10 covering personnel temporarily seconded from HTs or directly contracted. It will be composed by:*
>
> 1) *Stable staff, belonging to the LIC Core group, from participating laboratories, institutes or organizations, who will be involved in all tasks across the project life;*
> 2) *Technical staff from JA HT, participating on the different phases foreseen throughout the project and being involved across the project life in the agreed assigned tasks, for working on a daily basis as LIC Core group members, i.e. fully integrated as additional members of LIC Core group; and*
> 3) *Sub-systems groups staff from the HTs for their corresponding tasks mainly during IST and Accelerator commissioning, who will be temporarily on site during the particular defined tasks related with their home institutes.*

In order to integrate specific skills in the LIC Unit, which presently are not present, additional forces are intended to be joined from the IA and PT, forming a new “Integrated LIC (ILIC)” Unit which is expected to enhance efficiency and be of sufficient size to attract accelerator experts from Europe and Japan. The internal structure of the ILIC unit will take into account JAEA internal hierarchical aspects. A balance between the IAs for the assignment of responsibilities will be ensured. A specific proposal for the organisation of the ILIC Unit has been recommended by the members of the IFMIF/EVEDA Project Committee and will be submitted to BASC-13 for approval in December 2013.

Status of EU Contributions

PA reference	PA title	Planned credit BAUA
TF01	Engineering Design of HFTM (EU)	2065
TF02	Irradiation Tests in Fission Reactor (EU)	1850
TF04	Other Engineering Validation Tasks (EU)	5260
LF01	EVEDA Li Test Loop (EU)	800
LF03	Erosion/Corrosion (EU)	1220
LF04	Purification (EU)	490
LF05	Remote Handling (EU)	1710
AF01	Tranversal Activities of the Accelerator Prototype (EU)	16700
AF02	Injector (EU)	4580
AF03	Radiofrequency Quadrupole (EU)	25370
AF04	First Cryomodule of SRF LINAC (EU)	6110
AF05	Medium Energy Beam Transport line MEBT (EU)	3470
AF06	RF Power (EU)	23200
AF07	High Energy Beam Transport line HEBT and Beam Dump (EU)	5490
AF08	Auxiliary Systems (Control Systems and support) (EU)	1600
AF10	Diagnostics (EU)	1520
AF09	Installation, Checkout, Start-up & Commissioning (EU)	11400
AF12	Cryoplant (EU)	2490
ED01	Eng. Design of IFMIF Plant (EU)	2610
ED02	Eng. Design of Accelerator Facility (EU)	6360
ED03	Eng. Design of Lithium Target Facility (EU)	800
ED04	Eng. Design of Test Facility (EU)	4270
	Total IFMIF	129335

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 Fig. 19.

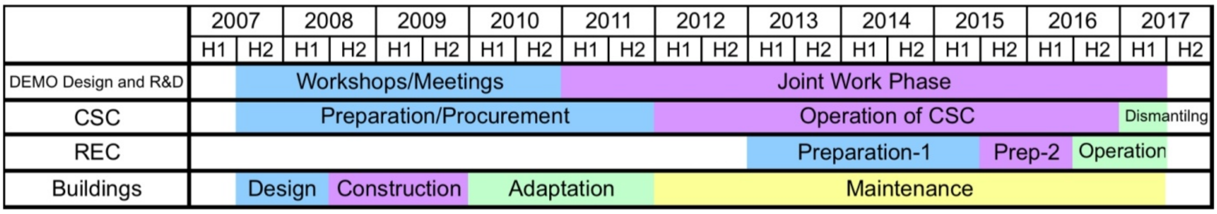


Fig. 19 - IFERC High Level Project Schedule

The main project milestones are bulleted below:

- **January 2012: Start of supercomputer exploitation at Rokkasho**
- **January 2013: Start of detailed DEMO studies**
- **April 2014: Start of exploitation of enhancement of supercomputer**
- **October 2016-March 2-17: test of REC**
- **December 2016:** End of supercomputer operation and start of dismantling
- **Mid 2017:** End of the studies in the framework of the BA Agreement

Procurement arrangements

PA reference	PA title	Planned credit BAUA
IFERC-CSCPA01-EU.CEA	Supply of the supercomputer and peripheral equipment for the IFERC project (CSC activity)	91500
IFERC-CSCPA01-EU.CEA	Supply of the supercomputer and peripheral equipment for the IFERC project (CSC activity)	6320
IFERC-T1PA01-EU.CIEMAT	DEMO R&D Activities on SiC/SiC Composites for the IFERC Project	2849
IFERC-T1PA01-EU.ENEA	DEMO R&D Activities on SiC/SiC Composites for the IFERC Project	442
IFERC-T1PA02-EU.ENEA	DEMO R&D on SiC/SiC Composites for the IFERC Project: erosion/corrosion of SiC and SiC/SiC in liquid metal	1032
IFERC-T3PA01-EU.KIT	DEMO R&D Activities in DEMO Blanket for the IFERC Project	2647
IFERC-T3PA01-EU.SCK.CEN	DEMO R&D Activities in DEMO Blanket for the IFERC Project	885
IFERC-T3PA01-EU.CRPP	DEMO R&D Activities in DEMO Blanket for the IFERC Project	425
IFERC-REC01-JA.EU	REC Requirement definition	100
IFERC-REC01-EU	REC Data Access Software	1400
IFERC-DPA01-JA.EU	Phase two DEMO Design Activities	5000
	Total IFERC	112685

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.

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 and proceed under Procurement Arrangements.

- T1: SiC/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 was performed, in order to review the results obtained so far and take into account the input from the DEMO design activities. Recommendations have been followed in order to adapt the ongoing activities to the needs expressed by the DEMO Design Activities members.

EU Procurement Arrangements planned:

A PA for a new activity for T2, analysis of JET tiles, will start in 2014.

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.

The Procurement Arrangement for the supply of a supercomputer and peripheral equipment was signed in 2010, and the contracts for the supply of the equipment, and operation and maintenance were signed in March 2011. Other Procurement Arrangements were signed to take care of the various interfaces. The main task of the EU-IA was to procure the supercomputer, the peripheral equipments and the operation and maintenance associated services. The main task of JA-IA was to prepare interfaces for the installation of the equipments and to contribute to the seamless integration of the IT equipments and services in the International Fusion Energy Research Centre, in particular by providing support for the interface with the users. The Phase one concluded as scheduled in December 2011 with the successful test and acceptance by F4E of supercomputer Helios in Rokkasho.

Phase Two started on schedule in January 2012 the activity being to effectively operate the HPC system and to coordinate the time-sharing for users. The first year of operation of CSC in 2012 has been dedicated to run four “lighthouse projects” during the first three months, and to normal operation for the rest of the year. In 2013, a PA for the enhancement of Helios has been signed. The enhancement of the CSC aims mainly at encouraging the fusion community to prepare the efficient and skilful usage of the most “state of the art” supercomputer system.

It is planned to dismantle Helios in the 1st semester of 2017.

One of the key issues in the Phase Two is to effectively support users. Quarterly Reports will be submitted to the PC chair in order to summarize how such support is provided and how the supercomputer system is optimized according to users’ needs.

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 started 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. In 2013 a Procurement Arrangement to define in detail the requirements of REC was signed, and the first technical PAs have been prepared to allow remote data access. REC follows closely the approved schedule. The EU contribution to REC comes from F4E budget.

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 signed in 2012 regarding site management, etc. These PAs are concerned with JA activities.

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
BAUA	Broader Approach Unit of Account. In July 2012 the BAUA corresponded to the value of 783.503 Euros.
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
IUA	ITER Unit of Account. In July 2012, the IUA corresponded to 1619.65 Euros
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	Radiological 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

APPENDIX II: MAIN MILESTONES TABLE

Main short Term Milestones (September 2012 until end 2015).
(Blue -shaded cells correspond to Achieved milestones).

WBS L3	Milestone Name	SMP Baseline Date	DWS current Date
EU.01.11.01 Toroidal Field Coils	ATPC - IO Approval for Insulate, impregnate and Cure (8.3.5) TFWP11	October 2014	July 2015
	Coil Insertion Facility Ready	April 2015	December 2015
	Cold Test+Buildings+Tooling+Assembly of TFWP into Coil Cases, Contract Signed.	March 2013	December 2013
	Contract Signed for Procurement for Radial Plates Mat & Fab & Tooling	November 2012	December 2012
	DP Prototype Final Report and TF Coil Manufacturing Plan	September 2013	May 2014
	Phase II - TF Coils - Joints and Helium Inlets Mock Ups Complete (CAS Milestone)	July 2012	November 2013
	RP & Covers delivery (DP2 / TFWP11)	July 2013	August 2014
	TFWP11-DP2 Complete, Ready for Stacking	November 2013	February 2015
	TFWP11-DP4 Complete, Ready for Stacking	March 2014	March 2015
EU.01.11.02 Pre Compression Rings	Contract Signed for Pre-compression rings	May 2012	October 2012
	HPC - Material Selection and Qualification Report (6.2.5)	June 2013	February 2014
	IPL > Delivery of Lower Pre-Compression Rings (01 - 03 plus 3 Spares) from EU-DA to ITER Site	January 2015	December 2015
EU.01.11.03 PF Coils	Contract Signed for Additional Tooling (TA)	September 2014	November 2014
	Contract Signed for Cold Test Engineering Study and Facility Construction (CTF)	December 2014	March 2015
	Contract Signed for Impregnation Tooling Provision (TI)	September 2014	November 2014

EU.01.11.03 PF Coils	Contract Signed for PF Coil Engineering & Integration (EI)	May 2013	August 2013
	Contract Signed for PF Coil Site & Infrastructure (S&I)	July 2014	October 2014
	Contract Signed for PF Coils Manufacturing (MFR)	November 2014	October 2014
	Contract Signed for QualificationTooling (TQ)	N/A	May 2014
	Contract Signed for Winding Tooling Provision (TW)	August 2013	March 2014
	HPC - IO Approval for Final report of Winding Qualification Test of Full Dummy DP of PF5 (8.14)	December 2014	January 2016
	HPC - IO Approval for Final report of Winding Qualification Test of Full Dummy DP of PF6 (8.14)	March 2015	December 2014
	Start Qualification of PF Coils	November 2013	December 2014
EU.01.11.04 Magnet Conductors	IPL > Delivery of PF conductor (UL16) for DP8/PF6 from EU-DA to EU-DA	January 2013	May 2014
	IPL > Delivery of PF conductor (UL7) for DP4/PF6 from EU-DA to EU-DA	August 2013	December 2014
	IPL > Delivery of PF Cu Dummy conductor (720m) (UL2) for PF6 from EU-DA to EU-DA	October 2012	March 2014
	IPL > Delivery of UL(100m) CICC s.c. Dummy from EU-DA to EU-DA	September 2012	December 2012
	IPL > Delivery of UL(415m) sDP s.c. Dummy from EU-DA to EU-DA	October 2012	October 2012
	IPL > Delivery of UL(760m, 18 of 19) for EU07/VV9/TF01/rDP3 Conductor to EU-DA by EU-DA	November 2014	January 2015
	IPL > Delivery of UL(760m, 1 of 19) for EU01/VV5/TF11/rDP2 Conductor to EU-DA by EU-DA	N/A	May 2013
EU.01.15.01 Main Vessel	First delivery of Forged Blocks for Sector 5	N/A	January 2014
	IO Approval of CMAF Basic Design PHASE II - 3D MP Model - PS1 (A1)	N/A	December 2012
	NP - Completion of Sector 4 Jigs	N/A	December 2014

	NP - Completion of Sector 5 Jigs	N/A	May 2015
	Start of Fabrication (1st cutting/bending of plates) - Sector 5	September 2013	October 2013
EU.01.15.02 Blanket Manifolds	Contract Signed for Piping Manufacturing	January 2015	August 2016
	< IPL Signature of PA 1.7.P1.EU.01 Blanket Manifold	March 2014	May 2015
EU.01.16.01 Blanket and First Wall Panels	< IPL Pre- PA Task Agreement for the Fabrication and Test of the Full Scale Prototypes for Blanket First Wall Signed	October 2012	October 2012
	< IPL Signature of PA.1.6.P1A.EU.01	December 2014	December 2014
EU.01.17.01 Divertor Cassette Body and Assembly	Contract Signed for Prototype + Series CB	November 2013	November 2013
	Factory Acceptance of the CB prototype (Documentation) sent to IO	October 2015	October 2015
	Release Cassette Body (Series Production)	November 2015	November 2015
	Signature of the contract for Prototype CA Integration	March 2015	March 2015
EU.01.17.02 Divertor Vertical Target	Contract Signed for Contract Signed for PFC (Series)	June 2015	January 2016
EU.01.17.03 Divertor Rails	< IPL PA 1.7.P1.EU.01 APFC Signed	September 2014	September 2014
EU.01.23.02 Divertor Remote Handling System	Contract Signed for Procurement of Divertor RH	May 2013	February 2014
	EU DIVRH Preliminary Design approved	January 2015	January 2015
	< IPL PA 2.3.P2.EU.01 Divertor RH System Signed	September 2012	October 2012
EU.01.23.03 Transfer Cask System	Contract Signed for CPRHS Procurement Contract	January 2014	January 2015
	< IPL PA 2.3.P3.EU.01 Cask & Plug RH System Signed	July 2013	May 2014
EU.01.23.04	Contract Signed for Procurement of IVVS	February 2014	January 2015

InVessel Viewing System	< IPL PA 2.3.P4.EU.01 IVVS Signed	June 2013	May 2014
EU.01.23.05 Neutral Beam Remote Handling System	Contract Signed for Design, Fabrication and Installation of Neutral Beam Remote Handling System	September 2013	October 2014
	< IPL PA 2.3.P5.EU.01 Neutral Beam RH System Signed	January 2013	June 2013
EU.01.31.01 Cryopumps	Contract Signature Warm Regeneration Lines	February 2013	August 2014
	Contract Signed for Call for tender for Torus and Cryostat Cryopumps	January 2015	June 2016
	Contract Signed for Manufacturing and Factory Testing of Cold Valve Boxes	June 2014	August 2015
	Final Design Review Cryopumps Valve Boxes & Connecting Cryolines	N/A	February 2016
	Final Design Warm Regeneration Lines - Final Approval	N/A	May 2015
	IPL > Delivery of Warm Regeneration Lines by EU-DA to ITER Site	April 2014	June 2016
	< IPL PA 3.1.P1.EU.01 Front End Cryo-Distribution: Warm Regeneration Lines Signed	September 2012	September 2013
	< IPL PA 3.1.P1.EU.02 Front End Cryo-Distribution: Front End Cryopump Distribution	December 2013	December 2014
	< IPL PA 3.1.P1.EU.03 for Cryopumps: Torus & Cryostat Cryopumps Signed	July 2014	October 2015
	< IPL PA 3.1.P1.EU.04 for Cryopumps: NB Cryopumps Signed	November 2015	March 2016
EU.01.31.02 Leak Detection and Localization System	Contract Signed for of components for Leak Detection and Localisation	N/A	February 2016
	< IPL PA 3.1.P3.EU.01 Leak Detection & Localisation System Signed	June 2014	May 2015
	Preliminary Design of Leak Detection and Localisation system	N/A	February 2016

EU.01.32.02 Water Detritiation System	Contract Signed for Procurement of WDS Tanks including Inst'n	June 2013	September 2013
	HPC - IO approval for Final Design for tanks	January 2014	March 2014
	IPL > Delivery of Large WDS tanks 100 m3 by EU-DA to ITER Site	N/A	December 2014
	IPL > Delivery of Large WDS tanks 20 m3 by EU-DA to ITER Site	November 2014	March 2015
	< IPL PA 3.2.P5.EU.01 WDS Tanks Signed	September 2012	December 2012
	< IPL PA 3.2.P5.EU.02 WDS Main System Signed	December 2014	February 2016
EU.01.34.01 Liquid Nitrogen Plant and Auxiliary Systems	Authorization for launching of long lead items	July 2014	October 2014
	Contract Signature for Design, Procurement & Technical Assistance of LN2 Plant and Auxiliary Systems	October 2013	December 2013
	Contract Signed for Installation of Liquid Nitrogen Plant and Auxiliary System	N/A	June 2015
	HPC - IO approval of Mfg Inspection plans (MIP)	February 2015	August 2015
	IPL > Delivery 80K Loop 1 by EU-DA to ITER Site	December 2015	June 2016
	IPL > Delivery of GAN Generator by EU-DA to ITER Site	November 2015	May 2016
EU.01.41.01 Electrical	Contract Signed for Procurement, Install. and Commissioning Equipments / Cables (TB06)	March 2013	March 2014
	HPC - IO approval of Detailed Assembly and Installation Design for SSEN & PPEN	May 2014	April 2015
	HPC - IO approval of Tender Design for 400kV, 22kV, 6.6kV SSEN Distribution & IP & SR Distribution Class III, II & I	August 2012	August 2012
	IPL > Delivery of PBS 43 Diesel Gen + EFTS - IP A	November 2014	October 2015
	IPL > Delivery of PBS 43 Diesel Gen + EFTS - IP B	November 2014	October 2015

Power Distribution System	< IPL PA 4.1.P1A-P8B.EU.02 Installation & Commissioning of the SSEN & PPEN and SSEN cables Signed	December 2011	December 2013
	< IPL PA 4.1.P8A.EU.01 Materiel procurement for SSEN Emergency Power Supply Signed	December 2012	November 2013
	< IPL PA 4.1.P8C.EU.01 Materiel procurement for SSEN Signed	July 2012	November 2013
	TB04 Basis of Design completion	N/A	November 2013
	TB04 Contract Signature	March 2013	July 2013
	TB04 T0 Commencement Date	N/A	September 2013
	TB10 Contract Signature	March 2014	April 2015
EU.01.51.01 Ion Cyclotron Antenna	Final Design for the IC Antenna approved by IO	July 2015	July 2016
	Preliminary Design for the IC Antenna approved by IO	October 2013	July 2013
EU.01.52.01 Electron Cyclotron Upper Launcher	Contract Valves Awarded	June 2015	June 2016
	< IPL PA 5.2.P1B.EU.01 EC Upper Launcher Primary Confinement System (PCS) Signed	November 2014	November 2015
	< IPL Receipt of FDR 1 Closure sent by IO to EU-DA	N/A	August 2015
EU.01.52.02 Electron Cyclotron Gyrotrons	Contract Signed for Procurement of the EU 1MW CW Gyrotron Prototype	N/A	December 2013
EU.01.52.03 Electron Cyclotron Power Supplies	NP - Contract Signed for BPS & MHVPS (main contract)	July 2013	January 2014
EU.01.53.06	HPC - SPIDER ISEPS Delivered to Padua Site (SMP baseline is 02 May	May 2014	February 2014

Neutral Beam Power Supplies	2014) (1-MS-2 OPE46)		
	NP - Contract Signed - HVD1 + Bushing	January 2013	April 2014
	NP - Contract Signed - NB AGPS + GRPS	December 2013	February 2015
EU.01.53.07 Neutral Beam Test Facility	NP - Contract Signed - MITICA Vessel	October 2013	September 2014
	NP - Delivery of Special Tooling and Equipment for CP inst and Start of Assembly on Site- SPIDER Cooling Plant (M1-13)	N/A	July 2014
EU.01.55.01 Magnetics	IPL > Delivery of Final Requirements & Interfaces for Magnetics Sensors by EU-DA to EU-DA	N/A	February 2014
EU.01.55.04 Pressure Gauges	Preliminary Design of Sensor (& Box, Baffle and Platforms) Available	July 2015	December 2015
EU.01.55.06 Tokamak Services (IO and RP)	FDR of In-V Elec Looms completed	N/A	August 2015
	PDR approved for Cabling, Looms and Conduits by IO	N/A	August 2015
	PDR of In-V Elec Looms completed	N/A	August 2015
EU.01.55.07 Radial Neutron Camera - Gamma Spectrometer	IPL > Preliminary Definition of Interfaces and Test Requirements for RNC port-interspace/cell components Available - IO	January 2014	February 2014
EU.01.55.10 Low Field Side Collective Thomson Scattering	IPL > Delivery of Final Definition of CTS Interfaces and Test Requirements by EU-DA to CN-DA (Certified by IO)	April 2014	February 2015
EU.01.56.01 European Test Blanket System Arrangement	TBMAs signed	N/A	April 2014
	TBS CDR close-out report & Plan for resolution of Cat. 2 chits	N/A	October 2014
	IPL > - 400kV Power Line Works	N/A	June 2012

EU.01.61.01 Site Preparation	Completed		
	IPL > Components Transportation Itinerary Available for First Convoy	N/A	February 2013
	IPL > Cooling Water Supply available on ITER site - 1st phase	N/A	November 2012
	IPL > F4E Technical Acceptance Process Completed	N/A	November 2013
EU.01.62.02 Buildings and Civil Infrastructures	Contract Signed for Cargo Lift & Assembly Hall Cranes (TB02)	November 2012	June 2013
	Contract Signed for Civil Works & Finishing Blgs 21, 23, 24, 34, 37 (TB09)	March 2015	April 2015
	Contract Signed for Civ W & Fin Bs 11,13-17, 51-53,61,71-75 & PCD (TB03)	February 2013	December 2012
	Contract Signed for Completion Contract (TB11)	January 2014	November 2015
	Contract Signed for Design & Build Buildings 32, 33, 38 (TB05)	December 2012	October 2013
	Contract Signed for Design & Build Buildings 67, 68, 69 (TB07)	May 2013	October 2013
	Contract Signed for HVAC, Elec & Fluid Nets & Hand'g Blgs 21, 23, 24, 34, 37 (TB10)	March 2015	April 2015
	Contract Signed for Site Infrastructure (TB08)	November 2012	December 2012
	HPC - IO Final approval of A/E Construction Design B2 Slab - Civ W & Fin Bs 11, 14, 74	September 2012	November 2013
	IPL > Construction of Hot Basin & Cooling Towers (67) Completed	April 2015	September 2015
	IPL > Cooling Water Pumping Station (68) RFE (RFE #15)	July 2014	March 2015
	IPL > Hot Basin & Cooling Towers (67) RFE (RFE #15)	September 2014	March 2015
EU.01.62.02 Buildings and Civil	IPL > Magnet Power Conversion Building (32) RFE (RFE #7)	March 2015	March 2016
	IPL > Main Alternating Current Distribution Building (36) RFE (RFE #6)	May 2014	October 2015

Infrastructures	IPL > Site Services Building (61) RFE (RFE #17)	January 2015	August 2015
	NPC - Notice to Commence construction of Cleaning Facility Bldg (17)	February 2014	January 2014
	NPC - Notice to Commence construction of Control Bldg (71)	March 2014	April 2014
	NPC - Notice to Commence construction of Cryoplant Coldbox Bldg (52)	June 2014	November 2013
	NPC - Notice to Commence construction of Cryoplant Compressor Bldg (51)	June 2014	November 2013
	NPC - Notice to Commence Construction of Cryoplant Infrastructure (53)	November 2014	November 2013
	NPC - Notice to Commence construction of Diagnostic Bldg (74)	October 2012	May 2014
	NPC - Notice to Commence construction of Emergency Power Supply Bldg (Train A) (44)	March 2015	September 2015
	NPC - Notice to Commence construction of Emergency Power Supply Bldg (Train B) (45)	March 2015	September 2015
	NPC - Notice to Commence construction of FDU & SNR Bldg (75)	May 2014	October 2014
	NPC - Notice to Commence construction of Fuel Storage Tanks (EPS Train A) (42)	March 2015	September 2015
	NPC - Notice to Commence construction of Fuel Storage Tanks (EPS Train B) (43)	March 2015	September 2015
	NPC - Notice to Commence construction of Heat Exchangers (69)	October 2013	April 2014
	NPC - Notice to Commence construction of Hot Basin & Cooling Towers (67)	October 2013	April 2014
	NPC - Notice to Commence construction of Hot Cell Facility Bldg (21)	October 2015	October 2015
	NPC - Notice to Commence construction of Magnet Power Conversion Bldg 1 (32)	July 2013	June 2014
	NPC - Notice to Commence construction of Main AC Distribution Bldg (36)	July 2013	August 2014

	NPC - Notice to Commence construction of MV Distribution Bldg LC/1A (46)	August 2015	August 2014
	NPC - Notice to Commence construction of MV Distribution Bldg LC/2B (47)	January 2015	August 2014
	NPC - Notice to Commence construction of NB HV Power Supply Bldg (37)	October 2015	November 2015
	NPC - Notice to Commence construction of NB Power Supply Bldg (34)	August 2015	September 2015
	NPC - Notice to Commence construction of Reactive Power Control Bldg (38)	December 2013	October 2014
	NPC - Notice to Commence construction of RF Heating Bldg (15)	August 2013	January 2014
	NPC - Notice to Commence Construction of Service Trenches	May 2013	July 2013
	NPC - Notice to Commence construction of Site Services Bldg (61)	May 2013	December 2013
	NPC - Notice to Commence construction of Tritium Bldg (14)	October 2012	May 2014
	NPC - Notice to Commence Work (TB04)	N/A	August 2013
	NPC - RFOC Tokamak Building (11) level B2 (For Drain Tank installation)	March 2014	October 2015
	Start Construction of Liquid & Gas Distribution Network	August 2013	December 2013
	Start of construction Phase of Tokamak complex foundations (B11-B14-B74)	October 2012	January 2013
	Tender Design complete	December 2013	July 2014
EU.01.64.01 Radiological and Environmental Monitoring System	HPC - IO approval for Preliminary Design Review of REMS accepted by IO	N/A	December 2015
	< IPL PA 6.4.P1.EU.01 for Design of ITER REMS Signed	October 2012	September 2013

EU.01.66.01 Radiological and Conventional Waste Treatment and Storage	< IPL PA.6.3.P1.EU.01 Type A Radwaste Treatment & Storage System Signed	September 2014	April 2015

APPENDIX III: RISK METRICS DETAILS

1. THREAT RATING (risk with negative impact)

LIKELIHOOD of risk occurrence

Value		Description	
Not Credible	1	probability of occurrence < 1%.	the probability of the risk is very low
Unlikely	2	probability of occurrence > 1% but <10%	the probability of the risk is low or if its occurrence is late in relation to the lifetime of the project.
Not Likely	3	probability of occurrence > 10% but <40%	
Likely	4	probability of occurrence > 40% but <80%	the risk is identified. There exists a high probability that it will occur
Very Likely	5	probability of occurrence > 80%	the probability of the risk identified is almost certain

TECHNICAL / OTHER IMPACT

Value		Impact on				
		Technical Performance	Human health, safety and well being	Environment	Reputation and Image	Political
Negligible	1	Minimal or no consequence to technical performance	No injuries	No environmental impact	No damage to reputation/image	No political/ organizational impact
LOW	2	Minor reduction in technical performance or supportability, can be tolerated with little or no impact on program	Minor injuries; no public health risk; short term well being impact	Minor,/recoverable short-term isolated/ localized environmental impact	Recoverable / short term local damage to reputation/image	Local political / organizational impact
MEDIUM	3	Moderate reduction in technical performance or supportability with limited impact on program objectives	Limited public health risk &/or injuries requiring medical & mental health treatment	Moderate, medium term, medium spread environmental impact	Medium term / regional damage to reputation/image	Regional political / organizational impact
HIGH	4	Significant degradation in technical performance or major shortfall in supportability; may jeopardize program success	Major public health risk &/or major injuries/well being impact	Serious, long term, widespread environmental impact	Long term/ state damage to agency reputation/image	State political / organizational impact
VERY HIGH	5	Severe degradation in technical performance; Cannot meet baseline or key technical/ supportability threshold; will jeopardize program success	Significant public health risk &/or human deaths/ long lasting well being issues	Irreversible environmental impact	Long term / (inter) national damage to reputation / image irreversibly impacted	National political / organizational impact

COST IMPACT

Value		Budget Change by
Negligible	1	CHANGE < Budget * 0.01
LOW	2	Budget * 0.01 ≤ CHANGE < Budget * 0.1
MEDIUM	3	Budget * 0.1 ≤ CHANGE < Budget * 0. 2
HIGH	4	Budget * 0.2 ≤ CHANGE < Budget * 0. 4
VERY HIGH	5	CHANGE ≥ Budget * 0.4

SCHEDULE IMPACT

Value		DELAY on Milestone (at project level Integrated Project Schedule Milestones)	
		NON Critical Path Milestone	Critical Path Milestone
Negligible	1	No delays on milestones (< 1 month)	No delays on milestones (<1 week)
LOW	2	1 month ≤ DELAY < 3 months	DELAY < 1 month
MEDIUM	3	3 month ≤ DELAY < 6 months	1 month ≤ DELAY < 3 months
HIGH	4	6 month ≤ DELAY < 1 year	3 month ≤ DELAY < 6 months
VERY HIGH	5	DELAY ≥ 1 year	DELAY ≥ 6 months

2. OPPORTUNITES RATING (risk with positive impact)

LIKELIHOOD of opportunity realization

Value		Description	
Not Credible	1	probability of realization < 1%.	the probability of realizing the opportunity is very low
Unlikely	2	probability of realization > 1% but <10%	the probability of realizing the opportunity is low or if its occurrence is late in relation to the lifetime of the project.
Not likely	3	probability of realization > 10% but <40%	
Likely	4	probability of realization > 40% but <80%	the opportunity is identified. There exists a high probability that it will be realized
Very Likely	5	probability of realization > 80%	the probability of the opportunity being realized is almost certain

TECHNICAL / OTHER IMPACT

Value		Impact on				
		Technical Performance	**Human health, safety and well being**	**Environment**	**Reputation and Image**	**Political**
Negligible	1	Minimal or no consequence to technical performance	No injuries	No positive environmental impact	No improvement to reputation/image	No political/ organization nal positive impact
LOW	2	Minor improvement in technical performance or supportability, can be achieved with little or no impact on program	Minor improvement to public health & mitigation against minor injuries ; short term well being positive impact	Minor,/short-term isolated/ localized positive environmental impact	Short term local improvement to reputation/image	Local political / organizational positive impact
MEDIUM	3	Moderate improvement in technical performance or supportability with limited impact on program objectives	Limited improvement to public health & mitigation against injuries requiring medical treatment ; medium term well being positive impact	Moderate, medium term, medium spread positive environmental impact	Medium term / regional improvement to reputation/image	Regional political / organizational positive impact
HIGH	4	Major improvement in technical performance or supportability; will improve program success	Major improvement to public health & mitigation against major injuries : Positive well being impact	Major, long term, widespread positive environmental impact	Long term/ state improvement to organization reputation/image	State political / organizational positive impact
VERY HIGH	5	Significant improvement in technical performance; Meets baseline or key technical/ supportability threshold; will significantly improve program success	Significant improvement to public health & mitigation against deaths ; Long lasting positive well being impact	Significant positive environmental impact	Long term / (inter) national improvement to reputation / image	National political / organizational positive impact

COST IMPACT

Value		Budget Change by
Negligible	1	CHANGE < Budget * 0.01
LOW	2	Budget * 0.01 ≤ CHANGE < Budget * 0.1
MEDIUM	3	Budget * 0.1 ≤ CHANGE < Budget * 0. 2
HIGH	4	Budget * 0.2 ≤ CHANGE < Budget * 0. 4
VERY HIGH	5	CHANGE ≥ Budget * 0.4

SCHEDULE IMPACT

Value		IMPROVEMENT on Milestone (Contract Milestones)	
		NON Critical Path Milestone	Critical Path Milestone
Negligible	1	No improvements on milestones (< 1 month)	No improvements on milestones (<1 week)
LOW	2	1 month ≤ IMPROVEMENT < 3 months	IMPROVEMENT < 1 month
MEDIUM	3	3 month ≤ IMPROVEMENT < 6 months	1 month ≤ IMPROVEMENT < 3 months
HIGH	4	6 month ≤ IMPROVEMENT < 1 year	3 month ≤ IMPROVEMENT < 6 months
VERY HIGH	5	IMPROVEMENT ≥ 1 year	IMPROVEMENT ≥ 6 moths

3. Risk Level definition (threats and opportunities)

Following the 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 TPO concerned. Actions are evaluated in order to reduce the risk.
LOW	They are included in the risk file and reviewed by TPO concerned. Actions are evaluated in order to reduce the risk.
MEDIUM	An owner is appointed to monitor the risk evolution and report to the TPO 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 TPO 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