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**29-30 June 2016**  
**2nd Amendment to 2016 WP for publication on F4E`s**  
**extranet.**

**2nd Amendment to 2016 WP**

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<i>Approval Process</i>			
	<i>Name</i>	<i>Action</i>	<i>Affiliation</i>
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**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 SECOND AMENDED 2016 WORK PROGRAMME 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<sup>1</sup>, and in particular Articles 6(3)(d) and 11 thereof;

Having regard to Council Decision N° 791/2013 of 13 December 2013 amending decision 2007/198/EURATOM establishing the European Joint Undertaking for ITER and the Development of Fusion Energy and conferring advantages upon it<sup>2</sup>

Having regard to the Financial Regulation of Fusion for Energy<sup>3</sup> adopted by the Governing Board on 22 October 2007, last amended on 25 November 2011<sup>4</sup> (hereinafter "the Financial Regulation"), and in particular Title III thereof;

Having regard to the Implementing Rules of the Financial Regulation<sup>5</sup> adopted by the Governing Board on 22 October 2007, last amended on 11 December 2013<sup>6</sup> (hereinafter "the Implementing Rules"), and in particular Title III thereof;

Having regard to the comments and recommendations of the Administration and Management Committee and the Technical Advisory Panel;

Whereas:

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

Has adopted this decision:

*Article 1*

The 2<sup>nd</sup> Amended 2016 Work Programme of Fusion for Energy annexed to this Decision is hereby adopted.

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<sup>1</sup> OJ L 90, 30/03/2007, p. 58

<sup>2</sup> OJ L 349, 21/12/2013 p.100-102

<sup>3</sup> F4E(07)-GB03-11 Adopted 22/10/2007

<sup>4</sup> F4E(11)-GB21-10c Adopted 25/11/2011

<sup>5</sup> F4E(07)-GB03-12 Adopted 22/10/2007

<sup>6</sup> F4E(13)-GB28-14.2 Adopted 11/12/2013

F4E(16)-GB35-13.1

*Article 2*

The Governing Board hereby delegates the power to make non-substantial amendments to the approved annual Work programme (and any amendments to it subsequently approved by the GB) to the Authorizing Officer of Fusion for Energy. Changes are considered to be 'non-substantial' if they cumulatively amount to <3% of the approved annual expenditure, provided that the changes do not have a significant impact on the nature of the actions or on the objectives of the Work Programme.

*Article 3*

This Decision shall have immediate effect.

Done at Barcelona, 29 June 2016

For the Governing Board

A handwritten signature in blue ink, appearing to be 'Joaquin Sanchez', written in a cursive style.

**Joaquin Sanchez**  
Chair of the Governing Board

For the Secretariat

**Romina Bemelmans**  
Secretary of the Governing Board

A handwritten signature in blue ink, appearing to be 'Romina Bemelmans', written in a cursive style.

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## INTRODUCTORY MEMORANDUM

### LEGAL BASIS

According to Article 6(3)(d) of the Statutes annexed to the Council Decision establishing Fusion for Energy, the Governing Board (GB) shall adopt the Work Programme drawn up by the F4E Director.

According to the Article 32 of the F4E Financial Regulation, F4E shall draw up a programming document containing the multi-annual and annual programming (annual Work Programme), taking into account to the extent possible guidelines set by the Commission. Article 32(3) of the F4E Financial Regulation determines that the annual work programme of the Joint Undertaking shall comprise detailed objectives and expected results including performance indicators. It shall also contain a description of the actions to be financed and an indication of the amount of financial and human resource allocated to each action. The annual work programme shall be coherent with the multi-annual programme.

Provided these elements are clearly set out in the Work Programme, the latter is equivalent to a financing decision according to Article 68 of the F4E Financial Regulations, the Work Programme shall be equivalent to a financing decision for the activities it covers. The financing decision shall set out the essential elements of an action involving operational expenditure from the budget.

According to the Article 58 of the Implementing Rules of the F4E Financial Regulation the financing decision shall set out the following:

**(a) for grants:**

- (i) the reference to the Constituent instrument and the budgetary line;
- (ii) the priorities of the year, the objectives to be fulfilled and the foreseen results with the appropriations authorised for the financial year;
- (iii) the essential selection and award criteria to be used to select the proposals;
- (iv) the maximum possible rate of co-financing and if different rates are envisaged the criteria to be followed for each rate;
- (v) the timetable and the indicative amount of the calls for proposals.

**(b) for procurement:**

- (i) the global budgetary envelope reserved for the procurements during the year;
- (ii) the indicative number and type of contracts envisaged and if possible their subject in generic terms;
- (iii) the indicative timeframe for launching the procurement procedures.

### SYNOPSIS –EXPLANATORY MEMORANDUM

In accordance with the Financial Regulation of F4E and its Implementing Rules, this document lays down a detailed programme of activities that are foreseen to be implemented and financed under the budgetary appropriation for 2016. The 2016 Work Programme follows the EU Commission guidelines on common format for the annual work programme.

The chart below explains the link between the 2016 Budget and 2016 Work Programme.

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2016 Budget		Provisional Link 2016 Budget -2016 Work Programme		
Total revenue	<b>455 840 138.01</b>	Budget line	Title	2nd amendment WP2016 (chapters 3.1 to 3.4 subject to change according to the final amendment)
Of which Administrative Expenditure	45 765 046.01	3 1	ITER construction including site preparation	255 217 138.01
Total expenditure	<b>455 840 138.01</b>	3 2	Technology for ITER	9 900 000.00
Of which Administrative Expenditure	47 500 000.00	3 3	Technology for Broader Approach	8 723 000.00
Of which Operational Expenditure	<b>408 340 138.01</b>	3 4	Other expenditure	4 500 000.00
		3 5	Appropriation from the ITER Host State contribution	130 000 000.00
		<b>Total Title III of the Budget 2015</b>		<b>408 340 138.01</b>
		3 5	Host State contribution carried over from previous year and additional revenue	13 439 642.19
		3 1	Additional non-budgeted revenue	110 541.50
		<b>Total amount available for the operational expenditure</b>		<b>421 890 321.70</b>
		3 6	Revenue from the ITER Organisation Reserve Fund Allocation Scheme	<i>p.m.</i>

Mainly due to de-commitments of 2014 Global Commitments :  
 - 6.0 for Magnets,  
 - 4.3 for Site and Buildings  
 - 3.1 for Neutral Beam

### CHANGES TO THE WP2016

Since September 2015, when the Work Programme 2016 reference was defined, the following events occurred in F4E for ITER Project:

- Fund Allocation by the F4E Acting Director (in September 2015)
- Definition of the ITER Council Milestones by ITER Organization (November 2015)
- F4E proposal for the redistribution of CAS milestones and values (December 2015)
- Straight Road to First Plasma (SR2FP) project (called Staged Approach - Iteration Modelling in ITER IO) for the schedule and budget allocation. In many areas the activities have been rescheduled in line with the available financial resources. Additionally a lower level of implementation of the activities derived from the priority given by F4E to commitments for most critical systems in the period February-April 2016.
- Update of the planned Cash Contribution for IO and Japan based on the latest documents submitted to the MAC and latest update of PA signature dates issued by JADA.
- Update of the need dates from ITER Organization or other DAs.
- Implementation of PCRs and Deviations issued by ITER Organization.

As consequence of the above a new F4E schedule baseline will be set at the end of May 2016. The annual objectives and call for tenders/proposals in the 2<sup>nd</sup> Amendment WP2016 have been amended consequently.

Furthermore changes to the WP2016 are due to:

- Entry in force of the new F4E Financial Regulations and Implementing Rules
- Additional expenditures needed for 2016 as evolution of the projects and changes in the procurement strategy

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- Additional Cash Contribution to IO for the transfer of the procurement responsibility for the Vacuum Vessel sectors 7 and 8 from EURATOM to ITER Organization

Regarding the WP2016 for Broader Approach, the main assumptions are that this is to be coherent with the individual BA Projects' Work Programmes and Project Plans as approved by the Broader Approach Steering Committee and by further adjustments made at the 16th Steering Committee of 21st April 2015, at the 17th Steering Committee of 11th December 2015 and at the 18th Steering Committee of 22nd April 2016.

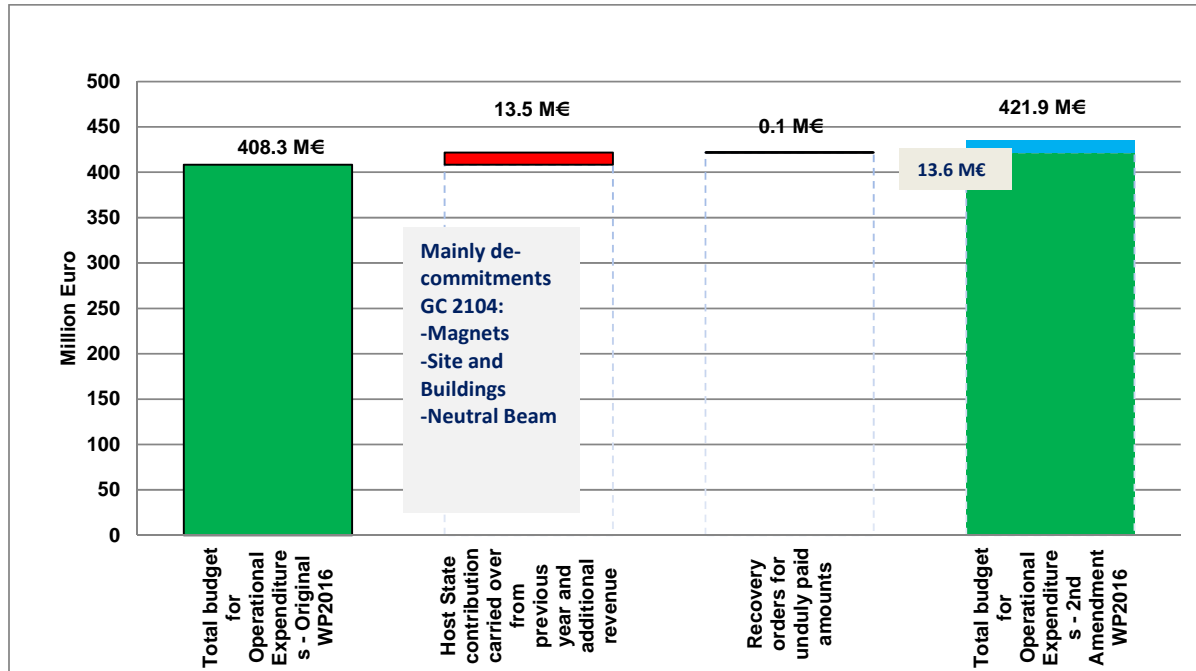


Figure 1 Changes in the available budget for WP2016

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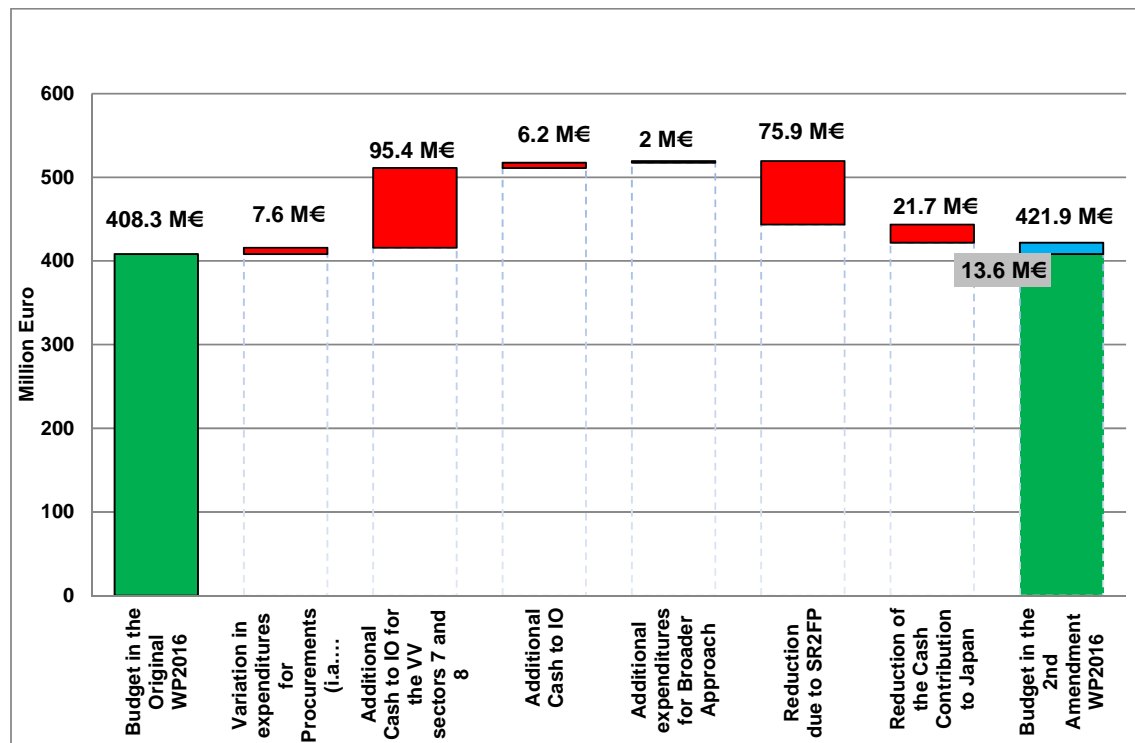


Figure 2 Change in the expenditures between the Original WP2016 and 2nd Amendment WP2016

For each WBS the sections updated are: challenges and objectives for the year 2016 and financing decisions. Current status refers still to the end of September 2015. Changes are identified in track change in the document. Changes related to the SR2FP are highlighted in blue. The summary of the substantial changes by WBS L2 is provided in the tables below.

The first table includes the WBSs impacted by the SR2FP implementation and the second table the changes not related to the SR2FP implementation.

WBS L2 impacted by SR2FP	Comment
<b>EU.01.15 – Blanket Manifolds</b>	The modifications in the area are a consequence of the rescheduling for the implementation of the SR2FP.
<b>EU.01.16 – Blanket</b>	The signature of contracts under the Blanket area were delayed due to SR2FP (prioritization of activities). The modifications in the area are a consequence of the rescheduling for the implementation of the SR2FP.
<b>EU.01.17 – Divertor</b>	The modifications in the area are a consequence of the rescheduling for the implementation of the SR2FP.
<b>EU.01.23 - Remote Handling</b>	The modifications in the area are a consequence of the rescheduling for the implementation of the SR2FP.
<b>EU.01.32 - Tritium Plant</b>	Few activities have been impacted by the SR2FP that caused few months of delay
<b>EU.01.51 - Ion Cyclotron Heating and Current Drive</b>	The modifications in the area are a consequence of the rescheduling for the implementation of the SR2FP. Main activities of the prototyping pushed to 2017 due to optimization of procurement strategy to adapt to the budget constraints.
<b>EU.01.52 - Electron Cyclotron Gyrotrons, power sources and supplies</b>	The modifications in the area are a consequence of the rescheduling for the implementation of the SR2FP.

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<b>EU.01.53 - Neutral Beam Heating and Current Drive</b>	The modifications in the area are a consequence of the rescheduling for the implementation of the SR2FP.
<b>EU.01.55 – Diagnostics</b>	The main changes in the Diagnostics are due to rescheduling to meet the SR2FP available financial resources and due to the interim measures. The diagnostics impacted are: Bolometers, Core Plasma Charge Exchange Recombination Spectroscopy, Magnetics, Pressure Gauges, Port Plug Integration and Structures, Plasma Position Reflectometry, Equatorial Visible/IR Wide Angle Viewing System, Low Field Side Collective Thomson Scattering (interim measures), Radial Neutron Camera (interim measures) and transversal support activities.
<b>EU.01.56 - Test Blanket</b>	The modifications in the area are a consequence of the rescheduling for the implementation of the SR2FP.
<b>EU.01.57 - RH In Vessel Viewing System</b>	The modifications in the area are a consequence of the rescheduling for the implementation of the SR2FP.
<b>EU.01.62 - Buildings and Civil Infrastructures</b>	New strategy for the Procurement of the TB12 and TB13 due to the implementation of the SR2FP
<b>EU.01.64 - Radiological and Environmental Monitoring</b>	Delay due to change in the priority given by F4E due to the SR2FP exercise.
<b>EU.01.66 - Waste Management</b>	Delay due to change in the priority given by F4E due to the SR2FP exercise.
<b>EU.01.ES - Technical Support Services</b>	The modifications in the area are a consequence of the rescheduling for the implementation of the SR2FP and previous 2015 fund allocation by F4E Acting Director

Changes not related to the SR2FP implementation

<b>WBS L2 impacted by other causes</b>	<b>Comment</b>
<b>EU.01.11 – Magnets TF</b>	Due to the forecasted delay of the Coils Structures from Japan, as anticipated with the original WP2016, the activities related to the winding pack delivery to and preparation of the Coil Insertion Facility have been rescheduled to avoid additional costs for the storage and personnel. The first Winding Pack 11 IC milestone has been achieved in April 2016 and an additional milestone for the Winding Pack 09 is foreseen in 2016. Due to the criticality of the pre-compression rings for the operation of the Tokamak and for the schedule, a tendering process for an additional contract to procure back-up rings (to be placed at the beginning of 2017) using an alternative technology will be initiated in the second half of 2016.
<b>EU.01.11 – Magnets PF</b>	Rescheduling to match the PF6 manufacturing schedule and to reduce storage time of the PF conductors. No schedule impact for the PF6 delivery.
<b>EU.01.15 - Main Vessel</b>	Additional Cash Contribution to IO for the transfer of procurement responsibility for the VV sectors 7 and 8 from EURATOM to IO. Provisions for project management support and engineering/manufacturing activities for the Vacuum Vessel project. Slippage of milestones due to the delays in the manufacturing activities for all the Vacuum Vessel sectors.
<b>EU.01.31 - Vacuum Pumping and Leak Detection</b>	Following the PCR 690, the MITICA cryopump activities have been moved from the WBS EU.01.53 to this WBS
<b>EU.01.34 – Cryoplant</b>	Changes in the need dates due to delay in the building availability.
<b>EU.01.52 - Electron Cyclotron Upper Launcher</b>	Change in the Baseline dates due to two PCRs (PCR-439 and PCR-715) affecting mechanical structure of the Uupper Launcher
<b>EU.01.52 - Electron Cyclotron Control</b>	Update of the PA scope and dates under discussion with IO.



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<b>EU.01.53 - Neutral Beam Heating and Current Drive</b>	Correction of the distribution of the Cash Contribution within the budget lines in the original WP2016 and minor update of the total amount based on the current status of the activities on site Some changes are due to technical issues during implementation and follow-up. Other changes are due to modifications in the procurement strategy.
<b>EU.01.55 – Diagnostics</b>	Minor changes due to the change in the strategy for the type and scope of the procurement procedures. Other changes are due to revision of the ITER Project need dates, delays in delivery of PAs by IO-CT or changes in IO-CT strategy with respect to execution of pre-PA activities.
<b>EU.01.62 - Buildings and Civil Infrastructures</b>	Main changes on the Load Centers delivery dates due to the various schedule adjustments linked to modification of Design and construction sequences and strategies, without any impact on RFE milestones. Additional changes due to late input received from IO for the final input data, including handling of PCRs delivery for Construction Design for Buildings 64, 68, 69 & 67 - Upper Slab/Services (TB07).  Minor change in the text related to the integration of the WBS EU.01.41 under the EU.01.62 with the purpose to change the structure of the WBS from a structure based on PA/contracts into a structure based buildings.
<b>EU.01.CC - Cash Contributions</b>	Cash Contributions Change in the Cash Contribution to Japan due to the implementation of deferrals for a part of the Atmospheric Detritiation System
<b>EU.BA.02 - Satellite Tokamak (JT-60SA)</b>	Main changes in the budget for 2016 are due to the rescheduling for the Superconducting Magnets Power Supplies and update of the needed date for the Cryostat on the Japanese Counterpart request.
<b>EU.BA.03 - IFMIF-EVEDA Project</b>	Main changes in the 2016 budget are related to the reimbursement of the transportation costs to the French contributors for the Cryoplant according to the Agreement of Collaboration.

The following areas implement very limited changes:

- EU.01.MF – Materials and Fabrication Technologies
- EU.01.PE – Plasma Engineering
- EU.01.NS – Nuclear Safety
- EU.01.PM – ITER Programme Management
- EU.01.TR – Transportation
- EU.BA.01 – Common Activities
- EU.BA.04 – International Fusion Research Centre

## UPDATED 2016 WORK PROGRAMME BUDGET SUMMARY

Budget line		Original 2016 Work Programme (December 2015)	1st Amended WP2016 (written procedure February 2016)	2nd Amended WP2016 (June 2016)	Difference 2nd Amendment-Original WP2016	Remarks
3	Total amount available for the operational expenditure	408 340 138.01	408 340 138.01	421 890 321.70	13 550 183.69	Additional expenditures made available from automatic carry over from the previous year, for the French contribution and recovery orders for unduly paid amounts.
3.1+3.5	ITER construction including site preparation	385 632 138.01	385 357 138.01	398 767 321.70	13 135 183.69	
	<i>Procurements</i>	<i>149 342 138.01</i>	<i>148 717 138.01</i>	<i>150 747 321.70</i>	<i>-40 194 816.31</i>	Additional expenditures made available from carry over from previous years and reduction in the expenditures needed for Grants and Cash Contribution have been assigned to Procurement actions to match the needs
	<i>Grants</i>	<i>33 800 000.00</i>	<i>33 800 000.00</i>	<i>11 500 000.00</i>	<i>-22 300 000.00</i>	Reduction mainly in the Diagnostics WBSs as consequence of the implementation of the SR2FP
	<i>Cash Contribution</i>	<i>202 490 000.00</i>	<i>202 840 000.00</i>	<i>236 520 000.00</i>	<i>75 630 000.00</i>	Additional Cash Contribution to IO for the transfer of procurement responsibility for the VV sectors 7 and 8 from EURATOM to IO. Update of the amounts for Cash Contribution to Japan and Cash Contribution to IO. Update of the Cash Contribution for NBTF
3.2	Technology for ITER	11 500 000.00	11 500 000.00	9 900 000.00	-1 600 000.00	
	<i>Procurements</i>	<i>5 500 000.00</i>	<i>5 500 000.00</i>	<i>3 500 000.00</i>	<i>-2 000 000.00</i>	Reduction as consequence of the implementation of the SR2FP
	<i>Grants</i>	<i>4 200 000.00</i>	<i>4 200 000.00</i>	<i>1 000 000.00</i>	<i>-3 200 000.00</i>	Reduction as consequence of the implementation of the SR2FP
	<i>Cash Contribution</i>	<i>1 800 000.00</i>	<i>1 800 000.00</i>	<i>5 400 000.00</i>	<i>3 600 000.00</i>	Update of the Cash Contribution for NBTF
3.3	Technology for Broader Approach & DEMO	6 708 000.00	6 983 000.00	8 723 000.00	2 015 000.00	
	<i>Procurements</i>	<i>5 000 000.00</i>	<i>5 000 000.00</i>	<i>6 300 000.00</i>	<i>1 300 000.00</i>	Main changes in the budget for 2016 are due to the rescheduling for the Superconducting Magnets Power Supplies and update of the needed date for the Cryostat on the Japanese Counterpart request (JT-60SA) and reimbursement of the transportation costs to the French contributors for the Cryoplat according to the Agreement of Collaboration.
	<i>Cash Contribution</i>	<i>1 708 000.00</i>	<i>1 983 000.00</i>	<i>2 423 000.00</i>	<i>715 000.00</i>	
3.4	Other Expenditures	4 500 000.00	4 500 000.00	4 500 000.00	0.00	
	<i>Procurements</i>	<i>4 500 000.00</i>	<i>4 500 000.00</i>	<i>4 500 000.00</i>	<i>0.00</i>	



**FUSION  
FOR  
ENERGY**

# 2<sup>nd</sup> Amendment Work Programme 2016

1<sup>st</sup> Edition

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## 1. EXECUTIVE SUMMARY

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This Work Programme 2016 (WP2016) offers an overview of the objectives of EU's Joint Undertaking for ITER and the Development of Fusion Energy (F4E) for the 2016 and also identifies the financial decisions for the actions that will have to be carried out in 2016 with the available budget.

It covers the work on both the ITER and the Broader Approach according to the tasks entrusted to the organization.

As for ITER, the EU is part of this large project bringing together seven parties that represent half of the world's population – the EU, Russia, Japan, China, India, South Korea and the United States.

The task of F4E is to discharge EU obligations to deliver its share of in-kind components and cash contributions to the ITER project, about 45% of the total value of the project in the construction phase.

This work is carried out under the coordination of the Central Team of the ITER Organization and it creates many challenges both from the technical and from an organizational point of view.

As for the Broader Approach, the EU activities are carried out in the frame of the agreement, concluded with Japan, consisting in activities which complement the ITER project and accelerate the realisation of fusion energy. Both parties contribute equally financially. The European resources for the implementation of the Broader Approach are largely volunteered by several participating European countries (Belgium, France, Germany, Italy, Spain and Switzerland).

The 2016 objectives, the main milestones and the allocation of the human resources provide a good idea of the complexity of the tasks to be carried throughout the year and of the technical challenges they entail.

As for ITER, 2016 is mostly focussed on the following activities:

- Magnets: completion of the first Toroidal Field (TF) Coils Winding Pack and preparation for its cold test. In 2016 the qualification of the PCR manufacturing process with the current automated filament placement solution should be proven in order to go ahead with the series production. In particular in order to maximize the chance of success, two alternative manufacturing options will be used to manufacture 2 different full size qualification mock ups. In addition a tendering phase for the manufacture of a number of back-up PCRs utilizing an alternative technology, to be used in case the PCRs produced by the present manufacture fail, will be launched. For the Poloidal Field (PF) Coils signature of the main contracts and the adaptation works of the PF Building will be completed. This will allow the delivery of the tools for the Double Pancake Manufacturing and the start of the winding activities on site.
- Main Vessel: production activities will have started for 5 of the 7 sectors and this will represent a huge increase of workload for both supplier and F4E requiring an additional effort on increasing efficiency and streamlining coordination at AMW. The main technical challenges are related to the control of distortions during the fabrication process, in order to guarantee the compliance with the final tolerances of the VV.
- Blanket System: progress with the manufacturing of the full-scale prototypes and continue the First Wall pre-qualification programme with the High Heat Flux testing of the remaining First Wall semi-prototypes.
- Divertor: Progress in the manufacture of the cassette bodies (CB) full-scale prototypes, completion of the manufacture of Inner Vertical Target (IVT) pre-qualification mock-ups and high heat flux testing of these mock-ups
- Remote Handling: follow up and coordination of the major suppliers for the RH systems (Cask and Plug Remote Handling System, Divertor Remote Handling System, Neutral Beam Remote Handling System and In Vessel Viewing Systems) during preliminary design, with particular focus also on the complementary cross cutting technological developments performed through other contracts/grants; ensure procurement of the individual packages and harmonisation between them.
- Vacuum Pumping and Fuelling: completion of final design and start of manufacturing for Warm Regeneration Lines and tendering for MITICA Cryopump and Front End Cryodistribution System.
- Tritium Plant: completion of preliminary design of the Water Detritiation System "Main" and Signature of the contract for the holding and feeding Water Detritiation System tanks procurement.

- Cryoplant: Completion of manufacturing, performance of factory acceptance tests and deliveries to site for the LN2 plant and Auxiliary Systems components.
- Electrical Power Supply and Distribution: start of the installation works for electrical distribution, with as main challenge, the connection to the RTE (400 kV) grid. Install the first Load Centres and start the building 36 works construction.
- Buildings and Civil Infrastructures: start of the level B1 civil works of the Tokamak Building. The main TB02 cranes will be installed in the Assembly building. Packages of construction design of the Tokamak Complex building services will be delivered for Construction Design review.
- Ion Cyclotron Heating and Current Drive: The activity for design (mainly via framework contract) and prototyping for the ICH antenna will continue in 2016.
- Electron Cyclotron Heating and Current Drive: for the Upper Launcher the management of changes stemming from the state of flux of main interfaces (plug environment, including nuclear issues) and the technical complexity and diversity of the components of the launcher; for EC Power sources (gyrotrons) a hold point is placed to evaluate the experimental results from the CW gyrotron prototype and related qualification activities in view of the series production for ITER; for EC Power Supplies, after the design and prototyping phase in 2015, the first PS set will be manufactured during 2016, when the factory tests are planned; for the EC Control System activity consists in the clear definition of the interfaces.
- Diagnostics: Procurement procedures will start during 2016 for the series manufacturing of cables, clips and connectors for Tokamak electrical services and of several magnetics sensors and platforms. A significant number of contracts for engineering analysis, manufacturing and testing of prototypes will be signed in support of the design of Diagnostics systems. During 2016, the launch of a framework contract for the production of the build-to-print drawings and manufacturing specifications is also foreseen.
- Test Blanket Systems: Execution of the 1<sup>st</sup> phase of the Preliminary Design of the TBM Sets and of the Ancillary Systems and associated R&D activities.
- Neutral Beam Heating and Current Drive: Signature and follow-up of the contracts for components for the NBT Facility, in particular for the MITICA Beam Source and the SF6 Handling Plant. Signature of PA 5.3.P4.EU.01 HNB (Vessels, Drift Duct, Fast Shutter, PMS), PA 5.3.P4.EU.02 for HNB BLV Exit Scraper, and PA 5.3.P5.EU.01 HNB ACC Coils is expected pending provision of documentation by IO.
- Radiological and Environmental Monitoring System (REMS): Preliminary design of Personal Access Control Building (PACB).

The latest project developments will focus on the systems required for the First Plasma and in line with the new strategy being defined also in agreement with IO-CT and due to be confirmed at the ITER Council in June 2016.

Most of the work will consist in the follow-up of the procurement contracts for the manufacturing of the European components. The contract to be placed in 2016 will further increase the amount of work in progress in all areas and F4E staff will have to face and solve many technical issues due to the complexity of the manufacturing.

As for Broader Approach, 2016 is mostly focussed on the following activities:

- Satellite Tokamak (JT-60SA): 2016 activities will be focused on manufacture and testing of JT-60SA Toroidal Field coils and structures, and transportation to Japan Port of Entry, assembly or support of assembly of various components under European responsibility (at Naka site), provision and installation of power supplies in Naka, support for installation and testing of Cryoplant in Naka.
- IFMIF-EVEDA Project: transportation, installation and commissioning of LIPAc components. Among the components to be shipped to Japan in 2016, there are several remaining key elements produced for the RF Power Systems and the Medium Energy Beam Transport as well as the full system for the Radiofrequency Quadrupole and the Cryoplant.
- International Fusion Research Centre: complete last year of operation of supercomputer Helios, implement Demo activities and deliver software for REC.

The work in this area is at an advanced stage and the activities foreseen in 2016 aim at further progressing toward the completion of the three projects.

## 2. INTRODUCTION TO THE ANNUAL WORK PROGRAMME

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### 2.1 Main Assumptions

ITER Project: following assumptions shall be considered as the basis of the Work Programme 2016:

- Following the instructions given by the ITER Council, ITER Organization (IO) and all Domestic Agencies (DA) have carried out an exercise to bring as much as possible reality into the schedule of the project by taking into account the accumulated delays and any other constraint that the Parties may have (i.e. budget, manpower, etc.). The result of this exercise has been submitted to the ITER Council in November 2015 to decide on a revised date for the first plasma. The planning of this exercise has foreseen that all DAs had to provide their input for their part of the schedule. F4E has carried out its part of the work and critically reviewed its schedule. The ITER Council approved a schedule and milestones covering 2016-17, and decided to conduct an independent review of the overall schedule and associated resources and to consider possible additional measures for expediting the schedule and reducing costs.
- Due to the ongoing project Straight Road to First Plasma it is intended to shift resources and budget from less urgent projects in the ITER project to those on the critical path, which may result in larger budgets for projects in the area of, for example, Vacuum Vessel, Buildings and Magnets, and reduction as well as delay of milestones in some other areas. The Work Programme is consistent with the results of the Straight Road to First Plasma (SR2FP) exercise (called Staged Approach - Iteration Modelling in ITER IO) for the schedule and budget allocation. The human resources redistribution is not yet available at the time of the preparation of the second Amendment of the WP2016.
- The F4E schedule used for the preparation of this document is as of end of May 2016.
- Credit values allocated to the objectives are in line with the F4E proposal of readjustment submitted to IO at the beginning of 2016.
- The realistic schedule exercise carried out by F4E takes into account:
  - the latest input and developments of the schedules from the F4E suppliers;
  - the most realistic assumption of Procurement Arrangement (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 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 Detailed Work Schedule (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 will be signed in 2016, an effort is in progress in the project to better identify the requirements that are linked to the specific procurement. 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.
- Technically and commercially complex procurements will be implemented whenever appropriate through the competitive dialogue procedure or through the negotiated procedure, in order to improve the alignment of supply chain response to F4E needs and to proactively adopt cost containment measures. This will be done in compliance with F4E Implementing Rules.
- Grants related to recurring and sequential R&D activities, with a well-defined development path eventually leading to an EU procurement package, will be implemented whenever appropriate through the Framework Partnership Agreement (FPA), in order to streamline and channel R&D funding, improve its effectiveness and reduce administrative burden to beneficiaries and F4E alike.



- Procurements which encompass scope within the domain of both F4E and contracting authorities, or for which a very close coordination between F4E and other entities is needed, will be implemented whenever appropriate through the Joint Procurement procedure.
- F4E endorsement of the Japanese Procurement Arrangement that foresees an EU financial contribution will be preceded by a budgetary commitment for the entire amount of the F4E contribution.
- The revenue from the Reserve Fund are provisional and depend on the authorisation of "changes to contracts" given by IO Director General.

Regarding the WP2016 for Broader Approach, the main assumptions are that this is to be coherent with the individual BA Projects' Work Programmes and Project Plans as approved by the Broader Approach Steering Committee and by further adjustments made at the 16<sup>th</sup> Steering Committee of 21<sup>st</sup> April 2015, at the 17<sup>th</sup> Steering Committee of 11<sup>th</sup> December 2015 and at the 18<sup>th</sup> Steering Committee of 22<sup>nd</sup> April 2016.

## 2.2 Definitions

1. The 2016 Work Programme follows the EU Commission guidelines on common format for the annual work programme anticipating the requirements for the new Financing Regulation.
2. Work Programme activities are "coherent actions with objectives and resources" and equivalent to the F4E Work Breakdown Structure (WBS) level 2. When deemed needed for a better understanding of the activities, additional levels have been added under the activities.
3. Each activity contains:
  - a. General overview, current status and challenges for the year 2016.
  - b. Link with the ITER Project multi-annual objectives:
    - i. The milestones that appear in both Work Programme and F4E Project Plan Annex IV are identified as "PP", while the ones relevant only for the work programme are identified as "WP". The link to the Project Plan is established through the activity ID.
  - c. Assigned human resources in the year 2016; it includes all tasks and activities which are performed for the benefit of an identified WBS element.
  - d. Financing Decision for each F4E WBS level 2, with the elements established by the Article 68 of the F4E Financial Regulations , includes:
    - i. Scope of the procurements/grants and cash expenditures foreseen to be financed under the budget 2016
    - ii. It includes provisions, even if not explicitly mentioned, for payment of liquidated damages, late payment interests, claims, release of options, indexation and other financial compensations that F4E may be obliged to pay under its contracts.
    - iii. It includes provisions for amendments to ongoing contracts covered by a previous financing decision(s) in accordance with the Implementing Rules, either directly or negotiated, if cumulative value of all amendments to a contract does not exceed 20% of the price of the initial contract.
    - iv. It includes provisions for, even if not explicitly mentioned, urgent general support tasks as cost/risk analysis, engineering support/analysis, I&C develop and support, quality assurance and quality control, nuclear safety CE marking analysis, transportation, material characterization and qualification activities, metrology, legal support, as needed. These tasks will be mainly implemented through specific contracts under existing framework contracts (see list in section 6.4 - List of Framework Contracts and Framework Partnership Agreements).
    - v. F4E has foreseen that some activities under the Work Programme 2015 will be implemented under the Global Commitment scheme in 2015 (GC2015). As the exact amount of the expenditure is not known when the Global Commitment is made or when the Work Programme 2015 (or its amendments) is prepared, therefore provisions for complementary expenditures are made available in WP2016 in the specific WBSs to fulfill the needs as in the relevant award decisions. The list of the contracts currently foreseen to be implemented under GC2015 scheme is available in section 6.7 – List of Procurement procedures GC2015.

- vi. Main Procurement Initiatives<sup>7</sup> to be launched during the year 2016; the list is based on the current information at the time of writing of the Work Programme and could be subject to changes. During the implementation of the work programme activities, F4E may identify the need for new calls, group more activities in a single call or split one activity in more calls. This will in any case be performed preserving the scope and objective presented in WP2016. Negotiated procedures under Article 85f of the Financial Regulation will not be included in this list given that this information cannot be available at the time of writing of the Annual Work programme. A change to this list shall be considered as a non-substantial for the purposes of the Article 32 point 4 of the F4E Financial Regulations if not affecting the available budget for 2016.
  - vii. The foreseen time of publication of calls, invitations dates are indicative only and based on the present understanding of the project development. For specific contracts and specific grants or use of Joint Procurements the foreseen time of publication of calls is not included (N/A in the Work Programme) as no formal publication will take place. Publication of the call for tender is intended as the date of publication on the Industry Portal (for open procedures/call for proposals) and the date of the Invitation letter to be sent out to the Suppliers (for negotiated procedures). For restricted procedures and competitive dialogues this milestone refers to the date of the call for expression of interest (first phase of the procedure).
  - viii. Certain activities have been moved from previous years into WP2016 due to changes in the overall planning and priorities: these items are included under the relevant WBS in the 2016 Work programme. It is understood that the inclusion of these items in WP2016 cancels and supersedes any corresponding item in a previous year's WP, unless otherwise specified in this document.
  - ix. Additional activities for ITER Project, upon the approval of the relevant PCRs and deviations by the ITER Organization Director General or his delegates in the frame of Reserve Fund Management Plan, will be implemented under the budget line 3.6. F4E will present to the final meeting of the GB each year, in an amendment to the Work Programme, a summary of the PCRs agreed within the year and the activities that the PCRs (including those agreed in previous years) have funded.
4. The use of the Grant Unique Beneficiary instrument will be fully justified and summary of justifications are available in the section 6.9 – Summary of Justifications for Unique Beneficiary Grants.
  5. Procurement Arrangements list is available in the F4E Project Plan ([F4E\\_D\\_2VCYRL](#)) in the section "ITER PROCUREMENT ARRANGEMENTS", Table 2.
  6. Framework Partnership Agreements (FPA) or Framework Contracts (FWC) are included in the year of signature for clarification purposes only and do not constitute part of the financing decision. The list of the FWCs and FPAs that will be on-going at the end of 2015 is available in section 6.4. List of Framework Contracts and Partnership Agreements
  7. Equivalence F4E OBS to F4E WBS level 3 is available in section 6.5; For ITER project the equivalence between the F4E WBS level 2/3 and ITER WBS is available in section 6.6.
  8. Some of the Work Programme activities refer to provision for recurrent activities with the same ultimate objective of supporting the final achievement either of the design (e.g. CAD support, engineering analyses, etc.), the manufacturing process (e.g. QA/QC Inspectors, engineering support for deviations analyses, CE marking, etc.) as requested in ITAs/PAs, or the site support services (access control and security, Facility Management Services, etc.). Therefore the description in term of financing decision will be similar over the years.

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<sup>7</sup> Defined as procurement procedures with budgeted amount or ceilings higher than 1 million Euros to be launched in the year 2016

### 3. ITER PROJECT

#### EU.01.11 ITER – Magnets

WBS: EU.01.11	Magnets	WP ref: WP16/11/01
<p><b><u>TOROIDAL FIELD (TF) COILS</u></b></p> <p><b><u>General Overview</u></b>            The scope of the Procurement Arrangement includes the supply of 10 out of 18 superconducting TF Coils used to produce a magnetic field around the torus. The TF coils will provide a total static field of 5.3 T at the plasma axis for confinement and operation. This means a peak field of ~12 T at the inner leg, thus requiring the use of Nb3Sn strand in the conductor and cooling by supercritical He (4.5 K). These magnets are built with the Wind, React &amp; Transfer technique. The total weight of each coil is about 300 tons. One addition spare TF coil will be produced by Japanese Domestic Agency (JADA).            During energization and plasma operation Toroidal loads are introduced in the inter-TF coil structures. In order to reduce these loads and increase the machine fatigue life, two sets of three pre-compression rings (PCR) will be installed on the top and the bottom of the TF magnets introducing a centripetal load to the TF Coils.</p> <p><b><u>Current Status</u></b>            All major contracts for production of TF Coils have been signed. Production of Radial Plates is on-going with 32 (over 70) Radial Plates delivered so far to Winding Pack manufacturer. The first ever prototype of the Double Pancake (part of the Winding Pack) has been successfully completed. Production of Double Pancakes is progressing well with 38 (over 70) Double Pancakes (DP) windings completed, 28 DPs transferred into the Radial Plates and 7 DPs fully impregnated and ready for the stacking of the first Winding Pack. Contract for Cold test and Coils Case Insertion is on-going with qualification of the main processes and procurement of the facilities and tools.            For the pre-compression rings the manufacturing contract is ongoing (qualification phase).</p> <p><b><u>Challenges for the next year</u></b>            In 2016 stacking and the completion of the first Winding Pack will be performed. The commissioning of all facilities and tools necessary for insertion process will be executed in parallel. After successful completion of tests required for a shipment the Winding Pack will be delivered to Coil Case Insertion contractor where will be unpacked and prepared for a Cold Test. Later in the 2016 the first Cold Test in the 77K will be performed.            A delay of more than 6 months has been announced by JADA for the delivery of the TFCS: this is going to be a big issue as it will require expensive storage of the Winding Packs (which will be ready more than 6 months earlier) and it will force the coil insertion supplier to be on hold for more than 6 months. This is likely to delay some of the intermediate milestones as the supplier might find financially more efficient to delay completion of the Winding Packs and installation of some tooling rather than install and pay it before needed and have it on hold for 6 months. This would also reduce extra costs for us.            In 2016 the qualification of the PCR manufacturing process with the current automated filament placement solution should be proven in order to go ahead with the series production. In particular in order to maximize the chance of success, two alternative manufacturing options will be used to manufacture 2 different full size qualification mock ups.            In addition a tendering phase for the manufacture of a number of back-up PCRs utilizing an alternative technology, to be used in case the PCRs produced by the present manufacture fail, will be launched.</p> <p><b><u>POLOIDAL FIELD (PF) COILS</u></b></p> <p><b><u>General Overview</u></b>            The scope of the Procurement Arrangement includes the production of five PF Coils (PF2-PF6). The PF coils will operate up to a peak field in the order of ~6-7 T, thus requiring the use of NbTi strand in the conductor and cooling by supercritical He (4.5 K). These magnets will be built with the Wind and Insulate technique. Four PF coils (PF2 to PF5) will be manufactured in a building provided by F4E in a location adjacent to the ITER site, while the lower coil PF6 will be provided to F4E by ASIPP - the Chinese Institute under a collaboration agreement. The total weight of each coil with support clamps is in the range of 200-400 tons. The upper and smallest coil PF1 will be provided by RFDA.</p> <p><b><u>Current Status</u></b>            Almost all major contracts have been signed during 2013-2015. The last two major contracts - Manufacturer (MFR) and Cold Test Facility (CTF) are in the final tendering phase and are planned to be awarded in 2015 and at the beginning of 2016 respectively. Preparation of the main winding tooling for all PF Coils is progressing well both in Europe and in China having the tooling in their facilities by the end of the year. The adaptation of the PF Coils Building in Cadarache for production of the PF Coils (offices, workshop area) is almost ready. Construction of the external storage building was initiated. The design of the impregnation and all the additional tooling started in the second half of this year.</p> <p><b><u>Challenges for the next year</u></b></p>		

At the beginning of 2016 the kick-off PF Coils Manufacturer (MFR) contract and Signature of the Cold Test Facility (CTF) contract will take place. The adaptation of the PF Coils Building and construction of External Storage Building in Cadarache shall be completed in 2016. The commissioning of the Winding Tooling and qualification of all PF Coils, winding of the first Double Pancakes in Europe (PF5) and in China (PF6) will start in the same year. The impregnation tooling and the other tools required for Double Pancake manufacture will be delivered and installed.

### ANNUAL OBJECTIVES

#### TF COILS

Milestone ID/ Objectives	Milestone Objective type	Scope Description	Achievement criteria /CAS received	Forecast achievement date	Relevant Deliverables
<b>Fusion for Energy suppliers responsibility</b>					
EU11.6A.13980	PP	Delivery of 760m TF Conductor for Double Pancake 5 of TF Coil #1	CAS 1.75000 kIUA	19/04/2016	Certificate of Acceptance (CoA) approved
EU11.1A.14800	WP	IO Approval of the Winding Pack Group Insulation 7DPs impregnated and stacked- TF WP11	Cleared by IO	08/04/2016	IC milestone
EU11.1A.15567	WP	F4E approval of Winding Pack Group Insulation 7DPs impregnated and stacked- TF WP09	Cleared by F4E	04/11/2016	Acceptance by F4E

#### PF COILS

Milestone ID/ Objectives	Milestone Objective type	Scope Description	Achievement criteria /CAS received	Forecast achievement date	Relevant Deliverables
<b>Fusion for Energy responsibility</b>					
EU11.3A.40 120	PP	Cold Test Engineering Study and Facility Construction	Contract Signature	30/03/2016	Not applicable
<b>Fusion for Energy suppliers responsibility</b>					
EU11.3B.01 980	PP	Start Qualification of PF Coils	Hold Point Clearance (HPC) of all Relevant Deliverables related to first qualification component	17/03/2016	Manufacturing and Inspection Plan Quality Plan Tooling Design Final Report Tooling Manufacture and Qualification Final Report Manufacturing Drawings
EU11.6C.02 15	PP	Delivery of PF conductor (UL7) for Manufacturing of Double Pancake # 4 of PF Coil#6	CAS 0.93604 kIUA	09/11/2016	Certificate of Acceptance (CoA) approved

### HUMAN RESOURCES ASSIGNED TO THE ACTIVITY

F4E will be supporting this activity during the year 2016 with 36.46 FTE.

FINANCING DECISION					
Procurement actions					
ITER Project actions in response of PAs and ITAs					
<p>For all the Magnets systems the procurement actions during the year 2016 will be focused on support the on-going main contracts for the TF Coils and PF Coils manufacturing.</p> <p>They will include provisions for characterization of the Nb3Sn strands samples, engineering support analysis (electromagnetic and mechanical analysis), quality assurance inspectors for contract follow-up, transportation and storage, provision and testing/qualification of pre-compression rings materials. These tasks will be mainly implemented through specific contracts under existing framework contracts (see list for the on-going framework contracts in section 6.4) or release of options of ongoing contracts.</p> <p>In addition an insurance contract for the Toroidal Field Winding Pack during the insertion process will be signed in 2016. For the Pre-compression rings a new tender procedure will be launched in 2016.</p> <p>During 2016 changes to the on-going magnets contracts will be implemented through amendments or release of contractual options in line with the provisions of the Financial Regulation. Additional expenses can be also generated by potential contractual price indexations requested by the suppliers or PCRs implementation.</p>					
Cash contribution					
Scope Description					Amount
Amendments for PF6 Manufacturing Contract in China					450.000 euros
Main Procurement initiatives					
F4E systems	Type of Contract/ Agreement	Scope description	Time of call	PA reference	In the budget 2016?
TF Coils	P Serv	Winding Pack Insurance	Q3/2016	1.1.P1A.EU.01	Y
PF Coils	Specific Contract	Poloidal Field Coils Series production follow-up	Q4/2016	PA 1.1.P3A-B.EU.01	Y
Pre – Compression Rings	P supply	Manufacture of the Pre-Compression Rings	Q3/2016	PA 1.1 P2A.EU.01	Y (partially)

## EU.01.15 ITER – Vacuum Vessel

WBS: EU.01.15	Vacuum Vessel	WP ref: WP16/15/01
<p><b><u>MAIN VESSEL</u></b></p> <p><b><u>General Overview</u></b></p> <p>The European contribution to the ITER Vacuum Vessel (VV) consists in the supply of 7 out of the 9 sectors in which the VV is subdivided. For the supply of these 7 sectors one single Procurement Arrangement was signed between F4E and the ITER IO. This PA is broken down into one main supply contract (F4E-OPE-068, Manufacturing and supply of 7 VV sectors) and a number of much smaller activities, mainly implemented through task orders under framework contracts in the following areas:</p> <ul style="list-style-type: none"> <li>• Inspection services;</li> <li>• Engineering support (CAD &amp; FEM analysis);</li> <li>• Legal services.</li> </ul> <p>The Vacuum Vessel is presently under fabrication by a consortium of 3 Italian companies: Ansaldo Nucleare, Mangiarotti and Walter Tosto (AMW). Each sector will be built up from four Segments, joined later to form the full Sector to be welded to the ports. As of today, the following sectors: 5, 4 and 3 have been released for manufacturing. The other sectors are planned to be released by October 2015.</p> <p><b><u>Current Status</u></b></p> <p>The complex process of implementation of design changes and definition of parts and welds has been completed in Sector 5 and Sector 4 3D CAD models in the IO Enovia CAD System, and therefore the 3D models are approved for fabrication. Conceptual and detailed fabrication design, including manufacturing drawings, Top Level Manufacturing Plan, part list, weld list, and inspection assessments, are completed for Sector 5 and approved by F4E, IO and the ANB (Agreed Notified Body) as representative of the French Nuclear Regulatory Body (ASN). Material suppliers have been qualified according to the French Nuclear code RCC-MR 2007 and delivery of plates and forgings for fabrication is on-going. Most of the fabrication procedures have been approved and ready to use in production. Qualification of welding procedures is completed for first welds and close to completion for rest of welds. Jigs and frames needed to support the VV fabrication are ready for the first welds, and the fabrication is on-going for the rest of welds according to the schedule. A detailed manufacturing strategy and resources study have been completed by the AMW consortium. Production activities have started including cutting, hot and cold forming of plates, bevelling of welding configurations, machining of forgings and first welds of Sector 5, together with the production control activities, such as dimensional inspections, visual inspections, dye penetrant tests, ultrasounds inspections, radiography, chemical and mechanical destructive testing, etc.</p> <p><b><u>Challenges for the next year</u></b></p> <p>In 2016, production activities have started for 5 of the 7 sectors (all released sectors) and this represents a huge increase of workload for both supplier and F4E requiring an additional effort on increasing efficiency and streamlining coordination at AMW. The main challenge for 2016 is for F4E to make sure that the Consortium AMW succeeds in placing the large amount of machining to its subcontractors in relatively short amount of time.</p> <p><b><u>BLANKET MANIFOLDS</u></b></p> <p><b><u>General Overview</u></b></p> <p>The design of the Blanket Cooling Manifold (BCM) pipes is now practically completed. The design for the standard sectors remains based on 20 pipe bundles (8 for the inboard and 12 for the outboard). For the NBI sectors, the lack of space in the upper port requires the routing of some pipes through the lower ports to feed the additional blanket modules. The design of the pipe supports is quite complex. The current concept includes the brazing of an alumina layer between the support clamps and the pipe to serve as an electrical insulation.</p> <p><b><u>Current Status</u></b></p> <p>The validation of the brazed pipe support design is currently taking place through an IO-CT contract. The FDR of the BCM system is scheduled in December 2015. 21 chits (including 2 Class1) have been raised and are currently being addressed.</p> <p><b><u>Challenges for the next year</u></b></p> <p>The resolution of all chits is foreseen by June 2016. The PA signature date is currently planned in December 2016. However, further to the delay induced by the current ITER Project scheduling exercise, discussions with IO-CT are on-going to postpone the signature of the PA. The 2016 activities will be focused on the development of an alternative design of the piping supports to reduce fabrication cost.</p>		

ANNUAL OBJECTIVES					
Milestone ID/ Objectives	Milestone Objective type	Scope Description	Achievement criteria /CAS received	Forecast achievement date	Relevant Deliverables
<b>Fusion for Energy responsibility</b>					
EU15.1A.30 08110	WP	Task order #1 Lot 2 Option #2 for VV resident Inspector #2	Task Order Option signature	07/01/2016	Release of the option by F4E
EU15.1A.30 08170	WP	Task order #2 Lot 1 Option #1 for VV Inspector #1	Task Order Option signature	23/03/2016	Release of the option by F4E
<b>Fusion for Energy suppliers responsibility</b>					
EU15.1A.11 29030	PP	Delivery of Forged Blocks for Sector 4 - Batch 2 from R-Kind	MAD approval for forged blocks from R-Kind for Sector 4	30 June 2016	MAD for forged blocks for sector 4 priority 1
EU15.1A.30 08600	PP	Rails Forgings Sector 5 & Sector 4 Ready for Machining	MAD approval for Rails Forgings Sector 5 & Sector 4	18/10/2016	MAD for rails forgings sector 5 and sector 4
EU15.1A.10 3150	PP	F4E Checked Detailed Manufacturing Design of portion of Sector 3	DCC to supplier for sector 3 PS3 detailed manufacturing design	12/09/2016	DCC to supplier for sector 3 PS3 detailed manufacturing design
EU15.1A.10 6060	PP	Start Fabrication - Sector 4 (Stage 4D)	First fabrication activities on sector 4	03/10/2016	Point clearance of first fabrication activity on sector 4
<b>HUMAN RESOURCES ASSIGNED TO THE ACTIVITY</b>					
F4E will be supporting this activity during the year 2016 with 26.97 FTE.					
<b>FINANCING DECISION</b>					
<b>Procurement actions</b>					
<b>ITER Project actions in response of PAs and ITAs</b>					
During 2016 changes to the on-going contracts will be implemented through amendments in line with the provisions of the Financial Regulation.					
Expenditures under the budget 2016 are foreseen for the following procurement actions:					
<ul style="list-style-type: none"> <li>• Procurement for instrumentation</li> <li>• Release of the option E of the vacuum vessel contract and other possible amendments to the main contract (OPE-068)</li> <li>• Price escalation for the main vacuum vessel contract (F4E-OPE-068)</li> <li>• Support for follow-up inspectors and engineering analyses, CAD, legal support, distributed over all year, mainly to be implemented as specific contracts under ongoing framework contracts (see section 6.4)</li> <li>• Provisions for project management support and engineering/manufacturing activities for the Vacuum Vessel project</li> </ul>					
<b>Cash Contribution</b>					
<b>Scope Description</b>					<b>Amount (Euro)</b>
Transfer the procurement responsibility for the delivery of 2 VV Sectors 7 and 8 from Euratom to the ITER Organisation					<b>95 400 000.00</b>
<b>Main Procurement initiatives</b>					

F4E systems	Type of Contract/ Agreement	Scope description	Time of call	PA reference	In the budget 2016?
VV	P Serv	Instrumentation for the 7 sectors	Q3/2016	PA 15.EU.01	Y
VV	FWC	Inspectors for SIC components	Q2/2016	PA 15.EU.01	N.A.

### EU.01.16 ITER – Blanket

WBS: EU.01.16	Blanket	WP ref: WP16/16/01			
<p><b>General Overview</b></p> <p>The overall objectives consist in the supply of 215 panels of the Blanket First Wall.</p> <p>The ITER Blanket-shield system is the innermost part of the reactor directly exposed to the plasma. Its basic function is to provide the main thermal and nuclear shielding to the Vacuum Vessel and external reactor components. Its concept is a modular configuration mechanically attached to the VV.</p> <p>The design of the First Wall (FW) Panels in the EU-DA scope of supply considers a maximum surface heat flux of 2 Mega Watt/m<sup>2</sup> and is called Normal Heat Flux (NHF). The FW Panels are essentially made of 3 materials: 316L (N) austenitic stainless steel, CuCrZr alloy and beryllium in the form of tiles. No spares are for the time being included in the draft Procurement Arrangement (PA). There are in all about 30 different designs of FW panels due to the need to have various kinds of diagnostics passing through the Blanket FW.</p> <p><b>Current Status</b></p> <p>The main activities on the Blanket FW are related to the preparation of the FW Procurement Arrangement and to the follow-up of the manufacture of the three full-scale prototypes (FSP) in the frame of the contracts F4E-OPE-443 Lots 1-3 (Manufacturing of full scale prototype), part of the ITA-169 on the manufacture and test of Normal Heat Flux FW Full Scale Prototypes. A number of options for these contracts are being released, inter alia, cost containment studies, use of electro-plated/foil copper layer and Beryllium (Be) tile coating. Quality Assurance and Quality Control support through a specific contract over the FWC will be continued for the aforementioned contracts.</p> <p>In parallel, several semi-prototypes are being submitted to High Heat Flux (HHF) tests in different facilities. The results are so far very good and will likely result in qualifying several Be-CuCrZr alloy joining conditions reducing therefore technical risks for the procurement of the FW.</p> <p><b>Challenges for the next year</b></p> <p>Main challenges in 2016 consist in achieving planned milestones per the schedule in the manufacturing of the three FSPs, while resolving manufacturing issues, continuing the FW pre-qualification programme with the HHF testing of the remaining FW semi-prototypes and launching the manufacturing of mock-ups to validate the design changes proposed in the cost saving plan. The In-Vessel Project Team continues the efforts for cost containment. Possible design improvements are being validated first via Finite Element Analysis (FEA) and then through the manufacturing and testing of additional mock-ups in 2016/17. This includes the activities envisaged for the qualification of new material grades.</p> <p>The PA will be of type "build to print". The signature, originally planned in 2015, has been postponed to a later stage to allow the implementation of design changes for cost reduction.</p>					
<b>ANNUAL OBJECTIVES</b>					
Milestone ID/ Objectives	Milestone Objective type	Scope Description	Achievement criteria /CAS received	Forecast achievement date	Relevant Deliverables
<b>Fusion for Energy responsibility</b>					
EU.16.01.12 3275	WP	Storage and recycling of Beryllium coated components.	Contract signed	30/09/2016	Not applicable
EU.16.01.22 120	WP	Release of contractual option for the contract F4E-OPE-443 Lot-3 (WP13/16/07 for use of electro-	Letter releasing the option	16/02/2016	Not Applicable



		plated/foil copper layer.			
<b>Fusion for Energy suppliers responsibility</b>					
EU.16.01.20 430	WP	WP - Assembly check prior to SS/CuCrZr 980C HIP operation for FSP - Lot 1	SS/CuCrZr assemblies ready for HIPing	23/09/2016	Assembly Check Prior To HIP SS-CuCrZr 980°C Operation for FSP - Report
<b>HUMAN RESOURCES ASSIGNED TO THE ACTIVITY</b>					
F4E will be supporting this activity during the year 2016 with 12.23 FTE.					
<b>FINANCING DECISION</b>					
<b>Procurement actions</b>					
<b>ITER Project actions in response of PAs and ITAs</b>					
<p>Expenditures for the following procurement actions are foreseen under budget 2016:</p> <ul style="list-style-type: none"> <li>• Release of Options under the three on-going contracts OPE-443 Lots 1-3 for the manufacture of full-scale prototypes (FSP) among other for cost containment studies, use of electro-plated/foil copper layer and Beryllium (Be) tile coating. Option under the on-going contract OPE-594 for fabrication of additional CuCrZr plates and Options under the ongoing contract for Ultrasonic Testing.</li> <li>• Specific contracts for Re-welding and PIE of Irradiated Pipe Specimens (TS)</li> <li>• Contract for dismantling of irradiation test rig</li> <li>• Quality assurance and quality control support for the Blanket First Wall on-going contracts During 2016 changes to the on-going contracts will be implemented through amendments and release of options in line with the provisions of the Financial Regulation.</li> </ul>					

### EU.01.17 ITER – Divertor

<b>WBS: EU.01.17</b>	<b>Divertor</b>	<b>WP ref: WP16/17/01</b>
<p>The EU contribution to the procurement of the ITER Divertor includes two procurement arrangements (PA), namely the PA 1.7.1 for the procurement of the Cassette Bodies and the Integration of the Plasma Facing Components (PFCs) and the PA 1.7.2B for the procurement of the Inner Vertical Target (IVT).</p> <p>The PA 1.7.1 concerns the supply of one cassette assembly prototype, the manufacturing of 54 divertor cassette bodies (CB) plus 4 spares and the installation of the PFCs. The ITER divertor requires an extensive set of diagnostic systems supplied by the ITER Parties but the integration of the diagnostics onto the CBs is also part of this PA. The integrated cassettes are called cassette assemblies (CAs). The diagnostic to cassette interfaces are frozen but, since the diagnostics design is not completed yet the procedures for diagnostics integration and their acceptance/qualification tests are not fully defined yet. The Procurement type is "build to print".</p> <p>The PA 1.7.2B concerns the supply of one inner vertical target prototype, 54 inner vertical targets and 4 spare inner vertical targets. The Procurement type is also "build to print".</p> <p><b>Current Status</b></p> <p>The Divertor Cassette PA 1.7.1 was signed on 8 May 2012. The CBs manufacturing feasibility is being addressed in the frame of three multiple framework contracts awarded to three companies for the manufacture of full size CB prototypes. The completion of this pre-qualification and readiness for series production is planned in year 2017. The pre-qualification for the CA integration will be launched in 2018.</p> <p>The IVT PA 1.7.2B was signed on 10 March 2010. The manufacturing feasibility is being addressed by one company with the manufacture of a full size IVT prototype. Three other companies are being involved in the pre-qualification for the IVT procurement through the fabrication and testing of small scale mock ups. The successful candidates will compete for the subsequent pre-qualification step with the manufacture of up to two full size IVT prototypes. The achievement of the pre-qualification and readiness for series production is planned in 2020.</p> <p><b>Challenges for the next year</b></p> <p>Main challenges in 2016 consist in the continuation of the manufacture of the CB full-scale prototypes and the completion of the manufacture of IVT pre-qualification mock-ups and the high heat flux testing of these mock-ups</p>		

ANNUAL OBJECTIVES					
Milestone ID/ Objectives	Milestone Objective type	Scope Description	Achievement criteria /CAS received	Forecast achievement date	Relevant Deliverables
<b>Fusion for Energy responsibility</b>					
EU17.2B.18 140	WP	Performance of High Heat Flux (HHF) of full tungsten small scale mock ups to pre-qualify additional suppliers for the procurement of the ITER divertor Inner Vertical Target.	Contract signed	03/10/2016	Not applicable
<b>Fusion for Energy suppliers responsibility</b>					
EU17.2B.30 810	WP	COMPLETION of the Mock-ups Stage 1 - OMF-567 - Lot 3	Delivery at manufacture facility	30/09/2016	Final Report
HUMAN RESOURCES ASSIGNED TO THE ACTIVITY					
F4E will be supporting this activity during the year 2016 with 12.71 FTE.					
FINANCING DECISION					
Procurement actions					
ITER Project actions in response of PAs and ITAs					
<p>Expenditures for the following actions for the procurement of the Inner Vertical Target are foreseen under budget 2016 for for :</p> <ul style="list-style-type: none"> <li>• Procurement for High Heat Flux (HHF) testing of Divertor components and,</li> <li>• Quality assurance and quality control support for the Divertor's on-going contracts.</li> </ul> <p>During 2016 changes to the on-going contracts will be implemented through amendments in line with the provisions of the Financial Regulation.</p>					

### EU.01.23 ITER – Remote Handling

WBS: EU.01.23	Remote Handling	WP ref: WP16/23/01
<p><b>General Overview</b></p> <p>The general scope of this WBS regards the following systems:</p> <ul style="list-style-type: none"> <li>• The Divertor Remote Handling, made of a series of movers able to travel from the Transfer Cask System docked to the VV equatorial ports 2, 8 and 14, to the working positions and to remove the 54 divertor cassettes, plus the diagnostic racks and the related primary closure plates</li> <li>• The Cask and Plug Remote Handling System, also known as Transfer Cask System, made of a fleet of units able to move from Hot Cell to Tokamak Building, dock to the various ports/docking stations, install and remove in-vessel components (i.e. Divertor cassettes, blanket modules, plugs, cryopumps, IVVS, NB) with the in-cask devices.</li> <li>• The Neutral Beam Remote Handling System, made of series of devices able to operate remotely in the NB cell to perform maintenance tasks on the NB injectors and on the upper Diagnostic tubes.</li> </ul> <p><b>Current Status</b></p> <p>The transition from pre-PA to PA regime has been completed with the signature of CPRHS PA. At the same time, the procurement contracts for procurement-in-kind are being placed. The ones for DRHS and NBRHS have already started. Complementary/preparatory activities in various technological areas are on-going mainly through specific contracts under</p>		

framework contracts and Grants.

### Challenges for the next year

In the frame of the global F4E contribution from ITER Remote Handling, the year of reference will see the signature of the last big procurement contract for Cask and Plug Remote Handling System (CPRHS) that will therefore give the possibility to initiate the preliminary design preparation by means of the 1st task order with the contracted supplier (1st in cascade). Meanwhile, Divertor Remote Handling System (DRHS) and Neutral Beam Remote Handling System (NBRHS) preliminary design will move on and start, respectively, and cross cutting technologies in the area of rad-hard components and control system will be further developed.

Next year the main focus will be the follow up and coordination of the major suppliers for the RH systems, which will be all contracted, in such a way to establish links and synergies among them. At the same time it is needed to take care of the cross cutting technological developments performed through other contracts/grants, in order to ensure procurement of the individual packages and harmonisation between them.

### ANNUAL OBJECTIVES

Milestone ID/ Objectives	Milestone Objective type	Scope Description	Achievement criteria /CAS received	Forecast achievement date	Relevant Deliverables
<b>Fusion for Energy responsibility</b>					
EU23.03.90 1410	PP	Cask & Plug Remote Handling System Procurement	Contract signed	31/05/2016	Not applicable
EU23.05.20 130	PP	Preliminary Design first priority items for Neutral Beam Remote Handling System	Contract signed	11/07/2016	Not applicable

### HUMAN RESOURCES ASSIGNED TO THE ACTIVITY

F4E will be supporting this activity during the year 2016 with 16.86 FTE.

### FINANCING DECISION

#### Procurement actions

#### ITER Project actions in response of PAs and ITAs

Preliminary design and engineering support activities (such as R&D, control system, test and prototyping) will be carried out for the Remote Handling System PAs. These activities will be implemented mainly through specific contracts under on-going framework contracts. In particular, the Divertor Remote Handling System activities will be carried out mainly through FWC 340 lot1 - Multiple Framework Contracts in cascade for the Development and Supply of the ITER Divertor Remote Handling System (DRHS); Cask and Plug Remote Handling System activities will be implemented mainly under FWC 0577 - Multiple Framework Contracts in cascade for the Development and Supply of the ITER Cask and Plug Remote Handling System (CPRHS); Neutral Beam Remote Handling System activities will be performed mainly under FWC 340 lot3 - Multiple Framework Contracts in cascade for the Development and Supply of the ITER Neutral Beam Remote Handling System (NBRHS).

Furthermore, Engineering support activities and activities belonging to ICARHE program (radiation assessment, studies, prototyping and qualification of Rad Hard components) will be implemented mainly under FWC 633 - Multiple Framework Service Contract in cascade for the Provision of Engineering Support in the area of Remote Handling, and other general support framework contracts (see section 6.4).

### Grants and Specific Grants

Scope	Type of procedure	Time of Call	Indicative Amount (Euro)	Budgetary line
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F4E(16)-GB35-13.1

2<sup>nd</sup> Amended 2016 Work Programme

Grant for Divertor RH Design and Control System support	Unique Beneficiary <sup>8</sup>	Q2/2016	200,000	31-35	
Main Procurement initiatives					
F4E systems	Type of Contract/ Agreement	Scope description	Time of call	PA reference	In the budget 2016?
Remote Handling	Specific Contract	Preliminary design first-priority items for Neutral Remote Handling	NA	PA 2.3.P5.EU.01	Y
Remote Handling	Specific Contract	Initial Scope Evaluation for Cask and Plug Remote Handling System	NA	PA 2.3.P3.EU.01	Y
Remote Handling	Framework Contract	FWC for Design, manufacturing and Installation for Cask and Plug Remote Handling System	Q2/2014	PA 2.3.P3.EU.01	N.A.

<sup>8</sup>Unique experimental facility (according to art.158.b of F4E Implementing Rules), Hytar Oy and Tamlink : Unique experimental Facility and technical competence.

## EU.01.31 ITER – Vacuum Pumping and Leak Detection

WBS: EU.01.31	Vacuum Pumping and Leak Detection	WP ref: WP16/31/01
<p><b><u>General Overview</u></b></p> <p>Vacuum Pumping and Leak Detection comprises five Procurement Arrangements (PA): Warm Regeneration Lines, Front End Cryopump Distribution Cold Valve Boxes and Warm Regeneration Box, Torus and Cryostat Cryopumps, Neutral Beam Cryopumps, and Leak Detection and Localisation.</p> <p><b>PA 3.1.P1.EU.01: Warm Regeneration Lines</b></p> <p>EU is responsible for the in-kind procurement (Detailed Design PA) of helium gas transfer lines for the warm regeneration system for the cryogenic pumps to be installed on the ITER vacuum vessel, the cryostat, and the neutral beam injector. The scope of supply is well defined, considering that the procurement type is a Detailed Design PA.</p> <p><b>PA 3.1.P1.EU.02: Front End Cryopump Distribution Cold Valve Boxes and Warm Regeneration Box</b></p> <p>EU is responsible for the in-kind procurement of the front end cryopump distribution Cold Valve Boxes (CVBs) and Warm Regeneration Box (WRB). This Detailed Design PA includes the Cold Valve Boxes (CVBs) for Torus Cryopumps and Cryostat Cryopumps, the CVBs for Heating Neutral Beam (HNB) Cryopumps and Diagnostic Neutral Beam (DNB) Cryopumps, together with the related cryojumpers, and the Warm Regeneration Box. The purpose of the front end cryodistribution system is to transfer the cryogens needed for the operation of the cryopumps so that the cryopanel and thermal shields in the cryopumps can be kept at low temperatures to pump the gases and to remove the heat loads from the surroundings and from the trapping of the gases.</p> <p><b>PA 3.1.P1.EU.03: Torus and Cryostat Cryopumps</b></p> <p>EU is responsible for the in-kind supply (Built-to-Print PA) of 6 Torus- and 2 Cryostat- Cryopumps (TCP and CCP). These pumps, which are expected to be identical, are used to provide ultra-high vacuum conditions to the Torus and the Cryostat.</p> <p><b>PA 3.1.P1.EU.04: Neutral Beam Cryopumps</b></p> <p>EU is responsible for the in-kind supply (Built-to-Print PA) of three Heating Neutral Beams (HNB) and one Diagnostic (DNB) Cryopumps, HNBCP and DNBCP respectively. The DNBCP is used for diagnostic purposes while the HNBCP for heating purposes and it is similar, but shorter, than the HNBCP. These cryopumps will be connected to the Neutral Beam boxes to pump the gas fed to the ion sources and neutralizers of the Neutral Beams.</p> <p><b>PA 3.1.P3.EU.01: Leak Detection and Localisation System</b></p> <p>EU is the responsible for the in-kind supply (Functional Specification PA) of the Leak Detection and Localisation (LDL) system. The leak detection system will mainly consist of commercial off-the-shelf components, which –for the tritium bearing systems- will be installed in glove boxes. Each vacuum system will likely be equipped with a leak detector, and several Residual Gas Analyzers (RGAs) will also form part of the leak detection system.</p> <p><b><u>Current Status</u></b></p> <p><b>PA 3.1.P1.EU.01: Warm Regeneration Lines</b></p> <p>Under PA 3.1.P1.EU.01 there is only one contract which was signed with CRIOTEC in September 2014. Currently, F4E is in the execution phase of the contract. The whole procurement has been tendered.</p> <p><b>PA 3.1.P1.EU.02: Front End Cryopump Distribution Cold Valve Boxes and Warm Regeneration Box</b></p> <p>The procurement strategy has not been defined yet. Thus, no fraction of the procurement has been already tendered. F4E is, currently, in the pre-PA stage. A preliminary design review took place in December 2014 under IO responsibility. However, the design is not considered at the required level of maturity and so it is not well established yet.</p> <p><b>PA 3.1.P1.EU.03: Torus and Cryostat Cryopumps</b></p> <p>This PA is expected to be signed in 2018. However, there are some on-going activities related to this future PA: A Pre-Production Cryopump (PPC) is being manufactured under a contract funded by an ITER Task Agreement (ITA). Following the manufacturing and the testing of the PPC, the final design review managed by IO will follow to fully define the TCPs and the related documentation.</p> <p><b>PA 3.1.P1.EU.04: Neutral Beam Cryopumps</b></p> <p>The procurement strategy of the PA is not defined yet, and no pre-PA task has been launched. The PA is expected to be signed in 2019. A test cryopump (MITICA) will be produced and tested at the RFX MITICA Facility, which will allow minimizing any risk related to the NB Cryopumps. As a result of the Project Change Request PCR-690, the MITICA Cryopump will be shifted to PA 3.1.P1.EU.04 (now MITICA Cryopump is part of PA 5.3.P9.EU.01). A Final Design Review for the MITICA Cryopump took place in November 2013.</p> <p><b>PA 3.1.P3.EU.01: Leak Detection and Localisation System</b></p> <p>The procurement strategy of the PA is not defined yet. Thus, no fraction of the procurement has been already tendered. However, so far the PA has been divided in two phases: (1) Primary Leak Detection and Localisation and (2) Cryostat Leak Detection and Localisation System to be signed in 2016 and 2017, respectively. IO and EU-DA have agreed that IO will perform the R&amp;D necessary to arrive at a conceptual design of the leak localisation system. This R&amp;D program has experienced some delays. It should include technology demonstration on ITER-like scale. It is necessary to ensure that IO's R&amp;D program advances the technology readiness level of the proposed leak localisation techniques sufficiently to allow for the signature of the Functional Specification PA.</p>		

<b>Challenges for the next year</b>					
<b>PA 3.1.P1.EU.01: Warm Regeneration Lines</b>					
<ul style="list-style-type: none"> <li>Final approval of the Final Design Warm Regeneration Lines (WRL)</li> <li>Completion of WRL Manufacturing Readiness Review</li> <li>Start of Manufacturing of WRLs.</li> </ul>					
<b>PA 3.1.P1.EU.02: Front End Cryopump Distribution Cold Valve Boxes and Warm Regeneration Box</b>					
<ul style="list-style-type: none"> <li>Signature of the PA 3.1.P1.EU.02: Front End Cryopump Distribution Cold Valve Boxes and Warm Regeneration Box.</li> </ul>					
<b>PA 3.1.P1.EU.03: Torus and Cryostat Cryopumps</b>					
<ul style="list-style-type: none"> <li>Finish of Manufacture of Pre-Production Cryopump, funded by ITA C32TD31FE</li> <li>Final assembly of Pre-Production Cryopump, funded by ITA C32TD31FE</li> </ul>					
<b>PA 3.1.P1.EU.04: Neutral Beam Cryopumps</b>					
<ul style="list-style-type: none"> <li>Signature of the PA 3.1.P1.EU.04: Cryopumps for the ITER Heating and Diagnostic Neutral Beam and MITICA test facility</li> <li>Procurement of Johnston Couplings.</li> <li>Start of the Pre Tendering and Tendering Phase for the MITICA cryopump.</li> </ul>					
<b>PA 3.1.P3.EU.01: Leak Detection and Localisation System</b>					
<ul style="list-style-type: none"> <li>Pre-PA activities for PA 3.1.P3.EU.01 signed, Primary Leak Detection and Localisation (LD&amp;L) System</li> </ul>					
<b>ANNUAL OBJECTIVES</b>					
Milestone ID/ Objectives	Milestone Objective type	Scope Description	Achievement criteria /CAS received	Forecast achievement date	Relevant Deliverables
<b>Fusion for Energy suppliers responsibility</b>					
EU31.01.00671	WP	Acceptance of Final Design Review Package WRL	Final Design Review Meeting held and final design accepted	26/09/2016	Final Design review package accepted
EU31.01.12113	PP	Final Approval of Final Design Warm Regeneration Lines	Final Design Review Meeting held & design endorsed by the Steering Committee.	03/11/2016	Design Review Panel Report issued and Steering Committee decision taken.
<b>HUMAN RESOURCES ASSIGNED TO THE ACTIVITY</b>					
F4E will be supporting this activity during the year 2016 with 6.73 FTE.					
<b>FINANCING DECISION</b>					
<b>Procurement actions</b>					
<b>ITER Project actions in response of PAs and ITAs</b>					
Expenditures are foreseen under budget 2016 for the following actions:					
<ul style="list-style-type: none"> <li>Further activities on final design and manufacturing of WRLs</li> <li>Provision for Johnston Couplings</li> </ul>					
<b>Main Procurement initiatives</b>					
F4E systems	Type of Contract/ Agreement	Scope description	Time of call	PA reference	In the budget 2016?
Vacuum Pumping and Fuelling	P Supply	Manufacturing and Factory Testing of MITICA cryopump	Q4/2016	PA 3.1.P1.EU.02	N

## EU.01.32 ITER – Tritium Plant

WBS: EU.01.32	Tritium Plant	WP ref: WP16/32/01
<p><b><u>General Overview</u></b></p> <p>Tritium Plant comprises three Procurement Arrangements (PA): Isotope Separation System (ISS), Water Detritiation System (WDS) Tanks, and WDS Main System.</p> <p><b>PA 3.2.P3.EU.01 Isotope Separation System</b> EU is responsible for the in-kind supply of the Hydrogen Isotope Separation System, via a Detailed Design Procurement Arrangement. ISS concept is based on the 2001 design which comprises a cascade of four inter-linked packed cryo-distillation columns cooled down to 20-25 K temperature and equipped with 6 equilibrators and various heat exchangers. Exploiting small differences in the boiling temperatures of the six hydrogen molecules, the ISS separates the hydrogen isotopes in the mixtures received from Tokamak Exhaust, Water Detritiation and Neutral Beam Systems and produces specific hydrogen isotopic streams for the Storage and Delivery System and the Water Detritiation System.</p> <p><b>PA 3.2.P5.EU.01 Water Detritiation System - Tanks</b> EU is responsible for the in-kind procurement of part of the Tritiated Water Holding Tanks (TWHT) of the WDS via a Detailed Design Procurement Arrangement. During ITER operation and maintenance, tritiated water generated by various sources and accumulated in amounts beyond the authorized discharge limits will be stored on site and processed in the Water Detritiation System (WDS), which is part of the Tritium Plant. There, this water will be converted into hydrogen and oxygen streams using tritium compatible electrolyzers. A part of the so produced tritiated hydrogen isotope mixtures will be sent to the ISS, whereas the main stream is injected into the bottom of the Liquid Phase Catalytic Exchange (LPCE) column where tritium from hydrogen is transferred to liquid water by means of catalytic exchange reactions. The detritiated hydrogen and oxygen will finally be discharged into the environment within the authorized release limits. The scope of this PA includes two 100 m3 emergency tanks (ETs), four 20 m3 Holding Tanks (HT), two HL Holding Tanks and two Feeding Tanks.</p> <p><b>PA 3.2.P5.EU.02 Water Detritiation System – Main System</b> EU is responsible for the in-kind procurement (Detailed Design PA) of the Water Detritiation System (WDS). The PA, which is focused in the whole WDS excluding the tanks mentioned before, is expected to be signed in 2021.</p> <p><b><u>Current Status</u></b></p> <p><b>PA 3.2.P3.EU.01 Isotope Separation System</b> The procurement strategy of the PA is not defined yet and, therefore, no fraction of the procurement has been already tendered. The PA is planned to be signed in 2020, hence, up to this date the conceptual design will be carried out by IO, whereas the preliminary design will be developed through an ITER Task Agreement (ITA) to come.</p> <p><b>PA 3.2.P5.EU.01 Water Detritiation System - Tanks</b> The procurement of the TWHTs has been performed by means of one contract for final design, manufacturing, delivery and witnessing of on-site installation. The choice to place only one contract for the final design and manufacturing of tanks is based on the outcome of the market survey carried out in 2011. Besides, a small amount contract was placed for quality control of the manufacturing and testing of the tanks in manufacturer's premises. The first part has been already tendered and manufactured: HTs and ETs. The same procurement strategy is planned for the four smaller tanks, scope of PCR-649.</p> <p><b>PA 3.2.P5.EU.02 Water Detritiation System – Main System</b> Currently, F4E is in the preliminary design of ITER WDS Main, which is developed with an ITER Task Agreement (ITA). Basically, the relevant activities funded by this ITA are the design and R&amp;D work (electrolyser and LPCE column) for development of detailed design of Water Detritiation System.</p> <p><b><u>Challenges for the next year</u></b></p> <p><b>PA 3.2.P3.EU.01 Isotope Separation System</b> Initially, the strategy was to develop the conceptual design of the ISS at F4E through an ITER Task Agreement (ITA) in 2016. This strategy, however, was changed and the conceptual design is to be developed directly at IO. Then, there are not significant challenges on this PA for 2016 apart from some support to IO activities when required.</p> <p><b>PA 3.2.P5.EU.01 Water Detritiation System - Tanks</b></p> <ul style="list-style-type: none"> <li>• Contract signed for the Procurement of HL Holding Tanks and Feeding Tanks.</li> </ul> <p><b>PA 3.2.P5.EU.02 Water Detritiation System – Main System</b></p> <ul style="list-style-type: none"> <li>• Finish relevant activities funded by ITA "Design and R&amp;D work for development of detailed design of Water Detritiation System": Preliminary Design of ITER Main WDS Stage 1 (excluding tanks).</li> </ul>		
<b>ANNUAL OBJECTIVES</b>		

Milestone ID/ Objectives	Milestone Objective type	Scope Description	Achievement criteria /CAS received	Forecast achievement date	Relevant Deliverables
<b>Fusion for Energy suppliers responsibility</b>					
EU32.05.18 1550	PP	Contract Signature for Procurement of 5m3 and 12m3 (Holding and Feeding) WDS tanks	Contract signature	15/12/2016	
EU32.05.01 760	WP	Delivery of Preliminary Design Package to IO	Delivery to IO	21/09/2016	Preliminary Design package
<b>HUMAN RESOURCES ASSIGNED TO THE ACTIVITY</b>					
F4E will be supporting this activity during the year 2016 with 4.19 FTE.					
<b>FINANCING DECISION</b>					
<b>Procurement actions</b>					
<b>ITER Project actions in response of PAs and ITAs</b>					
Expenditures are foreseen under budget 2016 for the following actions: <ul style="list-style-type: none"> <li>Procurement of 5m3 and 12m3 Water Detritiation System (WDS) Tanks</li> </ul>					
<b>Main Procurement initiatives</b>					
F4E systems	Type of Contract/ Agreement	Scope description	Time of call	PA reference	In the budget 2016?
PS. Tritium	P Supply	Procurement of 5m3 and 12m3 Water Detritiation System (WDS) Tanks	Q3/2016	PA 3.2.P5.EU.01	Y



## EU.01.34 ITER – Cryoplant

WBS: EU.01.34	Cryoplant		WP ref: WP16/34/01		
<p><b>General Overview</b></p> <p>EU is responsible for the in-kind procurement (Functional Specification PA) of the Liquid Nitrogen Plant and Auxiliary Systems of the ITER cryogenic system. The LN2 Plant and Auxiliary Systems is composed of the LN2 Plant, the 80K loops, the helium storage tanks, the helium purification system, the helium dryers and the heaters. Two 80K loops provide helium at 80K for the following duties: (1) cool the thermal shields of the cryostat, vacuum vessel, cryolines, cryodistribution and cryopumps as well as the magnet gravity supports; and (2) periodically regenerate the cryopumps. As part of the LN2 plant, two nitrogen refrigerators provide the cooling power for: (1) pre-cooling the LHe plant and (2) cooling the 80K loops. They also provide nitrogen in liquid or gaseous form at two temperature levels (300 K and 80 K) for the purification unit, quench tanks and LHe tanks, dryers and nitrogen utility network. The LN2 plant includes liquid and gas storage, a local nitrogen generator to compensate the nitrogen losses, pumps and a vaporiser. Helium storage tanks are designed to store the helium inventory for the ITER machine as well as the necessary helium volume to control the system in all operating scenarios. The helium purification system is designed to recover and clean helium gas. Heaters are designed to provide the necessary heating power to ensure testing and operation of the cryogenics system.</p> <p><b>Current Status</b></p> <p>This PA was signed on 15 June 2011. The chosen procurement strategy is for a main contract covering the engineering, manufacturing, transport, and supervision of installation and testing of the equipment part of the PA scope. The main contract was signed in December 2013 after a pre-engineering phase; Preliminary Design Review and Final Design Review took place in September 2014 and July 2015, respectively. The manufacturing phase started early 2015 with the Manufacturing Readiness Reviews (MRRs) of the Long Lead Items (compressors, heat exchangers, tanks, etc.). About 85% of the procurement has been tendered. Within this fraction, about 70% have been ordered (the options account for the 15% difference).</p> <p><b>Challenges for the next year</b></p> <ul style="list-style-type: none"> <li>• Procurement of rotating equipment, static equipment, plant and piping, instrumentation, electrical and ALAT Modules.</li> <li>• Package integration 80K He Loops and LHe Plant.</li> <li>• Manufacture, Factory Acceptance Test, Packing and Shipping, and delivery of 80K Loops.</li> <li>• Manufacture, Factory Acceptance Test of LN2 Plant.</li> <li>• Packing, shipping, and delivery of all equipment. Definition of the logistic strategy (transport included in the initial commitment of the main contract with Air Liquide, F4E's main supplier).</li> <li>• Execution of Option 1 for installation of liquid nitrogen plant and auxiliary systems.</li> <li>• Implementation of Option 12 Additional storage</li> <li>• Contract signed for Quench line for LN2 Plant and Auxiliary Systems</li> <li>• Contract signed for LHe Tank Platform</li> </ul>					
<b>ANNUAL OBJECTIVES</b>					
Milestone ID/ Objectives	Milestone Objective type	Scope Description	Achievement criteria /CAS received	Forecast achievement date	Relevant Deliverables
<b>Fusion for Energy suppliers responsibility</b>					
EU34.01.14 350	WP	HPC – IO approval for Factory Acceptance Test LIN Tanks	Hold Point Release	28/07/2016	Criteria fulfilled for LIN Tanks Factory Acceptance Test, and associated documentation approved.
EU34.01.21 530	WP	HPC – IO approval for Factory Acceptance Test GHe Storage Tanks	CAS 1.56980005 KIUA	16/08/2016	Criteria fulfilled for GHe Storage Tanks Factory Acceptance Test, and associated documentation approved.
EU34.01.16 138	WP	HPC – IO approval for Factory Acceptance Test He Dryers	Hold Point Release	10/08/2016	Criteria fulfilled for He Dryers Factory Acceptance Test, and associated documentation approved.

EU34.01.13 070	WP	HPC – IO approval for Factory Acceptance Test 80 K Loop 2	Hold Point Release	25/08/2016	Criteria fulfilled for 80 K Loop 2 Factory Acceptance Test and associated documentation approved.
EU34.01.15 710	WP	HPC – IO approval for Factory Acceptance Test He Purifier	Hold Point Release	16/09/2016	Criteria fulfilled for He Purifier Factory Acceptance Test, and associated documentation approved.
EU34.01.12 170	WP	HPC – IO approval for Factory Acceptance Test LN2 Plant Refrigerator 2	Hold Point Release	11/10/2016	Criteria fulfilled for LN2 Plant Refrigerator 2 Factory Acceptance Test, and associated documentation approved.
EU34.01.10 800	PP	Delivery 80K Loop 1 by EU-DA to ITER Site	80K Loop assembled, tested and delivered to ITER Site	24/10/2016	80K Loop 1
EU34.01.14 810	WP	HPC - IO approval for Factory Acceptance Test Quench Tanks	Hold Point Release	11/04/2016	Criteria fulfilled for Quench Tanks Factory Acceptance Test, and associated documentation approved.
EU34.01.13 850	WP	HPC - IO approval for Factory Acceptance Test LHe Tanks	Hold Point Release	03/11/2016	Criteria fulfilled for LHe Tanks Factory Acceptance Test, and associated documentation approved.

#### HUMAN RESOURCES ASSIGNED TO THE ACTIVITY

F4E will be supporting this activity during the year 2016 with 9.62 FTE.

#### FINANCING DECISION

##### Procurement actions

##### ITER Project actions in response of PAs and ITAs

Expenditures are foreseen under budget 2016 for the following actions:

- Implementation of options (inter alia installation of the Baseline Equipment at the ITER Site, Engineering support tasks, additional storage, installation of Liquid Nitrogen Plant and Auxiliary System: Complements to Options 1 and 9, etc.), and potential price revision for the main Cryoplant contract F4E-OPE-376.
- Provision for additional activities regarding Installation of the LN2 Plant and Auxiliary Systems
- Contract for LHe tank platform
- Contract for Quench line for LN2 Plant and Auxiliary Systems.  
Transportation of Heavy Exceptional Loads

##### Main Procurement initiatives

F4E systems	Type of Contract/ Agreement	Scope description	Time of call	PA reference	In the budget 2016?
Cryoplant	P Supply	LHe tank platform	Q4/2015	PA 3.4.P1.EU.01	Y

**EU.01.51 ITER – Ion Cyclotron Heating and Current Drive**

<b>WBS: EU.01.51</b>	<b>Ion Cyclotron Heating and Current Drive</b>				<b>WP ref: WP16/51/01</b>
<p><b>General Overview</b>                  The overall objectives consist in the supply of the European part of the Ion Cyclotron Heating System (ICH).                  The entire ICH system includes: two IC Antennas (Antenna N1 procured by the EU, procurement of Antenna N 2 by the EU pending resolution of Project Change Request (PCR) 400), the Ion Cyclotron Main Transmission Line (procured by the US) and the Ion Cyclotron Radio Frequency power sources (procured by IN).</p> <p><b>Current Status</b>                  The second phase of the design of the antenna, aimed at producing the antenna final design for the ITER Final Design Review (FDR) is implemented with a Framework Contract (FWC) which was signed in 2014.                  The Faraday Screen (FS) Small Scale Mock-Ups (SSMU) were successfully tested for 15,000 cycles at the design load of 3.5 MW/m<sup>2</sup>. The SSMUs were also tested for higher heat flux in disruptive tests. Post-mortem analysis to determine causes of failure are on-going.                  The specific contract of the design FWC, which includes general design management support, review of the requirements and introduction of the requirements in the DOORS database, is on-going. Further specific contacts for components design are foreseen for 2016. Preparation for prototyping activities is also foreseen for 2016.</p> <p><b>Challenges for the next year</b>                  The main challenge in 2016 will be to be able to plan the scope of work for the design specific contracts in an environment of changing interfaces and overall boundary conditions variability.</p>					
<b>ANNUAL OBJECTIVES</b>					
<b>Milestone ID/ Objectives</b>	<b>Milestone Objective type</b>	<b>Scope Description</b>	<b>Achievement criteria /CAS received</b>	<b>Forecast achievement date</b>	<b>Relevant Deliverables</b>
<b>Fusion for Energy responsibility</b>					
EU51.01.14 1065	WP	Design simplification of the ICH Antenna	Signature of Specific contract	11/07/2016	Not applicable
<b>HUMAN RESOURCES ASSIGNED TO THE ACTIVITY</b>					
F4E will be supporting this activity during the year 2016 with 5.80 FTE.					
<b>FINANCING DECISION</b>					
<b>Procurement actions</b>					
<b>ITER Project actions in response of PAs and ITAs</b>					
Expenditures are foreseen under budget 2016 for the following actions: Design, R&D and prototyping of the ITER Ion Cyclotron Heating antenna or for preparation of procurement for the final design review					

## EU.01.52 ITER – Electron Cyclotron Heating and Current Drive

WBS: EU.01.52	Electron Cyclotron Heating and Current Drive	WP ref: WP16/52/01
<p><b><u>ELECTRON CYCLOTRON UPPER LAUNCHER</u></b></p> <p><b><u>General Overview</u></b>  F4E is in charge of the in-kind procurement of 4 Electron Cyclotron Upper Launchers (in-vessel plug and ex-vessel system) and of the ex-vessel system of the Electron Cyclotron equatorial Launcher.  At the moment the launcher is in the final design phase, and F4E has been subcontracted the majority of the design, prototype and qualification work by IO, financed by a number of ITAs (ITER Task Agreements).</p> <p><b><u>Current Status</u></b>  The main activities on-going at the moment are related to general mechanical design, prototype procurement and testing (focused on Protection Important Components (PICs), i.e. components with a nuclear safety classification) and on consolidation of the technical baseline, configuration management and requirements identification and verification. Specifically, in 2015 we have completed the qualification of the diamond disk suppliers, prepared for the diamond window prototype and qualification, started the isolation valve qualification as well as continuing with the design and system engineering activities.</p> <p><b><u>Challenges for the next year</u></b>  The main challenges in the Launcher work are twofold: the management of changes stemming from the state of flux of main interfaces (plug environment, including nuclear issues) and the technical complexity and diversity of the components of the launcher, requiring a range of special and “rare” skills and suppliers. These two challenges impact on schedule, acquisition of specific expertise and suppliers. The ITA-supported work is very beneficial for F4E to prepare properly for the industrial phase and manage the risks related to some of these challenges.</p> <p><b><u>ELECTRON CYCLOTRON GYROTRONS, POWER SOURCES AND POWER SUPPLIES</u></b></p> <p><b><u>General Overview</u></b>  F4E is in charge of the in-kind procurement of 6 RF Sources (gyrotrons) producing each 1 MW of power at 170GHz at CW for the Electron Cyclotron (EC) system of ITER. The other Parties supplying gyrotrons are Russia, Japan and India with 8, 8 and 2 units, respectively, for a total of 24 gyrotrons (24 MW) to be installed in ITER. The gyrotrons for ITER are procured on the basis of the functional specifications that go beyond the present gyrotrons installed in the existing facilities.  The F4E contribution for EC Power Supplies concerns the final design, fabrication, delivery, installation and commissioning of 8 out of the 12 power supply sets as required by the EC Radio Frequency Sources (gyrotrons) of ITER. The main task of the EC power supplies is to transform the electrical power from the 22kV PPEN grid to regulated direct current and voltage that ITER will need to generate the electromagnetic waves in the gyrotrons. The 5.2.P4.EU.01 PA was signed in May 2012.</p> <p><b><u>Current Status</u></b>  F4E is in the validation phase of the development programme of the 1MW gyrotron for ITER, which is carried out in collaboration with the EGYC Consortium (KIT, CRPP, HELLAS, CNR, ISSP and USTUTT) and the industrial partner Thales Electron Devices, and takes advantage of the development and production of the 1MW, CW gyrotron for W7X. The manufacturing and experiments with a short pulse gyrotron and cavity mock-ups were successfully performed by the end of 2014 and beginning of 2015, whereas the validation tests with the 1MW CW gyrotron prototype are planned for the end of 2015 and 2016. The final design of the HV ECPS was finalized and approved by the end of 2014 and the qualification phase will be finalised within the 2015.</p> <p><b><u>Challenges for 2016</u></b>  A hold point for EC Power sources is placed along the track of F4E project plan in September 2016 to evaluate the results, the market situation and the procurement strategy in view of the series production for ITER. The remaining activities on the 1MW CW gyrotron prototype will then be completed with the extended tests at the EPFL-SPC facility, and the preliminary design of auxiliaries will be finalized. The EU obligations include the final design, manufacturing and factory testing of components, delivery and acceptance testing. . The final design and the series production activities are shifted to &gt;2020. For EC Power Supplies, after a qualification phase in 2015, the HV units of the first PS set will be manufactured and factory tested in 2016, Additional procurement lines related to the same PA are for the Instrumentation &amp; Control layer interfacing between the PS HV units and the upper ITER I&amp;C system and support to F4E for the technical monitoring of the industrial design and fabrication activities, which is being executed through separate F4E contracts.</p> <p><b><u>ELECTRON CYCLOTRON CONTROL</u></b></p> <p><b><u>General Overview</u></b>  F4E is in charge of the in-kind procurement of the Electron Cyclotron Plant control System (ECCS) and of the Upper Launcher Subsystem Control Unit (UL-SCU).  At the moment the control system is at the stage of conceptual design. F4E has taken the technical lead already in the preparation</p>		

of the Conceptual Design Review which was performed and approved without any major chit.

**Current Status**

The main activities on-going at the moment are related to the collection and consolidation of the requirements. A prototype of the most critical hardware component is also being developed and tested.

**Challenges for the next year**

The main challenge in the EC Control System activity consists in the clear definition of the interfaces. An interesting opportunity comes instead from the synergies with the development of the control system for the ECT-Falcon facility which will allow testing extensively the concepts developed for the EC Plant Controller.

**ANNUAL OBJECTIVES**

**ELECTRON CYCLOTRON UPPER LAUNCHER**

Milestone ID/ Objectives	Milestone Objective type	Scope Description	Achievement criteria /CAS received	Forecast achievement date	Relevant Deliverables
<b>Fusion for Energy suppliers responsibility</b>					
EU52.01.30 5110	PP	Provision of corrugated waveguide mock-ups for the EC Upper Launcher	Contract signature	06/10/16	Not applicable
EU52.01.20 1780	WP	Brazing of diamond disk completed, including acceptance of leak test	Successful results of leak test	09/02/2016	Brazing report

**ELECTRON CYCLOTRON POWER SOURCES AND POWER SUPPLIES**

Milestone ID/ Objectives	Milestone Objective type	Scope Description	Achievement criteria /CAS received	Forecast achievement date	Relevant Deliverables
<b>Fusion for Energy suppliers responsibility</b>					
EU52.04.23 010	WP	Release of Options for the Contract Procurement of Body PS & MHVPS (Main Contract)	Release of options	7/12/2016	Not applicable
EU52.03.11 7170	WP	Extension of 1MW CW gyrotron prototype testing and ECPS industrial follow-up	Contract Signature	14/12/2016	Not applicable
<b>Fusion for Energy suppliers responsibility</b>					
EU52.03.10 778	PP	Development of EU 1MW CW Gyrotron Prototype for ITER	Completion	15/12/2016	Exit Criteria
EU52.03.22 165	PP	Packing and Shipping of He-free Magnet II	Shipping	13/12/2016	Delivery Note

**ELECTRON CYCLOTRON CONTROL**

Milestone ID/ Objectives	Milestone Objective type	Scope Description	Achievement criteria /CAS received	Forecast achievement date	Relevant Deliverables
<b>Fusion for Energy responsibility</b>					
EU52.05.21 0170	WP	EC Plant Control System (Stage 1)	Contract signed	18/08/2016	Not applicable
<b>HUMAN RESOURCES ASSIGNED TO THE ACTIVITY</b>					
F4E will be supporting this activity during the year 2016 with 12.78 FTE.					
<b>FINANCING DECISION</b>					
<b>Procurement actions</b>					
<b>ITER Project actions in response of PAs and ITAs</b>					
<p>The main thrust of the Electron Cyclotron Upper Launcher is to continue the design work towards the final design and carry out supporting prototypes and qualification. The design work is carried out under a long-term grant, already in place, and includes design, analysis and support to the preparation of documentation for Final Design reviews. The prototype and qualification programme focuses on the diamond window unit, the Isolation valve and in initiating the waveguide prototype activities. A framework contract and the first specific contracts for the setup and operation of the EC components test facility (FALCON) will be put in place.</p> <p>Expenditures for procurement actions are currently planned for the 2<sup>nd</sup> EU Gyrotron Prototype (EU 1MW CW Gyrotron Prototype), the contract for a feasibility study to repair the ASG Superconducting Magnet, the specific contract for procuring the Gyrotron cooling system, the contract for transportation of the EU 1MW CW Gyrotron Prototype from KIT Karlsruhe to CRPP Lausanne, specific contracts for inspectors to control Gyrotron Superconducting Magnet and ECPS production phases, specific contracts for support engineering and qualification activities, the contract of Body PS &amp; MHVPS (Main Contract), the signature of the Framework for Technical Follow-up of the Procurement of Body Power Supply &amp; Main High Voltage Power Supply and and the release of options, amendments or price revisions of ongoing contracts.</p> <p>Concerning the EC Control System the main activities will regard to procurement of EC Plant Control System (stage 1) . .</p>					
<b>Grants and Specific Grants</b>					
<b>Scope</b>	<b>Type of procedure</b>	<b>Time of Call</b>	<b>Indicative Amount (Euro)</b>	<b>Budgetary line</b>	
Extension of 1MW CW gyrotron prototype testing and ECPS industrial follow-up	Unique Beneficiary <sup>9</sup>	Q3/2016	400,000	31	
<b>Main Procurement initiatives</b>					
<b>F4E systems</b>	<b>Type of Contract/ Agreement</b>	<b>Scope description</b>	<b>Time of call</b>	<b>PA reference</b>	<b>In the budget 2016?</b>
H&CD.EC UL	Framework Contract	Setup and Operation of the EC components test facility (FALCON)	Q2/2016	PA 5.2.P1B.EU.02	N.A.
H&CD.EC UL	Framework Contract	Engineering Support Build-to-Print EC UL	Q4/2016	PA 5.2.P1B.EU.02	N.A.

<sup>9</sup> EGYC Consortium: technical competencies, according to art.158.b of F4E Implementing Rules.

## EU.01.53 ITER – Neutral Beam Heating and Current Drive

WBS: EU.01.53	Neutral Beam Heating and Current Drive		WP ref: WP16/53/01		
<p><b>General Overview</b></p> <p>F4E is in charge of the in-kind procurement of the Neutral Beam (NB) Sources (2 Ion Sources and 1 Accelerator producing negative ion beams); the NB Beam Line Components (2 Neutraliser, 2 Residual Ion Dump and 2 Calorimeter), the NB Confinement and Shielding (2 vessels, 1 passive magnetic shielding, valves), 2 sets of NB Active Correction and Compensating Coils, the NB Assembly for the two ITER injectors and the NB Power Supplies.</p> <p>The finalisation of the ITER NB injectors has required the establishment and operation of the NB Test Facilities (NBTF) at RFX-Padua. The test facility is composed of two main test beds: SPIDER, a full size Ion Source with beam extraction at 100 kV, and MITICA, a full size ITER injector capable of operating at full performances (1 MV, 40 A at the grounded grid in D, 3600 sec).</p> <p><b>Current Status</b></p> <p>The establishment of the NBTF at RFX-Padua is progressing for many components with the SPIDER vacuum vessel delivered at the site, the NBTF vacuum and gas injection system and cooling plant, the SPIDER Ion Source and Extraction Power Supplies, and SPIDER High Voltage Deck and Transmission Line in installation phase at the site. Several contracts aimed to provide with other specific components for the NBTF are on-going (Control and data acquisition, SPIDER and MITICA diagnostics, MITICA vacuum vessel, MITICA ISEPS, High Voltage Deck and Bushing. Other contracts that will provide the NBTF with components are in the final phases before signature (Acceleration Grids Power Supplies planned to be signed in Oct 2015, Grounded Related Power Supplies planned to be signed in Dec 2015, NBTF Assembly Framework planned to be signed on Jan 2016, and SF6 gas handling plant planned to be signed in Feb 2016. The activities for designing components outside the NBTF (valves, exit scraper, etc.) have been finalised in July 2015.</p> <p><b>Challenges for 2016</b></p> <p>On the top of the below identified objectives for 2016, the main challenge of the year will be the signature of the 3 PAs: PA 5.3.P4.EU.01 HNB (Vessels, Drift Duct, Fast Shutter, PMS), PA 5.3.P4.EU.02 for HNB BLV Exit Scraper, and PA 5.3.P5.EU.01 HNB ACC Coils. Their signature is depending on the time schedule from preparation to finalisation and approval of those PAs mainly driven by IO. The PAs signatures deadline for the end of the year start to be challenging as no submission has been yet provided by IO (May 2016). Moreover, with the SR2FP scenario, the all above listed NB components are not anymore requested for first plasma so relaxing the pressure on IO to submit the PAs documentation.</p>					
<b>ANNUAL OBJECTIVES</b>					
Milestone ID/ Objectives	Milestone Objective type	Scope Description	Achievement criteria /CAS received	Forecast achievement date	Relevant Deliverables
<b>Fusion for Energy responsibility</b>					
EU53.TF.17 310	PP	Procurement for SF6 System for MITICA	Contract Signature/ CAS 0.16	06/05/2016	Contractual Documentation
EU53.TF.07 4100	WP	MITICA Beam Source	Specific Contract Signature/	29/07/2016	Contractual Documentation
EU53.TF.15 5900	WP	Procurement of NBTF SPIDER Control 3	Specific Contract Signature	15/11/2016	Contractual Documentation
EU53.TF.04 220	WP	PRIMA Assembly (FWC - Assembly)	Specific Contract Signature/ CAS 0.18	23/09/2016	Contractual Documentation
EU53.CA.00 225	WP	NBTF Work Programme 2017	Contract Signature	21/12/2016	Contractual Documentation
<b>Fusion for Energy suppliers responsibility</b>					
EU53.TF.13 290	WP	HPC - SPIDER Vessel - Accepted	IO Acceptance/CAS 0.32	15/12/2016	Acceptance Data Package
EU53.TF.15 110	WP	Manufacturing and Testing Completed - SPIDER Interlock	FAT completion	08/07/2016	Acceptance Data Package

EU53.06.02 320	WP	HPC - Final Documentation Set Accepted and Ownership of SPIDER ISEPS Transferred to IO	IO Acceptance/CAS 0.9	16/09/2016	Acceptance Data Package
EU53.TF.02 360	WP	HPC - SPIDER Vacuum and Gas Injection Plants - Accepted	IO Acceptance/ CAS 0.24	31/10/2016	Acceptance Data Package
EU53.TF.22 540	WP	HPC - SPIDER CODAS - Accepted	Contract completion/ CAS 0.95	08/08/2016	Acceptance Data Package
EU53.TF.20 880	WP	HPC - SPIDER TL - Accepted	Contract completion/CAS 0.2	06/07/2016	Acceptance Data Package
EU53.06.03 280	WP	HPC - First Design Report of MITICA AGPS & GRPS Accepted	IO Acceptance/ CAS 0.85	13/07/2016	Acceptance Data Package
<b>HUMAN RESOURCES ASSIGNED TO THE ACTIVITY</b>					
F4E will be supporting this activity during the year 2016 with 21.56 FTE.					
<b>FINANCING DECISION</b>					
<b>Procurement actions</b>					
<b>ITER Project actions in response of PAs and ITAs</b>					
The procurement procedures currently planned to be completed within 2016 are the signature of the contract for the Cryogenic Plant for MITICA facility, the Task Order for NBTF SPIDER Control, the specific contract - SPIDER Diagnostics (FW Contract - NBTF Diagnostics), the framework for NBTF Assembly and the consequent specific contract for PRIMA Assembly (FWC - Assembly), the framework for MITICA Beam Source and the consequent specific contract, the contract for SF6 System for MITICA, the Task Orders for NBTF Site Supervision and Support, the task order for QA Inspectors, engineering activities within the NB area and the release of options, amendments or price revisions of ongoing contracts.					
<b>Cash contribution</b>					
<b>Scope Description</b>					<b>Amount (Euros)</b>
<p>This cash contribution to the Consorzio RFX corresponds to the 2017 NBTF Work Programme and amendment of the 2016 NBTF WP implementing the agreement on the Neutral Beam Test Facility on credited and not-credited budget lines. The commitment for the activities will be implemented after the F4E approval of the NBTF 2017 Work Programme and after the F4E approval of the amendment of the 2016 NBTF WP. The main activities that will be performed in 2017 are:</p> <ul style="list-style-type: none"> <li>• Preparation for the exploitation of the SPIDER and MITICA test beds SPIDER commissioning and operation</li> <li>• MITICA components integration</li> <li>• R&amp;D activities and procurements for demonstration activities finalised to the verification and optimization of NB components;</li> <li>• Modelling and physics studies directly related to the development of the components for the NB system;</li> <li>• Support to F4E in the preparation and follow-up of procurements contract and project integration;</li> <li>• Provision of NBTF Host services like: technical support during installation, construction supervision, licensing and safety, insurance, procurement of balance of plants, consumables and other supplies and services necessary for construction, integration and operation;</li> <li>• Provision of site facilities to Third Parties, as applicable.</li> </ul>					7 050 000.00
<b>Main Procurement initiatives</b>					



F4E(16)-GB35-13.1

2<sup>nd</sup> Amended 2016 Work Programme

F4E systems	Type of Contract/ Agreement	Scope description	Time of call	PA reference	In the budget 2016?
Neutral Beam Test Facility	Specific Contract	PRIMA Assembly (FWC - Assembly)	N/A	5.3.P9.EU.01	Y
Neutral Beam Test Facility	Specific Contract	MITICA Beam Source (under FWC)	N/A	5.3.P9.EU.01	Y
Neutral Beam Test Facility	P Supply	SF6 System for MITICA	Q3/2015	5.3.P9.EU.01	Y
Neutral Beam Test Facility	Specific Contract	MITICA Beam Line Components	N/A	5.3.P9.EU.01	N
Neutral Beam Test Facility	Specific contract	Exec 2D drawings +Writing TS for Components Outside NBTF (NB Vessels, Fast Shutter, PMS, ACCC, Exit Scraper)	N/A	5.3.P4.EU.01 / 5.3.P5.EU.01	N
Neutral Beam Test Facility	P supply	Contract for the Cryogenic Plant for MITICA facility introduced in the 2016 Work Programme	Q4/2014	5.3.P9.EU.01	Y

## EU.01.55 ITER – Diagnostics

WBS: EU.01.55	Diagnostics			WP ref: WP16/55/01	
<p><b>General Overview</b></p> <p>The Diagnostics on ITER are measurement systems allowing evaluation of the parameters of the plasma and first wall. They provide key information to protect the machine from damage, to allow the plasma to be controlled and for physics studies.</p> <p>Europe is responsible for around one quarter of the ITER Diagnostics, including several systems which are essential for first plasma operations. Europe's scope of supply includes 11 distinct Diagnostic systems; Tokamak electrical services (cables, feedthroughs and connectors on the ITER vessel); design integration of diagnostics into 7 ports housing 22 diagnostic systems from Europe, IO and five other Domestic Agencies; and supply of 5 port plugs.</p> <p>Following a decision of the F4E Governing Board in March 2011, Europe is providing most systems to functional specifications from IO. The only exception is the magnetic sensors, which are typically provided to detailed design specifications</p> <p><b>Current Status</b></p> <p>Framework partnership agreements were signed for most of the diagnostics systems involving more than 28 EFLs and Industry in 12 EU countries.</p> <p>The identification, analysis and documentation of requirements &amp; interfaces, and flow-down to system-level have been completed for most systems, which are now in the process of revisiting conceptual design solutions and analysing architecture options for optimisation against requirements, cost and schedule, together with the process of thoroughly justify and document baseline design solution and demonstrate manufacturability and compatibility with cost and schedule constraints</p> <p>Significant advancement has also been done on Diagnostics Integration, including development of DSM (Diagnostics shield modules) designs, production of detailed manufacturing sequences for requirements-optimised architecture in 2 different technologies for DSMs and development of PIC electrical feedthroughs for port plugs.</p> <p>On Magnetics Diagnostics, design has significantly evolved for all EU sensors, including completion of the final design for Fibre-Optic Current Sensors and Continuous External Rogowski (CER). Manufacture of CER started in 2015, which is the first EU Diagnostics delivery to IO-CT.</p> <p><b>Challenges for the next year</b></p> <p>Design will progress during 2016 for Diagnostics systems mainly inside the existing FPAs to a level where manufacturability and compatibility with cost and schedule constraints can be demonstrated with the subsequent signature of the Annex B of the corresponding PA (note that most Annex B will be signed during 2016 and early 2017). A significant number of contracts for engineering analysis, manufacturing and testing of prototypes will be signed in support of the design.</p> <p>The procurement procedures for the manufacturing of several diagnostics components to be delivered to IO-CT will start during 2016, including among others cables, clips, connectors for Tokamak electrical services, and several magnetics sensors and platforms (magnetics and bolometers)</p> <p>During 2016, the launch of a framework contract for the production of the build-to-print drawings and manufacturing specifications is also foreseen.</p>					
<b>ANNUAL OBJECTIVES</b>					
Milestone ID/ Objectives	Milestone Objective type	Scope Description	Achievement criteria /CAS received	Forecast achievement date	Relevant Deliverables
<b>Fusion for Energy responsibility</b>					
EU55.01.10 7690	PP	End of Technical Support During Continuous External Rogowski Integration at ITER Site	CAS 0.00277 kIUA	20/12/2016	Not applicable
EU55.15.20 2400	WP	Publish Call for tender for manufacturing design and Build to Print drawings and specifications	Call for tender launched	10/06/2016	Not applicable
EU55.15.20 2450	PP	Signature of Grant for Development and Design of Mirror Lifetime Optimisation	Grant signed	10/11/2016	Not applicable

<b>HUMAN RESOURCES ASSIGNED TO THE ACTIVITY</b>				
F4E will be supporting this activity during the year 2016 with 23.08 FTE.				
<b>FINANCING DECISION</b>				
<b>Procurement actions</b>				
<b>ITER Project actions in response of PAs and ITAs</b>				
<p>In order to efficiently deal with the above explained challenges for the next and following years, Diagnostics team foresees expenditures procurements during 2016 mainly covering:</p> <ul style="list-style-type: none"> <li>• Design and R&amp;D for Low Field Side Collective Thomson Scattering</li> <li>• Design and R&amp;D for Bolometers Diagnostic</li> <li>• Procurement of Vacuum Vessel Mounted Platforms for Vacuum Vessel Mounted Bolometer Cameras</li> <li>• Design and R&amp;D for Plasma Position Reflectometry</li> <li>• Design and R&amp;D for Pressure Gauges Diagnostic</li> <li>• Design and R&amp;D for Core-Plasma Charge Exchange Recombination Spectrometers</li> <li>• Design and R&amp;D for Radial Neutron Camera and enabling of the Gamma Spectrometer</li> <li>• Design and R&amp;D for Tokamak Services (mainly feedthroughs and divertor RH connector)</li> <li>• Design and R&amp;D for Equatorial Visible/IR Wide-Angle Viewing System</li> <li>• Integration design of diagnostics into ITER ports</li> <li>• Irradiation and post-irradiation testing of diagnostic components and assemblies</li> <li>• Procurement of Prototypes &amp; Test Equipment</li> <li>• Procurement of I&amp;C Integrator services for all EU supplies</li> <li>• Contracts for the manufacturing of several Magnetic diagnostics components and software</li> <li>• Development and design of Mirror Lifetime Optimisation</li> <li>• Engineering support for Diagnostic components</li> </ul>				
<b>Grants and Specific Grants</b>				
<b>Scope</b>	<b>Type of procedure</b>	<b>Time of Call</b>	<b>Indicative Amount (Euro)</b>	<b>Budgetary line</b>
Design activities for the Low Field Side Collective Thomson Scattering diagnostic.	Specific Grants	n/a	10 600 000.00	3.1
Design activities for the Core-Plasma Charge Exchange Recombination Spectrometer Diagnostic	Specific Grants	n/a		3.1
Design activities for the Equatorial Visible-IR Wide-Angle Viewing System Diagnostic	Specific Grants	n/a		3.1
Design activities for the Bolometer Diagnostic	Specific Grants	n/a		3.1
Design activities for the Tokamak Electrical Services	Specific Grants	n/a		3.1
Design activities for the Radial Neutron Camera - Gamma Spectrometer Diagnostic	Specific Grants	n/a		3.1
Design activities for the Plasma Position Reflectometry Diagnostic	Specific Grants	n/a		3.1

Design activities for the Pressure gauges Diagnostic	Specific Grants	n/a		3.1	
Development and Design of Mirror Lifetime Optimisation	Call for proposal	Q3/2016		3.1	
Main Procurement initiatives					
F4E systems	Type of Contract/ Agreement	Scope description	Time of call	PA reference	In the budget 2016?
Port Plug design, testing and diagnostic integration	Specific Contract	Task order for preparatory design of the 5 ports under EU scope of supply and R&D on electrical feedthroughs	n/a	PA 5.5.P2.EU.01	Y
Magnetics Diagnostic	P Serv	Contract for Analysis Software Algorithm Design	Q3/2016	PA 5.5.P2.EU.01	N
Magnetics Diagnostic	P Supply	Contract for outer vessel coils	Q3/2016	PA 5.5.P2.EU.01	N
Magnetics Diagnostic	P Supply	Contract for inner-vessel coils	Q4/2016	PA 5.5.P2.EU.01	N
Magnetics Diagnostic	P Supply	Contract for the manufacturing of the Inner-Vessel HF sensor and Permanent Platforms	Q4/2016	PA 5.5.P2.EU.01	N
Magnetics Diagnostic	P supply	Contract for the manufacturing of RH Platforms for In-Vessel Discrete & HF sensors & Divertor Toroidal sensors	Q4/2016	PA 5.5.P2.EU.01	N
Bolometers Diagnostic	P Supply	Contract for the Design and Manufacturing of VV-Mounting Platforms for VV-Mounted Bolometer Cameras	Q3/2016	PA 5.5.P2.EU.01	N
Tokamak Services	P Supply	Procurement and Delivery for cables, clips and connectors (In-Vessel Components)	Q4/2016	PA 5.5.P2.EU.01	N
Diagnostics	Framework Contract	Framework contract for the support on the production of Diagnostics build-to-print design specifications and industrial expertise	Q2/2016	PA 5.5.P2.EU.01	N

## EU.01.56 ITER – Test Blanket

WBS: EU.01.56	Test Blanket		WP ref: WP16/56/01		
<p><b>General Overview</b></p> <p>The overall objectives consist mainly in the supply of two Test Blanket Module Systems (TBM) to the ITER Site, namely the Helium Coolant Lead Lithium (HCLL) and the Helium Coolant Pebble Bed (HCPB) with ancillary systems, data acquisition systems and Support to installation.</p> <p>The execution of both TBM Arrangements signed with ITER IO is funded 100% by the EU.</p> <p>The TBM shall be tested from the beginning of ITER operation, after the Phase Assembly II.</p> <p><b>Current Status</b></p> <p>Following the conclusion of the Conceptual Design Review (June 2015), activities are dedicated in priority to the resolution of the chits raised by the panel (propagation of new Defined Requirements; capacity of the HVAC in Port Cell #16 with regard to Tritium permeation from TBM Systems; etc.).</p> <p>The signature of pending procurement (contracts/specific contracts) is foreseen before the end of 2015, in particular the procurement of ~25 tons of EUROFER, irradiation campaign of EUROFER samples, and the start of Preliminary Design activities of the TBM Sets and of the Ancillary Systems.</p> <p>In R&amp;D two FPAs on modelling development will be signed while other activities, as mentioned above, will continue as planned.</p> <p><b>Challenges for the next year</b></p> <p>In 2016 the Test Blanket Module (TBM) activities will mainly focus on the Preliminary Design of the TBM Sets, the Ancillary Systems, and the Data Acquisition Control System toward the preparation of the Preliminary Design Review meeting foreseen in the end of 2022.</p> <p>Concurrently the R&amp;D activities will continue mainly in EUROFER irradiation and characterization, functional material, integrated tests, and standardization of welding procedures specifications for the TBM box.</p>					
<b>ANNUAL OBJECTIVES</b>					
<b>Milestone ID/ Objectives</b>	<b>Milestone Objective type</b>	<b>Scope Description</b>	<b>Achievement criteria /CAS received</b>	<b>Forecast achievement date</b>	<b>Relevant Deliverables</b>
<b>Fusion for Energy responsibility</b>					
EU56.01.12 25380	PP	Conceptual Design Review Steering Committee decision	Document approved in F4E IDM	03/10/2016	Documentation in F4E IDM
<b>HUMAN RESOURCES ASSIGNED TO THE ACTIVITY</b>					
F4E will be supporting this activity during the year 2016 with 17.36 FTE.					
<b>FINANCING DECISION</b>					
<b>Procurement actions</b>					
<b>ITER Project actions not in response of PAs or ITAs</b>					
<p>The scope of the procurement actions foreseen to be implemented under budget 2016:</p> <ul style="list-style-type: none"> <li>• Support from an Authorized Notified Body for TBM and Ancillary Systems preliminary design.</li> <li>• Preliminary design of TBM Sets, Ancillary Systems.</li> <li>• Welding Procedures Specifications and validation for TBM box assembly.</li> </ul>					

<ul style="list-style-type: none"> <li>TBS Safety and radwaste analysis and neutronics and Hazards in support of TBM Sets, Ancillary Systems Preliminary Design activities.</li> <li>Handling and storage of EUROFER.</li> </ul>				
Grants and Specific Grants				
Scope	Type of procedure	Time of Call	Indicative Amount (Euro)	Budgetary line
ECOSIMPRO platform for Tritium Migration Modelling validation and verification.	Grants - Unique Beneficiary <sup>10</sup>	Q2/2016	700 000.00	32
R&D activities in support of the Preliminary Design of the TBM Sets and of the Ancillary Systems will continue for all 2016.	Specific Grants	Q2-Q4/2016		32
The activities for the qualification and validation tests of EUROFER samples will continue in 2016.	Specific Grants	Q2/2016		32

<sup>10</sup> Unique Beneficiary Consortium formed by: Centro de Investigaciones Energeticas. Medioambientales y tecnologicas (CIEMAT) Empresarios Agrupados Internacional S.A. (EE.AA), high degree of specialization at the terms of the Article 158 of the F4E Implementing Rules

**EU.01.57 ITER – Remote Handling In Vessel Viewing System**

<b>WBS: EU.01.57</b>	<b>Remote Handling In Vessel Viewing System</b>				<b>WP ref: WP16/57/01</b>
<p><b>General Overview</b>                  The Remote Handling In-Vessel Viewing System (IVVS) composed by six identical units (plugs), each one composed basically of the following components:</p> <ul style="list-style-type: none"> <li>• IVVS probe, capable of performing the laser-based in-vessel viewing and metrology, connected to, and fed by, its deployment system;</li> <li>• IVVS Deployment system, capable of moving the IVVS along the tube from the parking position up to the various working positions;</li> <li>• Housing structure, including an end flange closing the VV port and equipped with feed-troughs for the various services given to the IVVS probe and deployment system (signals, electrical power); the housing tube is also provided with heating cables for baking purposes (to be confirmed);</li> <li>• The related control system;</li> <li>• Spare parts (to be defined).</li> </ul> <p><b>Current Status</b>                  The selection of the IVVS supplier (though OMF 383) is on-going following the complex tender that involves the preparation of a business case (an IVVS-relevant technical study) by the bidders. While preparing the awarding and signature of the contract, complementary works are being performed on IVVS requirement preparation on one hand, and on IVVS optical and interface studies on the other hand, plus some actualised neutronic studies being IVVS an in-vessel component.</p> <p><b>Challenges for the next year</b>                  The year of reference will be devoted to a robust start of In Vessel Viewing System (IVVS) preliminary design by means of the procurement contract (OMF 383 - Multiple Framework Service Contract in cascade for the Development and Supply of the ITER In-Vessel Viewing and metrology System). Meanwhile, some preparatory design and prototyping activities presently running (through a task order within OMF 272 - Multiple Framework Service Contract in cascade for the provision of Engineering Support in the area of Remote Handling) will provide further background to the IVVS supplier.</p> <p>A smooth and swift start of IVVS preliminary design is expected next year, in order to be able to tackle vigorously the various technological and design issues.</p>					
<b>ANNUAL OBJECTIVES</b>					
<b>Milestone ID/ Objectives</b>	<b>Milestone Objective type</b>	<b>Scope Description</b>	<b>Achievement criteria /CAS received</b>	<b>Forecast achievement date</b>	<b>Relevant Deliverables</b>
<b>Fusion for Energy responsibility</b>					
EU57.01.20 130	PP	Initial Scope Evaluation for IVVS Signed	Specific contract signed	21/12/2015	Not applicable
<b>HUMAN RESOURCES ASSIGNED TO THE ACTIVITY</b>					
F4E will be supporting this activity during the year 2016 with 7.07 FTE.					
<b>FINANCING DECISION</b>					
<b>Procurement actions</b>					
<b>ITER Project actions in response of PAs and ITAs</b>					
<p>Preliminary design and engineering support activities (such as R&amp;D, control system, test and prototyping) will be carried over for this Remote Handling System PA. These activities will be implemented mainly through specific contracts under on-going framework contracts. In particular, preliminary design activities will be mainly implemented under the Multiple Framework Service Contract in cascade for the Development and Supply of the ITER In-Vessel Viewing and metrology System.</p> <p>Furthermore, Engineering support activities will be implemented mainly under the new Multiple Framework Service Contract in cascade for the provision of Engineering Support in the area of Remote Handling and other general support framework contracts (see section 6.4)</p>					

**EU.01.62 ITER – Buildings and Civil Infrastructures and Power Supplies**

<b>WBS: EU.01.62</b>	<b>Buildings and Civil Infrastructures and Power Supplies</b>	<b>WP ref: WP16/62/01</b>
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**General Overview**

In the frame of the ITER in-kind contribution, Europe provides the detailed design and the construction of the buildings and site infrastructures and the detailed design, part of the procurement, and the installation of the electrical power distribution. F4E is supported by an Architect Engineer Contractor in its missions of delivering the detailed design, procurement activities, contract management and supervision of construction.

The Buildings and Civil Infrastructures and Electrical Power Supply and Distribution procurements to be provided by EU are listed here below:

PBS	EU obligation	Other DA involved
COIL POWER SUPPLY & DISTRIBUTION (Pulsed power electrical network PPEN which supplies the magnets converters and the additional heating and current drive systems)		
PBS 41.P1	Alternative current distribution system	CN, KO and RF are involved in other parts of the PPEN (Converters, Reactive Power Compensation & Harmonic Filter System, Switching Network & Discharge circuit)
STEADY STATE ELECTRICAL POWER NETWORK (SSEN, which supplies the auxiliaries systems; the Tokamak, the Cooling Water System, the Cryoplant and safety relevant loads being its main client)		
PBS 43	High Voltage, Medium Voltage and Low Voltage supply	US is involved in the procurement of components (75%)
SITE		
PBS 61	Site infrastructures related to the buildings	No
REINFORCED CONCRETE BUILDINGS		
PBS 62	All the "nuclear" buildings, including the Fire protection system, the HVAC system, the cranes, lifting and mechanical equipment	No
STEEL FRAMED BUILDINGS		
PBS 63	All the non-nuclear buildings, including the Fire protection system, the HVAC system, the cranes, lifting and mechanical equipment	No
LIQUID AND GAS DISTRIBUTION NETWORKS		
PBS 65	Potable water, Fire protection water, Hot water, Compressed Air, Demineralized Water, Breathing Air, Nitrogen, Helium (gas)	No

**Current Status**

All support contracts, Architect Engineer, Support to the Owner and Health and Safety / Legal inspection are in place. The main construction contracts are in place. The current status of procurement of contracts placed or in tendering phase is summarized in the table below:

Tender Batches	Contract Status	Signature Date/ Contractor	Phase status
Architect Engineer	In execution	Apr 2010 / ENGAGE	Design and construction follow-up
TB00 Tokamak SIP (Excavation Support structure, Seismic Isolation Basement, Upper Basemat –B2 and Assembly Hall slab)	Complete	May 2010 / GTM	Complete



TB01 Site adaptation works	Complete	Jul 2011 / COMSA	Complete
TBAP Galleries and drainage network around Tokamak	Complete	Jul 2012 / COMSA	Complete
TB02 Tokamak Cargo lift and Tokamak/Assembly Hall cranes	In execution	Jun 2013 / NKM/REEL	Design and manufacturing
TB03 Civil engineering and finishing works for Tokamak Complex and surrounding Buildings	In execution	Dec 2012 / VFR	Design and Construction
TB04 Mechanical, HVAC, Electrical and Handling Equipment supply and installation for Tokamak complex, Assembly Hall and surrounding Buildings	In execution	Jul 2013 / OMEGA	Design
TB05 Design & Build for Magnet Power Conversion Buildings (32-33) and Reactive Power Control Buildings (38)	In execution	Nov 2013 / FERROVIAL	Design and Construction
TB06 Electrical power distribution supply, installation and commissioning	In execution	Dec 2014 / FERROVIAL	Design and assembly
TB07 Design & Build for Cold Basin & Cooling Towers (67), Pumping stations (68) and Heat exchangers (69)	In execution	Oct 2013 / FERROVIAL	Design
TB16 Site infrastructure works	Call for tender ongoing	Dec 2015	Tendering

Civil works in the Tokamak Complex are progressing; the level B1 works have started in the Diagnostic building and the Tokamak Building. The construction of 8 other auxiliary buildings is under progress. Regarding building services, the Final Design for the Tokamak Complex is currently under Design Review.

#### **Challenges for the next year**

In 2016 the level L1 civil works of the Tokamak Building will start. The main TB02 cranes will be installed in the Assembly building. The construction design of the Tokamak Complex building services will be delivered for Construction Design review. Other milestones for the building's design and construction are the ones defined in the section Annual Objectives. The installation works for electrical distribution will start, with as main challenge, the connection to the RTE (400 kV) grid. The other challenges are to install the first Load Centres and to start the building 36 works construction.

In terms of procurement, following redefinition of the procurement strategy for the Emergency Power Supply Distribution, the procurement for Electrical Distribution buildings 44-47 will be proceeded in 2016. Similarly, the procurement strategy redefinition for buildings 34, 37, 71, 75 will allow to start the procurement process in 2016.

### ANNUAL OBJECTIVES

Milestone ID/Objectives	Milestone Objective type	Scope Description	Achievement criteria/CAS received	Forecast achievement date
EU41-43.1A.40100	PP	IO approval of Detailed Assembly and Installation Design for SSEN & PPEN	Hold Point Release	31 May 2016
EU41-43.115610	PP	Delivery of PBS 43 LC 14	Delivery	17/11/2016
EU62.05.28119	PP	NPC - Notice to Commence work of Hot Basin & Cooling Towers 67 (TB07)	No CAS associated to these milestones	15/12/2015
EU62.02.6006610	WP	HP - EU Submission of Construction Design for L3 level - B11, 14, 74 (Concrete Outline)		29/02/2016
EU62.05.28719	PP	NPC - Notice to Commence work of HRS Water Treatments + Heat Exchangers 64, 69 (TB07)		19/09/2016
EU62.02.6006660	WP	HP - EU Submission of Construction Design for L4 level -		15/06/2016

		B11, 14, 74			
EU62.05.28419	PP	NPC - Notice to Commence work of CW Pumping Station 68 (TB07)			30/11/2016
EU62.05.24209	PP	NPC - Notice to Commence construction of Main AC Distribution Buildings (36)			16/06/2016
EU62.05.272560	PP	NPC - Notice to Commence construction of Bus-Bar Bridges (between B32 &74)			19/10/2016
EU62.02.6006710	WP	HP - EU Submission of Construction Design for L5 level - B11, 14, 74			16/09/2016
EU62.05.65420	PP	NPC - Notice to Commence Assembly Hall cranes Installation			07/12/2015
EU62.05.27890	WP	NPC - Confirmation by IO of RFE completion for Site Services Bldg (61)	1.155		23/12/2016
<b>HUMAN RESOURCES ASSIGNED TO THE ACTIVITY</b>					
F4E will be supporting this activity during the year 2016 with 45.03 FTE.					
<b>FINANCING DECISION</b>					
<b>Procurement actions</b>					
<b>ITER Project actions in response of PAs and ITAs</b>					
Expenditures under the budget 2016 are foreseen for the following procurement actions:					
<ul style="list-style-type: none"> <li>• Changes to the ongoing services and construction contracts in relation with PCRs, input data delays and re-allocation of scope between contracts which will be implemented through amendments to the ongoing contracts in line with the provisions of the Financial Regulation</li> <li>• Options of the Ongoing Buildings contracts as follows: <ul style="list-style-type: none"> <li>○ TB04, options for Incentive Scheme</li> <li>○ Other contract options if needed depending on the evolution of the procurement strategy</li> </ul> </li> <li>• TB13 - Reduced scope to Design &amp; Build the Emergency Distribution Buildings and Equipment</li> <li>• TB 11- Final Construction works, 2016 activities Site Security and Reception Services for the ITER Site, Engineering counter-expertise for structural and geotechnical design and works execution and concrete testing, Facility management (Worksite common services), mainly to be implemented through specific contracts under ongoing framework contracts.</li> </ul>					
<b>Cash Contribution</b>					
<b>Scope Description</b>					<b>Amount (Euro)</b>
<u>Cash Contribution for Site cooperation agreement and host agreement of F4E Suppliers at Cadarache</u> The Agreement on ITER Site collaboration between the ITER Organization (IO) and Fusion for Energy (F4E) set out the terms and conditions under which F4E and IO may share certain goods and services available at the ITER Site (including electrical power, water and facilities on site) and the Host Agreement between the IO and F4E set out the terms and conditions under which IO provide support to F4E with equipment and/or IT, Mail & Landline services.					4 100 000.00
<b>Main Procurement initiatives</b>					
<b>F4E systems</b>	<b>Type of Contract/ Agreement</b>	<b>Scope description</b>	<b>Time of call</b>	<b>PA reference</b>	<b>In the budget 2016?</b>

F4E(16)-GB35-13.1

2<sup>nd</sup> Amended 2016 Work Programme

Buildings & Site infrastructure	P works	TB13 - Reduced scope to Design & Build the Distribution Buildings and Equipment	Q3/2016 Signature in May 2017	6.2.P2.EU.05 4.1.P1A-8B.EU.00 4.1.P8A-8C.EU.01	Y (partially)
Buildings & Site infrastructure	P works	TB 12 – Design & Construction of Buildings 24, 34, & 37	Q3/2016	6.2.P2.EU.05	N
Buildings & Site infrastructure	P works	TB 11 – Final Construction Works (Completion)	Q3/2016	6.2.P2.EU.05	Y

**EU.01.64 ITER – Radiological and Environmental Monitoring**

WBS: EU.01.64	Radiological and Environmental Monitoring	WP ref: WP16/64/01
<p><b>General Overview</b> EU is responsible for the in-kind procurement of the Radiological and Environmental Monitoring System (REMS). The primary functions of REMS are to provide health and radiological monitoring for workers as well as area environmental monitoring for the public and, thus, to assist in the protection against ionizing radiation during ITER operations and decommissioning. ITER-REMS shall cover the following safety functions during normal operations, including maintenance, as well as off-normal events, incident and accident: (a) health and radiological monitoring for workers, (b) environmental, and (c) tritium process control.</p> <p><b>Current Status</b> The REMS PA was originally a single Functional Specification Procurement Arrangement. In the frame of the PA signature preparation, a cost assessment was performed and the overall conclusion was that REMS PA was impacted by considerable over-costs. IO and EU-DA agreed that as a first step a PA restricted to the design would be signed with the aim to come up with an optimized configuration in terms of procurement and so a more reasonable cost. For this reason it was decided to divide the original PA in two PAs:</p> <ul style="list-style-type: none"> <li>• PA 6.4.P1.EU.01: Limited to the design (preliminary and final) of the REMS. This PA was signed in September 2013. <ul style="list-style-type: none"> <li>○ Preliminary design of the Tokamak Complex was finished at the end of July 2015.</li> <li>○ A cost assessment for REMS Tokamak Complex is expected to start at the end of 2015, and will be valuable so as to define the scope of the Tokamak Complex.</li> <li>○ Preliminary design for the Personal Access Control Building is expected to start at the beginning of 2016.</li> <li>○ Preliminary design for the Hot Cell Complex should start once the design of the complex reaches enough stability to allow the REMS development (expected in 2016).</li> </ul> </li> <li>• PA 6.4.P1.EU.02: Including the REMS systems, sub-systems and components procurement, delivery, assembly, testing and commissioning. This PA has not been signed yet.</li> </ul> <p>Currently, it is envisaged to amend the REMS Design PA (PA 6.4.P1.EU.01) in order to include the manufacturing, procurement, delivery, installation, testing and commissioning of the items of equipment needed for the 1<sup>st</sup> Plasma and Assembly Phase II.</p> <p><b>Challenges for the next year</b> Adapt the REMS development plan to the ITER project requirements.</p>		
<b>ANNUAL OBJECTIVES</b>		
<b>HUMAN RESOURCES ASSIGNED TO THE ACTIVITY</b>		
F4E will be supporting this activity during the year 2016 with 3.53 FTE.		
<b>FINANCING DECISION</b>		
<b>Procurement actions</b>		
<b>ITER Project actions in response of PAs and ITAs</b>		
Preparation of REMS Preliminary Design of Personal Access Control Building (PACB) and Hot Cell Complex.		

**EU.01.66 ITER – Waste Management**

WBS: EU.01.66	Waste Management	WP ref: WP16/66/01
<p><b>General Overview</b> EU is responsible to provide Waste Management System which fulfils the functional requirements established during the</p>		

conceptual design and to demonstrate that such requirements and the derived acceptance criteria are met. Waste Management Systems includes: (1) Radwaste Building Process Equipment for Low and Intermediate level short-lived solid, and liquid radwaste (Type-A radwaste based on the French Nuclear Waste Classification); and (2) Site Services Building Process Equipment, including equipment devoted to the treatment and storage of toxic and non-toxic-non-radioactive wastes.

**Current Status**

This is a Functional Specification PA, which has not been signed yet. The signature of this PA is on-hold because there is a disagreement between IO and F4E on how to proceed with this PA. The scope of supply is not well defined. As for example, the conceptual design provided by IO in 2013 needs to be reworked because new requirements (such as detritiation of solid waste) have been added.

Until 2015 the baseline was to swap this PA with the HC Extension Construction. Lately, it was decided by EU-DA senior management to stop the swapping activity. However, there is not any final decision on it yet. Up to now, the procurement strategy has not been drafted also because the PA scope has not been agreed. Nothing has been tendered so far except a minor amount for cost assessment.

**Challenges and objectives for the next year**

- Reach an agreement between EU-DA and IO on how to proceed with this PA: swapping, or not.
- In case EU-DA keeps the responsibility for the procurement of this PA:
  - Start of Waste Management Systems Preliminary Design phase.

**HUMAN RESOURCES ASSIGNED TO THE ACTIVITY**

F4E will be supporting this activity during the year 2016 with 1.80 FTE.

**FINANCING DECISION**

**Procurement actions**

**ITER Project actions in response of PAs and ITAs**

## EU.01.CC ITER – Cash Contribution

WBS: EU.01.CC	Cash Contribution		WP ref: WP16/CC/01
<p><b><u>General Overview</u></b></p> <p><b><u>Cash Contribution to ITER IO</u></b></p> <p>In accordance with the ITER Agreement, the financing of the ITER Organization is ensured through contributions made to IO in the form of cash (10%) or in kind (90%) from Members. In-cash contribution to IO for the management of ITER and research and development and participation to the ITER fund are shared among the ITER Members in proportion to each Member's share of common expenses during the various phases of the ITER project (EU share during the construction phase is 45.46%). Contribution in cash are payable in Euros. Cash contributions from ITER Members to IO are determined annually, based on estimates of the IO budget for the following year. The final figure is approved or modified by the ITER Council.</p> <p><b><u>Cash Contribution to Japan</u></b></p> <p>According to the ITER Agreement, there is a transfer of procurement responsibility from EURATOM to Japan under the supervision of the ITER Organization. This is financed through a cash contribution from EU to Japan paid by F4E. Initially, all payments were carried out following the acknowledgment by ITER IO of the achieved milestone and the associated credit. Currently, F4E provides a yearly payment based on the forecasted milestones achievement for that specific year. An update of the schedule of payments is provided by the Japanese Domestic Agency (JA DA) twice a year. An extra contribution to Japan of 75,000,000 Euros (2014 value) will be provided by EU (through F4E) as a consequence of the settlement agreed in January 2014.</p> <p><b><u>Current Status</u></b></p> <p><b><u>Cash Contribution to ITER IO</u></b></p> <p>Up to end of 2015, about 528 million Euros will be paid by EU to ITER IO.</p> <p><b><u>Cash Contribution to Japan</u></b></p> <p>Up to end July 2015, about 88% of the cash contributions to Japan have been already committed, with the exception of the extra contribution of 75 million Euros.</p> <p><b><u>Challenges for the next year</u></b></p> <p><b><u>Cash Contribution to ITER IO</u></b></p> <p>A cash contribution of about 121.5 million Euros is foreseen to be committed in 2015 for being paid in 2016. A cash contribution of about 172.61 million Euros is foreseen to be committed in 2016 for being paid in 2017.</p> <p><b><u>Cash Contribution to Japan</u></b></p> <p>A new commitment of about 3.91 million Euro and payments for a total of approx. 76 million Euros are foreseen in 2016.</p>			
<b>ANNUAL OBJECTIVES</b>			
<p>The multi-annual objective is to pay to IO the contribution as agreed by the ITER Council and to Japan as defined in the schedule for the relevant credits earned by the JA DA for those components transferred by the EU to them.</p>			
<p>The current plan provides an indicative estimate of the involved budget (in MEuro):</p>			
	<b>2016</b>	<b>2017</b>	<b>2018</b>
Cash to IO – Commitments*	172,61	186.85	193.13
Cash to IO – Payments*	144.3	165.3	172
Cash to Japan - Commitments	3.91	0	38.4
Cash to Japan - Payments	76	14.8	3.3
* including estimated contribution to Reserve Fund			
<b>HUMAN RESOURCES ASSIGNED TO THE ACTIVITY</b>			

F4E(16)-GB35-13.1

2<sup>nd</sup> Amended 2016 Work Programme

F4E will be supporting this activity during the year 2016 with 0.92 FTE.	
<b>FINANCING DECISION</b>	
<b>Cash contribution</b>	
Scope Description	Amount
Cash Contribution to ITER IO	166,640,000 Euros
Cash Contribution to Japan for the signature of the PA 3.2.P4.JA.01. Atmospheric Detritiation System	2.3 kIUA (3 910 000 Euros)

## EU.01.ES ITER – Technical Support Services

WBS: EU.01.ES	Technical Support Services	WP ref: WP16/ES/01
<p><b>General Overview</b></p> <p>The Technical Support Services Unit supports the ITER Department's Project Teams (and to a limited extent the BA department) by providing them with technical expertise in the key domains of engineering and fusion technologies. The Unit is covering the following areas of expertise:</p> <ul style="list-style-type: none"> <li>• Design office activities (mechanical and schematics);</li> <li>• Analysis : Mechanical, Structural Dynamics, Civil engineering, Fluid Dynamics, Electro Magnetism , Nuclear Analyses;</li> <li>• Design Codes and Standards;</li> <li>• Instrumentation and Control;</li> <li>• Metrology.</li> </ul> <p>Moreover, specific activities related to the production of nuclear data are carried out. Validated nuclear data for radiation transport and activation calculations are required to improve predictive capabilities in support of the nuclear design of fusion facilities.</p> <p><b>Current Status</b></p> <p>The matrix structure is now in place in the ITER Department. The support to the Project Teams in the technical areas listed above is provided either involving internal staff when specific skills or reactivity is needed or through specific contracts. To this end, a series of Framework Contracts have been signed or renewed recently.</p> <p><u>Design Office :</u></p> <p>The bulk of the activity consists in maintaining CAD and Engineering data management systems implemented earlier, to check the CAD data quality wherever they come from, to manage the CAD data exchange with both the IO and F4E suppliers, to support the F4E TROs in specifying the CAD works to be subcontracted, to carry out local mechanical configuration control and occasionally to perform in-house mechanical design;</p> <p><u>Analysis:</u></p> <p>The activities focus on providing technical support in the area of computational analysis to the development of the ITER design as well as to the F4E procurement contracts by placing and following up service contracts to qualified companies as well as internal analysis activity. Most of the analysis efforts have been so far dedicated to the Vacuum vessel, Magnets and Building design. Specific efforts have been done in the area of nuclear analysis aiming at checking the heat load on magnets and the ITER facility radio protection status.</p> <p><u>Design Codes and Standards:</u></p> <p>F4E follows the developments and the application of standard codes (e.g.; ASME, RCC-MR) to the design of the key ITER mechanical components (e.g.; vessel, buildings and magnets);</p> <p><u>Nuclear Data:</u></p> <p>The current exercise of prioritization aiming at accommodating a reduction of the EU budget for ITER and at better controlling its cost has led F4E to stop coordinating and funding the activities aiming at developing Fusion related Nuclear Data. The need for a continuous effort in support of the European Fusion Technology programme has been reconfirmed and related discussions with EUROfusion have been initiated. It is foreseen to implement a last Specific Grant on experimental validation activities as to allow a relatively smooth transition.</p> <p><u>Instrumentation and Control</u></p> <p>The direct support provided to F4E Project Teams on Instrumentation and Control areas, according to the strategy and maturity of each ITER Plant System includes requirements management and formalisation, participation and organization of design reviews, review of design documents from Plant System suppliers and selection process. The specific support to F4E Project Teams aiming at fostering a common approach for the integration of Plant Systems into ITER Central I&amp;C Systems, in discussion and consensus with ITER groups is performed through two Framework Contracts allowing outsourcing activities.</p> <p><u>Metrology:</u></p> <p>The generic requirements related to Metrology have been defined, in liaison with the IO metrology group and in coordination with F4E and IO RO's.</p> <p>The group supports the F4E Project Teams in the definition of a metrological strategy and in the preparation of technical specifications and follows up the project activities related to metrology. in particular, to support the Project Teams and suppliers in the preparation of uncertainties reports, to support the Project Teams in the verification of supplier metrological procedures, to participate to the assessment of Non Conformities related to metrology, to witness geometrical survey campaigns when needed, to carry out independent geometrical survey when needed, and to participate to all the relevant project progress meetings.</p> <p><b>Challenges for the next year</b></p> <p>One of the 2016 challenges will be to match the needs of the project teams with limited human resources complemented by out sourced resources accessible through the signed frame work contracts.</p>		



A large fraction of the resources will be dedicated to the support of the critical systems: Buildings, Vacuum vessel and Magnets.

The Design Office will have to train an increasing number of F4E contractors' staff so that the design work is done according to the ITER standard as to allow an efficient integration. The management of the mechanical configuration will remain a top priority. The internal design activities will be restricted to short notice studies or linked to the design of the Blanket First Wall.

Many analysis related to Safety Important Structures or Components will be carried out (internally or outsourced) which require beyond outstanding technical skills a high level of quality and traceability. The expected creation of an Integrated Project Team responsible for the Nuclear Shielding Design will require the allocation of many resources internal and external in the areas of nuclear analysis and project integration.

An increasing number of metrological inspections at F4E suppliers' premises will have to be conducted in order to support the follow up of the Project Teams contracts. From 2016 on, Metrological support will be help the Site & Buildings Project Team to follow up of the building construction. In view of the increasing demand of metrology services, analysis and surveys, it is foreseen to purchase a minimum set of tools to be used by F4E staff in the technical support services team to perform geometrical checks according component manufacturing schedule. Provisions for portable Metrology devices like laser trackers, laser tracker accessories and necessary tools to make surface scans and gap/step detection including all relevant software applications are included under the budget title 3.4.

With respect to Instrumentation and Control activities, the support to the building instrumentation will remain a top priority.

A new ITA is going to be signed in 2016 for Nuclear Analysis of ITER Magnet System (C11TD194FE).

**ANNUAL OBJECTIVES**

Milestone ID/ Objectives	Milestone Objective type	Scope Description	Achievement criteria /CAS received	Forecast achievement date
EU.ES.03.19550	WP	Instrumentation and control integration service	Contract signed	29/09/2016
EU.ES.01.21600	WP	Support in the area of integration, operation, maintenance, and other technical areas within short notice	Contract signed	02/11/2016

**HUMAN RESOURCES ASSIGNED TO THE ACTIVITY**

F4E will be supporting this activity during the year 2016 with 11.24 FTE.

**FINANCING DECISION**

**Procurement actions**

**ITER Project actions in response of PAs and ITAs**

For all the TSS areas of expertise the procurement actions during the year 2016 will be focused on support contracts for the F4E ITER Department project teams and relevant task orders. They will include inter alia the support in critical items like Buildings, Vacuum Vessel, Magnets, etc. In section 6.4 is available the list of the main General Support Framework Contracts that will be ongoing in 2016 and support these activities.

A Service Level Agreement with JRC Ispra focussing on the topics below will be signed and started in 2016.

- Expertise and advanced modelling in structural dynamics.
- Margin assessment of the support of safety important components through experimental tests.
- Survey activity regarding European standards applicable to transportation.
- Nuclear Analysis of ITER Magnet System

**Grants and Specific Grants**

Scope	Type of procedure	Time of Call	Indicative Amount (Euro)	Budgetary line
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F4E(16)-GB35-13.1

2<sup>nd</sup> Amended 2016 Work Programme

Nuclear Data experiments and measurement techniques	Specific Grant	Not applicable	300,000	32	
Main Procurement initiatives					
F4E Area	Type of Contract/ Agreement	Scope description	Time of call	PA reference	In the budget 2016?
Design Office	Framework Contract	Provision of CAD Design Support - General Mechanical Design	Q4/2015	Multiple	NA
I&C and CODAC	Framework Contract	Provision of Instrumentation and Control Integration Services	Q3/2016	Multiple	NA
I&C and CODAC	Framework Contract	Provision for Development of Nuclear Safety I&C	Q2/2015	Multiple	NA

## EU.01.MF ITER – Materials and Fabrication Technologies

WBS: EU.01.MF	Materials and Fabrication Technologies		WP ref: WP16/MF/01	
<p><b><u>General Overview</u></b></p> <p>The Materials and Fabrication group of the Technical Support Services Unit supports the ITER Department's Project Teams (and to a limited extent the BA department) by providing them with technical expertise in the domains of Materials Science, Materials Technologies and Manufacturing Processes. The group supervises the development and qualification of material, collect material data and qualify joining technologies. It may support the materials procurement on demand.</p> <p><b><u>Current Status</u></b></p> <p>The activities in this area include characterisation and assessment of materials data under ITER operational conditions via irradiation campaigns, testing at cryogenic, room and elevated temperatures, thermal fatigue testing, assessment of corrosion parameters and development of welding technologies. Assessments of materials data are performed by non-destructive testing, mechanical and physical characterisation of materials and joints. The activities are linked with R&amp;D, qualification and validation of series production stages of various EU-ITER and JT-60SA subsystems. As several ITER systems entered manufacturing phase during 2014, there is a significant increase in the materials follow-up support for the project teams.</p> <p><b><u>Challenges for the next year</u></b></p> <p>One of the 2016 challenges will be to match the needs of the project teams with limited human resources complemented by out sourced resources accessible through the signed frame work contracts.</p> <p>A large fraction of the resources will be dedicated to the support of the critical systems: ITER Vacuum vessel, ITER in-vessel components and ITER and JT60 SA Magnets.</p> <p>The development of additive manufacturing technologies for the construction of near net-shape components in austenitic stainless steel will remain a challenging objective for 2016.</p>				
<b>ANNUAL OBJECTIVES</b>				
<b>Milestone ID/ Objectives</b>	<b>Milestone Objective type</b>	<b>Scope Description</b>	<b>Achievement criteria /CAS received</b>	<b>Forecast achievement date</b>
EU.MF.01.1223120	WP	Provision of Destructive and Non-Destructive Testing of Materials at Room and Elevated Temperature	Contract signed	05/07/2016
EU.MF.01.221880	WP	Provision of Engineering Support on Joining and Non Destructive testing techniques for production of ITER Components	Contract signed	29/09/2016
<b>HUMAN RESOURCES ASSIGNED TO THE ACTIVITY</b>				
F4E will be supporting this activity during the year 2016 with 3.08 FTE.				
<b>FINANCING DECISION</b>				
<b>Procurement actions</b>				
<b>ITER Project actions in response of PAs and ITAs</b>				
<p>Task orders are planned to be implemented by all F4E Project WBSs for the following activities:</p> <ul style="list-style-type: none"> <li>• Joining Technology and non-destructive testing</li> <li>• Materials irradiation and post irradiation characterization</li> <li>• Material characterization at cryogenic temperatures</li> <li>• Material characterization at room/elevated temperatures</li> <li>• Material Manufacturing: Provision of Manufacturing Services using Hot Isostatic Pressing</li> <li>• Material Manufacturing: Development of additive technologies</li> </ul>				

Main Procurement initiatives					
F4E systems	Type of Contract/ Agreement	Scope description	Time of call	PA reference	In the budget 2016?
Materials	Framework Contract	Provision of Engineering Support on Joining and Non-destructive testing techniques for production of ITER Components	Q3/2014	Multiple	Not Applicable

## EU.01.NS ITER – Nuclear Safety

WBS: EU.01.NS	Nuclear Safety	WP ref: WP16/NS/01
<p><b><u>General Overview</u></b>  The Nuclear Safety group of the Nuclear Safety and Quality Unit (NSQ) is responsible to ensure that the nuclear safety aspects are correctly implemented and managed in the realization of the in-kind procurement for ITER. Integrated in the ITER Department, it is responsible for providing support to the project European teams, and supervises their activities, in the domain of Nuclear Safety.</p> <p><b><u>Current Status</u></b>  In the field of Nuclear Safety, the NSQ Unit will interact with the Project teams and with the IO Nuclear Safety team to ensure that the Safety requirements are properly understood and propagated, and that the technical solutions presented to the Safety Regulator are achievable.</p> <p>In this field of activities, in March 2015, a new Unit has been created and the following missions have been assigned :</p> <ul style="list-style-type: none"> <li>• Support F4E Project Teams in all aspects related to Safety and in particular Nuclear Safety. Provide clarification (or interpretation when needed) for Nuclear Safety definitions and propose positions for key Nuclear Safety issues; Support the review of F4E PA documentation, the writing and review of F4E technical specifications;</li> <li>• Control that the nuclear safety requirements and the corresponding regulations are dutifully applied in all F4E activities and adequately transmitted within F4E supply chain and report periodically to the Head of Department and the QM;</li> <li>• Provide advice on the classification of Protection Important Components (PIC) and Activities (PIA). Prepare guideline documents for design activities under F4E supervision. Check that all PIAs are being followed and reported for all F4E project teams;</li> <li>• Assist F4E PTs to produce definitive records of the demonstration and reporting to IO of individual system Safety Requirements;</li> <li>• Interact as required with IO Safety team and liaise with IO other safety officers;</li> <li>• Review and follow Non Conformities (NCR) and Deviation Requests (DR) which have an impact on PIC / SIC components, review them periodically with IO Nuclear Safety unit, perform regular audits of the F4E (NCR and DR) system to check the screening process has been correctly applied;</li> <li>• Implement, promote and support in the ITER department a strong nuclear safety culture. Organize regularly trainings in the field of Nuclear Safety and Nuclear Codes and Standards for F4E Contractors and Sub-Contractors;</li> <li>• Perform specific studies (if required and to complement what is done by F4E contractors) in Hazard Analysis of components being designed under F4E supervision, including techniques such as Fault Tree Analysis, FMEA, HAZOP for PIC components;</li> <li>• Implement R&amp;D activities in support of ITER licensing, if needed.</li> </ul> <p>In 2015, the related action plan, to raise as soon as possible the resources to the appropriate level in order to fulfil these missions assigned, has been provided, but is not implemented yet (currently, 1 FTE working in nuclear safety).</p> <p>Due to the resources not all in place yet, only a limited support could have been provided to the different project teams, and not all the assigned missions have been fulfilled. Nevertheless, around 1,200 documents have been reviewed in 2015 up to know to assess the compliance of F4E and F4E suppliers' activities with the nuclear safety regulations and IO requirements.</p> <p><b><u>Challenges for the next year</u></b>  Numerous analyses related to safety-important structures, systems and components shall be carried out (internally or outsourced) by F4E to assess integration and coherence, together with the compliance of F4E and F4E suppliers activities (in design and manufacturing) with clear obligations coming from the French nuclear legislation. Therefore it will require high-level and hands-on senior expertise in nuclear safety issues.</p> <p>The main challenge for 2016 is to start to develop this credible expertise in nuclear safety within F4E, by setting up the correct resources (both internal and external with contracts), in order to be able to develop the in-house nuclear safety analysis capacity and to fulfil F4E obligations as a main actor in the supply chain, in full compliance with nuclear regulations.</p>		

ANNUAL OBJECTIVES					
Milestone ID/ Objectives	Milestone Objective type	Scope Description	Achievement criteria /CAS received	Forecast achievement date	
EU.NS.01.22740	WP	Provision of Support for Nuclear Safety	Contract signed	29/09/2016	
HUMAN RESOURCES ASSIGNED TO THE ACTIVITY					
F4E will be supporting this activity during the year 2016 with 1.84 FTE.					
FINANCING DECISION					
Procurement actions					
Nuclear Safety Support to the ITER Project WBSs will be provided mainly through specific contracts under the ongoing framework contracts					
Main Procurement initiatives					
F4E systems	Type of Contract/ Agreement	Scope description	Time of call	PA reference	In the budget 2016?
Nuclear Safety	Framework Contract	Support for Nuclear Safety	Q2/2016	Multiple	Not Applicable

## EU.01.PE ITER – Plasma Engineering

WBS: EU.01.PE	Plasma Engineering		WP ref: WP16/PE/01																				
<p><b>General Overview</b></p> <p>The main activities of Plasma Engineering (PE) are in the following topical areas: plasma control, scenario development, plasma-wall interaction and plasma operation. The PE group provides a horizontal support within F4E to different procurements (for instance blanket, coils and TBMs). Plasma Engineering addresses in general the analysis and definition of the requirements (including loads definition and verification) coming from the interface with the plasma and is involved in the study of the impact of design changes on the ITER machine performance and operation.</p> <p>The PE scope includes also specific activities requested by ITER-Central Team by means of ITER Task Agreements (ITAs) in the areas of competence of the group.</p> <p>Furthermore PE supports F4E in managerial/strategic decisions and in the interaction with technical and scientific committees (TAP, STAC and other relevant committees).</p> <p><b>Current Status</b></p> <p>The PE group is carrying out several activities in the field of plasma operation. The main open contracts regard the assessment of the fuelling needs in ITER scenarios, the evaluation of loads due to mitigated disruptions, the effect of magnetic field asymmetries due to ferromagnetic materials.</p> <p><b>Challenges for the next year</b></p> <p>A relevant part of the PE activity responds to (often urgent) requests and hence is difficult to plan in advance.</p> <p>Next year the PE group is going to focus on transversal activities in support to F4E procurements and in particular for the Electron Cyclotron and Ion Cyclotron heating systems. Conversely the activity related to ITAs is likely to be reduced due to ITER-Central Team budget constraints.</p>																							
<b>ANNUAL OBJECTIVES</b>																							
<table border="1"> <thead> <tr> <th data-bbox="245 1056 386 1142">Milestone ID/ Objectives</th> <th data-bbox="389 1056 531 1142">Milestone Objective type</th> <th data-bbox="534 1056 764 1142">Scope Description</th> <th data-bbox="768 1056 943 1142">Achievement criteria /CAS received</th> <th data-bbox="946 1056 1105 1142">Forecast achievement date</th> <th data-bbox="1109 1056 1409 1142">Relevant Deliverables</th> </tr> </thead> <tbody> <tr> <td colspan="6" data-bbox="245 1146 1409 1194"><b>Fusion for Energy responsibility</b></td> </tr> <tr> <td data-bbox="245 1199 386 1255">EU.PE.5010 10</td> <td data-bbox="389 1199 531 1255">WP</td> <td data-bbox="534 1199 764 1255">Engineering support to PE and Antennas</td> <td data-bbox="768 1199 943 1255">FWC signed</td> <td data-bbox="946 1199 1105 1255">04/11/2016</td> <td data-bbox="1109 1199 1409 1255">Not applicable</td> </tr> </tbody> </table>						Milestone ID/ Objectives	Milestone Objective type	Scope Description	Achievement criteria /CAS received	Forecast achievement date	Relevant Deliverables	<b>Fusion for Energy responsibility</b>						EU.PE.5010 10	WP	Engineering support to PE and Antennas	FWC signed	04/11/2016	Not applicable
Milestone ID/ Objectives	Milestone Objective type	Scope Description	Achievement criteria /CAS received	Forecast achievement date	Relevant Deliverables																		
<b>Fusion for Energy responsibility</b>																							
EU.PE.5010 10	WP	Engineering support to PE and Antennas	FWC signed	04/11/2016	Not applicable																		
<b>HUMAN RESOURCES ASSIGNED TO THE ACTIVITY</b>																							
F4E will be supporting this activity during the year 2016 with 3.79 FTE.																							
<b>FINANCING DECISION</b>																							
<b>Procurement actions</b>																							
<b>ITER Project actions in response of PAs and ITAs</b>																							
Engineering support to EC and IC heating systems. Engineering and Physics Analysis Supporting the EC system Final Design. Plasma engineering analyses in support to F4E procurement.																							
<b>ITER Project actions not in response of PAs and ITAs</b>																							
Transversal activities in support to F4E in response to request from F4E management of technical committees.																							
<b>Grants and Specific Grants</b>																							

F4E(16)-GB35-13.1

2<sup>nd</sup> Amended 2016 Work Programme

Scope	Type of procedure	Time of Call	Indicative Amount (Euro)	Budgetary line
Analysis in support of Plasma Engineering and antennas including load specifications revision	Open Call	Q3/2016	300,000 Euro	3.1
Analysis and simulations of plasma operations, plasma machine interfaces and actuators	Open Call	Q3/2016		3.1



**EU.01.PM ITER – Programme Management**

WBS: EU.01.PM	ITER Programme Management	WP ref: WP16/PM/01
<p><b><u>SYSTEM ENGINEERING AND CONFIGURATION MANAGEMENT</u></b></p> <p><b><u>General Overview</u></b></p> <p>The main scope of this area is to develop both Configuration Control and Configuration Management activities according to Quality Assurance requirements - including managements of Deviation Requests (DR), Non Conformities (NC) and Project Change Requests (PCR) – and System Engineering tools and processes.</p> <p><b><u>Current Status</u></b></p> <p>An agreement has been reached in 2015 with IO in terms of future collaboration for the setup of a common methodology.</p> <p><b><u>Challenges for the next year</u></b></p> <p>Task orders of the existing framework will be placed in support of the activities of systems engineering and configuration management. A new framework will be launched in the last quarter of 2016 in support of the same area but with an enlarged scope to cover: harmonize F4E and ITER IO methodology.</p> <p><b><u>TECHNICAL INTEGRATION</u></b></p> <p><b><u>General Overview</u></b></p> <p>Technical Integration plays an essential role to define and coordinate cross-system design activities of the F4E procurements and to systematically manage transversal engineering requirements and activities like commissioning or maintenance.</p> <p><b><u>Current Status</u></b></p> <p>Technical Integration is currently limited to the evaluation and propagation of changes (PCRs) and to the participation in relevant Task forces (i.e. Port Plug, Stress Tests inter alia).</p> <p><b><u>Challenges for the next year</u></b></p> <p>The main goal is to fully develop a Technical Integration area in F4E by regularizing the Technical Integration and Coordination Board and setting up the resources (both internal and external with contracts).</p> <p><b><u>ASSEMBLY INTEGRATION AND VALIDATION (AIV)</u></b></p> <p><b><u>General Overview</u></b></p> <p>This area is in charge of F4E internal coordination and is counterpart of IO on the efforts related to the set-up of common policies, procedure, instructions, plans, etc. and the future approval of supplier's documentation required to start AIV activities onsite.</p> <p><b><u>Current Status</u></b></p> <p>A follow up of AIV documentation being prepared by ITER IO and F4E evaluation/assessment of Assembly related contracts performed.</p> <p><b><u>Challenges for the next year</u></b></p> <p>Support to Configuration Management in the expected upcoming set of PCRs/Deviation related to AIV scope of work; support to F4E teams in relation to logistics responsibilities on site (e.g. deliveries portal); supporting decisions on transfer of F4E AIV responsibilities to IO.</p> <p><b><u>QUALITY ASSURANCE, QUALITY CONTROL AND CE MARKING</u></b></p> <p><b><u>General Overview</u></b></p> <p>The Quality Assurance &amp; Quality Control group of the Nuclear Safety and Quality Unit (NSQ) is responsible to ensure that the quality aspects are correctly implemented and managed in the realization of the European in-kind procurement for ITER. Integrated in the ITER Department, it is responsible for providing support to the project teams, and supervises their activities, in the domains of Quality Assurance and Quality Control.</p> <p>The CE Marking group of the Nuclear Safety and Quality Unit (NSQ) is responsible to ensure that the CE Marking obligations coming from the European Directives are correctly implemented and managed in the realization of the European in-kind procurement for ITER. Integrated in the ITER Department, it is responsible for providing support to the project teams, and supervise their activities, in the domains of CE marking.</p>		

**Current Status**

In the field of Quality Assurance (QA), the NSQ Unit will control that the F4E QA processes are properly followed in the development of the different ITER projects and in line with the F4E Quality Management Policy.

In the field of Quality Control (QC), the NSQ Unit will support the Project teams in the follow-up and control of the activities performed by the F4E contractors.

In this field of activities, in March 2015, a new Unit has been created and the following missions have been assigned :

- Liaise with project teams on QA and QC topics ensuring that the F4E Quality Management System (QMS) is duly implemented within the department and through the supply chain. Advise the Department managers and responsible officers on quality matters. Support the review of project documentation for QA aspects;
- Support the Department teams on quality activities such as monitoring, audits, documentation review, conformance processes, etc. Perform monitoring, audits and assessments of the QMS implementation within F4E and its suppliers contributing to the F4E Annual Quality Audit Plan;
- Monitor the Department QA/QC activities. Identify QMS implementation problems and opportunities for improvement and propose relevant changes to the QMS;
- Closely monitor the nonconformity control process implementation within the Department;
- Implement and manage the required framework contracts to provide workshop/site inspectors, and any potential third party inspection, needed by the project teams during their manufacturing phase;
- Liaise with IO QA representatives on areas where the IO QA requirements have or could have a significant impact on the Department activities (including the Supplier Quality Requirements). Represent the Department in the IO/DAs integrated Safety & Quality Assurance Working Group (SQAWG);
- Represent the Department in the QA Coordination Board (QACB) meetings, which main goals are to collect, analyse, and consolidate management information taking into account the input received from the Project Team/Unit Managers but also from the Broader Approach and Administration departments;
- Organize regularly trainings, of operational QA to the project teams and the F4E Contractors of PIC.

In 2015, the related action plan, to raise as soon as possible the resources to the appropriate level in order to fulfil the assigned missions, has been provided but it is not implemented yet (currently, 4 FTE to cover the QA missions, 0 for the QC missions).

In the field of CE marking, the NSQ Unit will provide coordination for the ITER Department and analyse F4E duties in terms of CE marking for the components to be delivered by the EU-DA.

Due to the resources not all in place yet, only a limited support could have been provided to the different project teams, and not all the assigned missions have been fulfilled. Nevertheless:

- Around 3,500 documents have been reviewed in 2015 up to now by F4E QA officers to assess the compliance of F4E suppliers' activities with the procedures in force in F4E.
- 11 formal audits have been already performed in F4E suppliers premises by F4E certified QA auditors, according to F4E 2015 annual audit.
- For CE marking, 41 assessments on individual components or systems (to be delivered by F4E) concerning the obligations coming from European directives have been provided to the different project teams.

The Unit is in charge to support the F4E project teams in their assessment of the compliance with harmonised EN / European standards, in the frame of applicable EU legislation, for the structures, systems and components delivered by EU-DA.

**Challenges for the next year**

The three main challenges are for the Quality Assurance and Quality Control:

- to develop in F4E an appropriate capacity in Quality Assurance assessment, by setting up the resources (both internal and external with contracts), to be able to regularize and streamline the different activities related to quality assurance, currently dispersed in F4E;
  - to create a new group in Quality Control that will be able to fulfil the missions assigned, thanks to proper resources allocation, and especially to create in F4E a centralized and coordinated inspection capacity able to assess, far ahead of the final delivery acceptances, the risk of non-compliance with technical or regulatory requirements of products to be delivered by F4E suppliers
  - to coordinate all workshop/site inspectors needs from the project teams according to their actual manufacturing phases
- One of the main challenges for 2016 will be to collect all the reference missing documentation to continue to assess, one by one, the compliance with CE marking directives & regulations (mainly the Construction Product Regulation, the Machinery Directive, the Low Voltage Directive and the Electromagnetic Compatibility Directive).

ANNUAL OBJECTIVES					
<b><u>SYSTEM ENGINEERING AND CONFIGURATION MANAGEMENT</u></b>					
Milestone ID/Objectives	Milestone Objective type	Scope Description	Achievement criteria /CAS received	Forecast achievement date	Relevant Deliverables
EU.PM.3023850	WP	Provision of Support for Configuration Management and Systems Engineering - Barcelona and Cadarache	Contract signed	-05/12/2016	Not applicable
<b><u>TECHNICAL INTEGRATION</u></b>					
Milestone ID/Objectives	Milestone Objective type	Scope Description	Achievement criteria/CAS received	Forecast achievement date	
EU.PM.3025700	WP	Provision Of Support for Technical Integration	Contract signed	30/09/2016	
<b><u>QUALITY ASSURANCE, QUALITY CONTROL AND CE MARKING</u></b>					
Milestone ID/Objectives	Milestone Objective type	Scope Description	Achievement criteria/CAS received	Forecast achievement date	
EU.PM.1020970	WP	Extention of the provision of Support for Quality Assurance and Quality Control, inspectors	Contract signed	Q4/2016	
EU.PM.3009200	WP	Provision for CE marking analysis	Contract signed	Q3/2016	
HUMAN RESOURCES ASSIGNED TO THE ACTIVITY					
F4E will be supporting this activity during the year 2016 with 2.15 FTE.					
FINANCING DECISION					
Procurement actions					
<p>Support to the F4E Project teams for:</p> <ul style="list-style-type: none"> <li>• Configuration Management and Technical Integration areas. The scope of this financial decision includes a support to the Project teams during the different phases of PAs implementation.</li> <li>• Quality Assurance, Quality Control and CE marking. The scope of this financial decision includes a support to the Project teams during the different phases of PAs implementation.</li> </ul> <p>These activities will be mainly implemented through specific contracts under the ongoing framework contracts</p>					

Main Procurement initiatives					
F4E systems	Type of Contract/ Agreement	Scope description	Time of call	PA reference	In the budget 2016?
Configuration management and System Engineering	Framework Contract	Provision of Support for Configuration Management and Systems Engineering - Barcelona and Cadarache	Q3/2016	Multiple	NA
Quality	Framework Contract	Provision of Support for Quality Assurance and Quality Control, inspectors	Not Applicable	Multiple	NA

**EU.01.TR ITER – Transportation**

WBS: EU.01.TR	Transportation	WP ref: WP16/TR/01
<p><b><u>General Overview</u></b> This activity reflects the management, on the F4E side, of technical aspects of the joint procurement with IO for the transportation of ITER components to the site in Cadarache. The scope includes the transportation of all ITER Components from the port/airport of entry (Fos or Marignane) to ITER site.</p> <p><b><u>Current Status</u></b> Implementation agreement with the supplier signed. Necessary conventions with the French authorities put in place. Several transports mainly proceeding from NON EU DAs already performed in 2015, of which around 10 Heavy Exceptional Loads (HEL's) in 2015. For example US drain tanks and US transformers.</p> <p><b><u>Challenges for the next year</u></b> Continue to ensure the follow up of transportation activities for HEL, CEL and CL by the release of related TOs. Have an agreement on tariffs in place. Besides all non EU loads, transport the EU HEL's in 2016, being Assembly hall Crane beams and huge tanks and compressors for the EU Cryoplant project 34.01</p>		
<b>ANNUAL OBJECTIVES</b>		
<p>The following general support activities will be carried out during the next 3 years:</p> <ul style="list-style-type: none"> <li>• Signature of the specific contracts under the ITER Global Logistics Framework Contract for the transportation of ITER Components according to the needs identified by F4E (for EU components) and other DAs during the relevant year</li> <li>• Provide all support needed for the security of the transports</li> </ul>		
<b>HUMAN RESOURCES ASSIGNED TO THE ACTIVITY</b>		
<p>F4E will be supporting this activity during the year 2016 with 5.79 FTE.</p>		
<b>FINANCING DECISION</b>		
<b>Procurement actions</b>		
<p>Expenditures for the Global Transportation of EU and Non-EU DAs ITER In Kind components (from Fos/Marignane to Cadarache). Mainly to be implemented through specific contracts under the Global Logistics Framework Contract with IO.</p> <p>Additional scope is linked to the security services related to the transports.</p>		

#### 4. BROADER APPROACH PROJECTS

##### EU.BA.01 Broader Approach – Common Activities

WBS: EU.BA.01	Broader Approach - Common Activities	WP ref: WP16/BA/01										
<p><b>General Overview</b> The overall objectives consist in the coordination of Broader Approach activities.</p> <p><b>Current Status</b> Since the signature of the framework contract for the transport of BA deliverables in January 2013, 14 Task Orders have been placed for the 3 BA projects. The framework contract for the support of on-site activities was signed in June 2015, and so far one Task Order has been signed. Further Task Orders will follow in 2016. To support the PA- monitoring several pieces of equipment have been purchased, to be used e.g. hydraulic jacks and a gas leak detector.</p> <p><b>Challenges for the next year</b> In WP16 the activities cover general support and management of the two existing framework contracts for all three BA projects (actual transport and activities on site are covered under the specific BA projects). Technical support of a general nature for PA monitoring is also covered under this WBS. Furthermore support is provided for the management of inputs for meetings, such as the BA Steering Committee. For both framework contracts the coordination and support activities have to run smoothly and in a timely manner to help the implementation of the activities. For the PA monitoring area also fast reaction is needed, as the items should usually be available within a short period of time.</p>												
<b>ANNUAL OBJECTIVES</b>												
<table border="1"> <thead> <tr> <th data-bbox="245 1058 423 1104">Area</th> <th data-bbox="423 1058 1325 1104">Scope Description</th> </tr> </thead> <tbody> <tr> <td data-bbox="245 1104 423 1163">Transportation</td> <td data-bbox="423 1104 1325 1163">Transport of BA project deliverable, usually to Japan Port of Entry (PoE).</td> </tr> <tr> <td data-bbox="245 1163 423 1222">On-site Activities</td> <td data-bbox="423 1163 1325 1222">Common activities and framework activities relating to on-site activities of all BA projects, where not covered under specific projects.</td> </tr> <tr> <td data-bbox="245 1222 423 1281">PA Monitoring</td> <td data-bbox="423 1222 1325 1281">Purchase and deployment of equipment as needed to support PA-implied contract monitoring.</td> </tr> <tr> <td data-bbox="245 1281 423 1339">Legal costs</td> <td data-bbox="423 1281 1325 1339">Legal support for all BA projects.</td> </tr> </tbody> </table>			Area	Scope Description	Transportation	Transport of BA project deliverable, usually to Japan Port of Entry (PoE).	On-site Activities	Common activities and framework activities relating to on-site activities of all BA projects, where not covered under specific projects.	PA Monitoring	Purchase and deployment of equipment as needed to support PA-implied contract monitoring.	Legal costs	Legal support for all BA projects.
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PA Monitoring	Purchase and deployment of equipment as needed to support PA-implied contract monitoring.											
Legal costs	Legal support for all BA projects.											
<b>HUMAN RESOURCES ASSIGNED TO THE ACTIVITY</b>												
F4E will be supporting this activity during the year 2016 with 6.29 FTE.												
<b>FINANCING DECISION</b>												
<b>Procurement actions</b>												
<b>BA Project actions in response of PAs</b>												
Expenditures are foreseen under the budget 2016 for support on: Health & Safety for On Site Activities, Assembly onsite activities and legal activities, mainly to be implemented as specific contracts under the ongoing Framework contracts. In addition some minor costs for monitoring PAs also appear here, e.g. purchase of equipment for support.												

## EU.BA.02 Broader Approach – Satellite Tokamak (JT-60SA)

WBS: EU.BA.02	Satellite Tokamak (JT-60SA)	WP ref: WP16/BA/02
<p><b>General Overview</b></p> <p>The overall objectives consist in the contribution 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:</p> <ul style="list-style-type: none"> <li>• capable of confining break-even equivalent class high-temperature deuterium plasmas lasting for a duration longer than the timescales characteristic of plasma processes;</li> <li>• Pursuing full non-inductive steady-state operation with high plasma beta close to and exceeding no-wall ideal stability limits.</li> <li>• Establishing ITER-relevant high density plasma regimes well above the H-mode power threshold.</li> </ul> <p>The primary reference for the Satellite Tokamak Programme is the Project Plan yearly revised and submitted for endorsement to the BA Steering Committee (see BA SC 16-8.5).</p> <p>The general list and description of all activities related to the Satellite Tokamak Program (STP) (JT-60SA) for the year 2016 is contained in the corresponding STP WP2016 recommended by the STP Project Committee on the 27 October 2015 and approved by the BA Steering committee on 2 Dec 2015 (ref BA-STP-PC-17-7).</p> <p>The STP WP2016 contains all the activities and relative milestones. So all what is going to be done and achieved by EU and JA is listed in the WP2016 including the expected dates for creditable milestones and the corresponding credit. The EU activities include activities performed by the EU VCs (France, Italy, Germany, Spain and Belgium) and directly by F4E for the purpose of providing components and services forming the overall EU contribution to STP.</p> <p>The WP2016 covers the planned achievement of several important EU milestone including the completion of the fabrication, cold test, pre-assembly delivery on site of 8 TF coils, the completion of the commissioning of the Cryoplant, the delivery and installation of the Switching Network Units and part of the Superconducting Magnets Power Supplies, the completion, test and delivery of a large fraction of the High Temperature Superconducting Current Leads (HTSCLs)</p> <p>On the basis of the AoC established between F4E and the EU VC Designated Institutions F4E retains the overall technical coordination and management of the activities through its Department in Garching and the JT-60SA Unit.</p> <p>This requires F4E to implement specific actions for R&amp;D, validation of design, quality control, supervision of organisation and safety of onsite activities at JT-60SA site also including common activities with JAEA.</p> <p>F4E retains the direct responsibility of specific activities and namely:</p> <ul style="list-style-type: none"> <li>• All transport to Japan ( either directly contracted or reimbursed to the EU VC DI)</li> <li>• The direct contracting and supervision of the installation of a large share of the JT-60SA Power Supplies</li> <li>• The contribution to the fabrication of the two TF spare coils and ancillary components and services for the TF coils assembly on-site</li> </ul> <p><b>Current Status</b></p> <p>The current status of the STP is contained in the document Overview of the Present Status of STP 'Submitted to the STP PC on 27 October 2015 and to the BA Steering Committee on the 2 Dec 2015.</p> <p>The JA contributions are being delivered on time, or even ahead of time. It is noted that JAEA has completed the installation of the lower PF coils, and of 340 degrees of the vacuum vessel, is progressing on schedule for the fabrication of the balance of the PF coils and of the central solenoid. Moreover a number of ancillary systems and buildings necessary to the EU contributions have been made available on time. JAEA has also managed successfully the complex logistics of the transport of exceptional loads of the GHe Cryoplant from the port of entry of Hitachi and the JT-60SA Site in Naka.</p> <p>The EU contributions is also progressing vigorously .In 2015 important milestones have been achieved (and credited) including the completion of the installation, test and acceptance of the Quench Protection System (the emergency safety dump for the energy of the JT-60SA Superconducting magnets), the installation on site and start of the commissioning of the supercritical Helium Cooling system.</p> <p>In 2015 F4E in collaboration with CEA and ENEA has been implementing strong actions to limit the delays on the delivery of the TF coils which are now on the critical path of the project. The delivery of the TF casings (the primary cause of delay) is now running on schedule and 7 TF coil casings have been delivered (will be 8 within Dec 2016). The first two TF coils out of 18 needed (one produced by CEA/ALSTOM and one from ENEA/ASG) have been delivered to the Cold Test Facility at CEA Saclay). The Cold Test Facility at CEA Saclay has completed his commissioning in September 2015 and has started the cold test of the first TF coil at 4 K nominal current (25.7 kA).</p> <p>In the meantime the fabrication and testing of the TF coils High Temperature Superconducting Current Leads (produced by KIT, Germany) has been successfully completed and all the 6 units have been delivered to JT-60SA site. The fabrication of the PF coils HTSCL and their testing is also progressing well thanks to the doubling of the capacity of the CultKA Facility in Karlsruhe that is now able to test 4 units in parallel.</p>		

**Challenges for the next year**

In the following table all the main objectives are detailed with their deliverables and expected results, but it is important to note that, due to the collaborative nature of the BA STP Project, the deliverables/results listed and the corresponding credits are not corresponding to activities exclusively implemented by F4E, but include and incorporate results and deliverables achieved by the EU Voluntary Contributors).

The total amount of credits expected to be received by the EU in 2016 amounts to 66.649 kBAUA (corresponding to 45.188 million Euros @ 2005 currency)

The direct contribution of F4E is concentrated in the following activities:

- i) General Engineering Support
- ii) Coordination and H&S monitoring for EU Activities at JT-60SA Site
- iii) Transport and Delivery of TF coils and accessories
- iv) Transport and Installation of the SNU's
- v) Transport and installation of the SCMP's
- vi) Transport of the Cryostat Vessel Body Cylindrical Section
- vii) Transport of the PF/CS HTSCL's
- viii) Procurement of the TF casing for the 2<sup>nd</sup> Spare Coil
- ix) EU contribution to the Joint Fund for common expenses relative to Integrated Commissioning and Initial Operation
- x) Implementation of the procurement of the ECRH Power Supplies

**ANNUAL OBJECTIVES**

Objective	Objective Type	Scope Description	CAS received	Forecast achievement date	Relevant Deliverables Expected results
EU.BA.02.01 Satellite Tokamak (JT-60SA) Common Activities	WP	Common activities required to support JT-60SA activities, not covered under specific WBS sub elements of JT-60SA.	Expected total credit to EU: 1832 BAUA	Dec 2016 1832 BAUA	Disbursement of the EU share of the common fund for the integrated commissioning and initial operation
EU.BA.02.02 - Toroidal Field Magnet	WP	Manufacture and testing of JT-60SA TF coils and structures, and transportation to Japan PoE.	Expected total credit to EU: : 39098 BAUA	Dec 2016 1844 BAUA	First TF coil test completed
				Dec 2016 34576 +1398 BAUA	Transportation to Japan Port of Entry of 8 TF coils.+ Gravity Supports



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2<sup>nd</sup> Amended 2016 Work Programme

				Oct 2016 1280 BAUA	Transport and Acceptance of CS&EF current leads nr. 1-10 at Naka site
EU.BA.02.03 - Assembly	WP	Assembly or support of assembly of various components under European responsibility, at Naka site or in Europe prior to shipment, where not covered under individual subprojects.	Expected total credit to EU: : 442 BAUA	April 2016 (442 BAUA)	First TFC and OIS pair pre-assembled together: Start of onsite machining of splice plates
EU.BA.02.04 Power Supply (PS)	WP	Provision and installation of power supplies in Naka	Expected total credit to EU: 11668 BAUA	June 2016 (2832 BAUA) Dec 2016 (1062 BAUA)	SNU - Approval of Report of Factory Test and SNU delivery to JA PoE
				June 2016 (3213 BAUA) June 2016 (1606 BAUA) Dec 2016 (1606 BAUA)	SCMPS - Report on Factory Tests + Delivery on Port of Entry in Japan of power supplies units related to TF, EF2, EF3, EF4 and EF5 coils and their Final Acceptance Tests
				June 2016 (230 BAUA)	RWMPS Approval of First Design Report
				August 2016 (1119 BAUA)	ECPS the approval of the First Design Report
EU.BA.02.05 Cryogenic System	WP	Support for installation and testing of cryoplant in Naka.	Expected total credit to EU: 3186 BAUA	Oct 2016 (3186 BAUA)	Cryogenic System - Acceptance test of Cryogenic System finished

All these outputs contribute to the assembly and commissioning of JT-60SA, in particular of the superconducting magnet power supplies, toroidal field magnet, and cryostat. In addition under this heading F4E staffs supervise/contribute to the commissioning of the European cryogenic plant, TF coil testing, TF coil structural elements and pre-assembly and current lead manufacture.

#### HUMAN RESOURCES ASSIGNED TO THE ACTIVITY

F4E will be supporting this activity during the year 2016 with 9.89 FTE.

#### FINANCING DECISION

<b>Procurement actions</b>	
<p>In line with the objectives indicated above, the main new F4E procurement actions during the year 2016 focus on transportation of components to Japan as well as on-site installation activities and their support. All activities performed at in response to established PAs and AoCs.</p> <p>In addition commitments are foreseen under the budget 2016 for:</p> <ul style="list-style-type: none"> <li>• Additional expenses for the TF magnet Conductor cable jacketing</li> <li>• Opportune procurement of materials, accessories and spare parts and services needed during assembly and integrated commissioning and not provided by voluntary contributors</li> <li>• Magnet Engineering and R&amp;D Supply Including design, R&amp;D and third party inspections</li> <li>• In-Kind contribution to JT60SA integrated commissioning and initial operation</li> </ul>	
<b>Cash contribution</b>	
<b>Scope Description</b>	<b>Amount</b>
EU contribution to the Joint Fund for common expenses relative to Integrated Commissioning and Initial Operation	1,200,000.00 EUR
Power Supply transports reimbursement (Switching Network Units)	133,000.00 EUR
Reimbursement of the transportation of the French contribution of the Superconducting Magnet Power Supply	150,000.00 EUR
Reimbursement of the transportation of the Italian contribution of the Superconducting Magnet Power Supply	320,000.00 EUR

## EU.BA.03 Broader Approach – IFMIF-EVEDA Project

WBS: EU.BA.03	IFMIF-EVEDA Project		WP ref: WP16/BA/03		
<p><b>General Overview</b></p> <p>The aim of the IFMIF/EVEDA Project is to produce an integrated engineering design and develop the technology for a high intensity, high fluence neutron source for fusion. The F4E activities in this project are mainly aimed to ensure the EU contribution to the IFMIF/EVEDA sub-projects, which are:</p> <ul style="list-style-type: none"> <li>• Linear IFMIF Accelerator Prototype (LIPAc): For this sub-project, F4E is coordinating the achievement of the deliverables committed by the EU Voluntary Contributor and is responsible for the transport to Japan of the subsystems manufactured as key elements of the deliverables. In executing this transportation responsibility, F4E has issued and will continue to issue Specific Contracts within an existing Framework Contract for transporting the Injector, the Medium Energy Beam Transport (MEBT) line, the Radiofrequency Quadrupole, the High Energy Beam Transport (HEBT) line and Beam Dump, and the RF power system to Japan. In addition, a contract will be placed for technical; support provided for the assembly of the SRF accelerator stage ("Cryomodule") on site.</li> <li>• Lithium Target Facility: For this far advanced sub-programme, only long time erosion/corrosion experiments in LIFUS6 are still to be conclusively concluded by September 2016. These missing activities are conducted and financed by ENEA as EU Voluntary Contributor. F4E is coordinating the activities between ENEA and the Project Team at Rokkasho. No procurement activities are performed by F4E.</li> <li>• Test Facilities and IFMIF Engineering Design: Both sub-projects have been successfully accomplished in 2015 (Test Facilities) and 2013 (Engineering design), respectively. No more procurement activities are performed by F4E.</li> </ul> <p><b>Current Status</b></p> <p>Till end of 2015, 6 European experts are working at the IFMIF/EVEDA Project Team based on a Secondment Arrangement signed between F4E and JAEA of which 5 Secondment Arrangements are backed by a Back-to-Back Arrangement between F4E and Institutes of the Voluntary Contributors. The sixth expert is the Project Leader and a F4E staff member. Their mission-out-of-Japan are covered by the cash contribution as well as their IT hardware.</p> <p>The F4E part is responsible for the transport of the systems for the Linear IFMIF Prototype Accelerator (LIPAc) from the site of their acceptance tests in Europe to the Japanese port of entry, The injector system and major elements of the RF high power systems. In 2015, also a framework contract was placed with Bureau Veritas Japan to have a F4E On-Site Representative permanently at Rokkasho site starting with deuteron beam operation and the thereby required work in controlled areas.</p> <p>An accelerator expert is contracted for 3 years to provide consultancy for engineering and R&amp;D support during installation of LIPAc components during set-up, assembly and commissioning.</p> <p><b>Challenges for the next year</b></p> <p>Among the LIPAc components to be shipped to Japan in 2016, there are several remaining key elements produced for the RF Power Systems and the Medium Energy Beam Transport as well as the full system for the Radiofrequency Quadrupole and the Cryoplant. The latter transport will be organised by the Voluntary Contributor for the Cryoplant and then costs will be compensated by F4E in the form of cash contributions. Also in 2016, a F4E On-Site Representative will be permanently ensured at Rokkasho site by Bureau Veritas Japan based on specific contracts for the framework contract. The expert will be following up the F4E safety and health aspects and support the technical coordination of the European contributions.</p> <p>The accelerator expert who was contracted in 2015 for 3 years will provide consultancy for engineering and R&amp;D support during installation of LIPAc components explicitly for Radiofrequency Quadrupole installation and commissioning.</p>					
<b>ANNUAL OBJECTIVES</b>					
Milestone ID/ Objectives	Objective type	Scope Description	CAS received	Forecast achievement date	Relevant Deliverables
EU.BA.03.01 IFMIF/EVEDA Project Common Activities	WP	Common activities required to support IFMIF/EVEDA activities, not covered under specific WBS sub-elements of IFMIF/EVEDA.	Expected total credit to EU: 600 BAUA	Dec 2016	Disbursement of the EU share of the common fund and of the common expenses of the Project Team (e.g. missions).
EU.BA.03.02 LIPAc Activities	WP	Part of Delivery of Components of the Linear IFMIF Prototype Accelerator (LIPAc) to Rokkasho, i.e. transportation to Japan	No credits to F4E, Total of credits allocated to Institutes of Voluntary Contributors for	Last Transport: Q4 - 2016	Acceptance Note from JAEA of Transport

		PoE.	Delivery of RF system, RF Quadrupole: 21600 BAUA		
EU.BA.03.02 LIPAc Activities	WP	Installation and commissioning of Linear IFMIF Prototype Accelerator (LIPAc)	Credit for contribution to Installation and Commissioning Phase A: 110 BAUA.	September 2016: 110 BAUA).	Approval of Report on Installation and Commissioning Phase A by Project Leader
EU.BA.03.02 LIPAc Activities	WP	Contribution to Procurement Agreement PA AF04 (Cryomodule of SRF Linac)	Credits for F4E 880 BAUA Total of credits allocated for Delivery and Assembly of Cryomodule of SRF Linac: 3000 BAUA	Call for tender: Q3/2016 Contract signature Q1/2017	Approval of Report on Acceptance and Delivery Report of Cryomodule of SRF Linac by Project Leader
EU.BA.03.01 IFMIF/EVEDA Project Common Activities	WP	Coordination of Work from Designated Institutes of EU Voluntary Contributors to Validation of Lithium Target Facility	No credits to F4E, Total of credits allocated to Institute of Voluntary Contributors for Erosion/corrosion experiments in LIFUS6: 1220 BAUA	September 2016	Approval of reports documenting the Erosion/Corrosion experiments and their results and credit allocation to deliverables (PA LF03)

These outputs contribute mainly to the assembly and commissioning of LIPAc, a major European contribution to the IFMIF/EVEDA project.

#### HUMAN RESOURCES ASSIGNED TO THE ACTIVITY

F4E will be supporting this activity during the year 2016 with 10.79 FTE.

#### FINANCING DECISION

##### Procurement actions

The main procurement actions during the year 2016 focus on LIPAc commissioning and its support in Rokkasho. Expenditures are foreseen under the budget 2016 for:

- Transportation to Japan: Accelerator Facility RF Power System, Radiofrequency Quadrupole, High Energy Beam Transport line & Dump, Medium Energy Beam Transport line.
- On-site-support engineering and health and safety support for LIPAc
- Service contract for the Cryomodule assembly
- Engineering support activities for LIPAc

##### Cash contribution

Scope Description	Amount (Euro)
Cash contribution to IFMIF/EVEDA project to maintain project team common expenses (e.g. missions).and common funds (e.g. repairs).	500,000.00 EUR
Reimbursement of French contribution for the transportation costs for the Cryoplant	120,000.00 EUR

##### Main Procurement initiatives

F4E systems	Type of Contract/ Agreement	Scope description	Time of call	PA reference	In the budget 2016?

IFMIF	P Serv	Cryomodule assembly (IFMIF)	Q3/2016	PA AF10-EU-WP04	Y
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**EU.BA.04 Broader Approach – International Fusion Research Centre**

WBS: EU.BA.04	International Fusion Research Centre	WP ref: WP16/BA/04
<p><b>General Overview</b></p> <p>The IFERC activities include three sub projects - DEMO Design and R&amp;D activities, establishment and operation of a Computer Simulation Centre (CSC), and establishment and operation of a Remote Experimentation Centre (REC):</p> <ul style="list-style-type: none"> <li>Remote Experimentation Centre (REC): F4E is in charge of all procurements needed to deliver the EU in-kind contribution. These include providing software for remote experimentation, overseeing the usage of a cash contribution to Japan for the REC hardware, and testing the systems on an EU Tokamak.</li> <li>Computational Simulation Centre: for this sub-project the task of F4E is to ensure the coordination between the EU Voluntary contributor and the JAEA team. No procurement activities are performed by F4E.</li> <li>DEMO Design and materials R&amp;D: for this sub-project the task of F4E is to ensure the coordination between the EU Voluntary contributors, EUROfusion, and the JAEA team. No procurement activities are performed by F4E.</li> </ul> <p>The detailed list and description of all activities related to the IFERC Project for the year 2016 is contained in the corresponding IFERC WP 2016 recommended by the IFERC Project Committee on 1 October 2015 and to be approved by the BA Steering committee on 2 Dec 2015 (ref BA-IFERC-PC-17.13))</p> <p><b>Current Status</b></p> <p>Currently IFERC projects are mature and in some cases coming to completion. The Computational Simulation Centre (CSC, operating the Helios supercomputer, fully provided by voluntary contribution) will terminate its operation at the end of 2016 It will start its last cycle of projects in November 2015. The DEMO subproject continues under the collaboration with EUROfusion, with a number of DEMO relevant research areas covered by the EUROfusion work packages. The Remote Experimentation Centre (REC) is the only sub-project fully implemented with F4E budget. A series of contracts is planned for developing software enabling the EU users to participate in the JT-60SA. Tests from Rokkasho REC with EU tokamaks are also planned. In summary the current activities are:</p> <ul style="list-style-type: none"> <li>Ad-hoc expenses for site activities and insurance.</li> <li>Remote Experimentation Centre (REC) procurements and further design requirements development.</li> <li>Computational Simulation Centre (CSC) exploitation: Operation, maintenance and minor upgrades of Helios supercomputer</li> <li>DEMO design and materials R&amp;D</li> </ul> <p><b>Challenges for the next year</b></p> <p>In general, for IFERC the challenge for 2016 is to develop an extension of the activities of IFERC until the end of 2019 with a very limited amount of credits, which should support the IFMIF-EVEDA project, and prepare for possible collaborations after the BA period.</p> <p>For the CSC, the challenges are</p> <ul style="list-style-type: none"> <li>to perform the final small upgrade of Helios, consisting in the installation of a small partition of many-core processors, which will complete the first extension performed in 2014; these extensions aim to encourage the CSC users to adapt their codes to the next generation of supercomputers</li> <li>to ensure the orderly termination of CSC operation at the end of 2016, and the recovery of data by users</li> </ul> <p>For the DEMO activities, the challenges are</p> <ul style="list-style-type: none"> <li>to reinforce the collaboration with EUROfusion</li> <li>to merge the materials research activities into the DEMO design planning</li> </ul> <p>For the REC subproject the challenges are</p> <ul style="list-style-type: none"> <li>to place the necessary contracts for the completion of the REC software</li> <li>to follow up the usage of the EU cash contribution to Japan for the provision of the REC hardware.</li> </ul>		
<b>ANNUAL OBJECTIVES</b>		

WBS	Objective type	Scope Description	Achievement criteria/CAS received	Forecast achievement date	Relevant Deliverables Expected results
EU.BA.04.03	WP	Computational Simulation Centre (CSC): Operation, maintenance and upgrades of supercomputer Helios	Expected credit to EU: 6318 BAUA	December 2016 (will complete 97820 BAUA)	Final report of Operation and dismantling 2016
EU.BA.04.04	WP	DEMO Design and materials R&D activities: Develop design rules, databases for DEMO design	Expected total credit to EU: 1000 BAUA	December 2016	Annual reports of activities
EU.BA.04.02	WP	Remote Experimentation Centre: Preparation and establishment of a remote experimentation centre for ITER, to be tested on for example JT-60SA.	Expected total credit to EU: 1560 BAUA	December 2016	Annual reports of activities

These outputs contribute mostly to the development of the REC system in Rokkasho, as well as the operation of the CSC, and the development of design rules and material databases for DEMO.

#### HUMAN RESOURCES ASSIGNED TO THE ACTIVITY

F4E will be supporting this activity during the year 2016 with 5.69 FTE.

#### FINANCING DECISION

##### Procurement actions

The main procurement actions during the year 2016 focus on provision and commissioning of REC components in Japan as well as continued support to CSC.  
During 2016 changes to the ongoing contracts will be implemented through amendments in line with the provisions of the Financial Regulation.

## 5. F4E PROGRAMME MANAGEMENT

### EU.PM.PM – F4E Programme Management

WBS: EU.PM.PM	F4E Programme Management	WP ref: WP16/PM/02
<p><b><u>PROGRAMME MANAGEMENT</u></b></p> <p><b><u>General Overview</u></b>            The overall objectives consist in support to the organization and to the Units in three main domains: Operational Budget, Project Control and Programme Management.            As for the operational budget the activities concern mainly the preparation of the budget and its management and reporting according to the needs of the units, the liaison with the stakeholders for the provision of the funds and with ITER IO for the provision of the EU cash contribution.            The Project Control activities cover the needs in the areas of planning, reporting, costing and risk. Support is provided in all these areas to the Units with interfaces to the ITER Organization as it is required by the work. Both reporting and risk activities span also over the whole organization to ensure a correct monitoring of the work and tracking of milestones and actions.            As for Programme Management, the activities concern the preparation and the support to the Units in the implementation of the work programme and in the administrative tracking of ITER Task Agreements (ITA) and Procurement Arrangements (PA), the preparation and update of the internal project plan, the liaison with Japan concerning the EU cash contributions and the support to the Units on dual use (export control) topics.            Task orders of existing framework contracts are placed in support of activities in these areas. Also in the year of reference the activities will be focussed on providing such kind of support.            In addition the WBS EU.PM.PM covers as well the operational expenditures of administrative nature.</p> <p><b><u>Current Status</u></b>            As for the planning, a realistic project schedule was developed with ITER IO-CT to be presented for approval at the ITER Council in November 2015. An Estimate cost at completion (EAC) was developed at WBS Level 6 (contracts) including the identification of specific cost risks.            The technical risk logs were migrated to the Oracle environment and linked to the Primavera activities.            As for the dual use activities, the execution of a specific contract with an external company has allowed to progress on the definition of the Internal Compliance Programme. In 2015 the dual use tracker (IT tool) has been deployed to support the process.            Routine activities have been carried out in all areas (i.e. operational budget, project control and programme management) to make sure that the right support is granted and the required monitoring is provided.</p> <p><b><u>Challenges for the next year</u></b>            Main focus will be the planning activities following the agreement on a new reference schedule, expected for November 2015 and following the results of the Straight Road to First Plasma exercise in April 2016, the maintenance and update of the costing (both baseline at WBS L4 level and Estimate at Completion at WBS L6 level (contracts), the further improvement of the risk registers in all project areas through the link to the activities in Primavera, the increase in the number of standard reports available to the organization, the revision of existing process aiming at updating and simplifying them, the implementation of the Internal Compliance Programme for export control.</p> <p><b><u>OTHER EXPENDITURES – INFORMATION AND COMMUNICATION TECHNOLOGY</u></b></p> <p><b><u>General Overview</u></b>            Provision of ICT support (hardware, software and services) for the specific benefit of ITER Project.</p> <p><b><u>Current Status</u></b>            ICT Support for the ITER Project during 2015 covered the following areas:</p> <ul style="list-style-type: none"> <li>- EDM/PLM</li> <li>- Engineering Software provisioning</li> <li>- Primavera developments and maintenance</li> <li>- Provision of specific hardware (workstations)</li> </ul>		

ANNUAL OBJECTIVES			
<b><u>PROGRAMME MANAGEMENT</u></b>			
Area	Scope Description		
Risk management	<b>Improve risk management for specific in-kind procurements</b> Assistance of skilled risk management support staff will be provided to specific Project Teams in the same way it was already done for the buildings.		
Scheduling	<b>Scheduling support to PTs</b> Planning activities in specific areas following both F4E and IO-CT guidelines.		
Reporting	<b>Consultancy and support in the management of data through reporting system and specific applications.</b> Data maintenance and ad-hoc developments to improve the reporting data management. Ad-hoc reports to be provided regularly to stakeholders.		
Processes	<b>Update of existing and development of existing process in the budget and project control environments.</b> Review of existing processes and/or development of new ones in line with the F4E needs and for update of the F4E Manual.		
Export Control	<b>Implementation and follow-up of the Internal Compliance Programme</b>		
Programmatic Documents and Reports	<b>Preparation of the programmatic documents as foreseen by the Financial Regulation and F4E Statutes and preparation of ad-hoc reports</b>		
Budget	<b>Preparation and Monitoring of the Budget.</b> Follow-up and reporting according to the needs of the organization.		
Cost	<b>Cost Monitoring and Cost Containment activities</b> Follow-up and reporting of cost evolution with maintenance of data including cost risks		
<b><u>INFORMATION AND COMMUNICATION TECHNOLOGY</u></b>			
The main objectives of the year is to place the following task orders:			
Objective	Scope Description	CAS received/Achievement criteria	Forecast achievement date
EDM/PLM	Maintenance and development of F4E SmarTeam platform	Developments according to plans, maintenance contracts in place	Along 2016
Software licenses provisioning and maintenance	Provision of software licenses for engineering software packages	Needed number of licenses available, maintenance contracts in place	Along 2016
Project management platform support	Support for primavera platform, maintenance and further developments	Developments according to plans, platform updated according to plans	Along 2016
Workstations	Provision of specialised computer platforms	Hardware provided according to plans	Along 2016
HUMAN RESOURCES ASSIGNED TO THE ACTIVITY			
F4E will be supporting this activity during the year 2016 with 21.04 FTE.			
FINANCING DECISION			
Procurement actions			
<b><u>Programme Management</u></b>			
Transversal support to all teams on project management topics, such as planning, costing, risk, reporting, process development,			



support on export control. These activities will be mainly implemented through specific contracts under existing framework contracts (see section 6.4 for the list of main framework contracts that will be on-going in 2016).

#### **Other Expenditures**

In 2016 F4E will need specialist support from economic operators (by means of service contracts) for operational needs: this will include (where appropriate) legal and commercial services, including adjudicators of on-going contracts and provision to cover the Chairman and advisors fees in case of lost disputes in front of the adjudication Panel. Provision in this sense is included in the budget for 2016. In 2016, F4E may need specific external legal advice with regards to complex dispute resolutions (including mediation, adjudication or litigation) and other ad hoc specific legally complex matters.

F4E has issued calls for expressions of interest for individual experts to provide technical assistance in a number of specific areas related to ITER and the Broader Approach. Provision is included in the budget for a total equivalent of approximately 4000 expert man-days in 2016.

A general provision is included in 2016 for the consultancy service for participation to specific ITER/F4E committees and support/advice to F4E Management. Provisions for financial audit for the on-going contracts are included under the same budget title.

The performance of operational technical activities requires provisions for storage/shipment/use and access to specific software, technology, hardware and items (inter alia for CAD design, planning, configuration management and reporting tools, engineering analysis codes and technical material/safety items). Provisions for supply, licenses, development, installation, maintenance and training are included under the budget title 3.4

The close follow-up of the ongoing manufacturing contracts require F4E staff to stay at supplier's premises or facilities for long periods. Provisions for expenditures incurred for the long-term mission are included under the budget title 3.4.

## 6. ANNEXES

## 6.1. ANNEX I - 2016 Work Programme Budget Summary

Budget line	Title	Commitment appropriation (Euro)		
		Original 2016 Work Programme (December 2015)	1st Amended WP2016 (written procedure February 2016)	2nd Amended WP2016 (June 2016)
3.1	ITER construction including site preparation	255 632 138.01	255 357 138.01	255 217 138.01
3.2	Technology for ITER	11 500 000.00	11 500 000.00	9 900 000.00
3.3	Technology for Broader Approach & DEMO	6 708 000.00	6 983 000.00	8 723 000.00
3.4	Other Expenditures	4 500 000.00	4 500 000.00	4 500 000.00
3.5	Appropriation from the ITER Host State contribution	130 000 000.00	130 000 000.00	130 000 000.00
Total Title III of the Budget 2016		<b>408 340 138.01</b>	<b>408 340 138.01</b>	<b>408 340 138.01</b>
3.1+3.5	Recovery orders for unduly paid amounts	0.00	0.00	114 144.66
3.5	Host State contribution carried over from previous year	0.00	0.00	13 436 039.03
3.6	Additional revenue from the Implementation of the Reserve Fund Allocation scheme with ITER Organization	0.00	p.m.	p.m.
Total amount available for the operational expenditure		<b>408 340 138.01</b>	<b>408 340 138.01</b>	<b>421 890 321.70</b>

Commitment appropriation (Euro)										
Budget line	Title	Original 2016 Work Programme (December 2015)			1st Amended WP2016 (written procedure February 2016)			2nd Amended WP2016 (June 2016)		
		Grants	Procurement	Cash	Grants	Procurement	Cash	Grants	Procurement	Cash
3 1+3 5	Expenditure in support of ITER Project credited by IO (Multiple WBS)	33 800 000.00	149 342 138.01		33 800 000.00	148 717 138.01		11 500 000.00	109 147 321.70	
3 1+3 5	Contribution in cash in support of ITER (EU.01.CC)			166 640 000.00			166 640 000.00			172 610 000.00
3 1+3 5	Contribution in cash to Japan (EU.01.CC)			25 650 000.00			25 650 000.00			3 910 000.00
3 1+3 5	Contribution for Site Agreement (EU.01.62)			3 500 000.00			3 500 000.00			4 100 000.00
3.1+3.5	Contribution for PF6 Manufacturing Contract in China (EU.01.11)			100 000.00			450 000.00			450 000.00
3 1+3 5	Contribution in cash on NBTF Agreement (EU.01.53)			6 600 000.00			6 600 000.00			1 650 000.00
3.1+3.5	Transfer the procurement responsibility for the delivery of VV Sectors 7 and 8 from Euratom to the ITER Organisation									95 400 000.00
3.1+3.5	<b>Subtotals</b>	<b>33 800 000.00</b>	<b>149 342 138.01</b>	<b>202 490 000.00</b>	<b>33 800 000.00</b>	<b>148 717 138.01</b>	<b>202 840 000.00</b>	<b>11 500 000.00</b>	<b>109 147 321.70</b>	<b>278 120 000.00</b>
3 1+3 5	<b>Total ITER Construction</b>		<b>385 632 138.01</b>			<b>385 357 138.01</b>			<b>398 767 321.70</b>	

Commitment appropriation (Euro)										
Budget line	Title	Original 2016 Work Programme (December 2015)			1st Amended WP2016 (written procedure February 2016)			2nd Amended WP2016 (June 2016)		
		Grants	Procurement	Cash	Grants	Procurement	Cash	Grants	Procurement	Cash
3 2	Design and R&D in support of ITER, not credited	4 200 000.00	5 500 000.00		4 200 000.00	5 500 000.00		1 000 000.00	3 500 000.00	
3 2	Contribution in cash on NBTF Agreement (EU.01.53)			1 800 000.00			1 800 000.00			5 400 000.00
3.2	<b>Subtotals</b>	<b>4 200 000.00</b>	<b>5 500 000.00</b>	<b>1 800 000.00</b>	<b>4 200 000.00</b>	<b>5 500 000.00</b>	<b>1 800 000.00</b>	<b>1 000 000.00</b>	<b>3 500 000.00</b>	<b>5 400 000.00</b>
3 2	<b>Total Technology for ITER</b>		<b>11 500 000.00</b>			<b>11 500 000.00</b>			<b>9 900 000.00</b>	

## Commitment appropriation (Euro)

Budget line	Title	Original 2016 Work Programme (December 2015)			1st Amended WP2016 (written procedure February 2016)			2nd Amended WP2016 (June 2016)		
		Grants	Procurement	Cash	Grants	Procurement	Cash	Grants	Procurement	Cash
3 3	Expenditure in support of Broader Approach (EU.BA)		5 000 000.00			5 000 000.00			6 300 000.00	
3.3	Cash Contribution to JT-60SA project (EU.BA.02)			1 483 000.00			1 483 000.00			1 803 000.00
3 3	Cash contribution to IFMIF/EVEDA project (EU.BA.03)			225 000.00			500 000.00			620 000.00
	<b>Subtotals</b>	<i>0.00</i>	<i>5 000 000.00</i>	<i>1 708 000.00</i>	<i>0.00</i>	<i>5 000 000.00</i>	<i>1 983 000.00</i>	<i>0.00</i>	<i>6 300 000.00</i>	<i>2 423 000.00</i>
<b>3 3</b>	<b>Total Technology for Broader Approach and DEMO</b>	<b>6 708 000.00</b>			<b>6 983 000.00</b>			<b>8 723 000.00</b>		
3 4	Other Expenditure (EU.PM.PM)		4 500 000.00			4 500 000.00			4 500 000.00	
3.4	<b>Subtotals</b>	<i>0.00</i>	<i>4 500 000.00</i>	<i>0.00</i>	<i>0.00</i>	<i>4 500 000.00</i>	<i>0.00</i>	<i>0.00</i>	<i>4 500 000.00</i>	<i>0.00</i>
<b>3 4</b>	<b>Total Other Expenditure</b>	<b>4 500 000.00</b>			<b>4 500 000.00</b>			<b>4 500 000.00</b>		
3.6	Additional revenue from the Implementation of the Reserve Found Allocation scheme with ITER Organization		p.m.			p.m.			p.m.	
	<b>Subtotals</b>	<i>p.m.</i>			<i>p.m.</i>			<i>p.m.</i>		
<b>3.6</b>	<b>Total for Additional Revenue for the RF with ITER IO</b>	<i>p.m.</i>			<i>p.m.</i>			<i>p.m.</i>		
<b>3</b>	<b>Total expenditure by type</b>	<i>38 000 000.00</i>	<i>164 342 138.01</i>	<i>205 998 000.00</i>	<i>38 000 000.00</i>	<i>163 717 138.01</i>	<i>206 623 000.00</i>	<i>12 500 000.00</i>	<i>123 447 321.70</i>	<i>285 943 000.00</i>
<b>3</b>	<b>Total Operational Expenditure</b>	<b>408 340 138.01</b>			<b>408 340 138.01+p.m.</b>			<b>421 890 321.70+p.m.</b>		

Notes

- Figures corresponding to items to be credited by IO through ITA are provisional, and are based on the present understanding of the share of work to be assigned to F4E by IO with yearly planned ITAs (not competed) or through competitive procedures (competed ITAs).
- Following the evaluation of the proposals and updates on the cash contributions, the final budget repartition may vary by up to 10% of the specified budget figures in the table above.

## 6.2. ANNEX II - Essential selection and award criteria for Grants

With regard to grant actions referred to in this work programme, the essential selection and award criteria are:

### **Essential Selection Criteria**

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

### **Essential Award Criteria**

- Relevance and quality of the proposal with regard to the objectives and priorities set out in this work programme and in the relevant call for proposals.
- Effectiveness of the implementation as well as of the management structure and procedures in relation to the proposed action.
- Cost-effectiveness and sound financial management, specifically with regard to F4E's needs and objectives and the expected results.

With regard to the specific action, more details will be provided in the call for proposals. Thresholds and weighting for the essential and additional award criteria will also be indicated in the call for proposals.

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

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

### 6.3. ANNEX III - Upper funding limits for Grants

With the entry into force of the recast F4E Financial Regulation and Implementing Rules on 1<sup>st</sup> January 2016, the following upper funding limits apply for grants:

1. Research, technological development and demonstration activities	40%
2. Purchase/manufacturing of durable equipment or assets and of ancillary services approved by the Joint Undertaking as necessary to carry out such activities	100%
3. Coordination and support actions, including studies	100%
4. Management activities, including certificates on the financial statements, and other activities not covered by paragraphs 1 and 2	100%

#### 6.4. ANNEX IV - List of Framework Contracts and Framework Partnership Agreements

List of General Support Framework contracts expected to be ongoing at the end of 2015; specific contracts and grants can be implemented in different WBSs level 2 as needed by the project.

WBS level 2	F4E-Work Programme year	F4E-WPref	Contract type	FWC/FPA scope	Procurement Contract Code
EU.01.15	WP15	WP14/15/04	FwC	Quality Assurance Audits	F4E-OMF-557-01
EU.01.ES	WP12	WP11/ES/07	FwC	CAD Design Support - General Mechanical Design	F4E-OMF-357-01
EU.01.ES	WP12	WP12/45/02	FwC	Provision of Instrumentation and Control Integration Services	F4E-OFC-361
EU.01.ES	WP12	WP12/ES/05	FwC	Engineering Support in the area of Mechanical Analysis for the Vacuum Vessel	F4E-OMF-356
EU.01.ES	WP13	WP13/ES/02	FwC	Mechanical analyses of ITER components	F4E-OMF-0457
EU.01.ES	WP13	WP13/ES/03	FwC	Metrological Support Services	F4E-OMF-468
EU.01.ES	WP14	WP13/ES/01	FwC	Provisions of Engineering Support in the Area of Electromagnetic and Electro-Mechanical Analysis	F4E-OMF-0508
EU.01.ES	WP14	WP12/ES/08	FwC	Provision of Support in the Area of Nuclear Analysis	F4E-OMF-466
EU.01.ES	WP14	WP14/ES/10	FwC	Engineering Analysis in the Area of Thermo- Hydraulic and Fluid dynamic Analyses	F4E-OMF-0578
EU.01.ES	WP14	WP12/ES/01	FwC	Seismic Analyses of IO Buildings and Mechanical Components	F4E-OMF-0503-01
EU.01.ES	WP14	WP12/ES/01	FwC	Dynamic Analyses of IO Buildings and Mechanical Components.	F4E-OMF-0503-02
EU.01.ES	WP14	WP12/ES/01	FwC	Structural Analyses of IO Buildings and Mechanical Components	F4E-OMF-0503-03
EU.01.ES	WP15	WP15/IC/03	FWC	Provision of system, instrumentation and control engineering support - Conventional Instrumentation and Control (I&C)	F4E-OFC-620-01
EU.01.ES	WP15	WP15/IC/03	FWC	Provision of system, instrumentation and control engineering support - Nuclear Instrumentation and Control (I&C)	F4E-OFC-620-02
EU.01.ES	WP15	WP15/ES/06	FwC	Provision of CAD Design Support - General Mechanical Design	Not yet available
EU.01.ES	WP15	WP15/ES/05	FwC	Provision of Schematic CAD Design Support Services	F4E-OMF-0641-01
EU.01.ES	WP16	WP16/ES/01	FWC	Support in the Area of Integration, Operation, Maintenance	F4E-OPE-0707
EU.01.MF	WP11	WP11/MF/04	FwC	Engineering Support on Joining and Non-destructive tests for production of ITER Components	F4E-2010-OPE-149
EU.01.MF	WP14	WP14/MF/08	FwC	Material Characterization at Cryogenic Temperatures	F4E-OMF-0563



EU.01.MF	WP14	WP14/MF/07	FwC	Provision of Engineering Support on Joining and Non-destructive test for production of ITER Components	F4E-OMF-0586
EU.01.MF	WP15	WP15/MF/01	FwC	Provisions for Destructive and Non-Destructive Testing of Materials at Room and Elevated Temperature	F4E-OFC-0618
EU.01.NS	WP15	WP15/SF/02	FwC	Engineering Support Services in the Area of Compliance with ITER Safety Requirements	Not yet available
EU.01.PM	WP11	WP11/PO/13	FwC	Provision of Planning & Scheduling Support Services	F4E-OFC-252
EU.01.PM	WP13	WP13/PO/15	FwC	Project Management Services Lot 2 - Configuration Management & System Engineering	F4E-OMF-436-02
EU.01.PM	WP13	WP13/PO/15	FwC	Project Management Services Lot 3 - Project Management Systems	F4E-OMF-436-03
EU.01.PM	WP13	WP13/PO/15	FwC	Provision of Project Management Services Lot 4 - Cost Management Support	F4E-OMF-436-04
EU.01.PM	WP13	WP13/PO/16	FwC	Project Management Services Lot 5 - CE Marking Support	F4E-OMF-436-05
EU.01.PM	WP14	WP14/PO/17	FwC	Provision of Project Management Services Lot 1 – Risk	F4E-OMF-436-01
EU.01.PM	WP14	WP14/PO/18	FwC	Support on Planning & Scheduling	F4E-OMF-556
EU.01.PM	WP14	WP13/PO/06	FwC	Dual Use Management Support	F4E-OMF-555
EU.AD.02	WP14	N/A	FwC	Provision of Legal Services in the Field of Industrial Contracting	F4E-ADM-363

List of Framework Contracts and Framework Partnership Agreements that will be on-going at the end of 2015 by specific areas. Specific contract/Grants will be implemented during the year 2016 using these contracts:

#### Magnets:

WBS level 2	F4E-Work Programme year	F4E-WPref	Contract type	FWC/FPA scope	Procurement Code
EU.01.11	N/A	N/A	FwC	Strand characterization of TF Nb3Sn samples	F4E-OPE-145-01 (MS-MG)
EU.01.11	WP14	WP13/11/04	FwC	Framework Contract for Testing and Characterization of PF conductor strands	F4E-OMF-405

#### Vacuum Vessel:

WBS level 2	F4E-Work Programme year	F4E-WPref	Contract type	FWC/FPA scope	Procurement Code
EU.01.15	WP15	WP14/15/04	FwC	Vacuum Vessel Inspectors	F4E-OMF-557-02

**Remote Handling:**

WBS level 2	F4E-Work Programme year	F4E-WPref	Contract type	FWC/FPA scope	Procurement Code
EU.01.23	WP14	WP11/23/02	FWC	Procurement activities related to DIV RH	F4E-OMF-340-01
EU.01.23	WP15	WP15/23/01	FwC	FWC for Engineering Support Contracts for RH Engineering Studies	F4E-OMF-0633
EU.01.23	WP15	WP11/23/06	FwC	Design, manufacturing and Installation of Neutral Beam Remote Handling System	F4E-OMF-340-03
EU.01.23	WP16	WP11/23/04	FwC	Design, manufacturing and Installation for Cask and Plug Remote Handling System	F4E-OMF-0577
EU.01.57	WP15	WP11/23/08	FwC	Design, manufacturing and Installation of In Vessel Viewing System	F4E-OMF-383

**ICH Antenna:**

WBS level 2	F4E-Work Programme year	F4E-WPref	Contract type	FWC/FPA scope	Procurement Code
EU.01.51	WP13	WP11/51/02	FwC	Development of Build to print design of the ICH Antenna	F4E-OPE-0484

**Electron Cyclotron Upper launcher:**

WBS level 2	F4E-Work Programme year	F4E-WPref	Contract type	FWC/FPA scope	Procurement Code
EU.01.52	WP15	WP15/52/01	FwC	Contract for Support for design of cooling systems	F4E-OFC-0569
EU.01.52	WP16	WP16/52/01	FWC	Procurement of Mechanical Prototypes for the EC UL	Not yet available
EU.01.52	WP16	WP16/52/01	FWC	Nuclear safety, analysis and engineering verification	Not yet available

**Electron Cyclotron Control System:**

WBS level 2	F4E-Work Programme year	F4E-WPref	Contract type	FWC/FPA scope	Procurement Code
EU.01.52	WP15	WP15/52/10	FWC	EC Operation and Control	Not yet available

**Electron Cyclotron Power Sources and Supplies:**

WBS level 2	F4E-Work Programme year	F4E-WPref	Contract type	FWC/FPA scope	Procurement Code
EU.01.52	WP16	WP16/52/01	FWC	Set up of an Electron Cyclotron Launcher components test facility, ECT – FALCON (Electron Cyclotron Test Facility Launcher COmpoNents), operation and execution of tests	F4E-OFC-0671

**Neutral Beam:**

WBS level 2	F4E-Work Programme year	F4E-WPref	Contract type	FWC/FPA scope	Procurement Code
EU.01.53	WP14	WP11/53/08	FwC	FWC Neutral Beam Test Facility Control, Interlock and Safety	F4E-OFC-280 ( PMS-H-CD )
EU.01.53	WP14	WP11/53/09	FwC	FWC Procurement of Neutral Beam Test Facility Diagnostics	F4E-OFC-531 ( PMS-H-CD )
EU.01.53	WP15	WP12/53/06	FwC	FWC Procurement of NBTF Assembly	F4E-OFC-582
EU.01.53	WP15	WP15/53/03	FWC	Engineering, consultancy and legal services, mainly related to work on the	F4E-OMF-660-01
EU.01.53	WP15	WP15/53/03	FWC	Services for Static Tests and Inspection "Collaudo"	Not yet available

**Diagnostics:**

WBS level 2	F4E-Work Programme year	F4E-WPref	Contract type	FWC/FPA scope	Procurement Code
EU.01.55	WP11	WP11/55/01	FPA	Radial Neutron Camera R&D/Design - Phase 1	F4E-FPA-327
EU.01.55	WP11	WP11/55/11	FPA	Design and R&D for Pressure Gauges	F4E-FPA-364
EU.01.55	WP12	WP11/55/01	FPA	Tokamak Services R&D/Design	F4E-FPA-328
EU.01.55	WP13	WP11/55/10	FwC	Irradiation Testing - Lot #1	F4E-OFC-358 -01
EU.01.55	WP13	WP11/55/10	FwC	Irradiation Testing - Lot #2	F4E-OFC-358-02
EU.01.55	WP13	WP13/55/01	FPA	Equatorial Visible/IR Wide-Angle Viewing System	F4E- F4E-FPA-407
EU.01.55	WP13	WP13/55/01	FPA	Design and R&D for Low Field Side Collective Thomson Scattering	F4E-FPA-393
EU.01.55	WP13	WP13/55/01	FPA	Design and R&D for Plasma Position Reflectometry	F4E-FPA-375
EU.01.55	WP13	WP13/55/01	FPA	Design and R&D for Bolometers - Phase 1	F4E-FPA-384
EU.01.55	WP14	WP14/55/05	FPA	Phase 1 of Core-Plasma Charge Exch. Recombination Spectrometer	F4E-FPA-408
EU.01.55	WP14	WP12/55/11	FwC	FWC Integration Design of Diagnostics Into ITER Ports	F4E-OFC-433 (PMS-DG)
EU.01.55	WP16	WP16/55/01	FWC	Support on the production of diagnostics build-to print Design specifications and industrial Expertise	F4E-OFC-0666

**Test Blanket Modules:**

WBS level 2	F4E-Work Programme year	F4E-WPref	Contract type	FWC/FPA scope	Procurement Code
EU.01.56	WP11	WP11/56/03	FPA	R&D in support to the finalization of the TBM Systems conceptual design	F4E-FPA-380-02
EU.01.56	WP11	WP11/56/03	FPA	R&D in support of ancillary systems conceptual design	F4E-FPA-380-01
EU.01.56	WP11	WP11/56/03	FPA	Project Management for Qualification of Functional Materials for Test Blanket Module	F4E-FPA-380-03
EU.01.56	WP11	WP11/56/07	FPA	Experimental Activities in support of the design of HCLL and HCP	F4E-FPA -372
EU.01.56	WP11	WP11/56/11	FwC	Conceptual & Preliminary Design of TBMs set and analyses	F4E-OMF-331-01
EU.01.56	WP11	WP11/56/11	FwC	Conceptual & Preliminary design of TBS ancillary systems	F4E-OMF-331-02
EU.01.56	WP11	WP11/56/11	FwC	Conceptual & Preliminary Design of Maintenance Equipments	F4E-OMF-331-03
EU.01.56	WP11	WP11/56/11	FwC	Test Blanket Systems safety analyses	F4E-OMF-331-04
EU.01.56	WP11	WP11/56/11	FwC	Preliminary Welding Procedure Specifications for TBM box	F4E-OMF-331-05
EU.01.56	WP14	WP13/56/02	FwC	Support from Notified Body for TBS	F4E-OMF-545
EU.01.56	WP15	WP12/MD/01	FPA	FPA TBM design methodologies and design code - Development Phase	F4E-FPA-603-01
EU.01.56	WP15	WP13/MD/06	FPA	FPA TBM structural materials characterization	F4E-FPA-603-02
EU.01.56	WP15	WP15/56/03	FwC	Continuation of Handling & Storage of EUROFER	F4E-OFC-637
EU.01.56	WP15	WP12/56/07	FPA	Development of simulation tools for the exploitation of the HCLL and HCPB TBS operation in ITER: Action 1- thermo-hydraulics/MHD/chemistry of Pb-16Li and tritium transport in solid, liquid, gases and interfaces	F4E-FPA-611-01
EU.01.56	WP15	WP12/56/07	FPA	Development of simulation tools for the exploitation of the HCLL and HCPB TBS	F4E-FPA-611-02

**Radiological and Environmental Monitoring System:**

WBS level 2	F4E-Work Programme year	F4E-WPref	Contract type	FWC/FPA scope	Procurement Code
EU.01.66	N/A	N/A	FwC	ESS in the area of Compliance with ITER Safety Requirements	F4E-OMF-298-01
EU.01.66	N/A	N/A	FwC	ESS in the area of Radiological and Environmental Monitoring System	F4E-OMF-29802
EU.01.66	N/A	N/A	FwC	ESS in the area of Compliance with ITER Safety Requirements	F4E-OMF-298.03

**Plasma Engineering:**

WBS level 2	F4E-Work Programme year	F4E-WPref	Contract type	FWC/FPA scope	Procurement Code
EU.01.PE	WP15	WP13/PE/09	FwC	Engineering Support for Plasma Engineering and Antennas	Not yet available
EU.01.PE	WP16	WP16/PE/01	FwC	FwC Signed for Engineering Support to PE and Antennas	Not yet available

**Nuclear data:**

WBS level 2	F4E-Work Programme year	F4E-WPref	Contract type	FWC/FPA scope	Procurement Code
EU.01.ES	WP12	WP12/ND/01	FPA	Nuclear Data Experiments and Measurement Techniques	F4E-FPA-393
EU.01.ES	WP12	WP12/ND/01	FPA	Nuclear Data Experiments and Measurement Techniques	F4E-FPA-395
EU.01.ES	WP15	WP15/ND/01	FPA	Development of Nuclear Data Files (2015-2019)	Not yet available
EU.01.ES	WP16	WP16/ES/01	FPA	Summary - Execution of FPA GRT-TBD Development of Nuclear Data Files (2015-2019)	Not yet available

**Broader Approach:**

WBS level 2	F4E-Work Programme year	F4E-WPref	Contract type	FWC/FPA scope	Procurement Code
EU.BA.01	WP12	WP12/BA/06	FwC	Transport for Broader Approach	F4E-OMF-451
EU.BA.01	WP14	WP14/BA/16	FwC	Engineering and Safety Support for onsite activities	F4E-OMF-0608

### 6.5. ANNEX V - Mapping of Organisational Breakdown Structure (OBS – F4E Teams/Units) and WBS level 3

F4E UNIT	WBS REF. (LEVEL 3)	WBS NAME (LEVEL 3)	
Magnets (MG)	EU.01.11.01	Toroidal Field Coils	
	EU.01.11.02	Pre Compression Rings	
	EU.01.11.03	Pooidal Field Coils	
	EU.01.11.04	Magnet Conductors	
Vacuum Vessel (VV)	EU.01.15.01	Main Vessel	
In Vessel (IV)	EU.01.15.02	Blanket Manifolds	
	EU.01.16.01	Blanket and First Wall Panels	
	EU.01.17.01	Divertor Cassette Body and Assembly	
	EU.01.17.02	Divertor Vertical Target	
	EU.01.17.03	Divertor Rails	
Remote Handling (RH)	EU.01.23.01	Remote Handling Common Activities	
	EU.01.23.02	Divertor Remote Handling System	
	EU.01.23.03	Cask and Plug Remote Handling System	
	EU.01.23.05	Neutral Beam Remote Handling System	
	EU.01.57.01.	Remote Handling In Vessel Viewing System	
Cryoplant and Fuel Cycle (CF)	EU.01.31.01	Cryopumps	
	EU.01.31.02	Leak Detection and Localization System	
	EU.01.32.01	Hydrogen Isotope Separation System	
	EU.01.32.02	Water Detritiation System	
	EU.01.34.01	Liquid Nitrogen Plant and Auxiliary Systems	
	EU.01.64.01	Radiological and Environmental Monitoring System	
	EU.01.66.01	Radiological and Conventional Waste Treatment and Storage	
Antennas and Plasma Engineering (PE)	EU.01.51.01	Ion Cyclotron Antenna	
	EU.01.52.01	Electron Cyclotron Upper Launcher	
	EU.01.52.05	Electron Cyclotron Control System	
	EU.01.PE.01	Plasma Engineering	
	EU.01.PE.02	Plasma Control System	
Neutral Beam and EC Power Supplies and Sources (NB)	EU.01.52.02	Electron Cyclotron Gyrotrons	
	EU.01.52.03	Electron Cyclotron Power Supplies	
	EU.01.53.01	Neutral Beam Assembly and Testing	
	EU.01.53.02	Neutral Beam Source and High Voltage Bushing	
	EU.01.53.03	Beamline Components	
	EU.01.53.04	Pressure Vessel and Magnetic Shielding	
	EU.01.53.05	Active Correction and Compensation Coils	
	EU.01.53.06	Neutral Beam Power Supplies	
	EU.01.53.07	Neutral Beam Test Facility	
EU.01.53.08	Neutral Beam Common Activities		
Diagnostics (DG)	EU.01.55.01	Magnetics	
	EU.01.55.02	Bolometers	
	EU.01.55.03	Plasma Position Reflectometry	
	EU.01.55.04	Pressure Gauges	
	EU.01.55.06	Tokamak Services	
	EU.01.55.07	Radial Neutron Camera - Gamma Spectrometer	
	EU.01.55.08	High Resolution Neutron Spectrometer	
	EU.01.55.09	Core-plasma Thomson Scattering	
	EU.01.55.10	Low Field Side Collective Thomson Scattering	
	EU.01.55.11	Core-Plasma Charge Exchange Recombination Spectrometer	
	EU.01.55.13	Equatorial Visible/Infrared Wide-Angle Viewing System	
	EU.01.55.14	Port Engineering Systems	
	EU.01.55.15	Diagnostics Common Activities	
	TBM and Materials Development (TB)	EU.01.56.01	European Test Blanket System Arrangement
		EU.01.56.02	Test Blanket Systems Research & Development
Site and Buildings and Power Supplies (SB)	EU.01.41.01	Electrical Power Distribution System	

	EU.01.62.02	Buildings and Civil Infrastructures
Technical Support Services (TS)	EU.01.ES.01	Engineering Support and Integration
	EU.01.ES.02	Engineering Analysis and Nuclear Data
	EU.01.ES.03	Embedded Control Data Access and Communication
	EU.01.MF.01	Materials and Fabrication Technologies
	EU.01.PM.11	Assembly Coordination
Planning and Monitoring (PM)	EU.01.TR	Transportation
	EU.01.CC.01	Cash Contributions to ITER Organization
	EU.01.CC.02	Cash Contributions to Japan Domestic Agency
	EU.PM.PM.02	Risk Management
	EU.PM.PM.03	Planning and Scheduling
	EU.PM.PM.04	Project Management
Technical Process Integration (TP)	EU.PM.PM.09	Other Expenditures
	EU.01.PM.03	Technical Integration
	EU.01.PM.05	Systems Engineering
Nuclear Safety and Quality (NS)	EU.01.PM.06	Configuration Management
	EU.01.PM.01	Programme Management -Quality Assurance
Broader Approach Common (BA)	EU.01.PM.04	Programme Management – CE Marking
	EU.01.NS.01	Nuclear Safety
	EU.BA.01.01	Transportation
	EU.BA.01.02	On site activities
Satellite Tokamak JT-60SA (JT)	EU.BA.01.03	PA Monitoring
	EU.BA.01.04	Legal Costs
	EU.BA.02.01	Satellite Tokamak (JT-60SA) Common Activities
	EU.BA.02.02	Toroidal Field Magnet
	EU.BA.02.03	Assembly
	EU.BA.02.04	Power Supply
	EU.BA.02.05	Cryogenic System
EU.BA.02.06	Materials	
IFMIF (IF)	EU.BA.02.07	Cryostat
	EU.BA.03.01	IFMIF-EVEDA Project Common Activities
IFERC (BA)	EU.BA.03.02	LIPAc Activities
	EU.BA.04.01	International Fusion Energy Research Centre Common Activities
	EU.BA.04.02	Remote Experimentation Centre
	EU.BA.04.03	Computational Simulation Centre
Legal Service (LS)	EU.BA.04.04	DEMO Design
	EU.PM.PM.09.95	Additional Operational Expenditure-Legal Specific Contractual Support
Information and Communication Technology (ICT)	EU.PM.PM.09.93	Additional Operational Expenditures-ICT
Corporate Services (CS)	EU.PM.PM.09.92	Additional Operational Expenditures-Corporate Service Unit

Different supporting teams could be responsible of lower levels of WBSs.

## 6.6. ANNEX VI - Mapping F4E WBS Level 2 vs. ITER IO WBS Level 3

F4E WBS L2 Code	F4E WBS L2 Name	F4E WBS L3 Code	F4E WBS L3 Name	IO WBS Code	IO WBS Name
EU.01.11	Magnets	EU.01.11.01	Toroidal Field Coils	00.01.01.02.02	TF Coils
		EU.01.11.02	Pre Compression Rings	00.01.01.02.02	TF Coils
		EU.01.11.03	Poloidal Field Coils	00.01.01.02.03	PF Coils
		EU.01.11.04	Magnet Conductors	00.01.01.02.08	Superconductor Systems and Auxiliaries
EU.01.15	Vacuum Vessel	EU.01.15.01	Main Vessel	00.01.01.03.02	Main Vessel & Supporting Systems
		EU.01.15.02	Blanket Manifolds	00.01.01.06.02	Blanket
EU.01.16	Blanket System	EU.01.16.01	Blanket and First Wall Panels	00.01.01.06.02	Blanket
EU.01.17	Divertor	EU.01.17.01	Divertor Cassette Body and Assembly	00.01.01.06.02	Blanket
				00.01.01.06.03	Divertor
		EU.01.17.02	Divertor Vertical Target	00.01.01.06.03	Divertor
		EU.01.17.03	Divertor Rails	00.01.01.06.03	Divertor
EU.01.23	Remote Handling	EU.01.23.01	Remote Handling Common Activities	00.01.05.09	CIE Remote Handling Equipment
				00.01.05.09.00	Project Management & Technical Integration
				00.01.05.09.01	In-Vessel Remote Handling
				00.01.05.09.02	Ex-Vessel Remote Handling
		EU.01.23.02	Divertor Remote Handling System	00.01.05.09.00	Project Management & Technical Integration
				00.01.05.09.01	In-Vessel Remote Handling
				00.01.05.09.02	Ex-Vessel Remote Handling
		EU.01.23.03	Cask & Plug Remote Handling System	00.01.05.09.02	Ex-Vessel Remote Handling
EU.01.23.05	Neutral Beam Remote Handling System	00.01.05.09.02	Ex-Vessel Remote Handling		
EU.01.31	Vacuum Pumping and Leak Detection	EU.01.31.01	Cryopumps	00.01.03.06.03	Vacuum Systems
		EU.01.31.02	Leak Detection and Localization System	00.01.03.06.03	Vacuum Systems
EU.01.32	Tritium Plant	EU.01.32.01	Hydrogen Isotope Separation System	00.01.03.06.02	Tritium Plant
		EU.01.32.02	Water Detritiation System	00.01.03.06.02	Tritium Plant
EU.01.34	Cryoplant	EU.01.34.01	Liquid Nitrogen Plant and Auxiliary Systems	00.01.03.04.03	LN2 & Auxiliaries Cryoplant
EU.01.41	Electrical Power Supply and Distribution	EU.01.41.01	Electrical Power Distribution System	00.01.03.02.02	Electrical Power Distribution (EPD) System
				00.01.04.03.01	Common Works
EU.01.51	Ion Cyclotron Heating and Current Drive	EU.01.51.01	Ion Cyclotron Antenna	00.01.02.03.02	Ion Cyclotron H&CD



F4E WBS L2 Code	F4E WBS L2 Name	F4E WBS L3 Code	F4E WBS L3 Name	IO WBS Code	IO WBS Name
EU.01.52	Electron Cyclotron Heating and Current Drive	EU.01.52.01	Electron Cyclotron Upper Launcher	00.01.02.03.03	Electron Cyclotron H&CD
		EU.01.52.02	Electron Cyclotron Gyrotrons	00.01.02.03.03	Electron Cyclotron H&CD
		EU.01.52.03	Electron Cyclotron Power Supplies	00.01.02.03.03	Electron Cyclotron H&CD
		EU.01.52.05	Electron Cyclotron Control System	00.01.02.03.03	Electron Cyclotron H&CD
EU.01.53	Neutral Beam Heating and Current Drive	EU.01.53.01	Neutral Beam Assembly and Testing	00.01.02.03.04	Neutral Beam H&CD
		EU.01.53.02	Neutral Beam Source and High Voltage Bushing	00.01.02.03.04	Neutral Beam H&CD
		EU.01.53.03	Beamline Components	00.01.02.03.04	Neutral Beam H&CD
		EU.01.53.04	Pressure Vessel and Magnetic Shielding	00.01.02.03.04	Neutral Beam H&CD
		EU.01.53.05	Active Correction and Compensation Coils	00.01.02.03.04	Neutral Beam H&CD
		EU.01.53.06	Neutral Beam Power Supplies	00.01.02.03.04	Neutral Beam H&CD
		EU.01.53.07	Neutral Beam Test Facility	00.01.02.03.06	Neutral Beam Test Facility
				00.01.03.06.03	Vacuum Systems
EU.01.53.08	Neutral Beam Common Activities	00.01.02.03.04	Neutral Beam H&CD		
		00.01.02.03.06	Neutral Beam Test Facility		
EU.01.55	Diagnostics	EU.01.55.01	Magnetics	00.01.02.02.03	EU DA Diagnostics
		EU.01.55.02	Bolometers	00.01.02.02.03	EU DA Diagnostics
		EU.01.55.03	Plasma Position Reflectometry	00.01.02.02.03	EU DA Diagnostics
		EU.01.55.04	Pressure Gauges	00.01.02.02.03	EU DA Diagnostics
		EU.01.55.06	Tokamak Services	00.01.02.02.03	EU DA Diagnostics
		EU.01.55.07	Radial Neutron Camera - Gamma Spectrometer	00.01.02.02.03	EU DA Diagnostics
		EU.01.55.08	High Resolution Neutron Spectrometer	00.01.02.02.03	EU DA Diagnostics
		EU.01.55.09	Core-plasma Thomson Scattering	00.01.02.02.03	EU DA Diagnostics
		EU.01.55.10	Low Field Side Collective Thomson Scattering	00.01.02.02.03	EU DA Diagnostics

F4E WBS L2 Code	F4E WBS L2 Name	F4E WBS L3 Code	F4E WBS L3 Name	IO WBS Code	IO WBS Name
		EU.01.55.11	Core-Plasma Charge Exchange Recombination Spectrometer	00.01.02.02.03	EU DA Diagnostics
		EU.01.55.13	Equatorial Visible/Infrared Wide-Angle Viewing System	00.01.02.02.03	EU DA Diagnostics
		EU.01.55.14	Port Engineering Systems	00.01.02.02.03	EU DA Diagnostics
		EU.01.55.15	Diagnostics Common Activities	00.01.02.02.03	EU DA Diagnostics
EU.01.56	Test Blanket	EU.01.56.01	European Test Blanket System Arrangement	00.01.01.06.04	Test Blanket Module
		EU.01.56.02	Test Blanket Systems Research & Development		
EU.01.57	In Vessel Viewing System	EU.01.57.01	In Vessel Viewing System	00.01.05.09.01	In-Vessel Remote Handling
				00.01.05.09.02	Ex-Vessel Remote Handling
EU.01.62	Buildings and Civil Infrastructures	EU.01.62.02	Buildings and Civil Infrastructures	00.01.03.02.02	Electrical Power Distribution (EPD) System
				00.01.03.05.03	Radwaste Treatment & Storage Systems
				00.01.04.02.01	Site Preparation - Overall
				00.01.04.03	Buildings & Site
				00.01.04.03.01	Common Works
				00.01.04.03.02	Buildings
				00.01.04.03.03	Site Infrastructure
				00.01.04.03.04	Liquid & Gas Distribution
				00.01.04.03.05	IO Technical Oversight & Contract Management
				00.01.06.07.04	Technical Integration
EU.01.64	Radiological and Environmental Monitoring	EU.01.64.01	Radiological and Environmental Monitoring System	00.01.03.06.05	Radiological and Environmental Monitoring System (REMS)
EU.01.66	Waste Management	EU.01.66.01	Radiological and Conventional Waste Treatment and Storage	00.01.03.05.03	Radwaste Treatment & Storage Systems

## 6.7. ANNEX VIII - List of Procurement procedures GC 2015

WBS Level 2 Code	WBS Level 2 Name	WBS Level 5 Code	Contract type	Contract name
EU.01.11	Magnets	EU.01.11.03.53.09	P works	Site & Building infrastructure (S&I)
EU.01.11	Magnets	EU.01.11.03.53.11	P supply	Cold Test Engineering Study and Facility Construction (CTF)
EU.01.16	Blanket	EU.01.16.01.08.11	P serv	Provision of Manufacturing Services Using Hot Isostatic Pressing
EU.01.16	Blanket	EU.01.16.01.52.10	P serv	Storage and recycling of Beryllium coated components
EU.01.52	Electron Cyclotron Heating and Current Drive	EU.01.52.03.51.02	P supply	Procurement of Body Power Supply & Main High Voltage Power Supply (Main Contract)
EU.01.PE	Plasma Engineering	EU.01.PE.01.77.08	P serv	Development of an EFIT like real time plasma boundary reconstruction code
EU.BA.02	JT-60SA	EU.BA.02.04.03	P supply	Procurement for Electron Cyclotron Power Supplies
EU.BA.03	IFMIF	EU.BA.03	P serv	Supply of Niobium Material for Cavities weld procedure qualification activities

## 6.8. ANNEX X – List of Acronyms

Acronym	Description
A/E	Architect Engineer
AGPS	Accelerator Ground Power Supplies
ATP	Authorization to Proceed
BA	Broader Approach
BAUA	Broader Approach Unit of Account <sup>11</sup>
BtP	Build-to-Print
BPS	Body Power Supply
CAD	Computer-Aided Design
CAS	Credit Allocation Scheme
CER	Continuous External Rogowski
CVB	Cold Valve Boxes
DA	Domestic Agency
DACS	Data Acquisition and Control System
DEMO	Demonstration fusion reactor
DIV	Divertor
DNB	Diagnostic Neutral Beam
DTP	Divertor Test Platform
DWS	Detailed Work Schedule
EC	Electron Cyclotron
EC UL	Electron Cyclotron Upper Launchers
ECH	Electron Cyclotron Heating
EURATOM	The European Atomic Energy Community
FAT	Factory Acceptance Tests
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
HPC	Hold Point Clearance
HHF	High Heat Flux
HNB	Heating Neutral Beam
HV	High Voltage
HVAC	Heating Ventilation & Air Conditioning
HVD	High Voltage Deck
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. 12
IVT	Inner Vertical Target
IVVS	In-Vessel Viewing System
JAEA	Japan Atomic Energy Agency
JADA	Japanese Domestic Agency
LD&L	Leak Detection and Localization
LFS-CTS	Low Field Side – Collective Thomson Scattering(Check)
MAP	Multi-Annual Programme(check JJ)

<sup>11</sup> In July 2012 the BAUA corresponded to the value of 783.503 Euros.

MITICA	Megavolt ITER Injector & Concept Advancement
MV	Medium Voltage
NB	Neutral Beam
NBI	Neutral Beam Injector
NBPS	Neutral Beam Power System
NBTF	Neutral Beam Test Facility
NBRHS	Neutral Beam Remote Handling System
PA	Procurement Arrangement
PBS	Product Breakdown Structure
PE	Plasma Engineering
PF	Poloidal Field
PFC	Plasma Facing Components
PFC	Poloidal Field Coils
PIE	Post Irradiation Examination
PMU	Prototypical Mock-Up
PP	Procurement Package
PPC	Pre-Production Cryopump
PRIMA	Padua Research on ITER Megavolt Accelerator
QA	Quality Assurance
RCC-MRx	Design and Construction Rules for Mechanical Components in high-temperature structures, experimental reactors and fusion reactors
R&D	Research & Development
REM	Radiological Environmental Monitoring
RF	Radio Frequency
RFCU	Radio Frequency Control Unit
RH	Remote Handling
RNC	Radial Neutron Camera
SAT	Site Acceptance Tests
SMP	Strategic Management Planning
SPIDER	Source for Production of Ion of Deuterium Extracted from RF plasma
SS	Steady State
SSEN	Steady State Electrical Network
STP	Satellite Tokamak Programme
TBM	Test Blanket Module
TCS	Transfer cask System
TF	Toroidal Field
TFC	Toroidal Field Coils
TFWP	Toroidal Field Winding Pack
UT	Ultrasonic
Vis	Visible
VV	Vacuum Vessel
WAVS	Wide Angle Viewing System
WBS	Work Breakdown Structure
WDS	Water Detritiation System
WEST	Tungsten (W) Environment in Steady-state Tokamak
XXXX WP	Year XXXX Work Programme
WRL	Warm Regeneration Lines
CPRHS	Cask and Plug Remote Handling System
DRHS	Divertor Remote Handling System
NBRHS	Neutral Beam Remote Handling System
FPA	Framework Partnership Agreement
FWC	Framework Contract
TBM	Test Blanket Modules
TBMA	Test Blanket Module Agreement
CD	Conceptual Design
PD	Preliminary Design
FD	Final Design
CDR	Conceptual Design Review

### 6.9. ANNEX XI - Summary of Justifications for Unique Beneficiary grants

*(This annex shall be removed from the final version to be published)*

System	WP ref	WP activity title	Beneficiary	Justification
Remote Handling	WP16/23/01	Divertor RH Design Support	Hytar Oy and Tamlink	<p>Unique experimental facility (according to art.158.b of F4E Implementing Rules).</p> <p>The Grant for Divertor RH Design and Control System, to develop and test an innovative digital valve scheme for the water-hydraulic actuation of the Divertor Remote Handling sub-systems, was originally conceived with VTT and TUT acting as Unique Beneficiaries because they are host laboratory of the DTP2 facility and supported in this case by specialised industries Hytar and Tamlink (last one being a spin-off of TUT), as already done for other similar grants implemented in the past.</p> <p>F4E has been recently notified by the potential beneficiaries that, due to relative weight of the activities and co-funding scheme in Finland and in the interest of the action, is more adequate in this specific action to re-establish the responsibilities, with Hytar being the Unique Beneficiary that will be supported by the other 3 entities, still within the DTP2 domain.</p>
Electron Cyclotron Power Sources and Supplies	WP16/52/01	Extension of 1MW CW gyrotron prototype testing and ECPS industrial follow-up	EGYC Consortium	<p>EGYC Consortium was established in 2010 to join competences of the EU Associates in the area of gyrotron development for ITER. In collaboration with the industrial partner, the Parties of the Consortium have been the main actors of the design and development of high power gyrotrons in Europe over the last years. In the course of these developments, they have generated an important amount of unique scientific and technical knowledge necessary for continuing the gyrotron development for ITER according to the technical and scheduling needs of F4E.</p>
TBM	WP16/56/01	ECOSIMPRO platform for Tritium Migration Modelling validation and verification.	<p>Consortium formed by:</p> <p>Centro de Investigaciones</p>	<p>CIEMAT-Empresarios Agrupados developed the code/model (ECOSIMPRO) for the simulation of the tritium</p>

			<p>Energeticas. Medioambientales y tecnologicas (CIEMAT)</p> <p>Empresarios Agrupados Internacional S.A. (EE.AA)</p>	<p>migration under previous grants F4E-GRT-254 and F4E-GRT-542 (as Unique Beneficiary). They are the only body with technical knowledge and degree of specialization to perform the analysis and to continue with the upgrades and maintenance of the code.</p>
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