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 ANNUAL AND MULTI-ANNUAL PROGRAMME (2017-2021) OF THE EUROPEAN JOINT UNDERTAKING FOR ITER AND THE DEVELOPMENT OF FUSION ENERGY

THE GOVERNING BOARD OF FUSION FOR ENERGY,

HAVING REGARD to the Statutes annexed to the Council Decision (Euratom) No 198/2007 of 27 March 2007 establishing the European Joint Undertaking for ITER and the Development of Fusion Energy (hereinafter "Fusion for Energy") and conferring advantages upon it[1] (hereinafter "the Statutes") and in particular Article 6(3)(e) thereof, amended on 10 February 2015[2] with Council Decision Euratom 2015/224.

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[3]

HAVING REGARD to the Financial Regulation of Fusion for Energy[4] adopted by the Governing Board on 22 October 2007, last amended on 25 November 2011[5] (hereinafter "the Financial Regulation"), and in particular Title III thereof;

HAVING REGARD to the Implementing Rules of the Financial Regulation[6] adopted by the Governing Board on 22 October 2007, last amended on 19 March 2015[7] (hereinafter "the Implementing Rules"), and in particular Title III thereof;

HAVING REGARD to the Framework Financial Regulation for the bodies referred to in Article 208 pf Regulation (EU, Euratom) No 966/2012 of the European Parliament and of the Council last amended on 30 September 2013[8] and in particular Title III thereof;

HAVING REGARD to the comments and recommendations of the Committee(s) on on the present Annual and Multi Annual Programme (2017-2021)

WHEREAS:

1 O.J. L 90 , 30.03.2007, p. 58.
2 O.J. L 37 , 13.02.2015, p.8.
3 OJ L 349, 21.12.2013 p100-102
4 F4E(07)-GB03-11 Adopted 22/10/2007
5 F4E(11)-GB21-10c Adopted 25/11/2011
6 F4E(07)-GB03-12 Adopted 22/10/2007
7 F4E(15)-GB31-09.8 Adopted 19/03/2015
8 O.J. L 328, 7.12.2013

(1) The Director shall, in accordance with Article 11 of the Statutes, prepare each year the submission of the project plan to the Governing Board, the resource estimates plan and the detailed annual work programme, now merged in the Annual and Multi Annual Programme.

(2) The Administration and Management Committee (AMC) should, in accordance with Article 8a(2) of the statutes and with its mandate laid down in its Rules of Procedure , comment on and make recommendations to the Governing Board on the proposal for the project plan, the work programme, the resources estimate plan, the staff establishment plan, the staff policy plan and other related matters, now part of the Annual and Multi Annual Programme drawn up by the Director;

(3) The Technical Advisory Panel shall advise the Governing Board on the adoption and implementation of the project plan and work programme now part of the Annual and Multi Annual Programme.

(4) The Governing Board should adopt the Annual and Multi Annual Programme

HAS ADOPTED THIS DECISION:

Article 1

The Annual and Multi-Annual Programme (2017-2021) of Fusion for Energy annexed to this Decision is hereby adopted.

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 in Barcelona, 21 February 2017.

For the Governing Board

Joaquin Sanchez

Chair of the Governing Board

FUSION FOR ENERGY

Annual and Multiannual Programme

Years 2017-2021

THE EUROPEAN JOINT UNDERTAKING FOR ITER AND THE DEVELOPMENT OF FUSION ENERGY
Josep Pla nº 2 · Torres Diagonal Litoral · Edificio B3· 08019 Barcelona · Tel. +34 93 320 18 00 · Fax +34 93 320 18 51
www.fusionforenergy.europa.eu

Fusion for Energy

The European Joint Undertaking for ITER
and the Development of Fusion Energy
C/ Josep Pla 2,
Torres Diagonal Litoral
Edificio B3
08019 Barcelona
Spain

Tel: +34 933 201 800
Fax: +34 933 201 851
E-mail: info@f4e.europa.eu

fusionforenergy.europa.eu

TABLE OF CONTENTS

Section I. General Context

1. Introduction

This Multi-Annual Programming Document offers an overview of the objectives of the European Joint Undertaking for ITER and the Development of Fusion Energy ("Fusion for Energy" or F4E) for the years 2017 to 2021.
It covers the work on both the ITER and the Broader Approach (BA) projects according to the tasks entrusted to the organization.
As concerns ITER, Euratom (represented by the European Commission) is part of this large project involving a total of seven countries that represent half the world's population – Euratom, the Russian Federation, Japan, China, India, South Korea and the United States.
The task of F4E, as the Euratom Domestic Agency for ITER, is to discharge Euratom 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 (IO-CT) and it creates many challenges both from a technical and organizational point of view.
As concerns BA, activities are carried out in the frame of the agreement, concluded between Euratom and Japan, consisting in activities which complement the ITER project and accelerate the realization of fusion energy. Both parties contribute equally financially. The Euratom resources for the implementation of the BA are largely provided voluntarily by several participating European states (Belgium, France, Germany, Italy, Spain and Switzerland).
The overview of the objectives, the main milestones, both the human and financial resources foreseen in the next years provide an overview of the complexity of the tasks and of the technical challenges associated by the above-mentioned tasks.
For ITER the forthcoming work is not only focused on the follow-up of the procurement contracts for the manufacturing of the European components, but also progress in the design of the components still at an earlier stage of maturity, placing contracts and grants according to the agreed schedule, interface with IO-CT in each of the areas of F4E work and carry out project management activities, including risk, cost, scope and scheduling aspects. The forthcoming years are very important as the procurement activities in all areas will be in full swing and the F4E staff will be called in facing and solving many technical issues due to the complexity of the manufacturing.

1.1. Legal reference and drafting assumptions

Article 32 (Annual and Multi-Annual Programming) of the F4E Financial Regulation (F4E(15)-GB34-12.9 Adopted on 02/12/2015) reads as follows:

1. The Joint Undertaking shall draw up a programming document containing multi-annual and annual programming, taking into account to the extent possible guidelines set by the Commission.
2. The multiannual programme shall be composed of:
   (a) The project plan which shall include the overall strategic programming for the following five years, including objectives expected results and performance indicators for the first three years of this period.
   (b) The resource estimates plan which shall set out the resource programming, including multi-annual budget and staff.

The resource estimates plan shall include qualitative and quantitative information on the human resource and budgetary matters for reporting purposes, in particular:

(a) For the following five financial years, an indicative budget and staff resource programming.
(b) Estimates of income, expenditure and staffing of the Joint Undertaking for the following two financial years with reference to the previous year, namely.
- For the years N-1 and N, the information on the number of officials, temporary and contract staff as defined in the Staff Regulations as well as seconded national experts.
- For the year N-1 an estimate of the budgetary operations within the meaning of Article 97 and information on contribution in kind granted by the Host State to the Joint Undertaking.
- For the year N+1 estimate of the number of officials, temporary and contract staff as defined in the Staff Regulations.

The Commission shall send to the Joint Undertaking the opinion of its relevant services on the draft human resource programming.
If the Joint Undertaking does not fully take into account the Commission services' opinion, it shall provide the Commission with adequate explanations.
The resource programming shall be updated annually. The strategic programming shall be updated where appropriate.

3. The annual work programme of the Joint Undertaking shall comprise detailed objectives and expected results including performance indicators. Subject to paragraph 4, 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 referred to in paragraph 1.
   It shall clearly indicate which tasks of the Joint Undertaking have been added, changed or deleted in comparison with the previous financial year.
4. Any substantial amendment to the annual work programme shall be adopted by the same procedure as the initial work programme, in accordance with the provisions of the Constituent instrument and Article 33 of this Regulation.
5. The Governing Board may delegate the power to make non-substantial amendments to the annual work programme to the authorizing officer of the Joint Undertaking.

According to the article above, the core of this edition of the Annual and Multi-Annual Programme gathers together three other documents requested by the F4E rules:

1. The 2017 Work Programme (WP);
2. The 2016 Edition of the Project Plan (PP);
3. The 2016 Edition of the Resource Estimate Plan (REP).

2016 is the reference year (N) for the present edition of the document.
The WP, REP and the PP are documents that, according to the F4E Statutes and Financial Regulation, the Director shall prepare and submit to the Governing Board for approval.
The corresponding three parts of the present document shall end with the sole approval of the Multi Annual Programme at the December 2016 meeting of the Governing Board.
The **WP17** offers an exhaustive view of the F4E activities foreseen in 2017.
The **PP** is instead providing a multi-annual (up to 2021) view of the F4E activities in both ITER and BA projects
For ITER, it provides information on the status of the EU Procurement Arrangements, cash contributions to ITER and to Japan, key and main milestones, risk and quality. An on-line annex available internally provides more detailed information from the F4E Integrated Reporting System (IRS).
For BA it provides information on the status of its three projects (i.e. Satellite Tokamak Programme, IFMIF/EVEDA, IFERC) based on their project plans approved by the BA Steering Committee.

The **REP** provides the multi-annual information concerning both financial and human resources. The inclusion in the REP of detailed human resources information modifies the document's structure, previously agreed with the Commission's Services a few years ago. The new structure is to be confirmed upon for the submission to the Governing Board in December 2016.
The reference date for all figures in the present document is end of September 2016, corresponding to the last submission of the schedule to IO-CT before the finalization of the document, except where specifically mentioned.
The information provided is in line with the ITER Baseline foreseeing First Plasma (FP) in December 2025. ITER Organization and the Domestic Agencies are working together to prepare a new baseline, including both necessary financial and human resources, agreed in the ITER Council 18 in June and to be confirmed by the ITER Council 19 in November 2016.

1.2. Vision and Overall F4E Mission

"Bringing the power of the sun to earth"
This vision communicates the active role Fusion for Energy (F4E) takes in advancing fusion towards becoming a reliable source of clean abundant base load energy.F4E is the European centre to develop and build ITER and other facilities to turn fusion into a sustainable source of energy for mankind. F4E bridges the EU research community and the EU industry, to broaden the European industrial base for fusion technology. F4E was set up for 35 years from 19 April 2007 with a threefold mission:

1. To provide the contribution of the European Atomic Energy Community (Euratom) to the ITER International Fusion Energy Organisation.
2. To provide the contribution of Euratom to Broader Approach Activities with Japan for the rapid realization of fusion energy.
3. To prepare and coordinate a programme of activities in preparation for the construction of a demonstration fusion reactor and related facilities including the International Fusion Materials Irradiation Facility (IFMIF).

1.3. General context

The three main objectives from the Mission Statement are translated into specific ones to focus the work and the resources of the Agency on specific achievements with priorities to the following ones:

1. Maintain the schedule for the Implementation of the main ITER milestones assigned to Europe by the ITER Council (IC) within the foreseen quarter (assumptions being met). The ultimate goal of the milestones achievement is the discharge of the European obligations towards the project.
2. Manage and mitigate the risks, contain cost overruns in the project both at F4E and IO level and maintain the agreed baseline schedule for the delivery of the European components.
3. Reinforce industry-standard methodologies, processes and systems for project control (milestones / schedule, cost, scope and risk) in order to efficiently follow the project and keep it on track.

Since its creation in 2007 to date, Fusion for Energy is mainly responsible to provide Europe's contribution to both ITER and the Broader Approach projects.
ITER has the aim to produce a significant amount of fusion power to allow scientists to study "burning" plasma (i.e. heated by fusion reactions) and also to demonstrate many of the key technologies needed for future fusion reactors.
Europe, the Host State, supports this international project with about 45% of the construction cost and 34% of the cost of operation, deactivation and decommissioning of the facility as well as preparing the site.

The main peculiarity of the project is that about 90% of the ITER project is built by in-kind contributions distributed among the seven parties through the ITER Agreement to achieve the agreed level of contribution from each of them.
The Broader Approach agreement aims at complementing the ITER project and at accelerating the realization of fusion energy by carrying out Research and development (R&D) and developing some advanced technologies for future demonstration reactors.
In 2010 the EU Council reaffirmed its commitment to these activities and assigned to F4E a budget of EUR 6.6 billion (constant 2008 values) until 2020.
F4E carries out its activities following its statutes annexed to the legal basis, in particular regarding staffing and financial regulations, including the implementing rules.
However F4E is also the Euratom DA for ITER and has to comply with its needs defined by the seven partners together in the ITER agreement signed in November 2007. Responding efficiently to the projects needs implies very often a higher degree of flexibility than foreseen by the rules applying as F4E as a European community body.
The activities of F4E with respect to ITER are changing throughout its life. While at the beginning the focus was on launching the procurement of the EU in-kind components, the work has evolved into the follow-up of the manufacturing activities and will evolve in the coming years with a higher degree of involvement into the assembly of the machine. Similarly, the skills of the F4E staff have to evolve and specific training will have to be carried out in order to provide the staff with the right level of knowledge to carry out its activity.

1.3.1. The EU Contribution to ITER

ITER is a complex project from the scientific, technical and organizational points of view. Its aim is to enable the study of burning plasmas and to demonstrate the technologies which are necessary for the production of fusion power.
The project has the ultimate target to reach Deuterium-Tritium (DT) operations through a staged approach which is due to bring the project from a first plasma in December 2025 (earliest technically achievable date) to D-T operations ten years later.
The ITER International Agreement was signed in 2006 by the seven Member States that are part of the project. Each of them has a Domestic Agency (DA) that has the obligation to provide components in-kind to build the machine and funds to run the ITER Organization (IO). The in-kind contribution consists in the delivery of components to be manufactured by each DA according to an agreed share (i.e. about 45% for the EU).
The specifications of the components to be provided in-kind are defined in the Procurement Arrangements (PA) to be signed between the ITER Organization and each DA. The PA is the basis for F4E to start a procurement procedure to competitively tender for the work. Once the contract is awarded, the work of the supplier can start. During the execution of the contract, specific milestones are achieved, thus triggering the award of an amount of ITER credit, till the completion of the work, usually identified as the delivery of the component to IO.
The table here below provides the key for a correct understanding of how the PAs relate to the clustered activities (called Actions) used by F4E in this document.
The actions described in this document capture all necessary activities, including the transversal ones, to fulfill the EU obligations as agreed in 2006 and detailed in the Annex 6.3 (Common Understandings on Procurement Allocation) of the signed ITER Agreement.

ACTIONS	WBS (LEVEL 3)	WBS NAME (LEVEL 3)	PAs relevant
Magnets	EU.01.11.01	Toroidal Field Coils	PA 1.1.P1A.EU.01
	EU.01.11.02	Pre Compression Rings	PA 1.1.P2A.EU.01
	EU.01.11.03	Poloidal Field Coils	PA 1.1.P3A-B.EU.01
	EU.01.11.04	Magnet Conductors	PA 1.1.P6A.EU.01 PA 1.1.P6C.EU.01
Vacuum Vessel	EU.01.15.01	Main Vessel	PA 1.5.P1A.EU.01
In Vessel – Blanket	EU.01.15.02	Blanket Manifolds	PA 1.5.P1A.EU.02
	EU.01.16.01	Blanket and First Wall Panels	PA 1.6.P1A.EU.01
In Vessel – Divertor	EU.01.17.01	Divertor Cassette Body and Assembly	PA 1.7.P1.EU.01
	EU.01.17.02	Divertor Vertical Target	PA 1.7.P2B.EU.01
	EU.01.17.03	Divertor Rails	PA 1.7.P2E.EU.01
Remote Handling	EU.01.23.01	Remote Handling Common Activities	PA 2.3.P2.EU.01 PA 2.3.P3.EU.01 PA 2.3.P5.EU.01 PA 5.7.P1.EU.01
	EU.01.23.02	Divertor Remote Handling System	PA 2.3.P2.EU.01
	EU.01.23.03	Cask and Plug Remote Handling System	PA 2.3.P3.EU.01
	EU.01.23.05	Neutral Beam Remote Handling System	PA 2.3.P5.EU.01
	EU.01.57.01.	In Vessel Viewing System	PA 5.7.P1.EU.01
Cryoplant and Fuel Cycle	EU.01.31.01	Cryopumps	PA 3.1.P1.EU.01 PA 3.1.P1.EU.02 PA 3.1.P1.EU.03 PA 3.1.P1.EU.04
	EU.01.31.02	Leak Detection and Localization System	PA 3.1.P3.EU.01
	EU.01.32.01	Hydrogen Isotope Separation System	PA 3.2.P3.EU.01
	EU.01.32.02	Water Detritiation System	PA 3.2.P5.EU.01 PA 3.2.P5.EU.02
	EU.01.34.01	Liquid Nitrogen Plant and Auxiliary Systems	PA 3.4.P1.EU.01
	EU.01.64.01	Radiological and Environmental Monitoring System	PA 6.4.P1.EU.01 PA 6.4.P1.EU.02
	EU.01.66.01	Waste Treatment Storage (Type A Radwaste System)	PA 6.3.P1.EU.01
RF Heating and Current Drive	EU.01.51.01	Ion Cyclotron Antenna	PA 5.1.P1.EU.01
	EU.01.52.01	Electron Cyclotron Upper Launcher	PA 5.2.P1B.EU.02
	EU.01.52.02	Electron Cyclotron Gyrotrons	PA 5.2.P3.EU.01
	EU.01.52.03	Electron Cyclotron Power Supplies	PA 5.2.P4.EU.01
	EU.01.52.05	Electron Cyclotron Control System	PA 5.2.P1B.EU.01

Neutral Beam Heating & Current Drive	EU.01.53.01	Neutral Beam Assembly and Testing	PA 5.3.P1.EU.01
	EU.01.53.02	Neutral Beam Source and High Voltage Bushing	PA 5.3.P2.EU.01
	EU.01.53.03	Beamline Components	PA 5.3.P3.EU.01
	EU.01.53.04	Pressure Vessel and Magnetic Shielding	PA 5.3.P4.EU.01
	EU.01.53.05	Active Correction and Compensation Coils	PA 5.3.P5.EU.01
	EU.01.53.06	Neutral Beam Power Supplies	PA 5.3.P6.EU.01
	EU.01.53.07	Neutral Beam Test Facility	PA 5.3.P9.EU.01
Diagnostics	EU.01.55.01	Magnetics	PA 5.5.P1.EU.01-02-16-17-19
	EU.01.55.02	Bolometers	PA 5.5.P1.EU.01-03
	EU.01.55.03	Plasma Position Reflectometry	PA 5.5.P1.EU.05
	EU.01.55.04	Pressure Gauges	PA 5.5.P1.EU.07
	EU.01.55.06	Tokamak Services	PA 5.5.P1.EU.01
	EU.01.55.07	Radial Neutron Camera - Gamma Spectrometer	PA 5.5.P1.EU.15
	EU.01.55.08	High Resolution Neutron Spectrometer	PA 5.5.P1.EU.15
	EU.01.55.09	Core-plasma Thomson Scattering	PA 5.5.P1.EU.01
	EU.01.55.10	Low Field Side Collective Thomson Scattering	PA 5.5.P1.EU.09
	EU.01.55.11	Core-Plasma Charge Exchange Recombination Spectrometer	PA 5.5.P1.EU.04
	EU.01.55.13	Equatorial Visible/Infrared Wide-Angle Viewing System	PA 5.5.P1.EU.06
	EU.01.55.14	Port Engineering Systems	PA 5.5.P1.EU.10-11-12-13-14
	EU.01.55.15	Diagnostics Common Activities	PA 5.5.P2.EU.01
Test Blanket	EU.01.56.01	European Test Blanket System Arrangement	No PA
	EU.01.56.02	Test Blanket Systems Research & Development	No PA
Buildings infrastructure and Power supplies (BIPS)	EU.01.62.02	Buildings infrastructure and Power supplies	PA 4.1.P1A-8B.EU.01 PA 4.1.P8C.EU.01 PA 4.1.P8A.EU.01 PA 4.1.P1A-8B.EU.02 PA 6.2.P2.EU.01 PA 6.2.P2.EU.02 PA 6.2.P2.EU.03 PA 6.2.P2.EU.04 PA 6.2.P2.EU.05 PA 6.2.P2.EU.06
Cash	EU.01.CC.01	Cash Contribution to ITER Organization	No PA

Contributions	EU.01.CC.02	Cash Contribution to Japan DA	No PA
Supporting Activities	EU.01.PM	ITER Programme Management	No PA
	EU.01.TR	Transportation	No PA
	EU.01.ES.01	Engineering Support and Integration	No PA
	EU.01.ES.02	Engineering Analysis and Nuclear Data	No PA
	EU.01.ES.03	Embedded Control Data Access and Communication	No PA
	EU.01.MF.01	Materials and Fabrication Technologies	No PA
	EU.01.NS.01	Nuclear Safety	No PA
	EU.01.PE.01	Plasma Engineering	No PA
	EU.01.PE.02	Plasma Control System	No PA
	EU.PM.PM	F4E Programme Management	No PA
Broader Approach	EU.BA.01	Common Activities	
	EU.BA.02	Satellite Tokamak (JT-60SA)	
	EU.BA.03	IFMIF-EVEDA Project	
	EU.BA.04	International Fusion Energy Research Centre	

Table 1. Correspondence between Actions and Procurement Arrangements.

1.4. Multiannual and annual programming

In line with established reporting, both the Multi Annual and the Annual Programme present a coherent description of the foreseen objectives and the available human resources for new clustered activities, called Actions, from the F4E Work Breakdown Structure (WBS) at level 2/3.The mapping between WBS and Actions is detailed in Annex V.

1.5. Multi annual objectives

The focus of the F4E activities is to discharge the Euratom obligations on both ITER and BA projects. The objectives of the organization are therefore geared to achieve this aim and are reflected in the yearly corporate objectives that are proposed by the Director and approved by the Governing Board.
The Project Plan contains F4E's Technical Objectives (FTO's) from 2016 until 2025 which correspond to both the IC and GB milestones.
The purpose of table 1 is not solely listing FTO's, but being the base for showing its Key Performance indicators (KPI) used to measure the actual milestone slippage, which F4E will use to reflect variance in days between the latest integrated date and the reference date presented here.
Milestones for Broader Approach have also been shown.

Section II. Multi-annual programming 2017 -2021

1. Project Plan

1.1. Introduction

In accordance with the Financial Regulation of F4E and its Implementing Rules, this Project Plan (PP) lays down an overall strategic programing foreseen to cover five years (i.e. 2017-2021). This multi-annual information is complemented by the REP.
As far as the ITER project is concerned, this document is supplemented by an on-line annex, linked to the F4E Integrated Reporting System (IRS) and available internally to F4E staff.
As far as the Broader Approach is concerned, this document includes three individual projects (i.e. Satellite Tokamak Programme, IFMIF/EVEDA and IFERC). Correspondent Annexes, containing more details, are available.

1.2. Reference schedules

1.2.1. Input timeframe

Generally speaking**,** the PP covers 5 years; from 2017-2021 both inclusive. It should be mentioned that currently, although the path to First Plasma (FP) in December 2025 is well defined and specific milestones have been agreed at ITER Council level, there is still no decision on the budget to be made available to F4E to carry out its activities after 2020. Therefore all information concerning the years after 2020 and included in this document is only indicative, as not supported by an assigned budget, yet.

1.2.2. Schedule

The dates provided in this document are according to the F4E Detailed Work Schedule (DWS)[1] submitted to IO-CT at the end of September 2016.

1.3. ITER

1.3.1. Overall scenario

At the Seventeenth Meeting (IC-17) of the ITER Council (IC) in November 2015, the ITER Organization (IO-CT) presented a resource-loaded Updated Long-Term Schedule (ULTS). The IC took a number of decisions including:

[1] After every F4E DWS submission, usually at the beginning of each month, IO-CT carries out an integration of all DWSs received from all DAs and derives an integrated project schedule that readjusts the dates to take into account, possible delays in supplies also between DAs. Therefore further adjustments to the overall schedule can happen after the integration work. The integrated schedule is then used by F4E for the monitoring and reporting exercise.

1. From the Integrated Schedule to First Plasma, approved the 2016/2017 schedule and associated milestones against which the project progress should be controlled and reported for the coming two years (2016-2017) until the updated schedule is baselined.
2. Requested the IO-CT Director-General to update the Integrated Schedule to First Plasma beyond 2017 following iteration with DAs incorporating IC-17 decisions by the end of 2015.
3. Decided to charge a panel (the ITER Council Working Group on the Independent Review of the Updated Long-Term Schedule and Human Resources (ICRG)) with an independent review of the updated schedule together with the associated existing staff and future Staffing Plan, and other required resources as well as the IO's Human Resources organization and process/ procedures, which were to be completed by IC-18 (June 2016) at the latest.
4. Requested the IO and DAs jointly to find means of accelerating the schedule as much as possible and to find ways to reduce the increased costs.

1.3.2. Schedule to first plasma (FP) and beyond

The ITER top-level schedule (Figure 1) gives an overview of the most significant and critical ITER and F4E activities. In particular, the EU Vacuum Vessel (VV) sectors and nuclear buildings remain on the critical path. The recent decision of the IC-18 to re-assign two of the EU VV sectors (#7 and #8) to the ITER Organization is decreasing the risk in this area, which however remains of primary importance to the project.

The F4E top-level schedule is under-pinned by comprehensive lower-level schedules (i.e. the DWS) of 65,000 activities, detailing the individual activities to be conducted at cost account level.

From an F4E perspective both the VV and Tokamak building complex are on the critical path to first plasma, but F4E is also responsible for other main components not on the critical path, notably the magnets, the LN2 cryoplant, other buildings, etc.

F4E has re-planned the non-FP components (i.e. neutral beams, IC antenna, Tritium systems, etc.) in line with the evolving higher level planning from IO-CT.

This planning has taken into account the capped budget available up to 2020, and assumes a reasonably smooth budget profile from 2021 onwards. The main target is to achieve a FP in December 2025 and fulfill the other given dates up to D-T operations as much as possible.

The approach for the planning is on a "rolling wave" basis with increased precision in the near term, and more global figures in the longer term. It must be clearly understood that the figures for the out-years will be subject to increasing uncertainty, and an increasing likelihood of variations in the future. Of course they will be subject to possible changes to follow any evolutions of the overall ITER schedule.

The dates used in the F4E Project Plan are in line with the project schedule to be proposed to the ITER Council in November 2016 (IC-19). F4E is planning to adopt the same baseline as ITER and this will be used to measure F4E's performance.

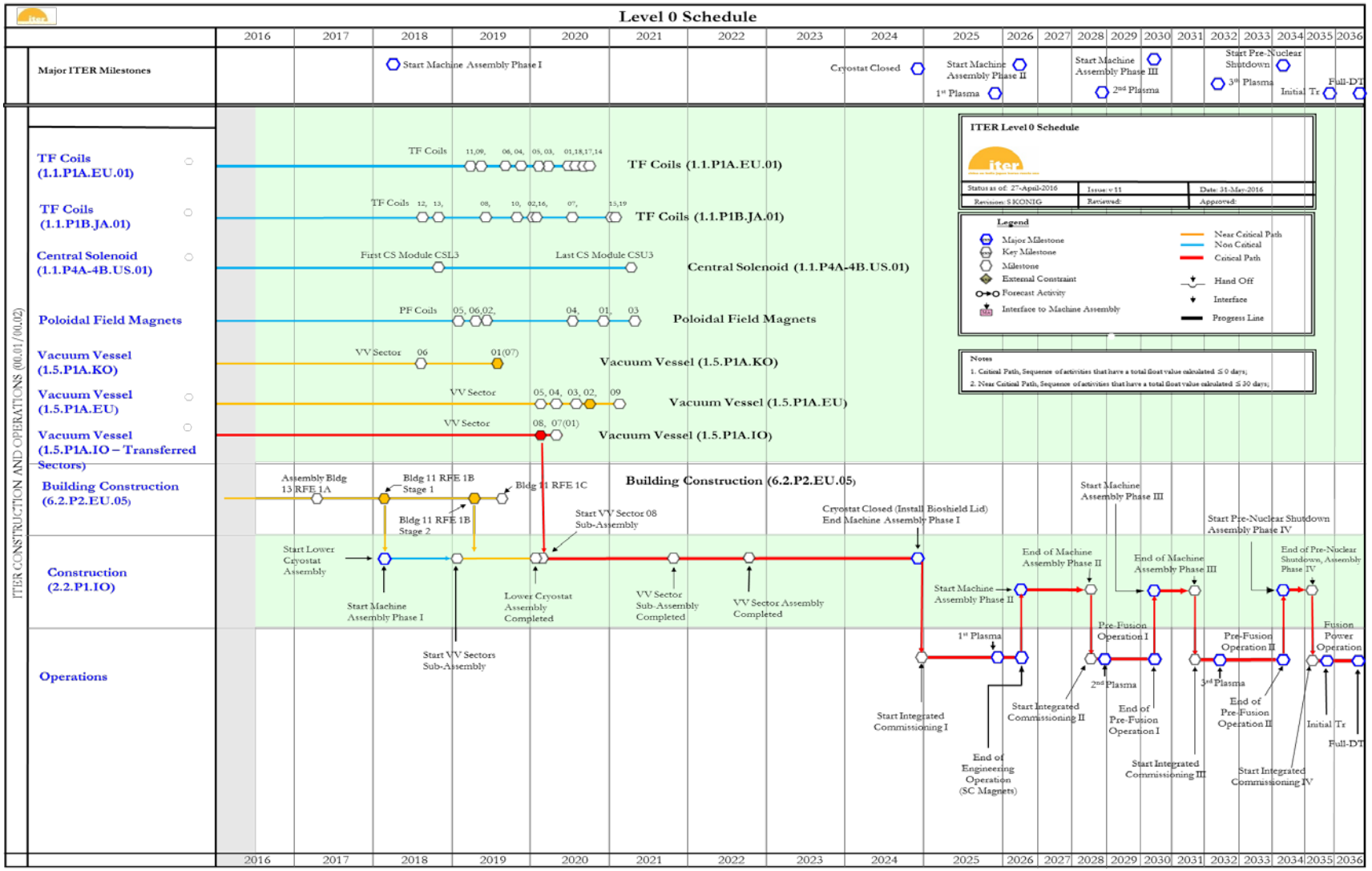


Figure 1. Detailed Summary of ITER Construction and Operation up to the First DT Operation Phase

1.3.3. Objectives

The ITER Council has decided that the progress of the project will be monitored through agreed high-level milestones. These milestones, agreed at the 18th ITER Council meeting ("ITER Council milestones" or IC milestones) are critical to achieving FP and their achievement is key to fulfill the agreed FP date. To complement these milestones, additional ones for the European deliverables, up to 2025, have been approved internally and presented to the Governing Board (GB-35) to complete the list. The reason for the creation of this second set of milestones is:

1. To include milestones representing all main F4E activities
2. To make a more homogeneous milestone-profile up to 2025.

Although this document focuses on the next 5 years (2017-2021), it was deemed necessary to include as objectives all IC and GB milestones up to 2025 in order to give a wider view of F4E activities. It is also important to mention that, taking into consideration that the Work Program (WP) focuses on the year 2017, one can also find in this document a list of more specific 2017 objectives per Activity. These Work Program Objectives (WPO) are intrinsically linked to the ones listed in this document. WPOs are enriched with 2017 milestones resulting from the identification of the predecessors of the Project Plan Objectives milestones. This way the WP and PP not only complete F4E's full picture of objectives by containing detailed and critical objectives, but both PP and WP also demonstrate their strong interrelation and coherence.

The table below shows the full list of the PP objectives for the time 2016-2025, with its agreed quarter, its achievement Indicator (KPI) and its related F4E-Action[2]. Objectives in the past are colored in gray. In line with the approach at the ITER Council meeting, the agreed completion dates are set at the end of the calendar quarter and not on a precise date. (See table 1)

[2] According to Article 2 of the Financial Regulations "Actions" need to be defined for the purposes of the Annual and Multi Annual programming and thus for Project Plan and Work program. "Actions" are defined as "coherent areas of action containing objectives and resources". "Actions" have been selected by F4E by taking Groupings of WBSs Level 2 based on similar technical scope, large funds and risk profiles. Primavera was adapted to facilitate the grouping of these actions. See column "F4E-WP action" in Annex V.

IC Ref	GB Ref	Area	Milestone	Agreed Quarter	Action
IC02	GB00	Buildings Infrastructure and Power Supplies	Start of B1 civil works in Tokamak building	Q1 2016	11
IC04	GB01	Buildings Infrastructure and Power Supplies	Erection of Tokamak Main Cranes in Assembly Hall	Q2 2016	11
IC05	GB02	Toroidal Field Coils	Completion of first EU TF winding pack	Q2 2016	1
IC09	GB03	Buildings Infrastructure and Power Supplies	Installation of WDS tanks in Tritium building	Q2 2016	11
IC13	GB04	Main Vessel	First Sub Segment Assembly of VV Sector 5 completed	Q4 2016	2
IC14	GB05	Liquid Nitrogen Plant and Auxiliary Systems	First Liquid Nitrogen Refrigerator equipment Factory Acceptance Tests completed	Q4 2016	6
IC19	GB06	Buildings Infrastructure and Power Supplies	Energisation of 400KV switch yard	Q1 2017	11
IC21	GB07	Buildings Infrastructure and Power Supplies	Completion of RFE 1A (Assembly Hall)	Q2 2017	11
IC24	GB08	Buildings Infrastructure and Power Supplies	Tokamak Concrete crown civil works achieved	Q4 2017	11
IC25	GB09	Buildings Infrastructure and Power Supplies	Civil works and finishing performed in B2 level allowing TB04 installation to begin in tokamak building B2 level	Q4 2017	11
IC30	GB10	Neutral Beam Test Facility	Neutral Beam Test Facility (NBTF): Start of integrated commissioning of SPIDER beam	Q1 2018	8
IC32	GB11	Buildings Infrastructure and Power Supplies	Buildings: First limited access to Tokamak pit for installation without large crane availability (RFE	Q2 2018	11
IC39	GB12	Poloidal Field Coils	PF Coil: EU PF 5 coil ready for cold test	Q4 2018	1
IC43	GB13	Buildings Infrastructure and Power Supplies	Building: Limited crane access between Assembly Hall and Tokamak Building (RFE 1B stage 2)	Q3 2019	11
IC44	GB14	Poloidal Field Coils	PF Coil: Manufacturing complete for EU PF 6 Coil and delivery to site	Q3 2019	1
IC47	GB15	Toroidal Field Coils	TF Coil: First EU TF Coil delivery to site	Q3 2019	1
IC48	GB16	Main Vessel	VV: First EU Vacuum Vessel Sector delivery to site	Q2 2020	2
IC49	GB17	Buildings Infrastructure and Power Supplies	Buildings: Full crane access between Assembly Hall and Tokamak Building to allow lowering of	Q2 2020	11
IC62	GB18	Leak Detection and Localization System	Commissioning: Cryostat Leak Detection and Localization System delivery to site	Q3 2023	6
	GB19	Buildings Infrastructure and Power Supplies	Buildings: Cryoplant Compressor Building (51) RFE (RFE #8B)	Q4 2018	11
	GB20	Divertor Vertical Target	In-vessel: Delivery of the first all-Tungsten prototype test assembly of the Divertor Inner Vertical Target to the RF test facility.	Q4 2018	4
	GB21	Buildings Infrastructure and Power Supplies	Buildings: Construction of Cryoplant Coldbox Building (52) Completed	Q3 2019	11

IC Ref	GB Ref	Area	Milestone	Agreed Quarter	Action
	GB22	Electron Cyclotron Upper Launcher	EC &IC: Manufacturing of 1st batch of Diamond Disks for EC Upper Launcher 1 finished	Q2 2020	7
	GB23	Toroidal Field Coils	Magnets : Delivery of TF01 (EU 07) by EU-DA to ITER Site	Q4 2020	1
	GB24	Buildings Infrastructure and Power Supplies	Buildings: Medium Voltage Distribution Building LC/1A (46) RFE (RFE #16)	Q1 2021	11
	GB25	Main Vessel	VV: Delivery of Sector 9 by EU-DA to ITER Site	Q2 2021	2
	GB26	Buildings Infrastructure and Power Supplies	Buildings: Medium Voltage Distribution Building LC/2B (47) RFE (RFE #10)	Q2 2021	11
	GB27	Neutral Beam Power Supplies	NB&PS: Start of Installation of Acceleration Grid Power Supplies - Converter System of Neutral Beam Injector-1 O2	Q3 2021	8
	GB28	Cryopumps	Cryo&FC: Delivery of Cold Valve Boxes and Cryojumpers 5-8 (4 no.) Batch 2 by EU-DA to Site	Q3 2021	6
	GB29	Electron Cyclotron Upper Launcher	EC &IC: Manufacturing of 1st batch of Waveguides for EC Upper Launcher 1 finished	Q4 2021	7
	GB30	Neutral Beam Power Supplies	NB&PS: Start of Installation of High Voltage Dec 1 of Neutral Beam Injector -1	Q1 2022	8
	GB31	Ion Cyclotron Antenna	EC &IC: Manufacturing of the Ion Cyclotron RF Window Prototype finished	Q2 2022	7
	GB32	Cask & Plug Remote Handling System	Remote Handling: Task Order Signed for Manufacturing for Cask and Plug Remote Handling System (CPRHS)	Q3 2022	5
	GB33	Cryopumps	Cryo&FC: Delivery of Torus & Cryostat Cryopumps by EU-DA to ITER Site	Q3 2022	6
	GB34	Buildings Infrastructure and Power Supplies	Buildings: Control Building (71) RFE (RFE #14)	Q4 2022	11
	GB35	Leak Detection and Localization System	Cryo&FC : Delivery of Primary (VV)Leak Detection and Localisation by EU-DA to ITER Site	Q4 2022	6
	GB36	Tokamak Services	Diagnostics: In-V Elec Feedthroughs Delivered to ITER Site	Q4 2022	9
	GB37	Blanket and First Wall Panels	In-Vessel: Completion of the qualification phase prior to start of Blanket First Wall series production	Q1 2023	3
	GB38	Divertor Cassette Body and Assembly	In-vessel: Completion of Stage I of the series production of Divertor Cassette Bodies.	Q2 2023	4
	GB39	Magnetics	Diagnostics: Electronics and Software for Magnetics Delivered to ITER Site	Q3 2023	9
	GB40	Cask & Plug Remote Handling System	Remote Handling :Equatorial Port Plug First Assembly Cask Delivered to ITER Site	Q4 2023	5
	GB41	Cask & Plug Remote Handling System	Remote Handling: Upper Port Plug First Assembly Cask Delivered to ITER Site	Q4 2023	5
	GB42	Neutral Beam Remote Handling System	Remote Handling :Monorail crane of Neutral Beam Remote Handling System and Delivered to ITER Site	Q1 2024	5
	GB43	Electron Cyclotron Power Supplies	NB & PS: 8th Set of Main High Voltage Power Supplies & Body Power Supplies (MHVPS & BPS) Delivered to ITER Site by EU-DA	Q2 2024	7

IC Ref	GB Ref	Area	Milestone	Agreed Quarter	Action
	GB44	Electron Cyclotron Control System	EC Upper Launcher Control System ITER Site Acceptance completed	Q3 2024	7
	GB45	Divertor Vertical Target	In-vessel: Completion of Stage I of the series production of Divertor Inner Vertical Target.	Q3 2024	4
	GB46	Electron Cyclotron Upper Launcher	EC &IC: Delivery 1st EC Upper Launcher from EU-DA to IO	Q4 2023	7
	GB48	Electron Cyclotron Gyrotrons	NB&PS: Delivery of 1st Set (1MW) of Gyrotrons Tubes by EU-DA to ITER Site	Q1 2025	7
	GB49	Divertor Rails	In-vessel: Delivery of the Divertor Rails to the ITER Site.	Q1 2025	4
	GB50	Cryopumps	Cryo&FC : Delivery of Heating Neutral Beam Cryopumps 1 from EU-DA to ITER Site	Q1 2025	6

Table 2. F4E technical objective's distribution throughout the First Plasma date

1.3.4. Objectives KPI

F4E's KPI measures the success of F4E in meeting the Objectives listed in the previous section. Such Objectives consist in the completion of specific main technical activities in which F4E engages, identified through the agreed IC and GB milestones. The Project Management Department (PM) will be in charge of measuring the performance of these Objectives by using a KPI that has been successfully used by the ITER Project. This indicator is meant to show the confidence in meeting the objective in terms of date and, concretely, the variance month by month of the completion date with respect to the end of the agreed quarter. This KPI will be shown in the F4E monthly reports through a "traffic-light" flagging system.

1.3.5. Strategy

In order to reassure our stakeholders on the feasibility to deliver on time and within budget, F4E has dedicated a great amount of effort to analyze the optimization of its resources. The core idea to this analysis entails focusing solely on components critical to FP; to be delivered by the end of 2025. Therefore, in order to maintain the ITER project within the approved budget and to keep deliverables in due time, F4E would focus its efforts solely on critical components. On the other hand, F4E would have to defer or even suspend other systems not considered critical to the FP. F4E has conducted this exercise in the first half of 2016 and has arrived to the conclusion that calling-off or even suspend non-critical activities, would bring about two risks which may have implications over the critical systems and thus over the FP:

1. Additional cost triggered by restarting a job that has been temporally called off.
2. Additional cost and time delay due to the stoppage of work that directly interfaces with the FP -related activities.

The systems not directly affecting the FP may be delayed, slowed down or even postponed depending on budget availability.

This internal F4E project, which has run parallel to IO-CT's "Staged Approach", has been named Straight Road to First Plasma (SR2FP).

1.3.6. Straight road to first plasma (SR2FP)

Taking into account the significant uncertainties about the capability for F4E to deliver on-time and within budget the components for the first plasma, including high financial risks in the buildings and vacuum vessel projects, the F4E Director launched a project called 'Straight Road to First Plasma' (SR2FP) in January 2016. The overall objective of the SR2FP project was to concentrate resources

(funding and staff) on the activities critical to the achievement of first plasma at end 2025 while slowing down or suspending other projects until after 2020 in order to improve the confidence of remaining within the EUR 6.6 billion budget and allowing for a reserve. Due to the complex interdependencies of ITER components this resulted in an extensive re-planning exercise which required several iterations with the IO-CT.

In parallel, the IO-CT was developing the longer term schedule to Deuterium-Tritium [DT] operations based on a four phase approach from FP at end 2025 through to DT operation in 2035. ITER's 'Staged Approach' (also referred to as the 'Iteration Modeling Approach') was based upon incorporating research operation periods as early as possible in the schedule depending on the availability of the additional components procured by the DAs consistent with their annual and long-term budgets. The four stages of the new approach are depicted below:

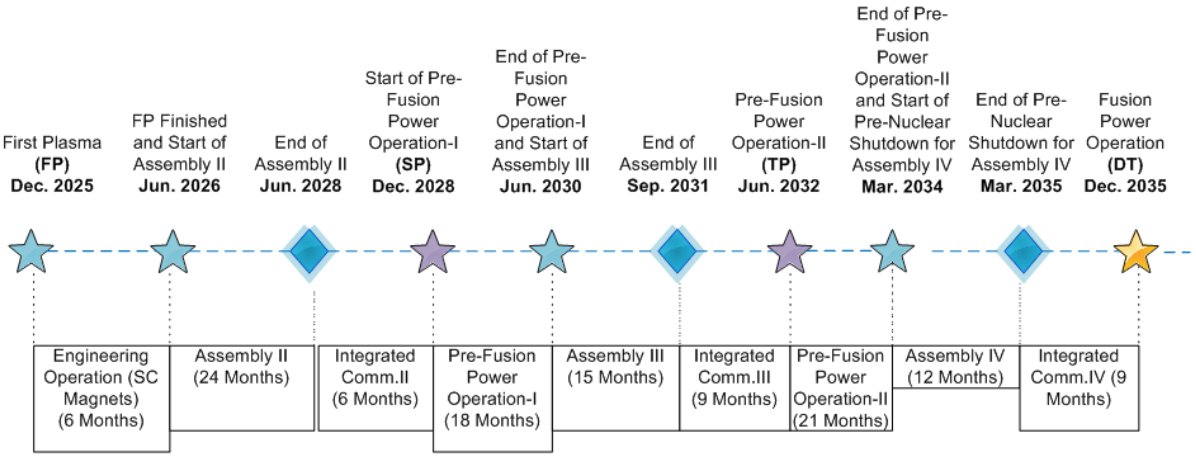


Figure 2. Schematic of the Staged Approach to ITER Operations

In March 2016 F4E concluded the initial phase of the SR2FP planning and identified a number of systems that are not necessary for FP. Clearly any budget reductions until 2020 achieved through the postponement of such items, trade off against cost increases in the longer-term due to prolongation of the whole project. However, such "leaner" FP configurations enable also to focus key staff to critical areas, and in turn reduce complexity by not having to work on so many systems at the same time.

During the same period the IO-CT and DAs including F4E were interacting with the ITER Council's Review Group (ICRG) who was examining the schedule. The ICRG drew a number of conclusions about the ULTS (Updated Long Term Schedule) of November 2015 including that December 2025 was the earliest possible technically achievable date for FP and that there was no possibility to bring this forward. The ICRG also noted that the schedule did not have any contingency on the critical path items (buildings, VV and assembly of the machine).

Concerning the staged approach, the ICRG, while recognizing that it was still a work in progress [at that time], observed that although the staged approach delays the crucial burning plasma experiments by a few years, it has a number of benefits compared to the ULTS:

1. All ITER Members can better focus on the successful achievement of FP.
2. Overall project risk is reduced by addressing the technical challenges step by step.
3. Funding requirements are reduced during the years 2017 to 2019, when some DAs face budgetary constraints.
4. There is better flexibility for accommodating delivery constraints of the DAs (and the IO-CT); and
5. There is time to accommodate a longer research program between FP and the start of DT Operations, thereby preparing the crucial DT experiments more thoroughly.

In the wake of the positive outcome of an extraordinary IC Meeting held on 27 April 2016, the 18th IC on 15-16 June 2016 approved ad referendum the schedule to FP in December 2025 and the level of cash contributions required for the IO-CT which are reduced compared to those presented to the IC-17 in November 2015. The IC also requested the IO-CT DG to freeze the interfaces of the FP components linked to the schedule and approved a list of significant milestones for 2018-2025 against which the project progress should be controlled and reported.
As for the non-first plasma F4E systems, their schedule was developed taking account of a number of constraints:

1. The required delivery dates as expressed iteratively by IO-CT.
2. The need to keep the funding requirement to the minimum.
3. The need to continue activities at an appropriate lower level to avoid a dramatic stop-start which would incur very high future costs and lead to an irrecoverable loss of key competences, both in F4E and the supply chain.
4. The need to progress the design to the point at which there is a reasonable confidence that the interface with first plasma components is understood and the likelihood of future changes minimised.

1.3.7. The ITER Procurement arrangements (PA)

According to the rules for a sound project management F4E has developed its own Work Breakdown Structure (WBS) to represent the work to be executed into a tree of activities broken down and propagated down to different levels. This is a common basis across the whole organization to allow the integration of scheduling, estimating, procurement and finance systems. The WBS consists of seven levels, where the fourth is at PA/ITA level and the sixth is the level of the contract execution.
This work was supplemented by the definition of specific Cost Centers, to be used for costing and funding management purposes. Cost centers are used to control the different contract allocations against its estimates. As for the credit F4E receives from IO-CT for successfully meeting specifically identified milestones, it is worth mentioning that, in most of the cases, it doesn't fully cover (by far) the real costs borne by F4E for the procurement of that component, even if increased whenever a Project Change Request (PCR) was agreed. Nonetheless, F4E considered that CAS milestones agreed for each PA are the most representative figures for our expected results.
In Table 2, the latest information (status end September 2016) concerning both the current and the signed credit values of the PAs for each area is shown. The table shows the evolution of the credit from the value included in the signed PA to the modified one which includes any modification due to the Project Change Requests (PCR) approved by the ITER Council.

PA BS		Current kIUA	Signed Value
1.1	Magnets	185.81881	185.81881
1.5	Vacuum Vessel	96.71200	92.19000
1.6	Blanket System	40.33000	
1.7	Divertor	32.88000	30.50000
2.3	R/H Equipment	32.93337	32.93337
3.1	Vacuum Pumping and Fuelling	14.16600	3.86400
3.2	Tritium Plant	6.33908	3.25200
3.4	Cryoplant and distribution	26.37110	26.37110
4.1	Electrical Power Supply and Distribution System	47.12703	47.18893
5.1	IC H and CD	3.96000	
5.2	ECH and CD	32.26511	13.02800
5.3	NB H and CD	85.07500	57.18200
5.5	Diagnostics	22.71197	1.13414
5.7	In-Vessel Viewing System (IWS)	6.80000	6.80000
6.2	Buildings	468.94512	468.94512
6.3	Waste	10. 10000	
6.4	Rad Protection	4.20000	0.60000

Table 3. Status of EU Procurement Arrangements: Current vs. Signed Value (September 2016)

1.3.8. The ITER credit

Table 4 here below shows, according to the WBS Level 2, the credit value that should have been earned up to end of September 2016 by F4E against the credit that was actually achieved and that already released by IO-CT as acknowledgement of the achieved milestones. In addition, the forecast credit up to end 2021 is shown. Figure 3 and 4 show other relevant PA data.

WBS Level 2	Baseline to end September 2016 (kIUA)	Achieved Credit (kIUA)	Released Credit (kIUA)	Forecast Credit up to end 2021 (kIUA)
	294.17360	**276.39605**	**177.99019**	**782.33388**
EU.01.11 - Magnets	81.08881	76.84673	60.37465	185.81881
EU.01.15 - Vacuum Vessel	34.06000	29.56000	2.20000	92.99000
EU.01.16 - Blanket	0.00000	0.00000	0.00000	3.60000
EU.01.17 - Divertor	1.22000	0.94000	0.94000	3.40000
EU.01.23 - Remote Handling	0.00000	0.00000	0.00000	6.10000
EU.01.31 - Vacuum Pumping and Leak Detection	0.02000	0.02000	0.02000	5.90200
EU.01.32 - Tritium Plant	2.55200	2.55200	2.55200	3.25200
EU.01.34 - Cryoplant	18.83478	17.73678	9.62300	26.37110
EU.01.52 - Electron Cyclotron Heating and Current Drive	2.32500	2.32500	2.32500	16.95911
EU.01.53 - Neutral Beam Heating and Current Drive	13.18000	10.73000	8.82000	49.72500
EU.01.55 - Diagnostics	0.02491	0.00554	0.00554	0.52768
EU.01.57 - Remote Handling IVVS	0.00000	0.00000	0.00000	1.36000
EU.01.62 - Buildings Infrastructure and Power Supplies	140.86810	135.68000	91.13000	386.32818
EU.01.64 - Radiological and Environmental Monitoring	0.00000	0.00000	0.00000	0.00000
EU.01.66 - Waste Management	0.00000	0.00000	0.00000	0.00000

Table 4. ITER Credit achieved and released and forecast up to end 2021 (September 2016)[3]

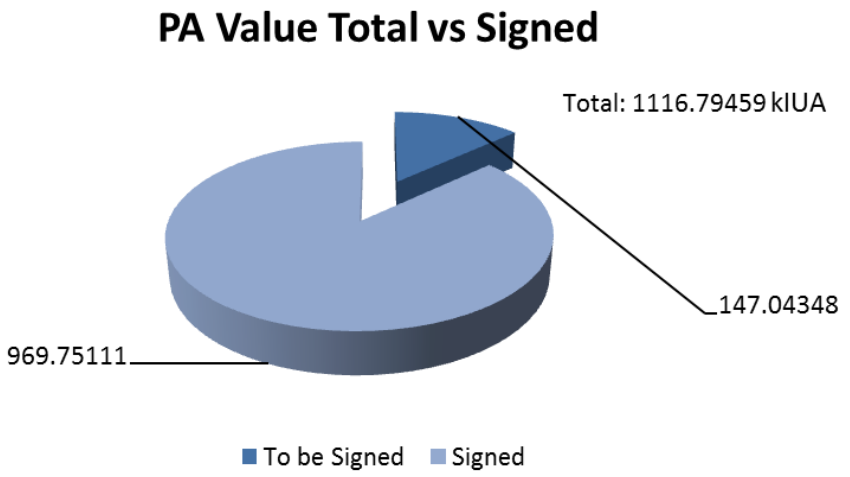


Figure 3. Value of Signed/not Signed EU PA (status September 2016)

[3] Forecast credit value includes credits for not yet signed PAs. In this case values are only indicative as negotiations will be carried out prior to PA signature to finalize them.

PA BS	Reference	Procurement Arrangement	Workflow Status
1.1 Magnets			
1.1 Magnets	1.1.P1A.EU.01	Toroidal Field Magnet Windings	Signed
1.1 Magnets	1.1.P2A.EU.01	Pre-Compression Rings	Signed
1.1 Magnets	1.1.P3A-B.EU.01	Poloidal Field Coils PF2, PF3, PF4, PF5 & PF6	Signed
1.1 Magnets	1.1.P6A.EU.01	Toroidal Field Magnet Conductors	Signed
1.1 Magnets	1.1.P6C.EU.01	Poloidal Field Magnet Conductors	Signed
1.5 Vacuum Vessel			
1.5 Vacuum Vessel	1.5.P1A.EU.01	Vacuum Vessel - Main Vessel, Vacuum Vessel - Blanket Manifolds & Hydraulic Connectors, and Vacuum Vessel	Signed
1.5 Vacuum Vessel	1.5.P1A.EU.02	Blanket Manifold/ Vacuum Vessel - Main Vessel, Vacuum Vessel - Blanket Manifolds & Hydraulic Connectors, and Vacuum Vessel	In-work
1.6 Blanket System			
1.6 Blanket System	1.6.P1A.EU.01	Blanket First Wall	In-work
1.7 Divertor			
1.7 Divertor	1.7.P1.EU.01	Cassette Body and Assembly	Signed
1.7 Divertor	1.7.P2B.EU.01	Inner Targets	Signed
1.7 Divertor	1.7.P2E.EU.01	Divertor Rail	In-work
2.3 R/H Equipment			
2.3 R/H Equipment	2.3.P2.EU.01	In-Vessel Divertor Remote Handling Equipment	Signed
2.3 R/H Equipment	2.3.P3.EU.01	Cask and Plug Remote Handling System	Signed
2.3 R/H Equipment	2.3.P5.EU.01	Ex-Vessel Neutral Beam Remote Handling Equipment	Signed
3.1 Vacuum Pumping and Fuelling			
3.1 Vacuum Pumping and Fuelling	3.1.P1.EU.01	Front End Cryo-Distribution: Warm Regeneration Lines	Signed
3.1 Vacuum Pumping and Fuelling	3.1.P1.EU.02	Front End Cryo-Distribution: Front End Cryopump Distribution	In-work
3.1 Vacuum Pumping and Fuelling	3.1.P1.EU.03	Cryopumps: Torus & Cryostat Cryopump	In-work
3.1 Vacuum Pumping and Fuelling	3.1.P1.EU.04	Cryopumps for ITER Heating and DNB System and MITICA Test Facility	Signed
3.1 Vacuum Pumping and Fuelling	3.1.P3.EU.01	Leak Detection (VS-LD) and Leak Detection	In-work
3.2 Tritium Plant			
3.2 Tritium Plant	3.2.P3.EU.01	Isotope Separation System (ISS) and Hydrogen Isotopes Separation	In-work
3.2 Tritium Plant	3.2.P5.EU.01	Water Detritiation System(WDS) Water Holding Tanks and Emergency Tanks	Signed
3.2 Tritium Plant	3.2.P5.EU.02	Water Detritiation System Tanks, Water Detritiation System Main System, and Water Detritiation	In-work
3.4 Cryoplant and distribution			
3.4 Cryoplant and distribution	3.4.P1.EU.01	Cryoplant (LN2 and Auxiliary Systems) and Cryoplant	Signed

4.1 Electrical Power Supply and Distribution System			
4.1 Electrical Power Supply and Distribution System	4.1.P1A-8B.EU.01	SSEN and PPEN Detailed System Engineering Design	Signed
4.1 Electrical Power Supply and Distribution System	4.1.P1A-8B.EU.02	SSEN and PPEN Installation	Signed
4.1 Electrical Power Supply and Distribution System	4.1.P8A.EU.01	Emergency Power Supply System	Signed
4.1 Electrical Power Supply and Distribution System	4.1.P8C.EU.01	SSEN Components	Signed
5.1 IC H and CD			
5.1 IC H and CD	5.1.P1.EU.01	IC Antenna	In-work
5.2 EC H and CD			
5.2 EC H and CD	5.2.P1B.EU.01	Electron Cyclotron Control System	Signed
5.2 EC H and CD	5.2.P1B.EU.02	EC Upper Launcher PTB Window, EC Upper Launcher PTB Main Plug, and EC Upper Launcher	In-work
5.2 EC H and CD	5.2.P3.EU.01	EC RF Gyrotrons	In-work
5.2 EC H and CD	5.2.P4.EU.01	EC HV Power Supply	Signed
5.3 NB H and CD			
5.3 NB H and CD	5.3.P1.EU.01	NB Assembly and Testing	In-work
5.3 NB H and CD	5.3.P2.EU.01	NB Beam Source and HV Bushing	In-work
5.3 NB H and CD	5.3.P3.EU.01	NB Beamline Components	In-work
5.3 NB H and CD	5.3.P4.EU.01	NB Pressure Vessel, Magnetic Shielding	In-work
5.3 NB H and CD	5.3.P5.EU.01	NB Active Correction and Compensation Coils	In-work
5.3 NB H and CD	5.3.P6.EU.01	NB Power Supply	Signed
5.3 NB H and CD	5.3.P9.EU.01	Neutral Beam Test Facility Components	Signed
5.5 Diagnostics			
5.5 Diagnostics	5.5.P1.EU.00	Diagnostic System	In-work
5.5 Diagnostics	5.5.P1.EU.01	Magnetics Sensor Electronics & Software	Signed
5.5 Diagnostics	5.5.P1.EU.02	CER(Continuous External Rogowskis)	Signed
5.5 Diagnostics	5.5.P1.EU.03	Bolometry System	In-work
5.5 Diagnostics	5.5.P1.EU.04	CXRS Core	In-work
5.5 Diagnostics	5.5.P1.EU.05	Plasma position reflectometry	In-work
5.5 Diagnostics	5.5.P1.EU.06	Vis/IR Eq	In-work
5.5 Diagnostics	5.5.P1.EU.07	Pressure Gauges	In-work
5.5 Diagnostics	5.5.P1.EU.08	Core Thomson Scattering	In-work
5.5 Diagnostics	5.5.P1.EU.09	Collective Thomson Scattering	In-work
5.5 Diagnostics	5.5.P1.EU.10	Up Port #01 Systems	In-work
5.5 Diagnostics	5.5.P1.EU.11	Eq. Port #01 Systems	In-work
5.5 Diagnostics	5.5.P1.EU.12	Eq Port #10 Systems	In-work
5.5 Diagnostics	5.5.P1.EU.13	Up Port #03 Systems	In-work
5.5 Diagnostics	5.5.P1.EU.14	Up Port #17 Systems	In-work
5.5 Diagnostics	5.5.P1.EU.15	Neutron Profile & Spectroscopy	In-work
5.5 Diagnostics	5.5.P1.EU.16	Outer Coils	In-work
5.5 Diagnostics	5.5.P1.EU.17	Inner Coils	In-work

5.5 Diagnostics	5.5.P1.EU.18	In Vessel Electrical Equipment	In-work
5.5 Diagnostics	5.5.P1.EU.19	Divertor Coils	In-work
5.5 Diagnostics	5.5.P1.EU.20	Lower Port Integration	In-work
5.7 In-Vessel Viewing System (IVVS)			
5.7 In-Vessel Viewing System (IVVS)	5.7.P1.EU.01	In-vessel viewing system	Signed
6.2 Buildings			
6.2 Buildings	6.2.P2.EU.01	PF Coil fabrication building	Signed
6.2 Buildings	6.2.P2.EU.02	Architect Engineering Services	Signed
6.2 Buildings	6.2.P2.EU.03	TKM Excavation & Ground Support Structure	Signed
6.2 Buildings	6.2.P2.EU.04	Anti-Seismic Bearing	Signed
6.2 Buildings	6.2.P2.EU.05	Building Construction	Signed
6.2 Buildings	6.2.P2.EU.06	Office Building	Signed
6.3 Waste			
6.3 Waste	6.3.P1.EU.01	Waste Treatment Storage (Type A Radwaste System)	In-work
6.4 Rad Protection			
6.4 Rad Protection	6.4.P1.EU.01	Radiological Protection for design	Signed
6.4 Rad Protection	6.4.P1.EU.02	Radiological Protection for procurement	In-work

Note: Diagnostics have only been considered as one PA in green, Diagnostics Systems.

Table 5. Number of Signed/not Signed EU PA (status September 2016)

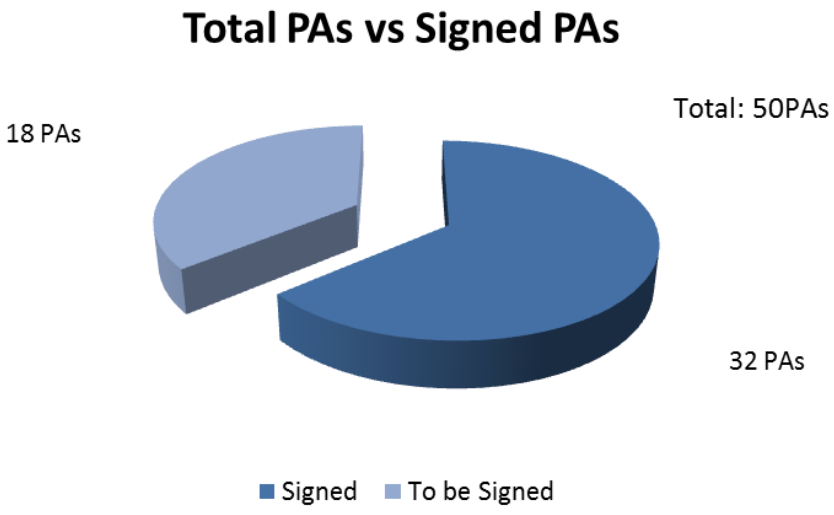
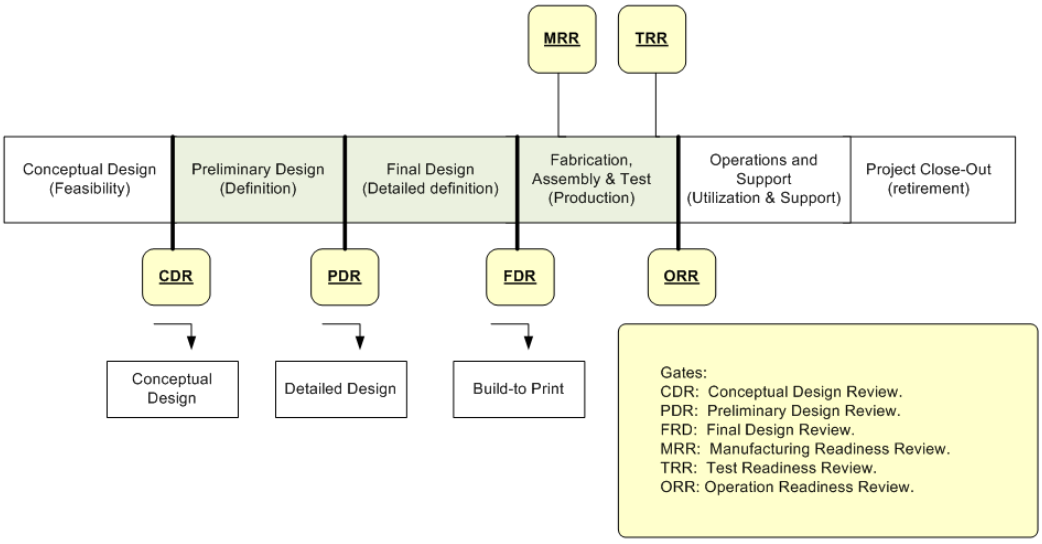


Figure 4. Number of Signed/not Signed EU PA (status September 2016)

1.3.9. Progress in the delivery of the EU contributions

The System Life Cycle establishes a framework for meeting the stakeholder‘s needs in an orderly and efficient manner. It also provides a quick overview of significant dates in the development of the Systems. Essentially, we define lifecycle stages with predefined levels of development by using specific dates to determine the readiness to move to the next stage The different stages are referred as CDR (Conceptual Design Reviews), PDR (Preliminary Design Reviews), FDR (Final Design Reviews) and MRR (Manufacturing Design Reviews) and Key milestones. Where any Component may contain more than one Design Review Date, in its design or construction process, we have taken the latest one. In the cells (Table 4), besides the pertinent dates, we can find “TBD” (To Be Determined) shown when for different technical or non-technical reasons the date is not known. We can also find “N/A” where, due to the nature of the component, the Design Phase in question may not apply. Finally the cells with a “-“show phases which dates are not part of F4E schedule.



EU DWS
WORKING AREA
27/09/2016

	EU.01.11 - Magnets	1.CDR	2.PDR	3.FDR	4.MRR
EU.01.11.01	Toroidal Field Coils	-	-	-	04/09/2017
EU.01.11.02	Pre Compression Rings	-	-	-	09/06/2017
EU.01.11.03	Poloidal Field Coils	-	-	-	02/08/2017
EU.01.11.04	Magnet Conductors	-	-	-	18/09/2014

	EU.01.15 - Vacuum Vessel	1.CDR	2.PDR	3.FDR	4.MRR
EU.01.15.01	Main Vessel	-	-	-	15/05/2013
EU.01.15.02	Blanket Manifolds	-			TBD

	EU.01.16 - Blanket	1.CDR	2.PDR	3.FDR	4.MRR
EU.01.16.01	Blanket and First Wall Panels				10/08/2023

	EU.01.17 - Divertor	1.CDR	2.PDR	3.FDR	4.MRR
EU.01.17.01	Divertor Cassette Body and Assembly	-	-	-	27/08/2015
EU.01.17.02	Divertor Vertical Target	-	-	-	15/05/2017
EU.01.17.03	Divertor Rails	-	-	-	05/06/2024

	EU.01.23 - Remote Handling	1.CDR	2.PDR	3.FDR	4.MRR
EU.01.23.02	Divertor Remote Handling System	-	28/11/2018	19/04/2022	16/10/2023
EU.01.23.03	Cask & Plug Remote Handling System	-	03/03/2020	27/05/2022	23/01/2023
EU.01.23.05	Neutral Beam Remote Handling System	-	13/10/2020	16/02/2023	27/11/2023

	EU.01.31 - Vacuum Pumping and Leak Detection	1.CDR	2.PDR	3.FDR	4.MRR
EU.01.31.01	Cryopumps	-	-	05/07/2022	TBD
EU.01.31.02	Leak Detection and Localization System	-	06/07/2020	16/03/2021	TBD

	EU.01.32 - Tritium Plant	1.CDR	2.PDR	3.FDR	4.MRR
EU.01.32.01	Hydrogen Isotope Separation System	-	30/06/2021	08/08/2024	05/05/2026
EU.01.32.02	Water Detritiation System	-	25/08/2016	11/06/2025	02/03/2026

	EU.01.34 - Cryoplant	1.CDR	2.PDR	3.FDR	4.MRR
EU.01.34.01	Liquid Nitrogen Plant and Auxiliary Systems	-	20/10/2014	09/11/2015	11/12/2015

	EU.01.51 - Ion Cyclotron Heating and Current Drive	1.CDR	2.PDR	3.FDR	4.MRR
EU.01.51.01	Ion Cyclotron Antenna	21/03/2011	01/07/2013	30/11/2022	27/11/2025

	EU.01.52 - Electron Cyclotron Heating and Current Drive	1.CDR	2.PDR	3.FDR	4.MRR
EU.01.52.01	Electron Cyclotron Upper Launcher	-	30/09/2011	27/05/2019	20/05/2020
EU.01.52.02	Electron Cyclotron Gyrotrons	-	29/11/2017	06/06/2023	06/06/2023
EU.01.52.03	Electron Cyclotron Power Supplies	-	N/A	05/12/2014	05/12/2014
EU.01.52.05	Electron Cyclotron Control System	29/01/2014	N/A	06/03/2026	N/A

	EU.01.53 - Neutral Beam Heating and Current Drive	1.CDR	2.PDR	3.FDR	4.MRR
EU.01.53.02	Neutral Beam Source and High Voltage Bushing	-	-	-	22/09/2026
EU.01.53.03	Beamline Components	-	-	-	14/04/2025
EU.01.53.04	Pressure Vessel and Magnetic Shielding	-	15/12/2014	11/02/2019	11/05/2023
EU.01.53.05	Active Correction and Compensation Coils	-	-	27/03/2020	08/11/2023
EU.01.53.06	Neutral Beam Power Supplies	-	26/08/2015	27/08/2020	23/06/2021
EU.01.53.07	Neutral Beam Test Facility	-	05/04/2019	03/12/2019	N/A
EU.01.53.08	Neutral Beam Not Credited Activities	-	-	-	-

	EU.01.55 - Diagnostics	1.CDR	2.PDR	3.FDR	4.MRR
EU.01.55.01	Magnetics	-	-	-	18/12/2020
EU.01.55.02	Bolometers	-	22/12/2021	18/01/2023	09/07/2026
EU.01.55.03	Plasma Position Reflectometry	-	18/03/2021	21/07/2022	09/07/2026
EU.01.55.04	Pressure Gauges	-	23/03/2018	20/07/2020	09/07/2026
EU.01.55.07	Radial Neutron Camera - Gamma Spectrometer	-	27/11/2018	12/05/2020	09/07/2026
EU.01.55.08	High Resolution Neutron Spectrometer	-	-	-	-
EU.01.55.09	Core-plasma Thomson Scattering	-	10/09/2021	21/09/2022	25/06/2026
EU.01.55.10	Low Field Side Collective Thomson Scattering	-	12/02/2018	18/10/2018	20/12/2019
EU.01.55.11	Core-Plasma Charge Exchange Recombination Spectrometer	-	24/10/2022	27/11/2023	09/07/2026
EU.01.55.13	Equatorial Visible/Infrared Wide-Angle Viewing System	-	12/04/2023	03/04/2025	09/07/2026
EU.01.55.14	Port Engineering Systems	-	26/08/2019	08/10/2021	11/07/2023

	EU.01.56 - Test Blanket	1.CDR	2.PDR	3.FDR	4.MRR
EU.01.56.01	European Test Blanket System Arrangement	25/11/2016	07/06/2023	29/05/2026	N/A

	EU.01.57 - Remote Handling IVVS	1.CDR	2.PDR	3.FDR	4.MRR
EU.01.57.01	In Vessel Viewing System	-	18/09/2019	26/10/2021	11/05/2022

Building Number	EU.01.62 - Buildings Infrastructure and Power Supplies			RFOC DATE	RFE DATE	COMPLETION DATE
11	TOKAMAK BUILDING			15/12/2017 Central Pit 15/03/2019 Crane Hall	08/02/2018 RFE 1B stage 1 26/04/2019 RFE 1B stage 2 09/09/2019 RFE 1C	22/03/2021
13	ASSEMBLY BUILDING			19/09/2016	07/04/2017	13/06/2018
14	TRITIUM BUILDING			02/06/2023 B2 Level	15/12/2025	18/11/2026
15	RF HEATING BUILDING			10/04/2017	06/12/2017	01/10/2018
21	HOT CELL			No RFOC as Design & Built contract	21/11/2028	19/12/2028
23	RADWASTE BUILDING			No RFOC as Design & Built contract	15/02/2027	09/09/2027
24	PERSONNEL ACCESS CONTROL BUILDING			No RFOC as Design & Built contract	12/03/2027	06/10/2027
32	MAGNETS POWER CONVERSION BUILDING			No RFOC as Design & Built contract	07/06/2017	19/03/2018
33	MAGNETS POWER CONVERSION BUILDING			No RFOC as Design & Built contract	05/07/2017	20/03/2018
34	NB POWER SUPPLY BUILDING			No RFOC as Design & Built contract	20/08/2021	29/03/2022
37	NB HIGH-VOLTAGE POWER SUPPLY BUILDING			No RFOC as Design & Built contract	25/01/2022	22/08/2022
51	CRYOPLANT COMPRESSOR BUILDING			22/08/2017	04/09/2017 RFE8A	12/07/2019
52	CRYOPLANT COLDBOX BUILDING			22/08/2017	04/09/2017 RFE8A	12/07/2019
53	CRYOPLANT INFRASTRUCTURE BUILDING			24/08/2017	13/09/2017 RFE8A	18/12/2018
61	SITE SERVICES BUILDING			27/10/2016	30/11/2017	15/01/2018
71	CONTROL BUILDING			03/09/2021	30/06/2022	26/05/2023
74	DIAGNOSTICS BUILDING			26/06/2017 B2 Level	27/01/2020	10/12/2020

	EU.01.64 - Radiological and Environmental Monitoring	1.CDR	2.PDR	3.FDR	4.MRR
EU.01.64.01	Radiological and Environmental Monitoring System	-	16/09/2024	20/05/2027	07/12/2028

	EU.01.66 - Waste Management	1.CDR	2.PDR	3.FDR	4.MRR
EU.01.66.01	Radiological and Conventional Waste Treatment and Storage	-	25/05/2020	16/09/2022	04/04/2024

Table 6. Life cycle of the EU procurements [4]

[4] Considering the high WBS level of the table, in a few cases it is possible that behind each line there are more than one component. In such a case, the table shows the latest Design Review date and the dates should not be understood as sequential ones for the lifecycle of one single Component. The RFOC=Ready for Other Contractors. RFE=Ready for Equipment.

1.3.10. Cash contribution to Japan

According to the ITER Agreement, there is a 10% 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 IO-CT of the achieved milestone and the associated credit. Following the new F4E agreement with the Japanese DA (JA DA) F4E provides a yearly payment based on the documented achievement of progress. New commitments are foreseen in the years 2017, 2018 and 2022. The full payments of two PAs have already been completed. Commitments of two new PAs are foreseen in 2017, 2018 and after 2020 (for a deferred item). In addition, a specific contribution to Japan is foreseen in 2022 to fulfill a settlement agreement between EU and Japan agreed in 2014.

System	Description	Percentage of System financed by EU through cash contribution to JA (approximate %)	Value of Cash Contribution (kIUA)	F4E Payments until end October 2016 (kIUA)
Magnets	Toroidal Field Magnet windings	8.96%	7.7362	**1.4923**
	Toroidal Field Magnet Structure	54.92%	49.3605	**22.7937**
	Toroidal Field Magnet Conductors	40.14%	21.5000	**21.500**
	Central Solenoid Magnet Conductors	100%	90.000	**70.283**
Tritium	Atmosphere Detritiation	50%	15.1	**0.00**
Neutral Beam H&CD	Beam Source and High Voltage Bushing	100%	2.0750	**2.0750**
	Power Supply for Heating Neutral Beam Padova	46.5%	22.6220	**21.8972**
	Power Supply for Heating Neutral Beam Cadarache		20.296	**0.00**

Future Commitments to complete EU Cash Contribution to Japan			
System	**Description**	**Value of Commitment**	**Forecasted Commitment Date**
Tritium	Atmospheric Detritiation (first part)	2.30 kIUA	Q2/2017
	Atmospheric Detritiation (second part)	12.80 kIUA	Q2/2022
Neutral Beam H&CD	Power Supply for Heating Neutral Beam Cadarache	20.2960 kIUA	Q1/2018
	Settlement Agreement between EU and Japan agreed in 2014	66.6 $MEuro_{2008}$	Q2/2022

Table 7. EU cash contribution to Japan.

1.3.11. Cash contribution to IO-CT

The sum of the EU in-cash and in-kind contribution is a fixed amount corresponding to the 45.46% of the total project costs during the construction phase.

The F4E share is paid in yearly contributions.

Table 8 shows the yearly cash contribution already paid to IO-CT and the current forecast for 2017 and 2018.

Contribution	Net in-Cash		In-Cash from Staff in-Kind		In-Cash from ITA in-Kind		Total In-Cash Contribution to IO	
	Amount (EUR)	Value (IUA)	Amount (EUR)	Value (IUA)	Amount (EUR)	Value (IUA)	Amount (EUR)	Value (IUA)
2006	2 046 000.00	1 416.90	0.00	0.00	0.00	0.00	**2 046 000.00**	**1 416.90**
2007	19 948 000.00	13 570.07	5 814 255.00	3 962.40	0.00	0.00	**25 762 255.00**	**17 532.47**
2008	36 234 990.34	24 186.33	4 174 642.71	2 783.80	149 815.55	100.00	**40 559 448.60**	**27 070.13**
2009	41 011 930.34	26 500.51	4 220 556.69	2 722.55	309 518.00	200.00	**45 542 005.03**	**29 423.06**
2010	55 717 039.12	35 894.60	3 510 933.10	2 268.96	6 019 586.72	3 878.00	**65 247 558.94**	**42 041.56**
2011	68 863 226.00	43 665.29	3 155 372.37	2 000.77	10 519 813.89	6 670.48	**82 538 412.26**	**52 336.54**
2012	87 274 631.00	53 884.87	2 810 278.03	1 735.11	7 714 938.77	4 763.34	**97 799 847.80**	**60 383.32**
2013	62 373 352.00	37 570.91	2 092 787.90	1 260.60	6 108 338.78	3 679.39	**70 574 478.68**	**42 510.90**
2014	79 418 854.00	47 486.86	2 412 032.00	1 432.84	14 618 812.00	8 684.15	**96 449 698.00**	**57 603.86**
2015	80 092 720.00	44 254.40	2 247 024.00	1 329.51	3 855 001.00	2 280.90	**86 194 745.00**	**47 864.81**
2016 (Budget)	121 521 513.00	71 901.12	1 914 730.00	1 132.90	5 630 831.00	3 331.62	**129 067 074.00**	**76 365.63**
2017 (Forecast)	177 418 178.00	104 973.72	1 550 905.00	917.63	4 727 379.00	2 797.07	**183 696 463.00**	**108 688.42**
2018 (Forecast)	186 454 292.00	110 320.15	1 550 905.00	917.63	1 269 941.00	751.39	**189 275 138.00**	**111 989.17**
2019 (Forecast)	210 601 720.00	124 607.55	1 550 905.00	917.63	225 000.00	133.13	**212 377 625.00**	**125 658.31**
2020 (Forecast)							**260 350 000.00**	**154 042.32**
2021 (Forecast)							**269 600 000.00**	**159 515.30**

Table 8. EU cash contribution to IO

1.4. Broader Approach activities

Fusion for Energy is the Implementing Agency for the EU contribution to the three BA projects, designated by the European Commission to discharge its obligations as defined in the BA Agreement. In particular, F4E is the organization delegated to agree and conclude Procurement Arrangements (PAs) with the Japanese Implementing Agency (QST).
With few exceptions, most of the activities to be undertaken in the frame of the BA agreement are carried out in-kind by Voluntary Contributors (VC). These are some of the member states represented in the GB of F4E which pledged to contribute to the BA projects, namely Belgium, France, Italy, Germany, Spain, and Switzerland (which has now withdrawn). In turn, each VC channels its contributions through the procurement arm of "Designated Institutions" (VC-DIs). F4E concludes Agreements of Collaboration (AoCs) with the VC-DI, to secure delivery of the EU contributions to meet the requirements of each Procurement Arrangement. The direct contribution of F4E through its own budget is therefore limited in general to a supporting, qualifying or integration role, with some direct procurement for agreed EU contributions not covered by the VCs.
Each of the BA Projects, while having some important differences, shares the common feature of being based on a collaboration in which the Parties contribute both to the definition of the overall integrated design and to the detailed design and realization.

1.4.1. Satellite TOKAMAK programme

Scope and Schedule

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

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

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 18-7.6 Project Plan v1.0 (F4E_D_25SPMV v1.0).

The baseline schedule of construction and assembly of JT-60SA foresees the first plasma in March 2019 as shown below.

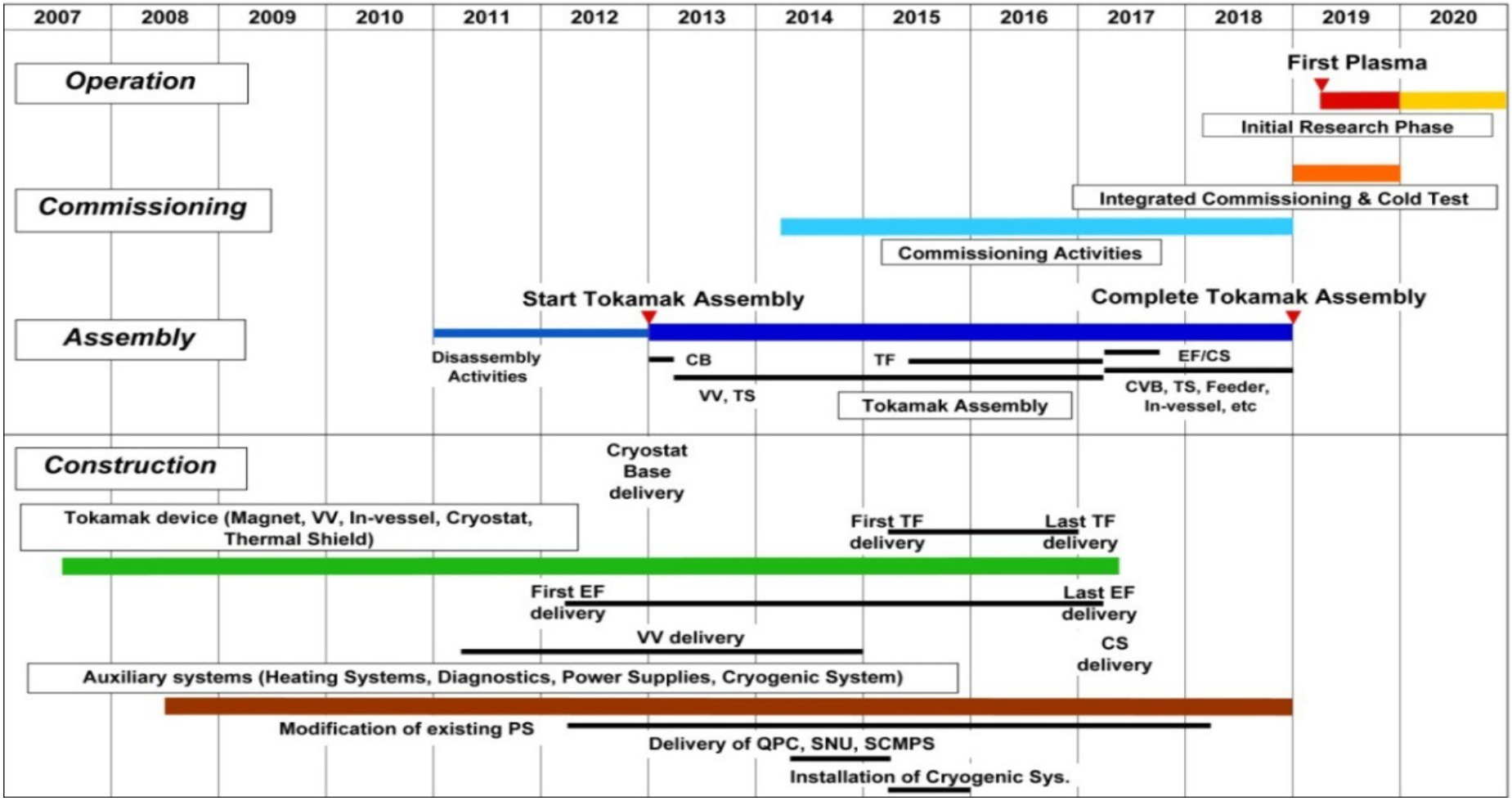


Figure 5. High-level Schedule (as endorsed by BASC 2012) (Project Baseline Schedule)

All the EU Procurement Arrangements and the relevant corresponding industrial contracts have been placed and are well underway. All the European contributions are in line with the above baseline schedule with the notable exception of the TF coils supply presently running with an estimated delay of about 13 (thirteen) months with respect to baseline completion date in January 2017. This delay is expected to be partially recovered during on-site installation activities, leaving the main project milestone of first plasma within year 2019.
Exploitation within the Broader Approach (BA) period is planned to cover the first part of the Initial Research Phase, where the main aim will be the integrated commissioning of the system including initial plasma operation (till end of 2020, see Figure 5).
A collaboration between F4E (through Eurofusion) is on-going with QST (i.e. the Japanese institution) for the preparation of the research plan and the joint exploitation phase of the device. A "JT-60SA Research Plan" was established at the end of 2011 and the latest version was released in 1st March 2016.

Objectives JT-60SA:

The technical objectives for the European part of the JT-60SA project are listed in the table below in which the original dates foreseen for their achievement (in line with the project baseline above) can be compared with the present forecast achievement date.
This simplified table is based on the grouping of the relevant project milestones, originally defined and valorized in the EU Procurement Arrangements.

Technical Objectives		KPI		
Related PA (BA)	Description	Baseline Achieve-ment Date	Forecast Achieve ment Date	Credit Allocation (kBAUA)
Integrated Commissioning and Initial Operation	Common activities required to support JT-60SA activities, not covered under specific WBS sub elements of JT-60SA - 2016 Part	Dec-16	Dec-16	1.872
Integrated Commissioning and Initial Operation	Common activities required to support JT-60SA activities, not covered under specific WBS sub elements of JT-60SA - 2017 Part	Dec-17	Dec-17	1.128
STP-EU-TFC + STP-EU-TFCTF	Transport and Delivery of TF coils and accessories - 2016 part	Dec-16	Mar-17	37.818
STP-EU-TFC + STP-EU-TFCTF	Transport and Delivery of TF coils and accessories - 2017 part	Dec-17	Jun-18	58.978
STP-EU-TFCSP	1st TF spare coils	Jun-18	Jun-18	5.197
STP-EU-TFC	2nd TF spare coils	Jun-18	Jun-18	5.197
STP-EU-HTSCL	Transport of the PF/CS HTSCLs - 2016 Part	Oct-16	Dec-16	1.280
STP-EU-HTSCL	Transport of the PF/CS HTSCLs - 2017 Part	Dec-17	Dec-17	1.280
STP-EU-TFCPRE	Assembly or support of assembly of various components under European responsibility -2016 Part	Jun-16	Sep-16	0.442
STP-EU-TFCPRE	Assembly or support of assembly of various components under European responsibility - 2017 Part	Dec-17	Mar-18	1.475
STP-EU-TFCPRE	Assembly or support of assembly of various components under European responsibility - 2018 Part	Jun-18	Jun-18	0.738
STP-EU-SNU	Transport and Installation of the SNUs -2016 part	Dec-16	Dec-16	3.894
STP-EU-SNU	Transport and Installation of the SNUs -2017 part	Jun-17	Jun-17	1.062
STP-EU-SCMPS	Transport and installation of the SCMPSs -2016 part	Dec-16	Dec-16	6.425
STP-EU-SCMPS	Transport and installation of the SCMPSs -2018 part	Mar-18	Mar-18	2.410
STP-EU-RWMPS	Transport and installation of the RWMPSs -	Jun-17	Jun-17	0.575
STP-EU-RWMPS	Transport and installation of the RWMPSs -2018 part	Sep-18	Sep-18	2.410
STP-EU-ECRHPS	Implementation of the procurement of the ECRH Power Supplies -2016 Part	May-16	Oct-16	1.119
STP-EU-ECRHPS	Implementation of the procurement of the ECRH Power Supplies -2017 Part	Sep-17	Dec-17	1.865
STP-EU-ECRHPS	Implementation of the procurement of the ECRH Power Supplies -2018 Part	Mar-18	Mar-18	0.746
STP-EU-CRYO	Follow-up of the integrated commissioning of JT-60SA Cryoplant	Oct-16	Oct-16	3.186
STP-EU-CR02	Transport of the Cryostat Vessel Body Cylindrical Section	Dec-16	Dec-17	10.433

Table 9. Objectives JT-60SA

Strategy and KPIs JT-60SA:

The JT-60SA project is in advanced implementation and all strategical aspects are defined and frozen.

Now the activities proceed according to a defined plan of deliveries, installation and commissioning with clearly defined roles and responsibilities of EU (F4E+ VCs) and JA (QST) as stakeholders.

The KPIs for the part relative to EU contribution are chosen as the accrual of credits that EU will earn on completion of the activities specified in the established PAs. They are indicated in the table above for each major set of technical objective (actually grouping several creditable milestones defined in the EU PAs).

PA Credit Summary JT-60SA:

The global total commitment for the EU corresponding to the STP (JT-60SA) amounts to 236,413.000 BAUA. At present date (25 July 2016) the credit awarded to EU is 96,437 BAUA. The remaining credits to be earned amount to 139,976 BAUA (from now to the end of 2019).

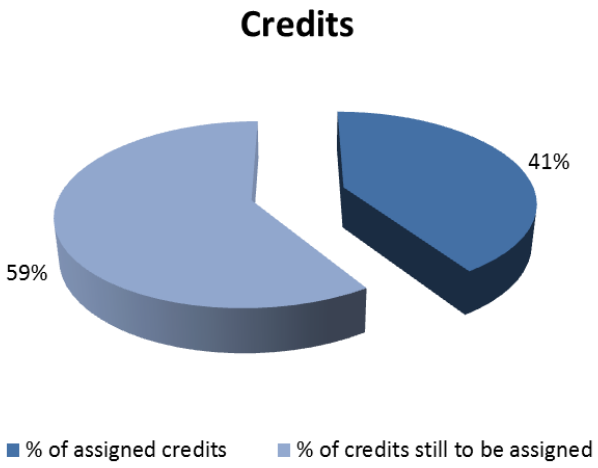


Figure 6. Percentage of assigned/not yet assigned credits in BAUA (Status July 2016)

1.4.2. IFMIF/EVEDA

Scope and Schedule

The IFMIF/EVEDA Project (Engineering Validation and Engineering Design Activities for IFMIF) started in June 2007 and has since undergone a re-scoping exercise in 2010 and an extension till December 2019 approved by the BA Steering Committee in December 2015. Its actual mission is to produce the intermediate engineering design of the International Fusion Materials Irradiation Facility (hereinafter "IFMIF") and to establish an experimental data base for the key elements of IFMIF, which are the Accelerator Facility ("LIPAc"), the Lithium Target Facility and the Test Facilities to back decisions on the construction, operation, exploitation and decommissioning of a fusion neutron source.

As the all deliverables of the Engineering Design activities and of the Engineering Validation activities for the Lithium Target facility (except the completion of erosion/ corrosion testing in the LIFUS 6 test loop at Brasimone) were achieved by 2015, IFMIF/EVEDA Project Plan which is updated on a yearly basis by the BA Steering Committee addresses the following goals:

1. Accomplish the erosion/ corrosion test programme for ferritic martensitic steels (Eurofer-97 and F82H) in the liquid lithium loop by October 2016.
2. Proceed with the Engineering Validation of the LIPAc accelerator over 4 interleaved phases:
   (a) Phase A: Commissioning of the ion source (Injector) studied in 3 sub-phases till late 2016.
   (b) Phase B: Commissioning of the Injector + RF Quadrupole + Medium Energy Beam Transport line + Diagnostics Plate + Low Power Beam Dump studied till mid 2017.
   (c) Phase C: Integrated commissioning of the LIPAc accelerator (with its Superconductive Cavities, High Energy Beam Transport and its Beam Dump) at low duty cycles till early 2018.
   (d) Phase D: Integrated commissioning of the LIPAc accelerator and performance validation under continuous wave conditions, completing the IFMIF/EVEDA Project by December 2019.
3. Prepare the necessary supporting documents for deciding and starting the IFMIF-DONES project (building a scaled down IFMIF plant with number of accelerators reduced from 2 to 1) with construction activities expected by 2020 targeting for a first neutron irradiation by 2027 (in collaboration with EUROfusion).

The schedule for completing the IFMIF/EVEDA Project by the end of 2019 is as follows:

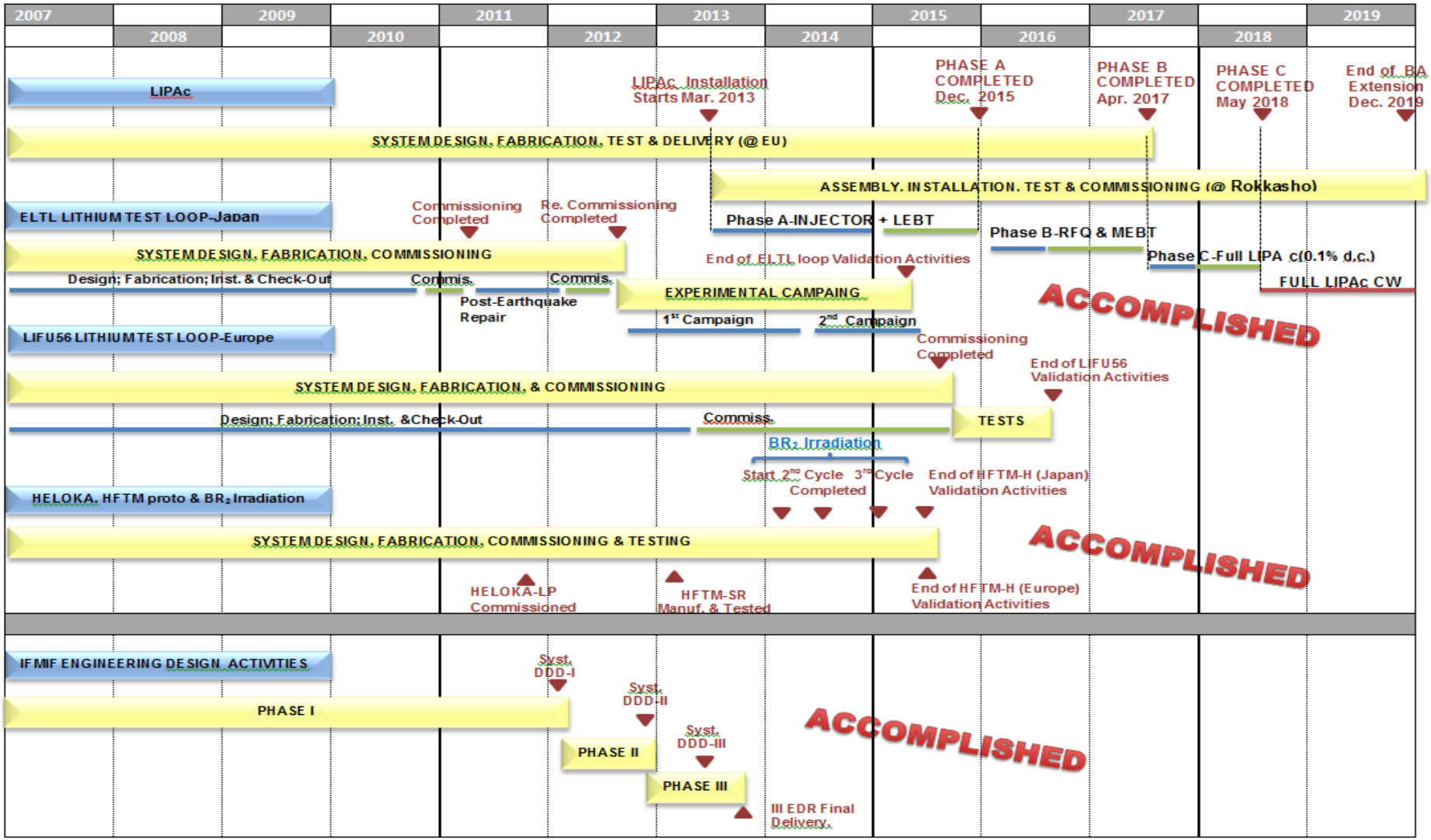


Figure 7. High-level Project Schedule (as endorsed by BASC-18 of April 2016)

Objectives IFMIF/EVEDA:

Technical Objectives		KPI		
Related PA (BA)	Description	Baseline Achievement Date	Forecast Achievement Date	Credit Allocation (kBAUA)
IFMIF-EU-PA-03	RFQ and ancillaries with its delivery report at the Rokkasho BA site	Feb-16	Sep-16	12.690
IFMIF-EU-PA-03.2	Backup set of RF couplers with their delivery report at the BA Rokkasho site	Jun-16	Sep-16	1.000
IFMIF-EU-PA-04	SRF Linac with its Delivery Report at BA site in Rokkasho	May-17	Feb-18	3.060
IFMIF-EU-PA-05	MEBT components with its delivery report at the BA site in Rokkasho	Dec-16	Mar-17	1.040
IFMIF-EU-PA-06	RF Power System with its Delivery Report at BA site in Rokkasho	Dec-16	Jun-17	17.400
IFMIF-EU-PA-07	HEBT & Beam Dump components with its delivery report at the BA site in Rokkasho	Mar-17	May-17	3.843
IFMIF-EU-PA-10-A	Phase A: Completion commissioning @ 100 keV	Oct-16	Dec-16	1.410
IFMIF-EU-PA-10-B	Phase B: Completion commissioning @ 5 MeV	Apr-17	Dec-17	3.470
IFMIF-EU-PA-10-C	Phase C: Commissioning of the full LIPAc @ 9 MeV at low duty cycle	Jun-18	Dec-18	3.890
IFMIF-EU-PA-10-D	Phase D: Commissioning of the full LIPAc @ 9 MeV in Continuous Wave	Jun-19	Oct-19	2590
IFMIF-EU-PA-12	Cryoplant Installation and Acceptance Test Report at Rokkasho BA Site	Jun-16	Sep-17	1.870

Table 10. Objectives IFMIF/EVEDA

Strategy and KPIs IFMIF/EVEDA

Results achieved during Injector Commissioning and RF Quadrupole Commissioning achieved by middle of 2017 should be stable enough to provide enough evidence of the performance of the accelerator prototype to support the hosting and scoping discussion for the IFMIF-DONES neutron source. The successful assembly in clean room of the SRF Linac for LIPAc by the end of 2017 will allow further refinement of the technical specifications for the four SRF Linac modules required for the IFMIF-DONES neutron source. With the successful beam commissioning of the full LIPAc accelerator - first in low duty cycle in 2018, then in continuous wave in 2019 - all hold points for issuing the tendering documents for the IFMIF-DONES accelerator are expected to be released. The goal till 2021 is to have the manufacturing activities for the IFMIF-DONES injector and the RF Quadrupole running to allow the accomplishment of the commissioning full IFMIF-DONES accelerator by 2027.

PA Credit Summary IFMIF/EVEDA:

The global total commitment for the EU corresponding to the IFMIF/EVEDA amounts to 147,330 BAUA. At present date (25 July 2016) the credit awarded to EU is 67,552 BAUA. The remaining credits to be earned amount to 79,778 BAUA (from now to the end of 2019).

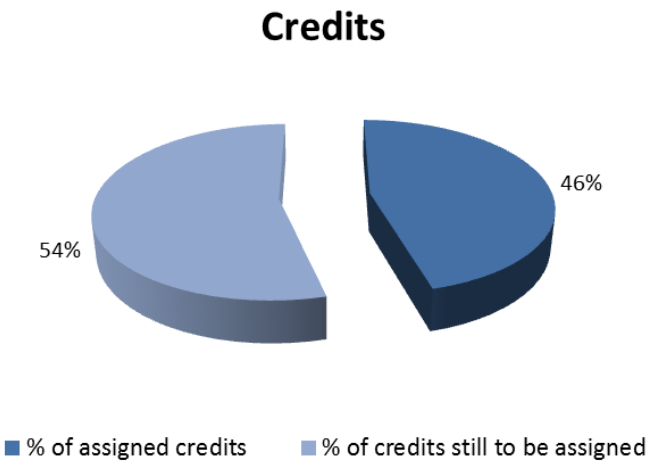


Figure 8. Percentage of assigned/not yet assigned credits in BAUA (Status July 2016)

1.4.3. IFERC

Scope and Schedule

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

DDA (DEMO Design Activities): All DEMO Design Activities are performed by EUROfusion acting as a voluntary contributor. After an initial phase of analysis (common elements for DEMO in EU and JA, 2007-2010), the work moved on to detailed studies to: a) follow-up work on key design issues and options and narrow down design options on which concentrate further analysis work; b) adjust design criteria, design equations, and cost models; c) evaluate sets of DEMO parameters as a function of uncertainties. Phase Two B was completed and reflected in the Intermediate Design report. The activities are now in Phase Two-C, (Jan 2015 – Jun 2017) in which pre-conceptual design options for DEMO are being developed. It is expected that this design activity will also suggest specific R&D activities, some of which would be carried out on ITER, or on the Satellite Tokamak (JT-60SA) and other facilities.

DEMO R&D Activities consist in research materials in order to establish a common basis for a DEMO design from the technology viewpoint. Five R&D tasks proceed under Procurement Arrangements (T1: SiC/SiC Composites, T2: Tritium Technology, T3: Materials Engineering for DEMO Blanket, T4: Advanced Neutron Multiplier for DEMO Blanket, T5: Advanced Tritium Breeders for DEMO Blanket). In the first years of BA these tasks were conducted in the Voluntary Contributors laboratories and were mostly completed by 2015; a few activities continue with EUROfusion acting as voluntary contributor.

Computer Simulation Centre (CSC) Activities: the Helios supercomputer was provided in Rokkasho by Europe at the end of 2011 has been operated by Europe, with all site supporting interfaces provided by Japan. Operation started on schedule in January 2012 with “lighthouse projects” during the first three months, followed by a 6 month first shared use cycle, and thereafter by successive yearly shared use operational cycles up to the end of 2016. The system has minor planned upgrades in

2014, 2015 and 2016, and is used as main supercomputing tool by the EU fusion community. It will be dismantled in the 1st semester of 2017.

Remote Experimentation Centre (REC): The Remote Experimentation Centre in Rokkasho aims to facilitate broad participation of scientists into ITER experiments. Remote experimentation techniques will be tested on existing machines, such as JT60-SA. A working group reviewed the requirements for ITER and JT60-SA remote experimentation and the schedule in 2012. All the contribution to REC is provided by F4E.

An extension of all BA Projects until the end of 2019 was approved by the BA SC. IFERC will have completed its main scientific missions in 2017 as planned, and is extended to support the IFMIF-EVEDA activities, and to maintain the links established between the technical communities during BA while discussions take place between EU and JA on a possible new agreement of collaboration after 2019.

	2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		2017		2018		2019	
	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2
DEMO Design		Workshops/Meetings							Joint Works/Safety research													voluntary Joint Work			
DEMO R&D		Execution of R&D Tasks/ Reporting																				voluntary Work				
CSC		Preparation/Procurement									Operation of CSC										Dismantling					
REC											Plan		Preparation				Set-up/verification				Demo	extra tests				
Site/Buildings		Design		Construction			Adaptation				Maintenance/upgrade											Maintenance				

Table 11. IFERC High Level Project Schedule

Objectives IFERC:

Technical Objectives		KPI		
Related PA (BA)	Description	Baseline Achievement Date	Forecast Achievement Date	Credit Allocation (kBAUA)
(Supercomputer) CSCPA01 CSCPA02	Successful termination of operation, exploitation, dismantling	Jun-17	Jun-17	7.38
(DEMO Design Activities) DPA01-JA-EU	Deliver reports on the agreed design activities on the	Oct-19	Oct-19	1.64
(DEMO R&D Activities) T1PA01.CIEMAT T2PA01.JA-EU	Deliver Reports on the DEMO R&D activities in CIEMAT and	May-17	May-17	0.56
(Remote Exper. Centre) RECPA01-EU	Delivery of software codes and reports on remote participation tests	Jun-19	Jun-19	1.5

Table 12. Objectives IFMIF/EVEDA

Strategy and KPIs IFERC

The IFERC project is in advanced implementation and all strategic aspects are defined and frozen. Now the activities proceed according to a defined plan of deliveries, installation and commissioning with clearly defined roles and responsibilities of EU (F4E+ VCs) and JA (QST) as stakeholders.
The KPIs for the part relative to EU contribution are chosen as the accrual of credits that EU will earn on completion of the activities specified in the established PAs. They are indicated in the table above for each major set of technical objective (actually grouping several creditable milestones defined in the EU PAs)

PA Credit Summary IFERC:

The total commitment for the EU corresponding to the IFERC amounts to 116,250 BAUA. At present date (25 July 2016) the credit awarded to EU is 103,468 BAUA. The remaining credits to be earned amount to 12,782 BAUA (from now to the end of 2019).

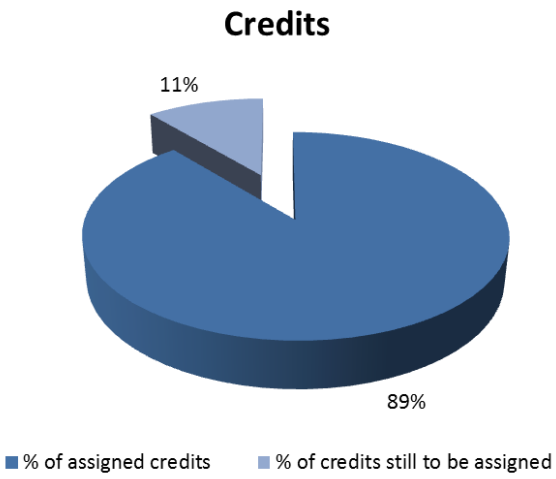


Figure 9. Percentage of assigned/not yet assigned credits in BAUA (Status July 2016)

2. Resource Estimates Plan

2.1. Introduction

The information presented in the Resource Estimates Plan (REP) is based upon the assumptions detailed in introduction.

The REP sets out the indicative resources deemed necessary for the implementation of the Project Plan and includes the following information according to the Article 32 of the Financial Regulation and to the guidelines received from the European Commission:

1. Overall cost estimates for the entire duration of the projects of the Joint Undertaking.
2. Forecast of annual expenditure of the Joint Undertaking for the following five financial years.
3. Estimates of income and expenditure of the Joint Undertaking for the 3 following financial years with reference to the previous and current years.
4. Qualitative and quantitative information on staffing for the 3 following financial years with reference to the previous and current years.

There are nevertheless no budgets assigned yet to F4E projects beyond the current Multi-annual Financial Framework of the EU (MMF 2014-2020). The information provided for 2021 refers to June estimates[5] and is therefore purely indicative.

2.2. Definitions

2.2.1. The budget

The budget is the sole instrument establishing the annual revenue and expenditure considered necessary for F4E, including staffing.
Each annual budget refers to the present Multi Annual Programme.

2.2.2. The revenue

F4E revenue is made up of the Euratom contribution, the ITER Host State contribution, the annual membership contributions from members other than Euratom, the miscellaneous revenue and the revenue from the Reserve Fund.

The Euratom contribution (European Union)

The contribution from Euratom constitutes the main source of revenue for F4E.
This contribution is foreseen at the Article 16 of the EU MFF for the period 2014-2020[6] as contribution to the financing of large scale projects. An amount of EUR 2 707 million in 2011 value is reserved for the ITER project.
The contribution is detailed in the Council decision 2013/791/Euratom[7] amending the Decision 2007/198/Euratom establishing Fusion for Energy (F4E), for the period 2014-2020. The amount of EUR 2 915.015 million is set up in current values for the period of reference and the annual breakdown is provided in its accompanying legal financial statement.
The annual contribution is determined in the European Union General Budget in Commitment and in Payment appropriation, as well as the F4E establishment plan.

[5] F4E(16)-GB35-14.1 Main F4E Milestones, schedule an resources associated with the new ITER baseline schedule.

[6] Council regulation (EU, Euratom no 1311/2013) laying down the multiannual financial framework for the years 2014-2020 (2 December 2013)

[7] Council decision (2013/791/Euratom) amending Decision 2007/198/Euratom establishing the European Joint Undertaking for ITER and the Development of Fusion Energy and conferring advantages upon it (13December 2013)

The revenue received from Euratom is earmarked for operational expenditure and for administrative expenditure (running costs).

The ITER Host State Contribution (France)

The contribution from the ITER Host State constitutes the second source of revenue for F4E. It corresponds to the commitment from the Host State to cover 9.09% of the total costs of the ITER construction phase, excluding expenditure related to Transportation, Test Blanket Modules and administrative expenditure.

The precise scope, conditions and the global amount of the French contribution for the ITER construction phase have been established in a formal exchange of letters between France and the European Commission in 2011[8].

This contribution is earmarked to ITER construction expenditure.

The Membership Contributions (F4E Members except Euratom)

The Annual Membership Contributions are established and adopted annually within the budget. It corresponds to 10% of the administrative budget calculated at the time of the adoption of the previous edition of the REP.

The individual contribution of each member is composed of:

- a minimum contribution of 0.1% of the total amount of annual membership contributions and,
- an additional contribution calculated in proportion to the Euratom financial participation (excluding JET) in the Member's expenditure in the framework of the Community Fusion research programme in the year before last.

The revenue from the Membership contributions is not earmarked.

Reserve Fund

The Revenue from the Reserve Fund managed by the IO-CT is assigned to the implementation of change orders which take place in the framework of the contractual relationships between the owner and the various suppliers.

The revenue from the Reserve Fund is earmarked for financing the corresponding requests for change from IO-CT.

2.2.3. The expenditure

The F4E expenditure is divided in operational and administrative expenditure, for projects and running costs respectively.

The Operational Expenditure

The operational expenditure corresponds to F4E tasks discharging Euratom obligations regarding:

1. The contribution of Euratom to the IO-CT, in accordance with the ITER Agreement.
2. The contribution of Euratom to the BA activities, in accordance with the BA Agreement with Japan.
3. The preparation and coordination of a programme of activities in preparation for the construction of a demonstration fusion reactor (DEMO).

F4E's activities are grouped under two headings:

2. The ITER project represents the core activity of F4E and consists of:
   (a) The tasks related to the ITER construction phase according to the PAs and ITAs signed with IO-CT.
   (b) The contribution in cash to ITER Organization to ensure the financing for its management, the research and development and for the participation to the ITER fund.
   (c) The contribution in cash to Japan within the frame of the transfer of procurement responsibilities from Euratom to Japan.

[8] Contribution financière française à la construction d'ITER - Letter from Mr Bigot to Ms Goeghegan-Quinn and Mr Oettinger on 08/09/11 and reply on 17/11/11

(d) The ITER site support activities.

3. The Technology project groups the R&D activities necessary for ITER and Broader Approach:
   (a) Technology for ITER and DEMO, to allow extra R&D activities, in particular related to the completion of specification by ITER and the preparation of DEMO.
   (b) Technology for BA corresponding to the Euratom contribution managed by F4E for IFMIF-EVEDA, the IFERC at Rokkasho and the JT-60SA Tokamak.
   (c) Technology for IFMIF construction: p.m.

The Reserve Fund

This is the expenditure (Mainly amendment to existing contracts) related to the requests for change initiated by IO-CT and approved for financing from the Reserve Fund.

The Administrative Expenditure

Administrative expenditure related to the functioning and operating costs of F4E is mainly made up of the Euratom contribution.

2.3. Budget forecasts and ceiling

2.3.1. Overall estimates of revenue and expenditure (2007-2041)

The total resources (2007-2041) necessary for F4E to carry out its tasks are divided into two periods:

1. The ITER construction phase and implementation of the BA activities.
   In its July 2010 conclusion the Council of the European Union fixed the overall budget to EUR 6.6 billion in 2008 value for the ITER construction period, until end of 2020 (including DEMO and Broader Approach).
2. The operation and decommissioning of ITER, the possible construction and operation of IFMIF and a programme of activities in preparation for DEMO.

The estimates[9] based on the 2001 final design are 1 278.4 kIUA[10] for the ITER operation phase and EUR 304 million (value 2005) for the decommissioning and de-activation phase.

[9] Resource Estimate Plan F4E(07)-GB04-10 adopted on 18th December 2007.

[10] IUA (ITER Unit of Account with 1 IUA= 1.2889 kEUR (2001 Conversion rate)

2.3.2. Estimates of revenue and expenditure for the period 2007-2020

Reference

As mentioned above, the European Council has fixed the global amount deemed necessary for all F4E activities during the ITER construction phase to EUR 6.6 billion (2007-2020), expressed in 2008 value.

This envelope was defined in commitment appropriation and the corresponding yearly resources have been calculated from the 2008 value in current value. A fixed annual escalation rate of 2% was applied to the estimated cost of the contracts based on their average duration and payment scheme, as defined in the 2011 occurrence of the REP. The result is a 2.6% escalation rate applied to operational expenditure (except experts and legal support), while the administrative expenditure of annual nature is based on the standard 2% escalation rate.

The link between 2008 value and economic condition (current value) is detailed with the expenditure in commitment appropriations in table 13. All other tables are in current value.

The estimate of revenue

Contributions to F4E MEUR	< 2007 Preparation	2007-2011 FP VII	2012-2013 FP VII +2	2014-2020	TOTAL 2007-2020	2021
Commitment appropriations	**42.129**	**1 545.163**	**2 266.377**	**3 791.818**	**7 645.487**	**1 127.110**
Payment appropriations	**42.129**	**788.298**	**692.619**	**4 228.696**	**5 751.743**	**675.000**

	Current Value MEUR	< 2007 Preparation	2007-2011 FP VII	2012-2013 FP VII +2	2014-2020	TOTAL 2007-2020	2021
Commitment Appropriations	Euratom contribution	40.645	1 260.833	2 011.800	2 915.165	**6 228.442**	1 127.110
	France contribution	1.484	270.002	246.200	843.191	**1 360.878**	
	F4E Members contribution	-	*12.808*	*8.200*	*33.020*	***54.028***	
	Miscellaneous revenue	-	1.520	0.177	0.442	**2.139**	
	F4E Total Budget	**42.129**	**1 545.163**	**2 266.377**	**3 791.818**	**7 645.487**	**1 127.110**
	Reserve Fund and Refund	-	-	*0.010*	*71.300*	***71.310***	
	F4E Total Revenue	**42.129**	**1 545.163**	**2 266.388**	**3 863.003**	**7 716.682**	**1 127.110**
Payment Appropriations	Euratom contribution	40.645	690.168	506.242	3 365.234	**4 602.289**	675.000
	France contribution	1.484	83.802	178.000	830.000	**1 093.287**	
	F4E Members contribution	-	*12.808*	*8.200*	*33.020*	***54.028***	
	Miscellaneous revenue	-	1.520	0.177	0.442	**2.139**	
	F4E Total Budget	**42.129**	**788.298**	**692.619**	**4 228.696**	**5 751.743**	**675.000**
	Reserve Fund and Refund	**-**	**-**	***0.010***	***71.300***	***71.310***	**-**
	F4E Total Revenue	**42.129**	**788.298**	**692.630**	**4 299.996**	**5 823.053**	**675.000**

Table 13. Revenue in payment and commitment appropriations

1. Euratom contribution:

The yearly breakdown of the Euratom contribution until 2020 was established with the Legal Financial Statement accompanying the Council Decision (2013/791/Euratom), which has been slightly adjusted with time.

Note: The delays in the implementation of the annual budgets, in particular with the postponement of EUR 500 million from the 2015 to the 2018 to 2020 budget make the total foreseen envelope lower than the EUR 6.6 billion (2008) deemed necessary, due to yearly escalation effect.

2. ITER Host State Contribution:

Based on the Council conclusions mentioned above, the ITER Host State contribution is strictly earmarked to ITER Construction and represents EUR 1 168.0 million (2008 constant values) or 20% of the cost of ITER construction according to the perimeter of contribution already mentioned (Excluding BA, Transportation, Test Blanket Modules and Administrative Expenditure). This contribution is adjusted with the agreement of French Authorities to the actual cost for the domain of participation of the ITER Host State.

3. Membership Contribution:

The annual calculation of this contribution is based on 10% of the administrative expenditure, as defined at the chapter 4.3 of the previous edition of the REP. This earlier stage reference avoids changes along the budgetary procedure, allowing the members to plan in advance their contribution.
To be noted, from 2016 onwards, the breakdown by member is established by Euratom on the basis of the figures provided by EUROfusion, in the respect of frame defined in F4E statutes.

Commitment appropriations made available again

Commitment Appropriations Current Value MEUR		< 2007 Preparation	2007-2011 FP VII	2012-2013 FP VII +2	2014 Executed	2015 Executed	2016 Executed	2017 Budget	2018 Draft Budget	2019 Indicative Forecast	2020 Indicative Forecast	>2020 Indicative Forecast	TOTAL
Commitment Appropriation	Cancelled CA	-	17.440	165.800	86.781	270.066	-	-	-	-	-	-	**540.086**
	CA made available again	-	9.760	-	-	-	-	96.000	205.250	65.120	163.712	-	**539.842**
	Total CA still to be made available again	**-**	**7.680**	**173.480**	**260.261**	**530.327**	**530.327**	**434.327**	**229.077**	**163.957**	**0.245**	**0.245**	**0.245**

Table 14. Revenue made available again

According to the annuality principle of the F4E Financial Regulation, unused appropriations at the end of each year are cancelled, as well as de-commitments (cancellation of budgetary commitments).
The F4E FR foresees the possibility to make those appropriations available again in subsequent budgets according to the needs for the project.
Surely, the following considerations impose keeping the EUR 6.6 billion (2008) budget up to 2020 and so to recover all cancelled appropriations;

1. The future increase of the cash contribution to IO-CT. Due to the implementation of the IO Reserve Fund dedicated to the project changes financing and to the possible increase in resources foreseen for the machine assembly.
2. Possible increase of cost of the in-kind procurements. Even if cost containment measures are used, the evolution of both the design and the manufacturing of components can bring an increase of the costs. This includes also the unavoidable obligation to comply with the requests issued by the Nuclear French Safety Authority.
3. Possible impact of cost risks. The analysis of the Estimate Cost at Completion (EAC) for the EU in-kind procurements has also identified a number of cost risks that, if materialized, will have an impact on the costs, despite mitigation actions. Among them, one category is represented by the cost claims for existing contracts. Delays in the building contract execution caused by IO/F4E late delivery of input data and other similar situations may trigger claims from the companies that will have to be resolved rapidly so as not to impact the schedule.

It should be noted this financial mechanism applies to operational annual budget of F4E, to the exclusion of Assigned Revenue (ITER Host State contribution, Reserve Fund) and administrative expenditure, both following specific rules.
The annual amounts cancelled and to be made available again later are detailed in the table 14.

Revenue from the ITER Reserve Fund and Refunds

The revenue from the Reserve Fund and refunds are excluded from the EUR 6.6 billion monitoring, considering both correspond to reimbursements or reimbursements like or previous expenditure already accounted against the EUR 6.6 billion.

The Estimate of expenditure

In commitment appropriations (Current value and reference value (2008)):

F4E - Expenditure Commitment appropriations	< 2007 Preparation	2007-2011 FP VII	2012-2013 FP VII +2	2014-2020	TOTAL 2007-2020	2021
Constant Value - MEUR$_{(2008)}$	44.472	1 344.989	1 886.745	3 255.417	6 531.623	811.000
Current Value - MEUR	42.129	1 401.295	2 112.489	4 089.406	7 645.320	1 127.110

	Constant Value MEUR$_{(2008)}$	< 2007 Preparation	2007-2011 FP VII	2012-2013 FP VII +2	2014-2020	TOTAL 2007-2020	
Commitment Appropriations	ITER Construction	44.472	1 205.691	1 801.330	2 743.013	5 794.507	671.000
	Technology	-	35.160	10.922	211.909	257.991	90.000
	Technology for ITER	-	*18.701*	*7.800*	*163.892*	*190.393*	
	Technology for BA, DEMO & IFMIF	-	*16.460*	*3.121*	*48.017*	*67.598*	
	Other Expenditure	-	***3.190***	***1.885***	***23.225***	***28.300***	
	F4E Administration	-	100.947	72.608	277.271	450.826	50.000
	F4E Total Budget	44.472	1 344.989	1 886.745	3 255.417	6 531.623	811.000
	Reserve Fund	-	-	-	55.948	55.948	-
	Refund	-	-	0.009	1.828	1.837	-
	F4E Total Expenditure	44.472	1 344.989	1 886.754	3 313.194	6 589.409	811.000

	Current Value MEUR	< 2007 Preparation	2007-2011 FP VII	2012-2013 FP VII +2	2014-2020	TOTAL 2007-2020	2021
Commitment Appropriations	ITER Construction	42.129	1 256.801	2 018.688	3 455.755	6 773.372	936.781
	Technology	-	36.554	12.367	273.970	322.890	125.649
	Technology for ITER	-	*19.480*	*8.848*	*214.003*	*242.331*	
	Technology for BA, DEMO & IFMIF	-	*17.074*	*3.519*	*59.966*	*80.559*	
	Other Expenditure	-	***3.325***	***2.059***	***27.996***	***33.380***	
	F4E Administration	-	104.615	79.376	331.686	515.678	64.680
	F4E Total Budget	42.129	1 401.295	2 112.489	4 089.406	7 645.320	1 127.110
	Reserve Fund	-	-	-	69.107	69.107	-
	Refund	-	-	0.010	2.193	2.203	-
	F4E Total Expenditure	42.129	1 401.295	2 112.500	4 160.706	7 716.630	1 127.110

Table 15. Expenditure in commitment appropriations

Escalation for current/2008 values: A 2.6% escalation rate is applied to operational contracts; the standard 2% rate is kept for administrative expenditure and other operational expenditure.

In payment appropriations:

F4E - Expenditure Payment appropriations	< 2007 Preparation	2007-2011 FP VII	2012-2013 FP VII +2	2014-2020	TOTAL 2007-2020	2021
Current Value - MEUR	42.129	684.322	754.208	4 271.245	5 751.903	675.000

Current Value MEUR		< 2007 Preparation	2007-2011 FP VII	2012-2013 FP VII +2	2014-2020	TOTAL 2007-2020	2021
Payment Appropriations	ITER Construction	42.129	562.819	658.431	3 684.913	4 948.292	575.000
	Technology	-	14.972	14.033	227.707	256.712	35.320
	Technology for ITER	-	*9.538*	*5.694*	*174.247*	*189.479*	
	Technology for BA, DEMO & IFMIF	-	*5.435*	*8.339*	*53.460*	*67.234*	
	Other Expenditure	-	*1.916*	*2.367*	*26.939*	*31.222*	
	F4E Administration	-	104.615	79.376	331.686	515.678	64.680
	F4E Total budget	42.129	684.322	754.208	4 271.245	5 751.903	675.000
	Reserve Fund	-	-	-	69.107	69.107	-
	Refund	-	-	0.010	2.193	2.203	-
	F4E Total budget	42.129	684.322	754.218	4 342.545	5 823.214	675.000

Table 16. Expenditure in payment appropriations

1. The operational expenditure for the ITER project:

The integrated activities for each system and financed by the F4E operational budget with the profile indicated in this document aim at the achievement of the following target:

Magnets

- Ten toroidal field coils and 20% of the Nb3Sn conductor to be used in the toroidal field coils.
- Five poloidal field coils and 11% of NbTi conductor for the poloidal field coils.
- Nine fibreglass composite pre-compression rings.
- Toroidal field conductor and poloidal field conductor.

Vacuum Vessel

- Five sectors of the vacuum vessel.

Blanket

- Blanket first wall: 48.4% of the first wall panels corresponding to the normal heat flux first wall.
- Blanket cooling manifold.

Divertor

- Divertor inner vertical target.
- Divertor cassette bodies and integration of plasma-facing components.
- Divertor rails.

Remote Handling

- Divertor Remote Handling System DRHS.
- Cask and Plug Remote Handling System CPRHS.
- In-Vessel Viewing System IVVS.
- Neutral Beam Remote Handling System NBRHS.

Vacuum and Fuelling

- Warm regeneration lines front-end cryodistribution with cold valve boxes, torus and cryostat cryopumps, cryopumps for the neutral beam system and leak detection and localization system.

Tritium System

- Tritium plant consisting of the water detritiation system (WDS) and the hydrogen isotope separation system (ISS).
- Waste Management System.

Cryoplant

- Liquid nitrogen (LN2) plant and auxiliary systems, approximately one-half of the Cryoplant.

Electrical Power Distribution

- Power Supplies — pulsed power and steady state power supplies.

Ion Cyclotron Antenna

- Ion cyclotron resonance heating system (two[11] equatorial port plugs incorporating on ion cyclotron antenna).

Electron Cyclotron (EC) Upper launcher and Electron Cyclotron Power Sources and Power Supplies

- Electron cyclotron resonance heating system (four upper port plugs) and the corresponding ex-vessel waveguide system (Primary Confinement System);
- Ex-vessel waveguide system of the Equatorial Launcher;
- The EC plant control system;
- 32% of the gyrotron sources and 67% of the power supplies.

Neutral Beam System

- Neutral beam assembly and testing.
- Beam source and high voltage bushings.
- Beam line components.
- Pressure vessel and magnetic shielding.
- Active corrections and compensation coils.
- Neutral beam power supplies and related systems.
- Neutral Beam Test Facility.

Diagnostics

- 13 distinct diagnostics systems; tokamak services (cables, feed-throughs and connectors on the ITER vessel); and integration of diagnostics into seven ports housing 22 diagnostics systems from Europe, ITER Organization and five other Domestic Agencies.
- F4E is responsible of about one quarter of the ITER Diagnostics.

Site and Buildings

- Poloidal Field Coil Winding Facility.
- Architecture engineering services.
- Tokamak excavation.
- Supply of anti-seismic bearings for Tokamak Complex.
- Building construction.
- Office buildings.

Radiological Environmental Protection Systems (REMS)

- Radiological and Environmental Monitoring Systems.

[11] Pending IC-19 decision

Waste Treatment and Storage

- Radwaste Building Process Equipment for Low and Intermediate level-short lived, solid and liquid radwaste,
- Site Services Building Process Equipment, including equipment devoted to the treatment and storage of toxic and non-toxic-non-radioactive wastes.

Test Blanket Modules (non-credited)

- First HCLL/HCPB TBM and its radiation shield.
- Full set of Ancillary Systems connected to a TBM, i.e for each TBM: Helium Cooling System, Tritium Extraction System, Coolant Purification System; and, specifically for the HCLL TBM, the PbLi loop.
- TBS Data Acquisition & Control Systems.
- Ancillary Equipment Units structures.
- Maintenance/inspection tools and equipment that are specific to only one TBS (non-standard for all TBS).
- Support to Assembly/installation of TBS in ITER.
- Shipping Cask for transport of irradiated TBMs (design only at this stage).

2. The operational expenditure for the Broader Approach project:

Under the Broader Approach Agreement, Euratom contributes a total of 500 kBAUA[12] of which 440 kBAUA are provided in kind by Voluntary Contributors as shown in the following figures. These revenue and expenditure are dealt with by each EU Member State participating to this programme.
The remainder is provided by Euratom through F4E as Implementing Agency in the BA Agreement and are foreseen in the direct revenue.

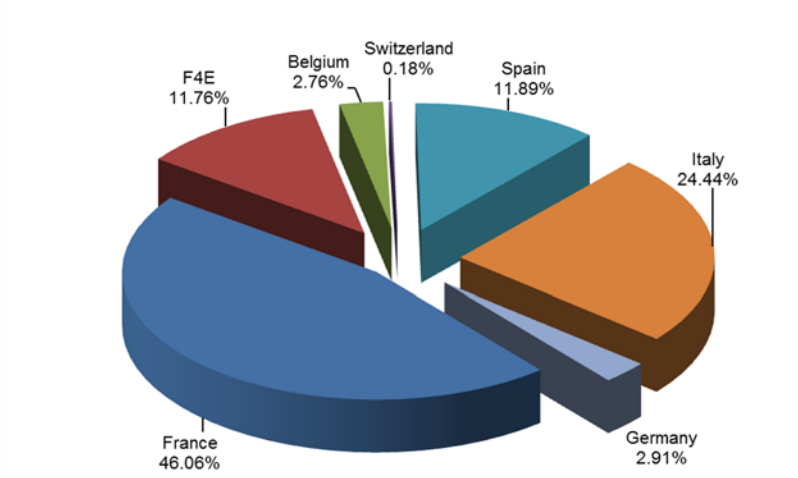


Figure 10. BA contribution by Members

The expenditure is detailed in the BA work programme adopted by its Steering Committee.

3. The administrative expenditure:

This expenditure is recurrent and mainly based on the establishment plan (salaries).

[12] BAUA (Broader Approach Units of Account with 1 BAUA = 678 € 2005 values)

2.4. Estimates of revenue and expenditure for 2014-2021

2.4.1. Revenue in commitment appropriations

REVENUE Commitment appropriations (EUR)	2014 Executed Budget	2015 Executed Budget	2016 Budget	2017 Draft Budget			Envisaged in 2018		Envisaged in 2019		Envisaged in 2020		Envisaged in 2021
				F4E request	Budget Forecast	VAR 2017/16	Forecast	VAR 2018/17	Forecast	VAR 2019/18	Forecast	VAR 2020/19	
1 REVENUE FROM FEES AND CHARGES													
2. EU CONTRIBUTION	**722 790 382.60**	**385 213 518.14**	**324 297 788.01**	**315 112 996.60**	**315 112 996.60**	**-2.8%**	**369 125 000.00**	**17.1%**	**410 929 000.00**	**11.3%**	**394 532 959.00**	**-4.0%**	**1 127 110 000.00**
of which Administrative (Title 1 and 2)	*41 127 422.32*	*43 860 000.00*	*47 794 650.00*	*47 547 440.40*	*47 547 440.40*	-0.5%	*49 200 000.00*	3.5%	*49 800 000.00*	1.2%	*45 670 000.00*	-8.3%	
of which Operational (Title 3)	*679 790 382.68*	*338 355 057.00*	*275 475 092.00*	*266 512 996.60*	*266 512 996.60*	-3.3%	*319 925 000.00*	20.0%	*361 129 000.00*	12.9%	*348 862 959.00*	-3.4%	
of which recovery from previous years admin	*1 872 577.60*	*2 998 461.14*	*1 028 046.01*	*1 052 559.60*	*1 052 559.60*	2.4%		-		-		-	
of wich recovery from previous years operational					-	-		-		-		-	
3 THIRD PARTIES CONTRIBUTION	**174 400 000.00**	**68 390 000.00**	**134 600 000.00**	**149 860 000.00**	**149 860 000.00**	**11.3%**	**146 920 000.00**	**-2.0%**	**141 980 000.00**	**-3.4%**	**60 061 000.00**	**-57.7%**	
Of which ITER Host State contribution	*170 000 000.00*	*64 000 000.00*	*130 000 000.00*	*145 000 000.00*	*145 000 000.00*	11.5%	*142 000 000.00*	-2.1%	*137 000 000.00*	-3.5%	*55 191 000.00*	-59.7%	
Of which Membership contribution	*4 400 000.00*	*4 390 000.00*	*4 600 000.00*	*4 860 000.00*	*4 860 000.00*	5.7%	*4 920 000.00*	1.2%	*4 980 000.00*	1.2%	*4 870 000.00*	-2.2%	
4 MISCELLANOUS REVENUE	*160 982.09*	*164 905.74*	*20 835.45*			-		-		-		-	
5 ADMINISTRATIVE OPERATIONS													
6 REVENUES FROM SERVICES RENDERED AGAINST PAYMENT													
7 CORRECTION OF BUDGETARY IMBALANCES													
8 INTERESTS GENERATED	*48 889.96*	*42 579.42*	*3 611.16*			-		-		-		-	
9 UNUSED APPROPRIATIONS FROM PREVIOUS YEARS	*21 108 957.31*	*10 793 033.79*	*13 436 039.03*	*96 000 000.00*	*96 000 000.00*	-	205 250 000.00	-	65 120 000.00	-68.3%	163 712 119.93	151.4%	
TOTAL REVENUE	**918 509 211.96**	**464 604 037.09**	**472 358 273.65**	**560 972 996.60**	**560 972 996.60**	**18.8%**	**721 295 000.00**	**28.6%**	**618 029 000.00**	**-14.3%**	**618 306 078.93**	**0.0%**	**1 127 110 000.00**
RESERVE FUND AND REFUND	**3 528.00**	**3 297 804.77**	**50 646 607.76**	**17 352 015.51**	**17 352 015.51**	**-**		**-**		**-**		**-**	
of which Reserve Fund		*1 301 314.76*	*50 453 772.43*	*17 352 015.51*	*17 352 015.51*	-		-		-		-	
of which Refund	*3 528.00*	*1 996 490.01*	*192 835.33*			-		-		-		-	

Table 17. Revenue in Commitment for 2014-2021[13]

[13] The 2017 budget submitted to the Governing board on December 2nd , in line with the previous edition of the REP adopted in Dec 2015, is lower than the sum of the actions in the corresponding 2017 WP. According to the progress achieved in implementing the 2017 WP during the first semester of 2017 F4E may request to the GB the release of a part of the unused appropriations according to Article 14(1) and Article 16 of the F4E Financial Regulations. This amending budget would allow to match the forecasted needs.

2.4.2. Revenue in payment appropriations

REVENUE Payment appropriations	2014 Executed Budget	2015 Executed Budget	2016 Budget	2017 Draft Budget			Envisaged in 2018		Envisaged in 2019		Envisaged in 2020		Envisaged in 2021
				F4E request	Forecast	VAR 2017/16	Forecast	VAR 2018/17	Forecast	VAR 2019/18	Forecast	VAR 2020/19	
1 REVENUE FROM FEES AND CHARGES													
2. EU CONTRIBUTION	**422 982 076.93**	**409 488 267.82**	**598 386 203.81**	**418 760 708.14**	**418 760 708.14**	**-30.0%**	**499 200 000.00**	**19.2%**	**524 800 000.00**	**5.1%**	**545 670 000.00**	**4.0%**	
of which Administrative (Title 1 and 2)	*41 127 422.32*	*43 754 912.00*	*47 794 650.00*	*47 547 440.40*	*47 547 440.40*	*-0.5%*	*49 200 000.00*	*3.5%*	*49 800 000.00*	*1.2%*	*45 670 000.00*	*-8.3%*	
of which Operational (Title 3)	*379 973 637.68*	*342 923 056.00*	*522 302 661.93*	*370 140 000.00*	*370 140 000.00*	*-29.1%*	*450 000 000.00*	*21.6%*	*475 000 000.00*	*5.6%*	*500 000 000.00*	*5.3%*	
of which recovery from previous years admin	*1 872 577.60*	*2 998 461.14*	*1 028 046.01*	*1 052 559.60*	*1 052 559.60*	*-*		*-*		*-*		*-*	**675 000 000.00**
of wich recovery from previous years operational	*8 439.33*	*19 811 838.68*	*27 260 845.87*	*20 708.14*	*20 708.14*	*-*		*-*		*-*		*-*	
3 THIRD PARTIES CONTRIBUTION	**127 365 000.00**	**81 390 000.00**	**124 600 000.00**	**129 860 000.00**	**129 860 000.00**	**4.2%**	**134 920 000.00**	**3.9%**	**134 980 000.00**	**0.0%**	**129 870 000.00**	**-3.8%**	
Of which ITER Host State contribution	*123 000 000.00*	*77 000 000.00*	*120 000 000.00*	*125 000 000.00*	*125 000 000.00*	*4.2%*	*130 000 000.00*	*4.0%*	*130 000 000.00*	*0.0%*	*125 000 000.00*	*-3.8%*	
Of which Membership contribution	*4 365 000.00*	*4 390 000.00*	*4 600 000.00*	*4 860 000.00*	*4 860 000.00*	*5.7%*	*4 920 000.00*	*1.2%*	*4 980 000.00*	*1.2%*	*4 870 000.00*	*-2.2%*	
4 MISCELLANOUS REVENUE	*160 982.09*	*164 905.74*	*20 835.45*			*-*		*-*		*-*		*-*	
5 ADMINISTRATIVE OPERATIONS													
6 REVENUES FROM SERVICES RENDERED AGAINST PAYMENT													
7 CORRECTION OF BUDGETARY IMBALANCES													
8 INTERESTS GENERATED	*48 889.96*	*42 579.42*	*3 611.16*			*-*		*-*		*-*		*-*	
9 UNUSED APPROPRIATIONS FROM PREVIOUS YEARS	*17 021 674.33*	*33 000 000.00*	*0.13*			*-*		*-*		*-*		*-*	
TOTAL REVENUE	**567 578 623.31**	**524 085 752.98**	**723 010 650.55**	**548 620 708.14**	**548 620 708.14**	**-24.1%**	**634 120 000.00**	**15.6%**	**659 780 000.00**	**4.0%**	**675 540 000.00**	**2.4%**	**675 000 000.00**
RESERVE FUND AND REFUND	**3 528.00**	**1 996 490.01**	**9 244 717.62**	**20 049 411.71**	**20 049 411.71**	**-**	**23 393 235.19**	**-**	**11 172 032.00**	**-**	**5 440 541.51**	**-**	
of which Reserve Fund			*9 051 882.29*	*20 049 411.71*	*20 049 411.71*	*-*	*23 393 235.19*	*-*	*11 172 032.00*	*-*	*5 440 541.51*	*-*	
of which Refund	*3 528.00*	*1 996 490.01*	*192 835.33*			*-*		*-*		*-*		*-*	

Table 18. Revenue in Payment for 2014-2021[14]

[14] The 2017 budget submitted to the Governing board on December 2nd , in line with the previous edition of the REP adopted in Dec 2015, is lower than the payment forecasts. Subject to the good implementation of the budget during the first semester of 2017 compared to those forecasts, F4E may request to the GB an increase of the 2017 contributions to respond to all payment obligations until the end of the year.

2.4.3. Expenditure in commitment appropriations

EXPENDITURE In Commitment Appropriations (EUR)	2014 Executed Budget	2015 Executed Budget	2016 Budget	2017 Draft Budget			Envisaged in 2018		Envisaged in 2019		Envisaged in 2020		Envisaged in 2021
				F4E request	Budget Forecast	VAR 2017/16	Forecast	VAR 2018/17	Forecast	VAR 2019/18	Forecast	VAR 2020/19	
Title 1 Staff Expenditure	**36 335 789.33**	**38 839 125.67**	**40 677 753.35**	**41 790 000.00**	**41 320 000.00**	**1.6%**	**42 285 000.00**	**2.3%**	**42 750 000.00**	**1.1%**	**41 538 000.00**	**-2.8%**	
Salaries & allowances	31 798 698.25	32 906 824.48	34 920 000.00	36 200 000.00	35 800 000.00	2.5%	36 600 000.00	2.2%	37 050 000.00	1.2%	36 478 000.00	-1.5%	
Of which establishment plan posts	*24 114 377.20*	*24 964 160.95*	*26 520 000.00*	*27 300 000.00*	*26 900 000.00*	*1.4%*	*27 400 000.00*	*1.9%*	*28 100 000.00*	*2.6%*	*27 928 000.00*	*-0.6%*	
Of which external personnel	*7 684 321.05*	*7 942 663.53*	*8 400 000.00*	*8 900 000.00*	*8 900 000.00*	*6.0%*	*9 200 000.00*	*3.4%*	*8 950 000.00*	*-2.7%*	*8 550 000.00*	*-4.5%*	
Expenditure relating to Staff recruitment	522 851.60	731 757.13	910 300.00	720 000.00	720 000.00	-20.9%	670 000.00	-6.9%	670 000.00	0.0%	550 000.00	-17.9%	
Mission expenses	1 800 000.00	2 728 251.96	2 100 153.35	2 100 000.00	2 000 000.00	-4.8%	2 100 000.00	5.0%	2 200 000.00	4.8%	1 900 000.00	-13.6%	
Socio-medical infrastructure	277 651.15	336 400.00	556 000.00	280 000.00	580 000.00	4.3%	580 000.00	0.0%	500 000.00	-13.8%	450 000.00	-10.0%	
Training	649 297.37	682 356.26	817 000.00	850 000.00	820 000.00	0.4%	880 000.00	7.3%	885 000.00	0.6%	800 000.00	-9.6%	
External Services													
Receptions, events and representation	4 667.66	5 000.00	10 000.00	10 000.00	10 000.00	0.0%	10 000.00	0.0%	10 000.00	0.0%	10 000.00	0.0%	
Social welfare													
Other Staff related expenditure	1 282 623.30	1 448 535.84	1 364 300.00	1 630 000.00	1 390 000.00	1.9%	1 445 000.00	4.0%	1 435 000.00	-0.7%	1 350 000.00	-5.9%	**64 680 000.00**
Title 2 Infrastructure and operating expenditure	**6 317 325.52**	**6 365 878.22**	**6 847 499.88**	**6 810 000.00**	**7 280 000.00**	**6.3%**	**6 915 000.00**	**-5.0%**	**7 050 000.00**	**2.0%**	**7 190 000.00**	**2.0%**	
Rental of buildings and associated costs	1 105 360.65	1 243 000.00	1 375 000.00	1 305 000.00	1 459 000.00	6.1%	1 360 000.00	-6.8%	1 380 000.00	1.5%	1 395 000.00	1.1%	
Information, communication technology and data processing	2 996 242.59	2 802 092.66	2 816 000.00	2 859 000.00	2 859 000.00	1.5%	2 920 000.00	2.1%	3 000 000.00	2.7%	3 100 000.00	3.3%	
Movable property and associated costs	386 466.09	185 000.00	213 000.00	230 000.00	530 000.00	148.8%	245 000.00	-53.8%	260 000.00	6.1%	280 000.00	7.7%	
Current administrative expenditure	927 177.69	1 118 822.79	1 296 799.88	1 354 000.00	1 354 000.00	4.4%	1 345 000.00	-0.7%	1 345 000.00	0.0%	1 350 000.00	0.4%	
Postage / Telecommunications	318 334.95	350 079.80	329 900.12	387 000.00	387 000.00	17.3%	400 000.00	3.4%	420 000.00	5.0%	430 000.00	2.4%	
Meeting expenses	318 911.37	400 000.00	367 000.00	380 000.00	287 000.00	-21.8%	350 000.00	22.0%	350 000.00	0.0%	380 000.00	8.6%	
Running costs in connection with operational activities													
Information and publishing	16 447.79	17 767.22	16 000.00	15 000.00	124 000.00	675.0%	15 000.00	-87.9%	15 000.00	0.0%	15 000.00	0.0%	
Studies													
Other infrastructure and operating expenditure	248 384.39	249 115.75	433 799.88	280 000.00	280 000.00	-35.5%	280 000.00	0.0%	280 000.00	0.0%	240 000.00	-14.3%	
Title 3 Operational expenditure	**591 475 800.92**	**419 303 588.23**	**424 833 020.42**	**512 372 996.60**	**512 372 996.60**	**20.6%**	**672 095 000.00**	**31.2%**	**568 229 000.00**	**-15.5%**	**569 278 078.93**	**0.2%**	
ITER construction including site preparation	394 806 946.30	322 011 951.12	257 596 674.85	348 272 996.60	348 272 996.60	35.2%	455 092 400.00	30.7%	353 494 500.00	-22.3%	449 087 078.93	27.0%	
Technology for ITER and DEMO	10 096 069.62	7 657 074.51	9 153 495.38	7 100 000.00	7 100 000.00	-22.4%	60 000 000.00	745.1%	60 000 000.00	0.0%	60 000 000.00	0.0%	**1 062 430 000.00**
Technology for Broader approach	6 636 281.75	11 850 000.00	10 143 000.00	8 600 000.00	8 600 000.00	-15.2%	10 002 600.00	16.3%	12 734 500.00	27.3%	0.00	-100.0%	
Other Expenditure	2 146 708.01	2 948 949.39	4 500 200.00	3 400 000.00	3 400 000.00	-24.4%	5 000 000.00	47.1%	5 000 000.00	0.0%	5 000 000.00	0.0%	
ITER construction- from ITER host state contribution	177 789 795.24	74 835 613.21	143 439 650.19	145 000 000.00	145 000 000.00	1.1%	142 000 000.00	-2.1%	137 000 000.00	-3.5%	55 191 000.00	-59.7%	
TOTAL EXPENDITURE	**634 128 915.77**	**464 508 592.12**	**472 358 273.65**	**560 972 996.60**	**560 972 996.60**	**18.8%**	**721 295 000.00**	**28.6%**	**618 029 000.00**	**-14.3%**	**618 006 078.93**	**0.0%**	**1 127 110 000.00**
Reserve Fund		**1 301 314.76**	**50 453 772.43**	**-**	**17 352 015.51**	**-**	**0.00**	**-**	**0.00**	**-**	**0.00**	**-**	
Refund	**3 528.00**	**1 996 490.01**	**192 835.33**	**-**	**0.00**	**-**	**0.00**	**-**	**0.00**	**-**	**0.00**	**-**	

Table 19. Expenditure in Commitment for 2014-2021[15]

[15] The 2017 budget submitted to the Governing board on December 2nd , in line with the previous edition of the REP adopted in Dec 2015, is lower than the sum of the actions in the corresponding 2017 WP. According to the progress achieved in implementing the 2017 WP during the first semester of 2017 F4E may request to the GB the release of a part of the unused appropriations according to Article 14(1) and Article 16 of the F4E Financial Regulations. This amending budget would allow to match the forecasted needs.

2.4.4. Expenditure in payment appropriations

EXPENDITURE In Payment Appropriations (EUR)	2014 Executed Budget	2015 Executed Budget	2016 Budget	2017 Draft Budget			Envisaged in 2018		Envisaged in 2019		Envisaged in 2020		Envisaged in 2021
				F4E request	Budget Forecast	VAR 2017/16	Forecast	VAR 2018/17	Forecast	VAR 2019/18	Forecast	VAR 2020/19	
Title 1 Staff Expenditure	**36 335 789.33**	**38 839 125.67**	**40 677 753.35**	**41 790 000.00**	**41 320 000.00**	**1.6%**	**42 285 000.00**	**2.3%**	**42 750 000.00**	**1.1%**	**41 538 000.00**	**-2.8%**	
Salaries & allowances	31 798 698.25	32 906 824.48	34 920 000.00	36 200 000.00	35 800 000.00	2.5%	36 600 000.00	2.2%	37 050 000.00	1.2%	36 478 000.00	-1.5%	
Of which establishment plan posts	*24 114 377.20*	*24 964 160.95*	*26 520 000.00*	*27 300 000.00*	*26 900 000.00*	*1.4%*	*27 400 000.00*	*1.9%*	*28 100 000.00*	*2.6%*	*27 928 000.00*	*-0.6%*	
Of which external personnel	*7 684 321.05*	*7 942 663.53*	*8 400 000.00*	*8 900 000.00*	*8 900 000.00*	*6.0%*	*9 200 000.00*	*3.4%*	*8 950 000.00*	*-2.7%*	*8 550 000.00*	*-4.5%*	
Expenditure relating to Staff recruitment	522 851.60	731 757.13	910 300.00	720 000.00	720 000.00	-20.9%	670 000.00	-6.9%	670 000.00	0.0%	550 000.00	-17.9%	
Mission expenses	1 800 000.00	2 728 251.96	2 100 153.35	2 100 000.00	2 000 000.00	-4.8%	2 100 000.00	5.0%	2 200 000.00	4.8%	1 900 000.00	-13.6%	
Socio-medical infrastructure	277 651.15	336 400.00	556 000.00	280 000.00	580 000.00	4.3%	580 000.00	0.0%	500 000.00	-13.8%	450 000.00	-10.0%	
Training	649 297.37	682 356.26	817 000.00	850 000.00	820 000.00	0.4%	880 000.00	7.3%	885 000.00	0.6%	800 000.00	-9.6%	
External Services													
Receptions, events and representation	4 667.66	5 000.00	10 000.00	10 000.00	10 000.00	0.0%	10 000.00	0.0%	10 000.00	0.0%	10 000.00	0.0%	
Social welfare													
Other Staff related expenditure	1 282 623.30	1 448 535.84	1 364 300.00	1 630 000.00	1 390 000.00	1.9%	1 445 000.00	4.0%	1 435 000.00	-0.7%	1 350 000.00	-5.9%	**64 680 000.00**
Title 2 Infrastructure and operating expenditure	**6 317 325.52**	**6 365 878.22**	**6 847 499.88**	**6 810 000.00**	**7 280 000.00**	**6.3%**	**6 915 000.00**	**-5.0%**	**7 050 000.00**	**2.0%**	**7 190 000.00**	**2.0%**	
Rental of buildings and associated costs	1 105 360.65	1 243 000.00	1 375 000.00	1 305 000.00	1 459 000.00	6.1%	1 360 000.00	-6.8%	1 380 000.00	1.5%	1 395 000.00	1.1%	
Information, communication technology and data processing	2 996 242.59	2 802 092.66	2 816 000.00	2 859 000.00	2 859 000.00	1.5%	2 920 000.00	2.1%	3 000 000.00	2.7%	3 100 000.00	3.3%	
Movable property and associated costs	386 466.09	185 000.00	213 000.00	230 000.00	530 000.00	148.8%	245 000.00	-53.8%	260 000.00	6.1%	280 000.00	7.7%	
Current administrative expenditure	927 177.69	1 118 822.79	1 296 799.88	1 354 000.00	1 354 000.00	4.4%	1 345 000.00	-0.7%	1 345 000.00	0.0%	1 350 000.00	0.4%	
Postage / Telecommunications	318 334.95	350 079.80	329 900.12	387 000.00	387 000.00	17.3%	400 000.00	3.4%	420 000.00	5.0%	430 000.00	2.4%	
Meeting expenses	318 911.37	400 000.00	367 000.00	380 000.00	287 000.00	-21.8%	350 000.00	22.0%	350 000.00	0.0%	380 000.00	8.6%	
Running costs in connection with operational activities													
Information and publishing	16 447.79	17 767.22	16 000.00	15 000.00	124 000.00	675.0%	15 000.00	-87.9%	15 000.00	0.0%	15 000.00	0.0%	
Studies													
Other infrastructure and operating expenditure	248 384.39	249 115.75	433 799.88	280 000.00	280 000.00	-35.5%	280 000.00	0.0%	280 000.00	0.0%	240 000.00	-14.3%	
Title 3 Operational expenditure	**463 722 767.43**	**478 785 303.19**	**675 317 815.22**	**500 020 708.14**	**500 020 708.14**	**-26.0%**	**584 920 000.00**	**17.0%**	**609 980 000.00**	**4.3%**	**626 512 000.00**	**2.7%**	
ITER construction including site preparation	344 390 588.32	355 658 408.25	525 114 203.93	329 320 708.14	329 320 708.14	-37.3%	410 420 000.00	24.6%	423 380 000.00	3.2%	449 212 000.00	6.1%	
Technology for ITER and DEMO	5 904 901.48	5 342 317.31	17 000 000.00	28 000 000.00	28 000 000.00	64.7%	33 000 000.00	17.9%	45 000 000.00	36.4%	40 000 000.00	-11.1%	**610 320 000.00**
Technology for Broader approach	5 444 868.07	5 715 259.80	9 200 000.00	12 700 000.00	12 700 000.00	38.0%	6 500 000.00	-48.8%	6 600 000.00	1.5%	7 300 000.00	10.6%	
Other Expenditure	911 845.27	2 026 738.54	4 000 000.00	5 000 000.00	5 000 000.00	25.0%	5 000 000.00	0.0%	5 000 000.00	0.0%	5 000 000.00	0.0%	
ITER construction- from ITER host state contribution	107 070 564.29	110 042 579.29	120 003 611.29	125 000 000.00	125 000 000.00	4.2%	130 000 000.00	4.0%	130 000 000.00	0.0%	125 000 000.00	-3.8%	
TOTAL EXPENDITURE	**506 375 882.28**	**523 990 307.08**	**722 843 068.45**	**548 620 708.14**	**548 620 708.14**	**-24.1%**	**634 120 000.00**	**15.6%**	**659 780 000.00**	**4.0%**	**675 240 000.00**	**2.3%**	**675 000 000.00**
Reserve Fund		**-**	**9 051 882.29**	**-**	**20 049 411.71**	**-**	**23 393 235.19**	**-**	**11 172 032.00**	**-**	**5 440 541.51**	**-**	
Refund	**3 528.00**	**1 996 490.01**	**192 835.33**		**0.00**	**-**	**0.00**	**-**	**0.00**	**-**	**0.00**	**-**	

Table 20. Expenditure in Payment for 2014-2021[16]

[16] The 2017 budget submitted to the Governing board on December 2nd , in line with the previous edition of the REP adopted in Dec 2015, is lower than the payment forecasts. Subject to the good implementation of the budget during the first semester of 2017 compared to those forecasts, F4E may request to the GB an increase of the 2017 contributions to respond to all payment obligations until the end of the year.

2.4.5. Information on previous outturn

The outturns are established at the beginning of the following year with the preparation of the provisional accounts and recovered by Euratom. It is systematically included in the preparation of the following draft budget:

Budget outturn	2013	2014	2015
Revenue actually received (+)	431 608 986.46	550 569 824.09	526 207 476.99
Payments made (-)	388 365 724.85	502 620 822.79	520 107 959.73
Carry-over of appropriations (-)	22 594 793.47	37 684 370.53	5 932 046.73
Cancellation of appropriations carried over (+)	1 328 467.16	1 024 717.48	925 783.04
Adjustment for carry over of assigned revenue appropriations from previous year (+)			
Exchange rate differences (+/-)	- 2 650.45	- 22 130.70	- 19 985.83
Adjustment for negative balance from previous year (-)	836 014.97	17 021 674.33	
Total	**22 810 299.82**	**28 288 891.88**	**1 073 267.74**

Table 21. 2013, 2014 and 2015 Budget Outturns

The outturn for each financial year is calculated as the total revenue actually cashed minus the total payments incurred during the year, minus the appropriation carried over to the following year. It is made of the unused payment appropriations, cancelled at the end of the year.
Regarding the 2015 outturn:

- There were no carry over in payment appropriation from 2015 to 2016, beyond the automatic cases for assigned revenue and non-dissociated appropriations.
- Unused carried-over non dissociated appropriations (administrative expenditure) from 2014 were cancelled at the end of 2015 and included in the budget outturn.

2.4.6. In kind contribution to F4E

There is no in kind contribution to the F4E Budget, except the premises hosting the Joint Undertaking provided by the Host Country (Spain). The office building used by F4E is free of charge. For the year 2015, this service in-kind amounts to EUR 3 million.

2.5. Human resource – Outlook for 2016 – 2021

2.5.1. Strategic perspective

In terms of personnel management, three strategic challenges stand out for the captioned period. First among these is the ex-post accompaniment of reorganization approved by the Governing Board on 29-30/06/2016 and implementation of the new structure on October 1st, of the same year. In this regard, the full benefits of the new organization won't be felt until after a comprehensive revision of the various internal processes, responsibilities and communication lines, which is currently ongoing. Ensuring that staff understand the different changes and receive revised job descriptions and objectives that effectively cascade from the new corporate and departmental objectives will therefore be a key concern.

Enhanced alignment of HR processes with the matrix organization -as reinforced by the reorganization- will be the 2nd foremost HR priority. The aim here will be to inject more flexibility into the workforce and manage staff in a manner more consistent with typical matrix organizations. As such, and in order to allow for increased responsive to project contingencies, efforts will be directed at assigning staff to projects with high priority rather than teams or units. A key HR process that will be impacted by this will be the performance appraisal mechanism which will need to be changed to better accommodate the dual reporting lines of staff working in matrix formation. In the same vein, HR will need to streamline processes related to transfers, mobility and re-assignments. A better definition and standardization of responsibility assignments will also be needed under this heading.

The third and possibly biggest HR challenge will pertain to workforce planning and the capacity to develop a credible and realistic resource loaded schedule. This requirement is consistent with the large number of 2nd contract renewal decisions that will need to be made in 2018 and 2019 and for which the Agency needs to get better visibility on staffing needs. Among other things this will require developing a better understanding of the skills already available and those that will be needed as the project transitions from procurement and construction to assembly, commissioning and operation with all the ensuing matters of managing the contracts and claims. In this respect, it is clear that the establishment plan numbers and most notably the reduction in headcount foreseen as of 2019 will need to be re-assessed. The currently foreseen reductions indeed stem from a staffing needs assessment dating from 2012 which does not reflect the substantial changes in focus and schedule adopted for the project since. At this preliminary stage, it seems likely that staffing levels will need to be maintained at their pre-2019 levels if F4E is to successfully accompany the transition from construction to assembly and commissioning.

2.5.2. Staff population overview

Staff population (1)		Authorised under 2015 EU budget (3)	Actually filled as of 31 12.2015 (4)	Authorised under 2016 EU budget (3)	Actually filled as of 30.09.2016	Requested for 2017 (10)	Envisaged in 2018	Envisaged in 2019	Envisaged in 2020	Envisaged in 2021 (9)
Officials	AD	40	37	40	38	39	39	39	39	39
	AST	16	15	15	14	12	12	12	12	12
	AST/SC	-	-	-		-	-	-	-	-
TA	AD	180	174	201	178	205	205	205	184	184
	AST	26	26	27	27	27	27	27	27	27
	AST/SC	-	-	-		-	-	-	-	
Sub Total[5] Establishment Plan		**262**	**252**	**283**	**257**	**283**	**283**	**283**	**262**	**262**
CA GFIV		106	98	106	98	107	107	98	88	88
CA GF III		50	49	50	46	50	50	49	48	48
CA GF II		24	20	24	19	24	24	22	21	21
CA GFI										
Sub Total CA[6]		**180**	**167**	**180**	**163**	**181**	**181**	**169**	**157**	**157**
SNE[6]		4	2	4	2	3	3	3	3	
TOTAL		**446**	**421**	**467**	**422**	**467**	**467**	**455**	**422**	**419**
Structural service providers [7]			7		17.6	10	**10**	10	10	10
External staff for occasional replacement [8]			15.8		12.1	16	16	16	16	16

[1] All F4E staff is EU-Financed.

[2] Of which **5** sent (and accepted) Temporary Agent offer letters, and **2** sent (and accepted) Contract Agent offer letters.

[3] As authorised for officials and temporary agents (TA) and as estimated for contract agents (CA) and seconded national experts (SNE). The 180 CA consist in 153 CA, 3 additional CA FG IV coming from the conversion of 3 SNE and 24 additional CA FGIV.

[4] Of which **9** sent (and accepted) Temporary Agent offer letters, and **9** sent (and accepted) Contract Agent offer letters.

[5] Headcounts.

[6] Filled including letters sent and accepted in Full time Equivalent (FTE).

[7] Filled in and envisaged FTE. Service providers are contracted by a private company selected through framework contracts /specific task orders. There are no individual contract with F4E .They carry out specialised outsourced tasks of horizontal/support nature, for instance in the area of information technology.

[8] Filled in and envisaged FTE, as instance for replacement due to maternity or long sick leave.

[9] The 2021 forecast is purely indicative, considering there is no budget assigned yet to F4E beyong the current MFF (14-20).

(10) Conversion of FO AD13 to TA AD13 as per 2015 F4E Decision F4E-D-3NCBRJ to convert vacant FO positions to TA positions, pending the approval of EU Budgetary Authority

Table 22. Overview of staff population and its evolution

For the 2015 budget:

- The establishment plan was made of 262 authorized positions. The vacancy rate of establishment plan posts was just below 5 % at the end of the year.
- 180 man/year were authorized for external staff, including 24 new positions, out of which 88 % were executed on the 31/12/2015.

For the 2016 budget:

- The establishment plan is made up of 283 authorized positions, including 21 new TA positions. The vacancy rate will be impacted by the Straight Road to First Plasma (SR2FP) initiative which involved a freezing of recruitments pending the adoption of the SR2FP. While it is likely that this will mean that the year 2016 will be concluded with a higher vacancy rate than 2015, the envisaged target will be to close the year at 5%-6%.
- 180 man/year are authorized for external staff, out of which 92 % are executed.

The only adjustment currently foreseen to the F4E establishment plan to the end of 2020 is the termination of the short term positions approved with the 2015 and 2016 budgets.

2.5.3. Multiannual staff policy plan

Category and grade	2015 Budget				2016 Budget				2017 Draft Budget		Forecast 2018		Forecast 2019		Forecast 2020		Forecast 2021	
	Authorised Establishment plan		Filled as of 31/12/2015		Authorised Establishment plan		Filled as of 30/09/2016		Establishment plan [1]		Establishment plan		Establishment plan		Establishment plan		Establishment plan	
	officials	TA	officials	TA	officials	TA	officials	TA	officials	TA	officials	TA	officials	TA	officials	TA	officials	TA
AD 16							0	0										
AD 15		1				1	0	0		1		1		1		1		1
AD 14				1	1		0	1	1		1		1		1		1	
AD 13	13	4	8	3	14	5	8	3	13	6	13	6	13	6	13	6	13	6
AD 12	17	8	9	2	16	8	9	1	17	13	17	13	17	13	17	13	17	13
AD 11	5	12	3	5	5	19	5	9	5	21	5	21	5	21	5	21	5	21
AD 10	3	30	4	25	3	27	2	26		25		25		25		25		25
AD 9	2	18	2	22	1	20	2	18		29		29		29		29		29
AD 8		20	1	24		34	6	39	1	40	1	40	1	40	1	40	1	40
AD 7		57	7	45		47	3	39		37		37		37		37		37
AD 6		30	2	47		40	2	42		33		33		33		12		12
AD 5			1				1	0	2		2		2		2		2	
Total AD	**40**	**180**	**37**	**174**	**40**	**201**	**38**	**178**	**39**	**205**	**39**	**205**	**39**	**205**	**39**	**184**	**39**	**184**
AST 11	3				3		0	0	4		4		4		4		4	
AST 10	3		1		3		1	0	2		2		2		2		2	
AST 9	3		1		3		1	0	3		3		3		3		3	
AST 8	1		1		1		2	0	1		1		1		1		1	
AST 7	1		1		3		0	0	2	1	2	1	2	1	2	1	2	1
AST 6	2	2	3		1	3	3	0		5		5		5		5		5
AST 5	3	9	2	1	1	13	1	5		14		14		14		14		14
AST 4		14	2	12		11	2	12		7		7		7		7		7
AST 3		1	1	13			2	10										
AST 2			2				1	0										
AST 1			1				1	0										
Total AST	**16**	**26**	**15**	**26**	**15**	**27**	**14**	**27**	**12**	**27**	**12**	**27**	**12**	**27**	**12**	**27**	**12**	**27**
Tot AST/SC	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
TOTAL	**56**	**206**	**52**	**200**	**55**	**228**	**52**	**205**	**51**	**232**	**51**	**232**	**51**	**232**	**51**	**211**	**51**	**211**

[1] conversion of FO AD13 to TA AD13 as per 2015 F4E Decision F4E-D-3NCBRJ to convert vacant FO positions to TA positions, pending the approval of EU Budgetary Authority

Notes:
- F4E Does not use of the flexibility rule (Art 38 of FR). The corresponding colums, systematically showing no changes in the establishment plan are not shown.
- The 2021 forecast is purely indicative, considering there is no budget assigned yet to F4E beyong the current MFF (2014-2020)

Table 23. Multi-annual staff policy Plan 2015-2021

2.5.4. Recruitment policy

The Fusion for Energy personnel structure consists of EU Officials, Temporary Agents and Contract Agents.

The tasks related to the operational mission of F4E require highly specialized profiles especially in the core areas related to the ITER and Broader Approach projects. This is also true for most of the staff working in the support functions as the project complexity and amount of capital involved are considerable.

EU Officials (FO) and Temporary Agents (TA) may be recruited under two function groups:

- Administrator (AD) profiles for senior and non-senior technical/legal/financial/procurement officers, contract managers, etc.
- Assistant (AST) profiles for senior and non-senior assistant positions.

Contract Agents (CA) work under the supervision of EU Officials and Temporary Agents and may be recruited under four function groups (from FGI to FGIV). However, F4E typically recruits the majority of its contract agents at the level of:

- FGIII, who are in charge of administrative tasks in various support and operational units (e.g. Team Assistants) and
- FGIV, who are mainly specialized technical staff (e.g. Technical Support Officers, Project Management Support Officers) and qualified specialists in administrative fields (e.g. human resources, procurement, project management, legal, finance, etc.).

In terms of contract duration, F4E distinguishes between (1) long-term and (2) short-term employment contracts as follows:

1. Long-term employment

EU Officials – appointed by F4E from reserve lists or transferred from other EU institutions.
Temporary Agents - recruited on five year renewable contracts which can be extended once for another period of five years and which are then followed by an indefinite duration contract if extended beyond the end of the first extension.
Contract Agents - recruited on a three year renewable contract which can be extended once for a further period of four years, and which are then followed by an indefinite duration contract if extended beyond d the end of the first extension.

2. Short-term employment.

Exceptionally, F4E recruits staff on short term periods in particular to address periods of peak workload.
Temporary Agents recruited for periods inferior to five years. Such contracts may or may not be renewed only once for a period of up to five years depending on the different phases of the ITER project (construction, exploitation, decommissioning).
In this vein, the budget authority granted F4E 21 TA AD6 short-term position for the year 2016. Under this agreement the contract offered was for a single three year non-renewable period.
The employment contract of the F4E Director also falls under the short-term category as it cannot be extended more than once and can hence be for a maximum period of two consecutive 5 year periods i.e. 10 years.
Contract Agents may also be recruited for a limited period similarly to what is applied to short-term Temporary Agents.
24 CA short-term posts were granted by the budgetary authority for the year 2015 to cover the peak of workload foreseen during the ITER construction phase.
Fusion for Energy may also employ Seconded National Experts (SNE). These are seconded to F4E for an initial maximum period of two years, renewable for another period of two years and up to a total maximum period of four years. SNEs are paid by the seconding organization (although F4E may reimburse the annual emoluments to the seconding organization) and receive a daily allowance and monthly allowance paid for by F4E.

2.5.5. Selection procedures

F4E applies the General Implementing Provisions (GIP) on the Procedure governing the Engagement and use of Temporary Agents by analogy. Pending the adoption by the Commission of the same rules for Contract Agents, F4E follows the same provisions for the engagement and use of its contract agents. For the selection and use of EU Officials, F4E follows the rules applied by the Commission, by analogy.
In agreement with the Commission and following a verification exercise by the European Personnel Selection Office (EPSO) of the F4E selection procedures, F4E has been selecting staff on the basis of both interviews and written tests since April 1st, 2013 and for all long-term employment contracts.
Vacancy announcements have typically been advertised on the career opportunities section of F4E's website as well as on the EPSO site[17]. However, following the October 2015 EPSO decision to halt any advertisements not translated in the 24 EU official languages (General court judgment from 24 September 2015 (Cases T-124/13 Italy vs. Commission and T-191/13 Spain vs. Commission), F4E has been using LinkedIn and a key means of generating interests in its job advertisements. Various other job portals and specialized media are used to attract applicants from a wide a geographical basis as possible.

[17] http://europa.eu/epso/apply/jobs/temp/index_en.htm

1. Selection of Established Officials

Vacant permanent posts intended to be occupied by already established Officials and/or candidates on reserve lists, are filled in conformity with the Staff Regulations. Interviews are conducted by a Panel (composed by a representative of the administration and a representative of the concerned department) using pre-defined criteria stipulated in the corresponding vacancy notice and a standard evaluation grid based on the aforementioned criteria.

Since 2007, F4E has launched 64 publications for FO positions. However, in an effort to harmonize its workforce structure and in keeping with the time limited mandate of F4E, a decision was taken to stop expanding the F4E FO staff contingent. This decision was taken during 2015 and provides that whenever FO positions become vacant, they shall be replaced by equivalent or lesser graded TA positions.

2. Selection of Temporary Agents

These are typically organized on the basis of the following grade brackets:

- AST 3 – AST 5 for assistant positions (technical and administrative).
- AD5 – AD8 for junior and intermediate profiles (technical and administrative);
- AD9 – AD12 for managerial and senior profiles (technical/scientific experts, group leaders depending on the group and functions to be developed);
- AD 13 for Heads of Department*.
- AD14 for the F4E Director

* While the model Implementing Rule on middle-management applicable to agencies only considers management to be senior as of grade AD14. F4E considers the role of Head of Department as an intermediate step between the Director (senior management) and the Heads of Unit (Project managers in the ITER Department).

2.5.6. Performance management

Staff performance is assessed annually on the basis of a F4E-wide performance appraisal exercise. The latter serves the purposes of improving individual staff performance by establishing and subsequently reducing gaps between desired and actual performance. The key constituent parts of the mechanism are:

1. Establishment of SMART and jointly agreed performance objectives.
2. Self-assessment by the staff member.
3. Performance review and dialogue with the line manager.
4. Definition of training objectives addressing agreed areas of improvement. The assessment period coincides with the calendar year and runs from January, 1st to December, 31st. In keeping with the staff regulations, the appraisal assesses three main areas of competence as follows: efficiency, abilities and conduct in the service. The use of languages and the level of responsibility exercised are two additional constituent components of the merit rating.

Looking forward and in keeping with its project nature, F4E will seek to better reflect its matrix structure into the annual performance appraisal exercise. The aim is to better capture performance feedback from both line managers and functional managers of staff having dual reporting lines in the framework of the matrix structure. Another objective for 2017 is to better cascade the corporate objectives down to individual objectives and to implement mid-year performance reviews. In keeping with the corporate challenge of enhanced accountability, 2017 will also see the introduction of standardized performance objectives for different workforce population groups. These standards will be based on a job classification review aimed at establishing clearly defined responsibility standards for each grade.

2.5.7. Advancement, reclassification and promotion

Staff who has been at one step in their grade for two years shall automatically advance to the next step in that grade, unless their performance has been evaluated as unsatisfactory pursuant to their last performance assessment report.

By decision of the appointing authority and/or authority authorized to conclude contracts, staff shall also be entitled to appointment to the next higher grade of their function group. Such decisions shall be made as part of an annual promotion/reclassification exercise which considers the comparative merit of staff. Promotions and reclassifications shall be exclusively by selection from officials, temporary agents and contract agents who have completed a minimum of two years in their grade.

Promotion/reclassification takes place on the 1 January of the year of the exercise (N) (or on the first day of the month following that in which the 2 years seniority are acquired). The Tables below provide an overview of the number of promotions awarded in each grade during the last exercise.

Category and grade	Staff in activity at 01.01.2015		Number of staff members promoted / reclassified in 2015		Average number of years in grade of reclassified/promoted staff members
	officials	TA	officials	TA	
AD 16					
AD 15					
AD 14					
AD 13	7	2			
AD 12	11	2			
AD 11	3	4			
AD 10	4	25		3	3.34
AD 9	2	18		4	4.32
AD 8		24		2	2
AD 7	7	50	4	15	2.58
AD 6	2	39	1	11	2.93
AD 5	1				
Total AD	**37**	**164**	**5**	**35**	**-**
AST 11					
AST 10	1				
AST 9	1				
AST 8	1				
AST 7	2		1		4
AST 6	3				
AST 5	2	1	1		3
AST 4	3	14		4	2.5
AST 3	1	10		3	4.42
AST 2	2		1		4
AST 1	1				
Total AST	**17**	**25**	**3**	**7**	**-**
Total	**0**	**0**	**0**	**0**	-
Total	**54**	**189**	**8**	**42**	**-**

Function Group	Grade	Staff in activity at 01.01.2015	How many staff members were reclassified in 2015	Average number of years in grade of reclassified staff members
CA IV	18			
	17			
	16	4	2	3.48
	15	14		
	14	35	7	3.1
	13	25	6	2.64
CA III	12			
	11	5		
	10	15	2	2.84
	9	19	5	3.15
	8	5	4	3.06
CA II	7			
	6	6	1	3
	5	11	3	2
	4	3	2	2
CA I	3			
	2			
	1			
Total		**142**	**32**	**-**

Table 24. Reclassification of temporary staff and contractual agents /promotion of officials in 2015

2.5.8. Gender balance

The Table below shows the gender balance as at 31.12.2015 based upon the number of persons in place on 31.12.2015 (accepted job offers are not included).

The figures are consistent with workforce statistics in the industry sectors related to the core tasks of the Agency and show a predominance of male colleagues in the technical functions. Conversely female colleagues are predominantly represented in administrative and support roles.

Staff	EU Official		TA		CA	SNE	TOTAL
	AD	*AST*	*AD*	*AST*			
Female	11	9	34	11	92		**157**
Male	26	6	140	15	75	2	**264**
Total	**37**	**15**	**174**	**26**	**167**	**2**	**421**

Table 25. Gender balance on 31/12/2015 (staff in place)

2.5.9. Geographical balances

The table below 26 provides the geographical distribution as at 31.12.2015 based upon the number of persons in place on 31.12.2015 (Job offers not included).

The over representation of Spanish nationals follows from the Agency being headquartered in Spain.

Looking forward F4E will continue to strike a balance between ensuring a broad geographical distribution of staff and the non-discrimination principle enshrined in its selection and recruitment policies.

Staff	EU Official		TA		CA	SNE	TOTAL
	AD	*AST*	*AD*	*AST*			
Belgian	1	1	6	5	8		**21**
Bulgarian			1		3		**4**
Czech			2		2		**4**
Dutch			4		1		**5**
British	1		15	2	4		**22**
Estonian			1		2		**3**
Finnish			4				**4**
French	5	4	44	6	16		**75**
German	3		6	1	10	1	**21**
Greek	1	1	3		5		**10**
Hungarian	2		1	1	3		**7**
Irish			2	1			**3**
Italian	13	4	36	3	33		**89**
Lithuanian		1		1	3		**5**
Maltese	1						**1**
Peruvian					1		**1**
Polish			1		1		**2**
Portuguese		1	4		5		**10**
Romanian			4	1	4		**9**
Slovak	1						**1**
Spanish	8	3	38	5	66	1	**121**
Swedish	1		2				**3**
Total	**37**	**15**	**174**	**26**	**167**	**2**	**421**

Table 26. Geographical balance on 31/12/2015 (staff in place)

2.5.10. Schooling

In the absence of a European School in F4E's Barcelona and Cadarache work sites, the Agency established Service Level Agreements with a number of international schools located in and around these two duty stations. Under these agreements, F4E staff enjoys easier access to school registration and enrollment for their dependent children. The agreements also provide a framework for the direct settlement of school fees by the Agency.
Service Level Agreements have been established with the following international schools:

1.	American School of Barcelona
2.	Deutsche Schule Barcelona
3.	Europa International School
4.	Hamelin International School
5.	Istituto Statale Italiano Comprensivo
6.	Saint Paul's School
7.	St. Peter's School
8.	Escoles Pérez Iborra
9.	Lycée Français de Barcelona
10.	École Ferdinand de Lesseps
11.	The British School
12.	Scuola Materna Montessori
13.	Kensington School
14.	Swiss School
15.	École Bel Air Sitges
16.	Highlands School
17.	Agora Sant Cugat
18.	La Miranda
19.	Escoles Betlem
20.	Col.legi Paideia
21.	Benjamin Franklin
22.	Bon Soleil
23.	Akua
24.	Canigo
25.	Sainte Victoire International School (SVIS) - Cadarache
26.	CIPEC – Cadarache (SLA discussions in progress)
27.	IBS – Cadarache (SLA discussions in progress)
28.	EPIM – Cadarache (SLA discussions in progress)

Table 27. Service Level Agreements with international schools

2.5.11. Staff mobility

1. Internal mobility

Increased career mobility consistently features as the foremost concern of staff. In recognition of this perception, the agency adopted an internal mobility policy in June 2015 foreseeing that all vacancies are subject to internal selections prior to being opened externally. The policy only provides for horizontal mobility and complements vertical mobility which is only possible through external selection procedures and/or promotion/reclassification decisions.

In keeping with its project nature and matrix organization, F4E will also seek to increase the effectiveness of its workforce management through increased flexibility and transience of project assignments and improved usage of the skills d-base introduced during the summer of 2015. As part of this endeavor F4E will seek to progressively 'flatten' its structure and reduce the number of vertical levels currently in place.

2. Inter-agency job Market,

While the inter-agency job market remains to be developed and while it will predominantly concern support and administrative profiles rather than operational and technical staff, the continued harmonization of policies and rules across the EU Agency landscape will progressively foster mobility opportunities.

2.6. Other information

2.6.1. Building policy

Surface area (in square metres) *- Of which office space* *- Of which non-office space*	9 000 m^2 *8 250 m^2* *750 m^2*
Annual rent (in EUR)	NA
Type and duration of rental contract	NA
Host country grant or support	Rent paid by Spain
Present value of the building	NA

Table 28. F4E building

In April 2016, Fusion for Energy received a formal offer from the Spanish Ministry consisting in fixing the F4E permanent premises at its current location.

This offer consisted of a long-term lease agreement for the current premises and an extension of approximately 1 000m^2 of additional space. The offer also included that the Kingdom of Spain will cover the refurbishment works of the additional space.

In May 2016, the long term agreement was signed by the Kingdom of Spain and the permanent premises of Fusion for Energy were fixed in the current premises.

2.6.2. Privileges and immunities

Joint undertaking privileges	Protocol of privileges and immunities / diplomatic status granted to Staff
Privileges provided by the Host State and concluded in the seat agreement: - VAT exemptions - Building free of charge	Diplomatic status only for the Director, and the person appointed to replace him in his absence - The PPI applies to all staff - VAT reimbursements during the first year on goods and furniture. - Purchase of one motor vehicle without taxes. - Exemption of import tax registration for vehicles (if done through the Spanish Ministry of Foreign Affairs) - No privilege granted regarding education/day care

Table 29. Privileges and Immunities

2.6.3. Evaluation

When the Council discussed the status of ITER and possible ways forward on 12th July 2010, it asked, inter alia:

1. "F4E to report at least once a year on (a) the progress achieved in implementing the cost containment and savings plan, (b) as well as the performance and management of the Agency and the ITER project, and (c) the fulfilment of the scheduled activities within its annual budget.
2. The F4E Governing Board (GB) to appoint an independent expert who will assess the [ITER] project progress on the basis of existing reports and will submit this opinion to the Governing Board and to the Competitiveness Council once a year".

Accordingly each year F4E reports to the Council on the status of the ITER Project, the evolution of the Cost containment and savings plan, an overview of the performance and management of the organisation and ITER Project, the progress related to the fulfilment of scheduled activities and F4E's Response to the External Annual Assessment. The progress report covering the period from August 2013 to July 2014 was sent to the European Commission beginning December 2014 and transmitted to the Council of the EU in January 2015.

In relation to the external assessments, the first of these assessments by Deloitte Touche Tohmatsu was forwarded to the Council in September 2012. And a second assessment, also by Deloitte Touche Tohmatsu, was forwarded to the Council in October 2013.

The third annual assessment has been prepared by three independent experts working under the supervision of the GB Chair with the assistance of Commission. The GB discussed the assessment at its meeting on 2nd and 3rd December 2014 and expressed its appreciation for the quality of the assessment and richness of its findings. It noted that there were a number of clear recommendations for improvement. The GB welcomed the overall reassurance it gave and noted that F4E has been progressively improving its internal governance, operational structures, and processes to increase efficiency and performance. Changes implemented to date have broadly achieved their aims, and those in the process of implementation or planned are judged to be appropriate to bring about further improvements. The assessors concluded that there was a low level of performance of F4E in 2013, but noted that there had been significant improvements in the first half of 2014. The assessors also noted that the ITER schedule against which F4E is judged is being revised to provide a realistic schedule, a process which is expected to be concluded by the ITER Council by 2015.

The fourth annual assessment is in progress and is being prepared by three independent experts working under the supervision of the GB Chair with the assistance of Commission.

2.6.4. Procurement plan for the year 2018

F4E is mainly a procurement agency for the acquisition and delivery of the In-kind contribution to the ITER and BA projects. The procurement plan is therefore based on the annual Work Programme

2.6.5. Organization chart (2017)

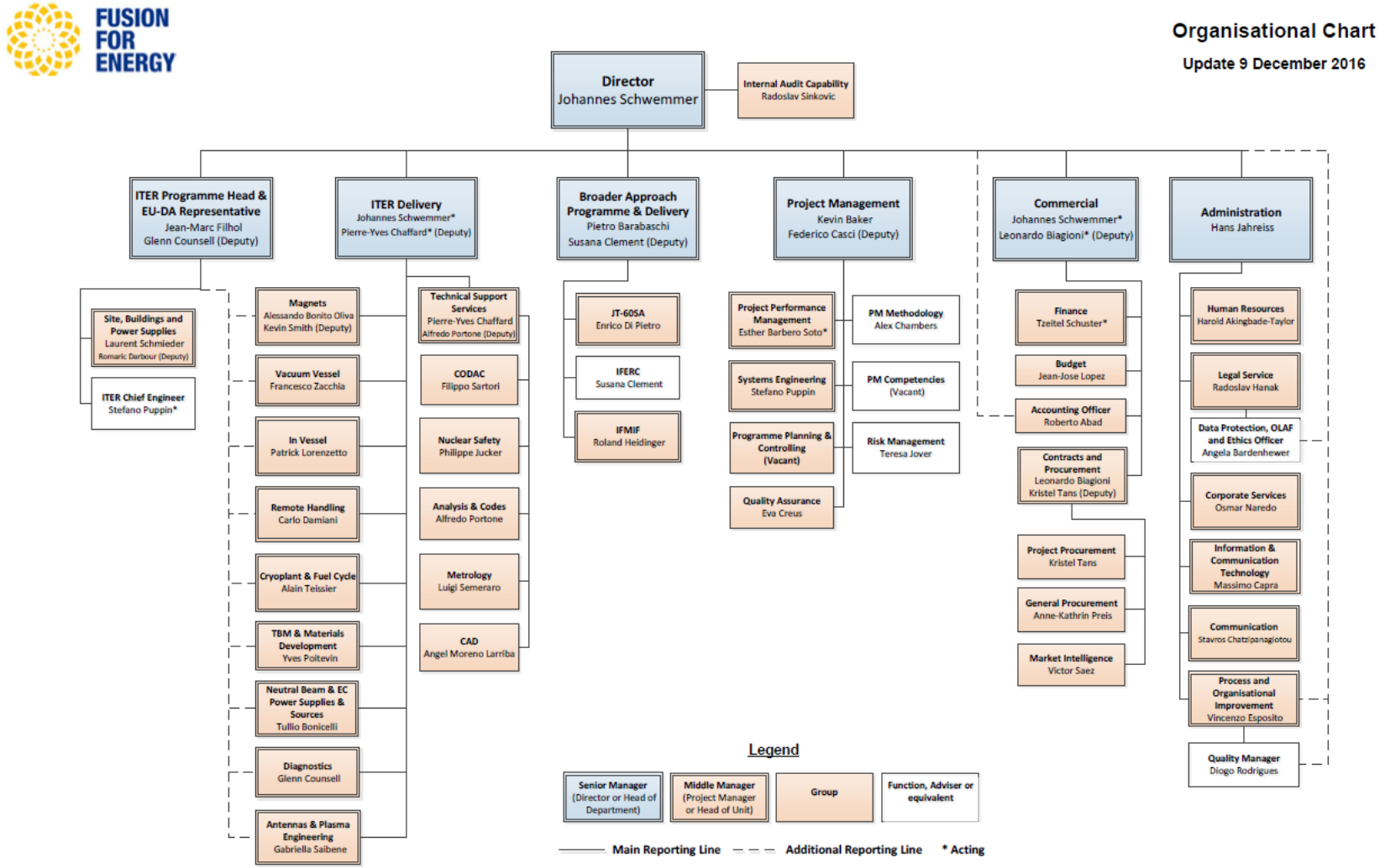


Figure 11. Organization chart (2017)

Section III. Work Programme Year 2017

1. Annual Programming

1.1. Executive summary for the annual work programme 2017

This Work Programme 2017 (WP17) offers an overview of the objectives of the European Joint Undertaking for ITER and the Development of Fusion Energy (F4E) for 2017 and also identifies the financial decisions for the actions that will have to be carried out in 2017 with the available budget.
It covers the work on both ITER and Broader Approach (BA) according to the tasks entrusted to the organization.
As for ITER, 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 (IO-CT) and it creates many challenges both from the technical and from an organizational point of view. The Straight Road to First Plasma (SR2FP) exercise launched in early 2016 has focused F4E resources on the activities to achieve First Plasma (FP) in 2025 while slowing down other projects until after 2020. A suitable scenario was selected for the non-FP systems, in order to avoid delays to the later machine phases and minimize over-costs. SR2FP has led to significant changes in the planning of non-FP systems and to a staged approach of the project.
As for the BA, 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 realization of fusion energy. Both parties contribute equally financially. The European resources for the implementation of the BA are largely volunteered by several participating European countries.
The 2017 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, 2017 is mostly focused on the following activities:

- Magnets (FP): as for both Toroidal and Poloidal Field coils, all major contracts have been signed. The core of the work will be the follow-up of manufacturing, including the PF6 being built in China. For the pre-compression rings additional contracts using a different technology will be placed to mitigate the risk of failure with the technology currently followed, and some contracts will be placed for the testing of mock-up produced during qualification. Specific contracts for inspection will be signed.
- Main Vacuum Vessel (FP): F4E will continue to drive the optimization of processes, management structures and competencies in the supplier organization as well as the addition of capacity to recover the massive delays and operational deficiencies of the past, with the objective of reaching the target dates required in the ITER schedule. This involves the use of a major engineering consultancy firm, amendments to the contract as well as the further increase of own personnel on site and tight management attention. On a more detailed perspective, it is anyway expected that, by the end of 2017, all five EU-VV sectors will have fully entered the manufacturing phase. Design activities for sector 4, in addition to sector 5, will be completed as well as the design activities for the regular poloidal segments for the

sectors 2 and 3. Specific contracts for inspectors, design analysis in support of design changes generated by non-conformities or Deviation Requests and other support activities will be performed.

- Blanket System (non-FP): The main activities on the Blanket First Wall (FW) are related to the preparation of the FW Procurement Arrangement, in particular the implementation of design and fabrication activities for cost reduction, and the follow up of the manufacture of the three full-scale prototypes in the frame of the existing contracts for the manufacture and test of Normal heat Flux of FW Full Scale Prototypes. Investigations will be performed to reduce the cost of the raw material procurement and to streamline the manufacturing route for the more than 200 FW panels.
- Divertor (non-FP): The main activities in 2017 are related to the completion of the manufacture and acceptance tests of the cassette bodies (CB) full-scale prototypes, the preparation of the documentation for the launch of the CB series and the signature of the contracts for the qualification of additional suppliers for the procurement of the Divertor Inner Vertical Target. Investigations will be performed to reduce the cost of the raw material procurement and towards manufacturing simplification.
- Remote Handling (partly FP): In line with the SR2FP, only design activities will proceed with the framework contracts already in place for the four RH systems. The divertor remote handling (RH) system will continue with the preliminary design and an early start of the preparatory activities for the final design. As for the Cask and Plug RH system, the main bulk of activities for the preliminary design for one cask typology will start. For both systems the work will be mainly performed through specific contracts under on-going framework contracts. For the NB RH system in 2017 the preliminary design phase 1 will be completed and phase 2 will start. The In-Vessel Viewing system will start the main preliminary design effort by placing specific contracts under on-going framework contracts.
- Vacuum Pumping (FP): The completion of the manufacturing of the pre-production cryopump and warm regeneration lines are scheduled. The contract for the manufacturing of the MITICA cryopump will be awarded. The call for procurement of the cryostat and torus cryopump front end cryodistribution will be launched. As far as the leak detection and localization system, F4E plans to sign the PA in 2017.
- Fuel Cycle: the design of the four water de-tritiation system holding and feeding tanks (FP) will be pursued and the manufacturing will be started.
- Cryoplant (FP): In 2017 the on-site installation and test phase of the ITER cryoplant will start upon building availability. For the MITICA Cryoplant contract, the preliminary design, final design and launch of the long lead items are planned to be performed in 2017.
- RF Heating & Current-Drive:
  For the Electron Cyclotron Upper Launcher (FP), a number of specific contracts are envisaged for mm-wave testing of Window, Valve and WG prototypes. Prototyping activities on the Isolation Valve (safety-important) will also continue by the signature of the prototype procurement contract. In addition, the mechanical mock-ups programme will start, with a framework contract for support and testing and a procurement contract for mock-ups manufacturing.
  For the Electron Cyclotron Control System (FP), the main activities for 2017 will cover design and prototyping.
  As for the Ion Cyclotron antenna (non FP), in the frame of SR2FP, the delay in the PA signature is used as an opportunity to implement staged R&D for the reduction of technical and cost risks (procurement preparation), especially for the development of the safety-important vacuum windows. The design work is complemented by specific contracts for the finalization of the Faraday Screen design and for the design of the connection between the US pre-matching system and the antenna.

- Neutral Beam Heating and Current Drive: Activities at the Test Facility in Padua proceed and integration amongst the SPIDER sub-systems will continue. Important components for the MITICA experiments, notably the vacuum vessel and the 1 MV High Voltage Deck and bushing, will be delivered and installed and integrated with the interfacing component procured by the Japanese Domestic Agency. The contract for the MITICA Beam Line Components (Calorimeter, Ions Dump and Neutralizer) is foreseen to be signed in 2017. In 2017 F4E will commit as cash contribution the 2018 NBTF Work Programme (WP) and a possible amendment of the 2017 NBTF WP.
- Diagnostics: Procurement procedures for manufacturing of several Diagnostic components and systems essential for First Plasma will be launched and/or signed during 2017, including for manufacturing of in-vessel cables, clips and connectors, in-vessel and ex-vessel captive components of the plasma position reflectometer, outer-vessel coils and in-vessel attachments of the magnetics sensors and in-vessel attachments of the bolometer diagnostic. A specific contract will be signed covering preliminary design of the vacuum vessel feedthroughs, which are both First Plasma and PIC components, as well as advancing the design of the upper and equatorial port structures and associated integration of diagnostics from Europe, IO and five other Domestic Agencies. Design of the visible/IR camera system, plasma position reflectometer, bolometer diagnostic and other systems with deliveries for First Plasma, will continue during 2017 mainly in the form of specific grants under running Framework Partnership Agreements (FPAs), as will design activities on the remaining diagnostic systems needed after First Plasma, including launch of a design contract for the core-plasma Thomson scattering system.
- Test Blanket Systems (TBM): Due to the SR2FP re-planning (pushing most of the funding beyond 2020), only three new framework contracts will be launched in 2017 mainly focused on carrying on the Preliminary Design of the TBM sets and of the Ancillary Systems and to perform safety and (if needed) accidental analysis to support the activities. The Preliminary Welding Procedures Specifications will be completed with a contract launched in Q4-2017.
- Buildings and Civil Infrastructures: Following agreement with IO-CT on the SR2FP, some activities have been delayed to beyond 2020. The procurement strategies for the Emergency Power Supply Distribution, for the buildings 71 and 75 have been redefined (aiming at reducing the pre-2020 financial commitments)., The procurement procedures for the Electrical Distribution Buildings 44, 45, 46 and 47 [TB13], for the Buildings 34, 37, 71(non-PIC part), 75(non-PIC part) [TB12], and for the completion of works [TB11] should be completed with contracts awarded. Specific contracts for Building Human-Machine-Interface (HMI) development will be signed under ongoing framework contract and under a new framework contract. Tasks orders for services in support to the main activities (e.g. Facility management, Site Security and Reception Services), and for Engineering and contract management consultancy services will be signed in 2017.

As for Broader Approach, 2017 is mostly focused on the following activities:

- Satellite Tokamak (JT-60SA)**:** The actions will focus on fabrication, testing, transportation and on-site installation done either by Voluntary Contributors or F4E. The activities under the responsibility of F4E are carried out through task orders of existing framework contracts or existing/new supply and service contracts. Cash contribution will be made to the Common Fund for integration and commissioning activities.
- IFMIF-EVEDA Project: The main objective is to reach an advanced status in Phase B for the LIPAc (Linear IFMIF Prototype Accelerator) systems at Rokkasho. It will consist of the final positioning, assembly and alignment of the systems required for validating the accelerator line for a deuteron beam of up to 5 MeV. This will be supported through Voluntary Contributors and F4E contracts. For the subsequent Phases C and D (due to start in 2018), components shall be contributed in 2017 through Voluntary Contributors and F4E contracts. In addition, all

commitments for the transport of the remaining systems will be placed through specific task orders within the existing transport framework contract. During all installation and commissioning phases, F4E will still be supported by experts, and on-site health and safety services to ensure safe operations funded respectively by F4E through expert contracts and specific contracts.

- International Fusion Research Centre: The IFERC project comprises three activities, CSC (supercomputer Helios), DEMO design and R&D activities, and REC (Remote experimentation Centre). These activities are in different phases of execution. The REC activities are fully under the financial responsibility of F4E, and are performed under F4E contracts to provide software and services, some of which will be completed in 2017 (site acceptance tests). A final integrated test (participation in the operation of a European Tokamak from Rokkasho) will need financing in 2017.

1.2. Introduction to the annual work programme 2017

The annual work program 2017 comprises the detailed objectives and expected results including performance indicators. These are expressed per action in sections 1.3.1.-1.3.14. The performance indicators comprise the following:

- Achievement of the annual objectives by the forecast date, and
- Achievement of the specified cumulative credit value, expressed in IUA

1.2.1. Main assumptions

ITER Project: following assumptions shall be considered as the basis of the Work Programme 2017:

- In the months following the ITER Council 17 (IC-17) of November 2015, it was decided to focus the ITER activities on the achievement of a First Plasma by the end of 2025 taking into account the financial resources available to all the Parties. In F4E the Director launched a project called 'Straight Road to First Plasma' (SR2FP) with the overall objective to concentrate resources (funding and staff) on the activities critical to the achievement of first plasma at end 2025 while slowing down or suspending other projects until after 2020. Due to the complex interdependencies of ITER components this resulted in an extensive re-planning exercise which required several iterations with the IO-CT. In parallel, IO-CT was developing the longer term schedule to Deuterium-Tritium [DT] operations based on a four phase approach from First Plasma at end 2025 through to DT operation in 2035. The 'Staged Approach' (also referred to as the 'Iteration Modeling Approach') was based upon incorporating research operation periods as early as possible in the schedule depending on the availability of the additional components procured by the DAs consistent with their annual and long-term budgets. Such approach was supported by the conclusions of a specific panel (the ITER Council Working Group on the Independent Review of the Updated Long-Term Schedule and Human Resources (ICRG)) in charge of reviewing the updated schedule together with the associated required IO resources. The result of the IC-18 in June 2016 was an endorsement of the approach by all Parties and the definition of a set of specific milestones up to 2025 in order to have a close monitoring of the performance of the project.
- The F4E schedule used for the preparation of this document is the one submitted to IO-CT at the end of September 2016.
- The F4E schedule supporting FP by the end of 2025 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 until end 2020. It should be borne in mind that the current F4E budget is assigned only until the end of 2020 and therefore the achievement and completion of activities beyond this date depend on the availability of the required budget after 2020.
    - 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 need still to be signed, a common F4E/IO effort is in progress to better identify the requirements that are linked to the specific procurement.
- 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 analyzed, 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.
- All the activities described in the overview of each action are intended as credited by PA or ITA. If an action is not credited, then it is explicitly mentioned in the overview. This is not applicable for the action “Broader Approach” (i.e. not credited).
- 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 authorization of “changes to contracts” given by IO Director General.
- Regarding the WP2017 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.
- Full Time Equivalent (FTE) values by action are as known at the time of the preparation of the document (i.e. end September 2016).
- The Art. 5 of the F4E Status states that the Joint Undertaking may award grants and prizes in accordance with the rules of its financial regulation. In this regard, Essential selection, award criteria and Upper funding limits are defined in Annex 3. To be considered that no priority has been given to the grants because they are in different technical area and they are all needed for the achievement of the objectives of their own WP action.

1.2.2. Definitions

1. The 2017 Work Programme takes into account to the extent possible the EU Commission guidelines for the Programming document as requested by the Financial Regulation.
2. "Action" for the purposes of work programme means “a coherent area of action with objectives and resources”. The list of the actions and the correspondence to the F4E WBS level 3 is available in Annex V.
3. Each action contains:
   (a) General overview that covers the scope of the procurements/grants and cash expenditures foreseen to be financed under the budget 2017. Furthermore:
      i. 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, storage, material characterization and qualification activities, metrology and legal

support, as needed[18]. These tasks will be mainly implemented through specific contracts under existing framework contracts.

ii. It includes provisions, even if not explicitly mentioned, for payment of liquidated damages, late payment interests, cost escalation, 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.

(b) The annual objectives. They are defined as:

i. IC/GB milestones in 2017 (if applicable);

ii. Milestones that will lead to the achievement of the future IC/GB milestones from the 2 earliest years (defined as predecessor of future IC/GB milestones) (if applicable).

iii. Internal milestones (in case of none of the above are applicable).

(c) Link with the ITER Project multi-annual objectives (defined as the whole set of IC/GB milestones):

i. When a WP annual objective is predecessor of a multi-annual objectives (IC/GB milestones), it is clearly identify to which milestone is linked in the column “type of milestone”.

(d) The expected results for the WP 2017.

(e) Human resources assigned to the action. The value provided under each action of the Workprogramme 2017 (WP2017) is an indicative estimate of the Full Time Equivalent (FTE) staff assigned to that specific action to cover all operational tasks and activities carried out during 2017. On top of the FTEs related to the operational departments, that value also includes the staff from other departments (i.e. Project Management, Administration and Commercial) assigned to perform specific tasks in support of such operational activities described under the different actions. The sum of the FTEs covering all operational actions corresponds to 350.65 FTEs.

The information in Table 22 shows a number of total positions requested by F4E in 2017 equal to 467. The difference (116.35 FTE) is performing tasks of more administrative nature and not to be directly related to the specific actions listed in the WP2017. The distribution among the F4E departments is as follows: Administration (76), Commercial (27), Director & Office of Director (7), Project Management (6.35).

(f) The target for the WP2017 is defined, when applicable, as the cumulative CAS foreseen to be achieved at the end of 2017 and it is based on the CAS profile proposed to IO that at the moment is under approval process.

(g) Procurement plan to be launched during the year 2017:

i. Main Procurement Initiatives[19]: 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 WP2017. 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 2017.

[18] In accordance to F4E WBS implementation rules, whenever a procurement activity is in support of a specific WBS L3, the related procurement should be implemented under the mentioned WBS L3. This is not the case for general support activities to multiple WBSs (e.g. external resource to support overall risk management, etc.). In this case, they are included under Action 13

[19] Defined as the two main procurement procedures with budgeted amount higher than 0.5 million Euros and all FwCs to be signed in the year 2017

ii. 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).
iii. Certain activities have been moved from previous years into WP2017 due to changes in the overall planning and priorities: these items are included under the relevant WBS in the 2017 Work programme. It is understood that the inclusion of these items in WP2017 cancels and supersedes any corresponding item in a previous year's WP, unless otherwise specified in this document.
iv. Additional activities for ITER Project, upon the approval of the relevant PCRs and deviations by the IO-CT 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.
v. Grants and specific Grants are clearly identified and information is provided to fulfill art.58 of the Financial Regulation.

4. Procurement Arrangements list for each work programme action is available in Annex IV.
5. 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.
6. Equivalence F4E OBS to F4E WBS level 3 is available in Annex IV.
7. 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.
8. Annex VIII presents an indicative value of financial resources corresponding to the actions defined in WP2017. As shown in Annex VIII, the budget requested by F4E is lower than the one covered by the activities planned in 2017. F4E has evaluated the most likely total level of commitments planned for the projects/actions in 2017 by taking into account the progress and the available manpower. This value is the target of the organization. Any additional budget required and exceeding the currently available one will consist of unused appropriations adjusted to match the final needs.

1.3. Actions

1.3.1. Action 1. Magnets

Action 1	Magnets

Overview on pre-compression rings and conductors

For the pre-compression rings the manufacturing contract is ongoing (qualification phase). 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, has been launched. In 2017 the full scale prototype should be completed and the qualification should be accepted in order to start the series production of the PCRs. The back-up PCR contract is expected to be signed at the beginning of 2017 and its qualification phase will be initiated soon after. A specific contract for inspection services will be signed in 2017 to follow up the manufacturing activities for this contract. Additional contracts will be placed for the testing of mock-up produced during qualification And for inspection services of qualification and manufacturing. Regarding the TF and PF conductors some final strand tests will be carried out in 2017 through specific contracts.

Overview on Toroidal Field Coils

All major contracts for production of Toroidal Field Coils have been signed. The manufacturing contract for Radial Plates is foreseen to finish by the end of 2017, with the completion of the last three Radial Plates (14, 17, and 18). Stage 2 of the Winding Pack contract will be concluded in 2017 with the delivery of the first WP to the insertion supplier. The 2nd and 3rd (out of 10) Winding Packs will also be delivered before the end of 2017. The coil insertion contract will complete all qualification and tooling activities during 2017 and the manufacturing of the first coil will have started. A specific contract for inspection services will be signed in 2017 to follow up the manufacturing activities for this contract.

Overview on Poloidal Field Coils

All major contracts for the Poloidal Field Coils have been signed, including the last two major contracts - Manufacturer (MFR) and Cold Test Facility (CTF). The main winding tooling for all PF Coils has been commissioned both in Europe, where it has been handed over formally to the MFR in Cadarache and in China, where ASIPP have wound a pre-dummy coil. In 2017, all remaining tooling will be delivered on-site. The qualification phase will be completed as well (with the exception of the large size (PF3/4) dummy Double Pancake). Hence, the series manufacturing will start in 2017, both in Europe and in China. Specific contracts for tests and a specific contract for inspection services will be signed in 2017 to follow up the manufacturing activities for this contract.

ANNUAL OBJECTIVES AND INDICATORS

Milestone ID/ Objectives	Scope Description	Forecast achievement date	Type of milestone
EU11.3B.30920	HPC - IO Approval for Double Pancake Final Acceptance Document (DPFAD) on DP5 of PF5	Q3-2017	Predecessor of: PF Coil: EU PF 5 coil ready for cold test
EU11.1A.22480	Arrival of TFWP11 to the Simic workshop	Q2-2017	Predecessor of: IPL > Delivery of TF11 (EU 01) by EU-DA to ITER Site
EU11.3B.528590	After the impregnation of the first DP, it is moved and placed on the stacking tool. (DP9 for PF6 stacked on WP Stacking Station).	Q3- 2017	Predecessor of: PF Coil: Manufacturing Complete for EU PF 6 Coil and Delivery to Site

EXPECTED RESULTS, TARGET AND INDICATORS
PF5: Double Pancake #5 (4 of 8) wound and impregnated PF6: Double Pancake #9 (1 of 9) wound, impregnated and placed on the stacking tooling TF11: Winding Pack delivered to the site of the supplier that is responsible for the Cold Test and Coil Insertion The target for 2017 is the achievement of a cumulative value of 101,363.8 IUA (CAS).
HUMAN RESOURCES ASSIGNED TO THE ACTION
F4E will be supporting this action during the year 2017 with 41.93 FTEs.
PROCUREMENT PLAN

Main Procurement initiatives

Scope description	Time of call	Type of Contract	Credit type
Manufacturing of Composite Pultruded Laminate Pre-Compression Rings	Q3-2016	PSupply	PA

Grants and Specific Grants

Scope description	Time of call	Indicative Amount	Budgetary line
N.A.	N.A.	N.A.	N.A.

1.3.2. Action 2. Vacuum Vessel

Action 2	Vacuum Vessel

Overview

Considering the current difficulties in keeping the production on schedule (threatening the critical path towards the First Plasma), some significant changes are being investigated together with the main contractor (Enhanced project management, increased manufacturing capacity) and will have to be implemented in the course of the year to the existing contract which will translate into contract amendments. By 2017, all five EU-VV sectors will have fully entered the manufacturing phase. All four poloidal segments (PS) of the sector 5 will be under manufacturing including the completion of the sub-assemblies. Design activities for sector 4, in addition to sector 5, will be completed as well as the design activities for the regular poloidal segments for the sectors 2 and 3. A few activities related to arc and electron beam welding qualification and material procurement will still take place.
In support of the above, specific contracts for inspectors, design analysis in support of design changes generated by non-conformities or Deviation Requests and other support activities (including the transportation of all 5 sectors DDU to Cadarache and support to the schedule recovery plan) will be performed. The transfer of the procurement responsibility for the delivery of 2 VV Sectors (7 and 8) from Euratom to the ITER Organisation is implemented through cash contribution. A first commitment has been implemented in 2016 while the remaining part will be committed in 2017.

ANNUAL OBJECTIVES AND INDICATORS

Milestone ID/ Objectives	Scope Description	Forecast achievement date	Type of milestone
EU15.1A.3011200	PS3 sector 5 First sub-assembly	Q3-2017	Predecessor of: IPL > Delivery of Sector 5 & all VV Splice Plates by EU-DA to ITER Site
EU15.1A.1138890	PS4 sector 5 First sub-assembly on triangular supports	Q3-2017	Predecessor of: IPL > Delivery of Sector 5 & all VV Splice Plates by EU-DA to ITER Site

EXPECTED RESULTS, TARGET AND INDICATORS

Completion of the first subassembly for the PS3 sector 5. PS3 ready for the next assembly steps.
Completion of the first subassembly for the PS4 sector 5. PS4 ready for the next assembly steps.
The target for 2017 is the achievement of a cumulative value of 64,560 IUA (CAS).

HUMAN RESOURCES ASSIGNED TO THE ACTION

F4E will be supporting this action during the year 2017 with 34.22 FTEs.

PROCUREMENT PLAN

Main Procurement initiatives

Scope description	Time of call	Type of Contract	Credit type
Procurement of Instrumentation supports for the five EU VV sectors[20]	Q1-2017	PSupply	PA

Grants and Specific Grants

Scope description	Time of call	Indicative Amount	Budgetary line
N.A.	N.A.	N.A.	N.A.

[20] PCR with IO is ongoing. The final scope of this procurement activity will be provided with the approval of the PCR.

1.3.3. Action 3. In Vessel – Blanket

Action 3	In Vessel - Blanket

Overview

Blanket and First Wall Panels

The overall procurement consists in the supply of 215 panels of the Blanket First Wall.

The main activities on the Blanket FW are related to:

- Preparation of the FW Procurement Arrangement.
- 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 the OPE-443 contracts have been 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.

In parallel, several semi-prototypes are being submitted to High Heat Flux (HHF) tests in different facilities.

Activities to verify by analyses the design improvements identified in the course of 2016 are on-going, as well as activities aimed at qualifying a different grade of beryllium.

An activity envisaged to identify possible solutions to repair a debonded tile has been concluded.

Main challenges in 2017 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.

With the aim to further reduce the fabrication cost, additional design improvements will be validated first via Finite Element Analysis (FEA) and then through the manufacturing and testing of additional mock-ups in 2017/18. This includes the activities envisaged for the qualification of new material grades and fabrication techniques.

The PA will be of type “build to print”. The signature, originally planned in 2015, has been postponed to 2017 also to allow the implementation of design changes for cost reduction.

A new contract aimed at developing the coatings needed on FW panel parts will be signed in the course of 2017, as part of ITA-169.

Beryllium Health & Safety issues are starting to have an impact on the planning and on the procurement strategy. Some expertise will be needed to address properly these topics in the frame of the ITER Beryllium Management Committee and to timely address the issues related to delivery, storage and handling of the FW panels at ITER site.

To support the design modifications implying the use of Electro Slag Remelted (ESR) material and to progress in the development work to increase competition and solve the technical issues on CuCrZr, contracts to procure material for development and to be provided to companies to manufacture the mock-ups to validate the design changes have been foreseen.

Blanket Cooling Manifolds

Further to the FDR held in December 2015, detailed analyses will be performed to develop an alternative BCM support design based on bolted supports. A technical specification will be prepared by end 2016 to place a small contract in 2017 for the manufacturing of a prototype to demonstrate the feasibility. In parallel to this activity, IO-CT will investigate one additional alternative, the Hot Radial Pressing (HRP), to the current brazing design.

ANNUAL OBJECTIVES AND INDICATORS			
Milestone ID/ Objectives	**Scope Description**	**Forecast achievement date**	**Type of milestone**
EU.16.01.20490	NDE after CuCrZr HIP operation for FSP	Q1-2017	Predecessor of: HP Process qualification - Readness review for series manufacturing
EXPECTED RESULTS, TARGET AND INDICATORS[21]			
Successful NDE after CuCrZr HIP operation for FSP.			
HUMAN RESOURCES ASSIGNED TO THE ACTION			
F4E will be supporting this action during the year 2017 with 10.34 FTEs.			
PROCUREMENT PLAN			
Main Procurement initiatives			
Scope description	**Time of call**	**Type of Contract**	**Credit type**
Design and Manufacturing of Components without SS Pipes	Q2-2017	P Supply	PA
Irradiation of Sintered Samples	Q2-2017	P Serv	PA
Grants and Specific Grants			
Scope description	**Time of call**	**Indicative Amount**	**Budgetary line**
N.A.	N.A.	N.A.	N.A.

[21] The target cannot be defined yet as the values of the CAS still need to be agreed as part of the process of signing the PA.

1.3.4. Action 4. In Vessel – Divertor

Action 4	In Vessel – Divertor

Overview

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).

The Divertor Cassette PA 1.7.1 was signed on 8 May 2012. The cassette bodies (CB) manufacturing feasibility is being addressed in the frame of two framework contracts for the manufacture of full size CB prototypes awarded to two EU companies. A similar contract awarded to a third company has been terminated at its early stage. The completion of this pre-qualification and readiness for series production is planned at beginning year 2018. The pre-qualification for the cassette assemblies (CA) integration will be launched in 2019.

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 have been 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-series qualification step by means of 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.

Main challenges in 2017 consist in the completion of the manufacture and acceptance tests of the CB full-scale prototypes, the preparation of the documentation for the launch of the CB series and the signature of the contracts for the qualification of additional suppliers for the procurement of the Divertor Inner Vertical Target.

ANNUAL OBJECTIVES AND INDICATORS

Milestone ID/ Objectives	Scope Description	Forecast achievement date	Type of milestone
EU17.2B.10760	Delivery to Ansaldo Energia – Prototype PFUs	Q4-2017	Predecessor of: IPL > Delivery of W TA-IT-PROTO1-02 from EU-DA to RF-DA at IDTF Site (OPE-138#01)
EU17.01.6110	Published Call for Tender for CB Series	Q4-2017	Predecessor of: Completion of Stage I of the series production of Divertor Cassette Bodies

EXPECTED RESULTS, TARGET AND INDICATORS

Delivery to Ansaldo Energia – Prototype PFUs
Published Call for Tender for Cassette Bodies Series

The target for 2017 is the achievement of a cumulative value of 1,540 IUA (CAS).

HUMAN RESOURCES ASSIGNED TO THE ACTION

F4E will be supporting this action during the year 2017 with 9.73 FTEs.

PROCUREMENT PLAN

Main Procurement initiatives

Scope description	Time of call	Type of Contract	Credit type
Full Scale Additional Prototype - IVT	Q2-2017	PSupply	PA

Grants and Specific Grants

Scope description	Time of call	Indicative Amount	Budgetary line
N.A.	N.A.	N.A.	N.A.

1.3.5. Action 5. Remote Handling

Action 5	Remote Handling

Overview

The procurement of the Remote Handling Systems (RHS) will mainly focus on the preliminary design activities.

In particular, the divertor RHS (DRHS) will continue with the PD, foreseen to finish in 2018, while an early start of the preparatory activities for the Final design will ensure a smooth transition across the procurement phases. These tasks will be mainly performed through specific contracts under on-going framework contracts.

During the first half of the year, for the Cask and Plug RHS (CPRHS) it is foreseen to complete the preparatory activities and to start the main bulk of activities for PD for one cask typology, foreseen to be finish in 2018. Like for the DRHS, also in this case the implementation will be through specific contracts under on-going framework contracts.

NBRHS also is presently focused on the PD that is handled in phases in a similar way to the other packages, i.e. through specific contracts. By the first half of the year it is foreseen to finish PD phase 1 and start the phase 2.

The IVVS finally will finish preparatory activities for PD and it will start the main design effort during the first half of the year by placing specific contracts under on-going framework contracts.

Complementary design, control system, prototyping and qualification in various RH technologies will be performed in support of the main operational activities, where needed.

ANNUAL OBJECTIVES AND INDICATORS

Milestone ID/ Objectives	Scope Description	Forecast achievement date	Type of milestone
EU23.03.90710	Preliminary Design (single variant) for CPRHS	Q1-2017	Predecessor of: Task Order Signed for Manufacturing for CPRHS

EXPECTED RESULTS, TARGET AND INDICATORS

Activity started of CPRHS Preliminary design (single variant) for the preparation of the submission of the regulatory file to ASN.

The target for 2017 is the achievement of a cumulative value of 3,400 IUA (CAS).

HUMAN RESOURCES ASSIGNED TO THE ACTION

F4E will be supporting this action during the year 2017 with 20.66 FTEs[22].

PROCUREMENT PLAN

Main Procurement initiatives

Scope description	Time of call	Type of Contract	Credit type
Preliminary Design Phase 2 first-priority items for NBRHS	N.A.	SC	PA
Preliminary Design (single variant) for CPRHS	N.A.	SC	PA

Grants and Specific Grants

Scope description	Time of call	Indicative Amount	Budgetary line
N.A.	N.A.	N.A.	N.A.

[22] 1 FTEs is assigned to specific IO tasks.

1.3.6. Action 6. Cryoplant and Fuel Cycle

Action 6	Cryoplant and Fuel Cycle

Overview

Following the award of the contract in 2016, the design of the four water de-tritiation system holdings and feeding tanks will be pursued and the manufacturing will be started. No F4E involvement is expected for the isotope separation system which is still in the conceptual design phase under IO-CT responsibility.

In the frame of the design PA for REMS (Radiological and Environmental Monitoring Systems), the preliminary design review of REMS for Tokamak will take place then the final design phase of the beryllium monitors will start. Those activities will be carried out in house, without any contract placed.

The type A radwaste development is currently in the conceptual design phase managed by IO. F4E will resume the negotiations with IO-CT with the view to transferring the procurement of the type A radwaste to IO-CT.

The activities in the field of vacuum pumping will grow quite significantly. The completion of the manufacturing of the pre-production cryopump and warm regeneration lines are scheduled mid-2017 and end of 2017 respectively. Credited by a built-to-print PA signed in Mid-2016, the contract for the manufacturing of the MITICA cryopump will be awarded and signed in 2017.

After signature of the detailed design PA, the call for procurement of the cryostat and torus cryopump front end cryodistribution will be launched with the objective to award and sign the contract for the final design and manufacturing at the very end of 2017.

As regards the leak detection and localization system, F4E will take charge of the development of the equipment required for localizing and detecting any leak on the primary components of the machine by signing the corresponding PA Mid-2017.

Furthermore a contract for the procurement of Johnson couplings will be signed in 2017.

Overview on Cryoplants

Most of the LN2 Plant and Auxiliary Systems components will have been delivered on site by the end of 2016. Furthermore a contract will be signed for the Quench line header for LN2 Plant and Auxiliary Activities.

So in 2017 the contracts for on-site installation and test phase of the ITER cryoplant will be signed and activities start upon building availability. For the MITICA Cryoplant contract (signed in August 2016), the preliminary design, final design and launch of the long lead items are planned to be performed in 2017.

ANNUAL OBJECTIVES AND INDICATORS

Milestone ID/ Objectives	Scope Description	Forecast achievement date	Type of milestone
EU31.01.125600	Signed Award Decision for Manuf. and Factory Testing of Torus and cryostat Front End Cryodistribution	Q4-2017	Predecessor of: IPL > Delivery of Cold Valve Boxes and Cryojumpers 5-8 (4 no.) Batch 2 by EU-DA to ITER Site
EU31.01.10550	< IPL PA 3.1.P1.EU.03 Documentation received from IO (18-Sep-17)	Q3-2017	Predecessor of: IPL > Delivery of Torus & Cryostat Cryopumps by EU-DA to ITER Site
EU31.03.10120	< IPL PA 3.1.P3.EU.01 Primary Leak Detection & Localization System Signed	Q3-2017	Predecessor of: IPL > Delivery of Primary Leak Detection and Localisation by EU-DA to ITER Site

EXPECTED RESULTS, TARGET AND INDICATORS
Start of LN2 Plant and Auxiliary Systems installation. Signed award decision for MTICA cryopump contracts. Preliminary Design Review for REMS for Tokamak. The target for 2017 is the achievement of a cumulative value of 25,710.3 IUA (CAS).
HUMAN RESOURCES ASSIGNED TO THE ACTION
F4E will be supporting this action during the year 2017 with 20.20 FTEs
PROCUREMENT PLAN

Main Procurement initiatives

Scope description	Time of call	Type of Contract	Credit type
Manufacturing and Factory Testing of Torus and Cryostat Front End Cryodistribution	Q1-2017	PSupply	PA
Mechanical, piping and test for installation of the LN2 Plant and Auxiliary Systems	Q1-2017	PServ	PA

Grants and Specific Grants

Scope description	Time of call	Indicative Amount	Budgetary line
N.A.	N.A.	N.A.	N.A.

1.3.7. Action 7. RF Heating and Current Drive

Action 7	RF Heating and Current Drive

Overview

Ion Cyclotron Antenna– not FP

The PA signature for the IC antenna has been delayed to 2022 as a result of SR2FP. This is used as an opportunity to implement staged R&D for the reduction of technical and cost risks (procurement preparation), especially for the development of the safety-important vacuum windows.

The ICH antenna project is in final design phase, implemented through a Framework Contract signed in 2014. The work for the final design also includes prototyping/testing and R&D for the Faraday Screen and the RF vacuum window. Challenges are found in interfaces and requirements not yet stabilised, as well as in redesign of some components for compliance with loads and improved manufacturability. Design work will be implemented in 2017 by specific contracts for design simplification, finalisation of the Faraday Screen design, design of the connection with the components outside the port plug, and requirement management and verification, as well as necessary support contracts. Options for one of the RF vacuum window R&D contracts (qualification of the rotary friction welding of Titanium to Stainless Steel) are also planned for 2017.

Electron Cyclotron (EC) Upper Launcher and ex-vessel equatorial launcher - FP

The EC Upper Launcher project is in the final design phase. The SR2FP has required replanning of FDR and procurement stages, to meet the budget constraints up to 2020, and therefore re-adjustments in WP 2016 (ongoing) and 2017. Main on-going activities are related to design, prototype fabrication and testing as well as qualification and requirements identification & verification. Management of interface changes and technical complexity and diversity of launcher components are the main challenges. Final design work is carried out under a long-term grant, already in place, which will go on during 2017, as well as additional design work for cooling systems that will be performed through specific contracts under an existing framework contract. Support for Build-to-print design will also be started during 2017 in view of the first FDRs for critical components. On prototyping, specific contracts under the recently signed framework contract for setup and operation of the EC components test facility (FALCON) are envisaged in 2017, including mm-wave testing of Window, Valve and WG prototypes, and procurement and testing of Mirror and Steering Mechanism prototypes. A separate contract for Valve prototype procurement will be signed. The mechanical mock-ups programme will start with a framework contract for support and testing and a procurement contract for mock-ups manufacturing. On engineering support, a framework contract and initial specific contracts for nuclear safety, analysis and engineering verification will be signed, as well as other specific contracts under existing TSS frameworks as needed (i.e. on metrology).

Electron Cyclotron Gyrotrons, Power Sources and Power Suppliers (PS)

For the EC Power Sources (Gyrotrons), due to the realignment with the Straight Road to First Plasma, in 2017, the European programme should be stopped after the completion of the testing of the 1st CW Gyrotron prototype and of the preliminary auxiliary designs. For the EC Power Supplies, the 1st set, composed of one main and two body HV power supplies, will be delivered to ITER, in 2017, after completion of the factory acceptance tests. The production of the sets 2-4 (out of 8 in total) will progressively start.

Electron Cyclotron Control System - FP

The Electron Cyclotron Control System is in Final design phase. During 2016, the main activities have been related to the collection and consolidation of the requirements. The main challenge in the EC Control System activity consists in the clear definition of the interfaces. An interesting opportunity will come from the synergies with the development of the control system for the ECT-Falcon facility (see EC

UL) which will allow testing extensively the concepts developed for the EC Plant Controller.
The main activities for 2017 will regard to design and prototyping. On design, a contract will be launched for support in the FDR preparation of the ECCS, as well as a framework and a specific contract for development of the conceptual design of the EC Upper Launcher subsystem control unit. On prototyping, a contract for development and testing of the most critical hardware component will be signed.

ANNUAL OBJECTIVES AND INDICATORS

Milestone ID/ Objectives	Scope Description	Forecast achievement date	Type of milestone
EU52.01.302215	Pressure tests of EC UL diamond disk brazed mock-up finished and report approved	Q2-2017	Predecessor of: GB MS: Manufacturing of 1st batch of Diamond Disks for EC Upper Launcher 1 finished
EU52.01.305145	Manufacturing drawings for EC UL corrugated waveguide mock-ups ready	Q2-2017	Predecessor of: GB MS: Manufacturing of 1st batch of Waveguides for EC Upper Launcher 1 finished

EXPECTED RESULTS, TARGET AND INDICATORS

Pressure test report of EC UL diamond disk brazed mock-up delivered and approved by F4E. Test results confirm suitability of disk design.
Manufacturing drawings for EC UL corrugated waveguide mock-ups produced and approved by F4E
The target for 2017 is the achievement of a cumulative value of 5,043 IUA (CAS).

HUMAN RESOURCES ASSIGNED TO THE ACTION

F4E will be supporting this action during the year 2017 with 19.26 FTEs.

PROCUREMENT PLAN

Main Procurement initiatives

Scope description	Time of call	Type of Contract	Credit type
Mechanical Mock-ups for the EC UL 9	Q4-2016	P Supply	ITA
Testing of Waveguide and Taper prototypes	Q1-2017	SC	PA/ITA
Provision of support services in the area of nuclear safety for ITER ECH and ICRH Antennas	Q4-2016	FwC	NA
Support to Mechanical Mock-ups, Testing & Qualification	Q4-2016	FwC	NA
Support to EC control plant design and operation	Q2-2017	FwC	NA
Technical Follow-up of the Procurement of Body PS & Main HV PS	Q2-2017	FwC	NA
Final Design and PA preparation for ICH Antenna	Q2-2017	FwC	NA

Grants and Specific Grants

Scope description	Time of call	Indicative Amount	Budgetary line
N.A.	N.A.	N.A.	N.A.

1.3.8. Action 8. Neutral Beam Heating and Current Drive

Action 8	Neutral Beam Heating and Current Drive

Overview

Test facility at RFX-Padua:

In 2017, the latest equipment's (Beam Source, Cooling Plant, CODAS) will be delivered and their site acceptance tests completed for SPIDER experiments foreseen to start mid-2018 after nine months of integrated commissioning. For MITICA, 2017 will see the delivery of the first components and equipment as the Vessel, the Vacuum and Gas Injection System, the SF6 Handling Plant, the Ion Source Extraction PS (ISEPS), the Acceleration Grid PS (AGPS) and Ground Related PS (GRPS) and the High Voltage Deck 1 & Bushing followed by the start of the MITICA on-site assembly. The contract for the MITICA Beam Line Components (Calorimeter, Ions Dump and Neutraliser) is foreseen to be signed end 2017 after completion of its final technical specification in December 2016. For the MITICA diagnostics the activities of design will be concluded, still in 2017, by a Final Design review. To reduce the risk, the challenging design, of the MITICA Beam Source, started mid-2016 by three companies in competition, will continue up to end 2017 with the final F4E/IO designs assessment.

The agreement on the Neutral Beam Test Facility with the Consorzio RFX is implemented through cash contribution both credited and not-credited. In 2017 F4E will commit as cash contribution the 2018 NBTF Work Programme and possible amendment of the 2017 NBTF WP.

Neutral Beam at ITER-Cadarache

The activity of the year will be the negotiation and the signature of the two PAs: PA 5.3.P4 HNB (Beam Vessels, Drift Duct, Fast Shutter, PMS, Exit Scraper, Lead Wall) and PA 5.3.P5.HNB ACC Coils. The finalization and approval (signature foreseen mid 2017) of those PAs, defined at Detailed level for most of the components, is mainly driven by IO.

ANNUAL OBJECTIVES AND INDICATORS

Milestone ID/ Objectives	Scope Description	Forecast achievement date	Type of milestone
EU53.TF.13210	HPC - NBTF Assembly - SPIDER Beam Source - Accepted	Q4-2017	Predecessor of: SPIDER Ready for Integrated Commissioning

EXPECTED RESULTS, TARGET AND INDICATORS

- Acceptance of assembly of SPIDER Beam Source
- Signature of procurements for MITICA Beam Source and for the Assembly Tools & Testing Equipment of PRIMA Plant.

The target for 2017 is the achievement of a cumulative value of 23,490 IUA (CAS).

HUMAN RESOURCES ASSIGNED TO THE ACTION

F4E will be supporting this action during the year 2017 with 21.02 FTEs.

PROCUREMENT PLAN

Main Procurement initiatives

Scope description	Time of call	Type of Contract	Credit type
Procurement of MITICA Beam Source	N.A.	SC	PA
Assembly Tools & Testing Equipment of PRIMA Plant (with Assembly)	N.A.	SC	PA

Grants and Specific Grants

Scope description	Time of call	Indicative Amount	Budgetary line
N.A.	N.A.	N.A.	N.A.

1.3.9. Action 9. Diagnostics

Action 9	Diagnostics

Overview

Procurement procedures for manufacturing of several Diagnostic components and systems essential for First Plasma will be launched and/or signed during 2017, including for manufacturing of in-vessel cables, clips and connectors, in-vessel and ex-vessel captive components of the plasma position reflectometer, outer-vessel coils and in-vessel attachments of the magnetics sensors and in-vessel attachments of the bolometer diagnostic.

A specific contract will be signed covering preliminary design of the vacuum vessel feedthroughs, which are both First Plasma and PIC components, as well as advancing the design of the upper and equatorial port structures and associated integration of diagnostics from Europe, IO and five other Domestic Agencies. Design and prototyping (when needed) of the visible/IR camera system, plasma position reflectometer, bolometer diagnostic and other systems with deliveries for First Plasma, will continue during 2017 mainly in the form of specific grants under running Framework Partnership Agreements (FPAs), as will design activities on the remaining diagnostic systems needed after First Plasma with the exception of the core-plasma Thomson scattering system, for which a design contract will be launched in 2017. Most of the systems 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 justifying and documenting baseline design solutions and demonstrating manufacturability and compatibility with cost and schedule constraints. This design effort will culminate in 2017 with the signature of Procurement Arrangements for all the systems relevant to First Plasma, as well as a majority of the remainder, allowing preliminary design to continue.

A significant number of contracts for engineering analysis, manufacturing and testing of prototypes and production of manufacturing specifications will be signed in 2017 to support of the design of Diagnostics systems. The procurement procedure for a Framework Contract for the production of the build-to-print drawings and manufacturing specifications will be completed, and some task orders under this contract will be signed for systems with First Plasma relevance.

ANNUAL OBJECTIVES AND INDICATORS

Milestone ID/ Objectives	Scope Description	Forecast achievement date	Type of milestone
EU55.06.691380	Specific contract for Design for Feedthroughs for Tokamak Services	Q2-2017	Predecessor of: IPL > In-V Elec Feedthroughs Delivered to ITER Site
EU55.01.300325	Contract for Analysis Software Algorithm Design	Q2-2017	Predecessor of: IPL > Electronics and Software for Magnetics Delivered to ITER Site

EXPECTED RESULTS, TARGET AND INDICATORS

Signature of specific contract for Port Plug design - Preliminary Design 9
Signature of specific contract for Design for Feedthroughs for Tokamak Services
Signature of contract for Analysis Software Algorithm Design
The target for 2017 is the achievement of a cumulative value of 698.09 IUA (CAS).

HUMAN RESOURCES ASSIGNED TO THE ACTION

F4E will be supporting this action during the year 2017 with 22.89 FTEs.

PROCUREMENT PLAN			
Main Procurement initiatives			
Scope description	**Time of call**	**Type of Contract**	**Credit type**
Port Plug design - Preliminary Design 9	NA	SC	PA
Design for Feedthroughs for Tokamak Services	NA	SC	PA
Grants and Specific Grants			
Scope description	**Time of call**	**Indicative Amount**	**Budgetary line**
Grant for Development and Design of Mirror Lifetime Optimization	Q4-2016	14,022,619 euros	31
Specific grants for design activities for the Low Field Side Collective Thomson Scattering diagnostic.	N.A.		
Specific grants for design activities for the Core-Plasma Charge Exchange Recombination Spectrometer diagnostic	N.A.		
Specific grants for design activities for the Equatorial Visible-IR Wide-Angle Viewing System diagnostic	N.A.		
Specific grants for design activities for the Bolometer diagnostic	N.A.		
Specific grants for design activities for the tokamak electrical services	N.A.		
Specific grants for design activities for the Radial Neutron Camera - Gamma Spectrometer diagnostic	N.A.		
Specific grants for design activities for the Plasma Position Reflectometry diagnostic	N.A.		
Specific grants for design activities for the Pressure Gauges diagnostic	N.A.		

1.3.10. Action 10. Test Blanket Module

Action 10	Test Blanket Module

Overview

In 2017 the Preliminary Design phase, commenced in the last quarter of 2016 after the approval of the Conceptual Design Review, will continue for the TBM Sets, the Ancillary Systems and the Preliminary Welding Procedures Specification.

The five Framework Contracts (FwC) launched in 2012 for the TBM Sets Conceptual Design will expire toward the end of 2016. Only three new FwCs will be launched in 2017 mainly focused on carrying on the Preliminary Design of the TBM sets and of the Ancillary Systems and to perform safety and (if needed) accidental analysis to support the aforementioned activities. The FwCs signature is foreseen toward the end of 2017 while the first Specific Contract will be launched at the beginning of 2018.

Maintenance activities will not continue in 2017 while the Preliminary Welding Procedures Specifications will be completed with a contract launched in 2017.

Other complementary activities planned for 2017 are new developments of the ECOSIMPRO code for Tritium transportation (Grant), the handling and storage of EUROFER (Specific Contract), the transportation of EUROFER batch #4 from the production site to the storage facility (Contract) and radwaste feasibility studies for the final disposal of the Pb-Li in ANDRA (Contract).

The Test Blanket Module procurement plan is not in response of PAs or ITAs.

ANNUAL OBJECTIVES AND INDICATORS

Milestone ID/ Objectives	Scope Description	Forecast achievement date	Type of milestone
EU56.01.130320	FwC for Preliminary Design of TBMs set signed	Q4-2017	Used as WP17 milestone
EU56.01.1230420	FwC for Preliminary Design of Ancillary Systems	Q4-2017	Used as WP17 milestone
EU56.01.1232800	FwC for Safety Analysis in support of TBS Preliminary Design	Q4-2017	Used as WP17 milestone
EU56.02.1218650	Contract for Preliminary Welding Procedures Specifications for TBM Box Manifold Area	Q4-2017	Used as WP17 milestone

EXPECTED RESULTS, TARGET AND INDICATORS

Signature of the Framework Contracts for Preliminary Design for TBMs set, Ancillary Systems and Safety Analysis

Signature of contract for Preliminary Welding Procedures Specifications for TBM Box Manifold Area

This action as it is not credited does not follow a credit scheme.

HUMAN RESOURCES ASSIGNED TO THE ACTION

F4E will be supporting this action during the year 2017 with 8.69 FTEs.

PROCUREMENT PLAN			
Main Procurement initiatives			
Scope description	**Time of call**	**Type of Contract**	**Credit type**
Preliminary Design of the TBM Sets and Analysis	Q2-2017	FwC - PServ	Not credited
Preliminary Design of the Ancillary Systems and integration in ITER	Q2-2017	FwC - PServ	Not credited
TBS transient and accidental analyses and safety studies in support to the Preliminary Design	Q2-2017	FwC - PServ	Not credited
Preliminary Welding Procedures Specification: Back Plates and Manifolds	Q2-2017	Contract PServ	Not credited
Grants and Specific Grants			
Scope description	**Time of call**	**Indicative Amount**	**Budgetary line**
New developments of the simulation tool, based on the EcosimPro platform, for tritium migration through HCLL and HCPB-TBS	Q1-2017	125 k€	3.2

1.3.11. Action 11. Buildings Infrastructures and Power Supplies

Action 11	Buildings Infrastructures and Power Supplies

Overview

Electrical Power Supply and Distribution: Delivery of the first Load Centre's and Building 36 is expected. The procurement of the first part of the Emergency Power Supply Distribution is due to be complete with contract awarded for the distribution buildings.

Buildings and Civil Infrastructures: The completion of Construction Design for the remaining levels of the Tokamak Complex with civil works construction works continuing up to L3. Building Services installation continuing with RFE milestone achieved in a number of Auxiliary Building.

In terms of procurement, following the redefinition of the procurement strategy for the Emergency Power Supply Distribution, the procurement of the Electrical Distribution Buildings 44,45, 46 and 47 [TB13], the Buildings 34, 37, 71(non-PIC part), 75(non-PIC part) [TB12], and the Contract for the completion of works [TB11] should be complete with contracts awarded.

Specific contracts for Building HMI Development will be signed under ongoing framework contract and under a new framework contract for which the signature is foreseen in 2017.

Furthermore, other specific contracts for procurement of services in support to the main activities will be signed in 2017. This includes, for example, Facility management, Site Security and Reception Services, Engineering and contract management consultancy services (with special respect to cost and schedule assessment) and consultancy for advice on interpretation of French Regulatory Law 2017.

Changes and exercise of options 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.

Cash contribution will cover the ITER site host agreement and the ITER site Services agreement.

Overview on TB 03

In 2017 the final Construction Designs for Level 5 and the roof will be delivered for review with the construction of level L3 of the civil works of the Tokamak and Diagnostic Building's starting and level L2 due to start in the Tritium Building.

The civil works are due to be completed in the Auxiliary Buildings B15 and B51/52.

Overview on TB 04

In 2017 the approval process for the Construction Design of the Tokamak Complex building services should begin- and be approved for the lower levels (these are the last Construction Designs foreseen within TB04). Installation works within B13, B17 and B61 should be complete (RFE) with the works continuing in B15 and due to commence in B51/52.

The installation of Load Centre's 03, 05 and 14 should be complete. The Assembly and Installation Design Reviews for the other Load Centres within the TB04 scope should be completed.

Overview on Architect engineer

In 2017 the last level of the Construction Design for the Tokamak Complex will be delivered, passed in Manufacturing Readiness Review, and delivered to the Contractor.

Overview on Remaining TBs

TB05: In 2017 the RFE of Buildings 32, 33 and 38 should be achieved.

TB06: In 2017 the installation works for electrical distribution will continue (Load Centres and Building 36 for completion), with as main challenge, the connection to the RTE (400 kV) grid.

TB07: In 2017 the RFE of Buildings 67, 68A and 69 should be achieved.

TB16: In 2017 the infrastructure works will continue on zone by zone basis with design and construction works. The foundations for Load Centres 03, 05, 06 and 14, in addition to Medium Voltage centres 01, 03 and 05, should be completed ready for the installation of the Load Centre equipment by others.

ANNUAL OBJECTIVES AND INDICATORS			
Milestone ID/ Objectives	**Scope Description**	**Forecast achievement date**	**Type of milestone**
EU41-43.106040	HPC - IO approval of PBS 43 1st HV Transformer (Unit 4) SAT	Q1-2017	IC/GB milestone
EU62.05.050	IPL > Assembly Building (13) RFE 1A (RFE #1)	Q2-2017	IC/GB milestone
EU62.05.604050	Cryostat Crown Civil Work Completed	Q4-2017	IC/GB milestone
EU62.05.20910	NPC - RFOC Tokamak Building (11) level B2	Q4-2017	IC/GB milestone
EU62.05.65840	NPC - RFOC Access Cryoplant Compressor Bldg (51)	Q3-2017	Predecessor of: IPL > Cryoplant Compressor Building (51) RFE (RFE #8B)
EU62.603400	NPC - Start of construction of Tokamak Building (11) level L3	Q1-2017	Predecessor of: IPL > Tokamak Building (11) RFE 1B - Stage 2 (RFE #1)
EU62.05.65890	NPC - RFOC Cryoplant Coldbox Bldg (52)	Q3-2017	Predecessor of: IPL > Construction of Cryoplant Coldbox Building (52) Completed

EXPECTED RESULTS, TARGET AND INDICATORS

The completion of Construction Design for the remaining levels of the Tokamak Complex with civil works construction works continuing up to L3. Building Services installation continuing with RFE milestone achieved in a number of Auxiliary Building, particularly the assembly building.
Delivery of the first Load Centre's and Building 36 is expected. The procurement of the first part of the Emergency Power Supply Distribution is due to be complete with contract awarded for the distribution buildings.

The target for 2017 is the achievement of a cumulative value of 233,764.98 IUA (CAS).

HUMAN RESOURCES ASSIGNED TO THE ACTION

F4E will be supporting this action during the year 2017 with 58.48 FTEs.

PROCUREMENT PLAN

Main Procurement initiatives

Scope description	Time of call	Type of Contract	Credit type
TB13 - Commitment for Contract for Design & Construction of Bldgs 44, 45, 46 & 47	Q4-2016	PSupply	PA
TB12 - Commitment for Contract for Design & Build of Bldgs 34, 37, 71 non PIC, 75 non PIC	Q1-2017	PSupply	PA

Grants and Specific Grants

Scope description	Time of call	Indicative Amount	Budgetary line
N.A.	N.A.	N.A.	N.A.

1.3.12. Action 12. Cash Contributions

Action 12	Cash Contributions

Overview

Cash Contribution to IO-CT

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. 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.

Cash Contribution to Japan

According to the ITER Agreement, there is a transfer of procurement responsibility from EURATOM to Japan under the supervision of the ITER Organization. This is financed through a cash contribution from EU to Japan paid by F4E. An update of the schedule of payments is provided by the Japanese Domestic Agency (JA DA) twice a year.

ANNUAL OBJECTIVES AND INDICATORS

	2017	2018	2019
Cash to IO – Commitment (in MEuros)[23]	186.85	193.13	221.04
Cash to Japan – Commitment (in MEuros)	3.887	38.356	0

EXPECTED RESULTS, TARGET AND INDICATORS

The expected result 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 assigned to JA DA for those components transferred by the EU to them.

HUMAN RESOURCES ASSIGNED TO THE ACTION

F4E will be supporting this action during the year 2017 with 0.33 FTEs.

PROCUREMENT PLAN

Cash Contribution

Scope description	Amount (in MEuros)
Cash Contributions to ITER Organization	186.85
Cash Contribution To Japan for the signature of the PA3.2.P4.JA.01	3.887

[23] The cash contribution required by IO-CT for the year N is committed by F4E at the end of the year (N-1). E.g. the commitment shown here in 2017 is the cash contribution to IO-CT for 2018.

1.3.13. Action 13. Supporting Activities

Action 13	Supporting Activities

Overview
The procurement of the supporting activities are mainly performed through Framework contracts and specific contracts related.

Engineering Support activities
Technical expertise in the key domains of engineering and fusion technologies such as Design office activities, Analysis (Mechanical, Structural Dynamics, Civil engineering, Fluid Dynamics, Electro Magnetism, Nuclear Analyses), Design Codes and Standards; Instrumentation and Control; Metrology. Beyond the preparation of specific contract, the procurement activities will be mainly focused on renewing Framework Contract providers, for keeping the same level of support to project teams both for ITER and BA.

Material and Fabrication
Technical expertise in the domains of Materials Science, Materials Technologies and Manufacturing Processes mainly supervising: the development and qualification of material; collection of material data; and qualification of joining technologies. It mays support the materials procurement on demand.

Transportation
During 2017, the technical aspects, on the F4E side, of the joint procurement with IO for the transportation of ITER components to the site in Cadarache will be managed. The scope includes the transportation of all ITER Components from the port/airport of entry (Fos or Marignane) to ITER site. In 2017 the IO-DAs framework contract in place should be renewed, as to ensure continuity of the service.

The main cost driver is for Highly Exceptional Loads (HEL) that follows the dedicated ITER itinerary. During 2017, this activity will mainly cover transportation of some NON EU loads between Fos and Cadarache (EU-leg): the main part of the HELs is the Assembly tooling components supplied by KO-DA. In 2017 focus will be as well put on the reduction of the number of HELs and the related number of convoys, this jointly with IO, all DAs and Daher.

Plasma Engineering (PE)
A relevant part of the PE activity responds to (often urgent) requests and hence is difficult to plan in advance. PE group in 2017 is going to focus on transversal activities in support to F4E procurements.

Nuclear Safety
Support to the project teams, by providing the expertise in the field of Nuclear Safety that could be required during the design and/or the manufacturing of Protection Important Components.

Quality Assurance, Quality Control
Ensure that F4E's QA processes are properly followed in the development of the different ITER projects and that the requirements are correctly propagated.

CE marking

The scope includes the support to the project teams in providing assessments, for each PBS, of the compliance with CE marking directives & regulations (mainly the Construction Product Regulation, the Machinery Directive, the Low Voltage Directive and the Electromagnetic Compatibility Directive).

Systems Engineering, Configuration Management and Technical Integration

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. As well as 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.

To this aim, within the first quarter of the year an FwC will be signed to provide a transversal and consistent support both for Barcelona and Cadarache.

Assembly Integration and Validation (AIV)

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.

Programme Management

Main focus will be the performance monitoring and reporting, the maintenance and update of the costing, 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 implementation of the Internal Compliance Programme for export control.
A general provision is foreseen for experts and consultancy service (e.g. participation to specific committees, support/advice to F4E Management, technical support) as well as provision for interim management services and audit.

Information and Communication Technology

Provision of ICT support (hardware, software and services) for the specific benefit of the operational activities.

ANNUAL OBJECTIVES AND INDICATORS	
Area	**Scope Description**
Engineering Support activities	On the top of regular support to the teams, renewing Framework Contract providers.
Material and Fabrication	The focus for 2017 will be Magnets and Vacuum Vessel projects
Transportation	On the top of regular support to the teams, renew of IO-DAs framework contract in place to ensure continuity of the service.
Plasma Engineering	On the top of regular support to the teams, in particular for the Electron Cyclotron and Ion Cyclotron heating systems.
Nuclear Safety	According to the project needs, this expertise will consist in providing advices or preparing positions on key Nuclear Safety issues, reviewing critical documentation, interacting with IO Safety, promoting the Nuclear Safety culture within F4E and fostering good practices.

Quality Assurance, Quality Control	Providing support to the project teams, in particular in performing audits, ensuring correct functioning of the nonconformity control process, managing the F4E inspector's contracts
CE marking	Regular support to project teams as needed
Systems Engineering, Configuration Management and Technical Integration	Improvement of the transversal support for both Barcelona and Cadarache.
Assembly Integration and Validation (AIV)	Regular support to project teams as needed
Programme Management	Management of risk, schedule, reporting (both internal and external), budget, cost.
Information and Communication Technology	Software licenses provisioning and maintenance, Project management platform support,

EXPECTED RESULTS, TARGET AND INDICATORS

N.A.

HUMAN RESOURCES ASSIGNED TO THE ACTION

F4E will be supporting this action during the year 2017 with 51.04 FTEs.

PROCUREMENT PLAN

Main Procurement initiatives

Scope description	Time of call	Type of Contract	Credit type
Convention 6 for Real Convoys for Gendarmerie Services	N.A.	SC	PA
Convention 7 for Real Convoys for Gendarmerie Services	N.A.	SC	PA
Engineering Support to Antennas and Plasma Engineering (In-sourcing)	Q4-2016	FwC	NA
Provision of Instrumentation and Control Integration Services	Q4-2016	FwC	NA
Mechanical analyses of ITER components	Q1-2017	FwC	NA
Maintenance calibration and Certification of metrology equipments	Q1-2017	FwC	NA

Grants and Specific Grants

Scope description	Time of call	Indicative Amount	Budgetary line
N.A.	N.A.	N.A.	N.A.

1.3.14. Action 14. Broader Approach

Action 14	Broader Approach

Overview

JT-60SA

In 2017, a large share of EU contribution will be delivered to the JT-60SA site. The actions will focus on fabrication, testing, transportation and on-site installation done either by Voluntary Contributors or F4E. The activities under the responsibility of F4E are carried out through task orders of existing framework contracts or existing/new supply and service contracts. Substantial progress is expected with the majority of the TF coils being transported by F4E and assembled by QST. The installation and commissioning of the first half of the ENEA contribution to the Super Conducting Magnets Power Supplies, as well as the remainder of such work on the Switching Network Units. The High Temperature Super Conducting Current Leads and the Cryostat will be delivered to site. The Electron Cyclotron Resonance Heating power supplies are expected to reach an advanced stage in manufacturing. On the basis of risk assessment, it is identified the possible need to perform actions in the area of re-machining of components, replacement of parts and systems on short notice, execution of on-site repairs and re-tests. F4E on site presence for the follow-up of the activities of installation of systems and components will continue to be supported by experts and health and safety services to ensure safe operations. Engineering and other auxiliary activities in support of the integrated assembly and commissioning are also planned.

Cash contribution will be made to the Common Fund for integration and commissioning activities. Reimbursements are also reserved for possible compensation to EU VCs according to the provisions of the respective Agreement of Collaborations.

IFMIF/EVEDA

Of the 4 key objectives of the IFMIF/EVEDA Project (Engineering Design, Li Target Prototyping, High Flux Test Module Prototyping, and Accelerator Prototyping), all committed tasks for the first 3 objectives are expected to be completed in 2016. Therefore in 2017, all work will be devoted to the installation and commissioning of the LIPAc (Linear IFMIF Prototype Accelerator) systems at Rokkasho implemented through Voluntary Contributors and F4E contracts. After the first phase (Installation and commissioning of the Injector), the main objective is to reach an advanced status in Phase B. It will consist of the final positioning, assembly and alignment of the systems required for validating the accelerator line for a deuteron beam of up to 5 MeV. This will be supported through Voluntary Contributors and F4E contracts. The subsequent Phases C and D are to start in 2018, and will see the integrated commissioning of the full LIPAc facility adding the high-energy part of the accelerator line. Selected components shall be contributed in 2017 through Voluntary Contributors and F4E contracts, and shall complete the IFMIF Engineering Validation Activities by end of 2019. In addition, all commitments for the transport of the remaining systems will be placed through specific task orders within the existing transport framework contract. These systems are presently under manufacture in Europe through the Voluntary Contributors with specific engineering support provided through F4E contracts. During all installation and commissioning phases, F4E will still be supported by experts, and on-site health and safety services to ensure safe operations funded respectively by F4E through expert contracts and specific contracts.

Cash contributions, will be made to maintain project team common expenses (e.g. missions) and common funds (e.g. repairs and spare parts).

IFERC

The IFERC project comprises three activities, CSC (supercomputer Helios), DEMO design and R&D activities, and REC (Remote experimentation Centre). These activities are in different phases of execution. The supercomputer Helios (provided by France as voluntary contributor) will stop operation in December 2016 and will be the dismantled in the first six months of 2017, completing the credit under two PAs. The DEMO design activities are at the pre-conceptual design level and are performed by EUROfusion acting as a Voluntary Contributor. The REC activities are fully under the financial responsibility of F4E, and are performed under F4E contracts to provide software and services, some of which will be completed in 2017 (site acceptance tests). A final integrated test (participation in the operation of a European Tokamak from Rokkasho) will need financing in 2017.

ANNUAL OBJECTIVES AND INDICATORS

Milestone ID/ Objectives	Scope Description	Forecast achievement date	Type of milestone
STP-EU-TFC	Transport and Delivery of TF coils and accessories - 2017 part	Q4-2017	Used as WP17 milestone
STP-EU-SNU	Delivery and installation of the SNUs	Q4-2017	Used as WP17 milestone
STP-EU-CR02	Transport of the Cryostat Vessel Body Cylindrical Section	Q4-2017	Used as WP17 milestone
Integrated Commissioning and Initial Operation	Common activities required to support JT-60SA activities, not covered under specific WBS sub elements of JT-60SA - 2017 Part	Q4-2017	Used as WP17 milestone
IFMIF-EU-PA-10-B	Phase B: Completion of commissioning @ 5 MeV	Q4-2017	Used as WP17 milestone
IFMIF-EU-PA-12	Cryoplant Installation and Acceptance Test Report at Rokkasho BA Site	Q3-2017	Used as WP17 milestone
REC (Remote Experimentation Centre)	Deliver software tools and codes	Q4-2017	Used as WP17 milestone

EXPECTED RESULTS, TARGET AND INDICATORS

JT-60SA

- Majority of the toroidal field coils delivered to the Naka site
- Switching Network Units delivered to and installed at the Naka site
- Cryostat Vessel Body Cylindrical Section delivered to the Naka site
- Common activities in support of JT-60SA as required by the progress of the work carried out

IFMIF

- Completion of commissioning @ 5 MeV (Phase B) completed
- Cryoplant installed at the Rokkasho BA site and the acceptance test report is prepared and approved

IFERC

- Software tools and codes for the Remote Experimentation Centre delivered

The target for 2017 is the achievement of a cumulative value of 92.751 kBAUA.

HUMAN RESOURCES ASSIGNED TO THE ACTION

F4E will be supporting this action during the year 2017 with 31.86 FTEs

PROCUREMENT PLAN			
Main Procurement initiatives			
Scope description	**Time of call**	**Type of Contract**	**Credit type**
Materials and components for LIPAc installation	Q4-2017	Supply	Not credited
Engineering support for installation in Rokkasho	Q4-2017	Service	Not credited
Grants and Specific Grants			
Scope description	**Time of call**	**Indicative Amount**	**Budgetary line**
N.A.	N.A.	N.A.	N.A.

ANNEXES

ANNEX I. 2017 Work Programme Budget Summary

Budget article		Commitment appropriations (EUR)
3 1	ITER construction including site preparation	348 272 997.00
3 2	Technology for ITER	7 100 000.00
3 3	Technology for Broader Approach & DEMO	8 600 000.00
3 4	Other expenditure	3 400 000.00
3 5	Appropriations from the ITER Host State contribution	145 000 000.00
Total Title III of the Budget		**512 372 997.00**
3 1 to 3 4	Additional non-budgeted revenue	P.M.
3 5	Host State contribution carried over from previous year	P.M.
3 6	Additional revenue from the Reserve Fund Allocation scheme with ITER Organization	P.M.
Total amount available for the operational expenditure		**512 372 997.00**

Work Programme		Commitment appropriations (EUR)		
		Grants	Procurement	Cash
3 1+3 5	Expenditure in support of ITER Project credited by IO	14 200 000.00	282 572 997.00	196 500 000.00
	Sub total ITER construction	**493 272 997.00**		
3 2	Design and R&D in support of ITER, not credited	250 000.00	1 550 000.00	5 300 000.00
	Sub total technology for ITER	**7 100 000.00**		
3 3	Expenditure in support of Broader Approach		5 600 000.00	3 000 000.00
	Sub total Technology for Broader Approach and DEMO	**8 600 000.00**		
3 4	Other Expenditure (EU.PM.PM)		3 400 000.00	
	Sub total Other Expenditure	**3 400 000.00**		
3.6	Reserve Fund		p.m.	
	Sub total Reserve Fund	**0.00**		
Totals Operational Expenditure		***14 450 000.00***	***293 122 997.00***	***204 800 000.00***
		512 372 997.00		

ANNEX II. Essential selection, award criteria and Upper funding limits 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 fulfill 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.

Upper funding Criteria

With the entry into force of the recast F4E Financial Regulation and Implementing Rules on 1st 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%

ANNEX III. Indicative number, type of contract and timeframe for launching the procurement procedures

Procurement procedures	Q1 / 2017	Q2 / 2017	Q3 / 2017	Q4 / 2017
P Supply – FWC	0	0	1	0
P Supply - Contract	6	11	9	11
P Supply – Specific Contract	2	0	2	3
P Serv – FWC	0	2	2	3
P Serv - Contract	3	9	5	10
P Serv – Specific Contract	22	23	24	21

NB
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 WP2017.

ANNEX IV. Mapping of Organizational Breakdown Structure (OBS – F4E Teams/Units). WBS level 3 and relevant Procurement Arrangements

F4E UNIT (OBS)	WBS REF. (LEVEL 3)	WBS NAME (LEVEL 3)	PAs relevant
Magnets (MG)	EU.01.11.01	Toroidal Field Coils	PA 1.1.P1A.EU.01
	EU.01.11.02	Pre Compression Rings	PA 1.1.P2A.EU.01
	EU.01.11.03	Poloidal Field Coils	PA 1.1.P3A-B.EU.01
	EU.01.11.04	Magnet Conductors	PA 1.1.P6A.EU.01 PA 1.1.P6C.EU.01
Vacuum Vessel (VV)	EU.01.15.01	Main Vessel	PA 1.5.P1A.EU.01
In Vessel (IV)	EU.01.15.02	Blanket Manifolds	PA 1.5.P1A.EU.02
	EU.01.16.01	Blanket and First Wall Panels	PA 1.6.P1A.EU.01
	EU.01.17.01	Divertor Cassette Body and Assembly	PA 1.7.P1.EU.01
	EU.01.17.02	Divertor Vertical Target	PA 1.7.P2B.EU.01
	EU.01.17.03	Divertor Rails	PA 1.7.P2E.EU.01
Remote Handling (RH)	EU.01.23.01	Remote Handling Common Activities	PA 2.3.P2.EU.01 PA 2.3.P3.EU.01 PA 2.3.P5.EU.01 PA 5.7.P1.EU.01
	EU.01.23.02	Divertor Remote Handling System	PA 2.3.P2.EU.01
	EU.01.23.03	Cask and Plug Remote Handling System	PA 2.3.P3.EU.01
	EU.01.23.05	Neutral Beam Remote Handling System	PA 2.3.P5.EU.01
	EU.01.57.01.	In Vessel Viewing System	PA 5.7.P1.EU.01
Cryoplant and Fuel Cycle (CF)	EU.01.31.01	Cryopumps	PA 3.1.P1.EU.01 PA 3.1.P1.EU.02 PA 3.1.P1.EU.03 PA 3.1.P1.EU.04
	EU.01.31.02	Leak Detection and Localization System	PA 3.1.P3.EU.01
	EU.01.32.01	Hydrogen Isotope Separation System	PA 3.2.P3.EU.01
	EU.01.32.02	Water Detritiation System	PA 3.2.P5.EU.01 PA 3.2.P5.EU.02
	EU.01.34.01	Liquid Nitrogen Plant and Auxiliary Systems	PA 3.4.P1.EU.01
	EU.01.64.01	Radiological and Environmental Monitoring System	PA 6.4.P1.EU.01 PA 6.4.P1.EU.02
	EU.01.66.01	Radiological and Conventional Waste Treatment and Storage	PA 6.3.P1.EU.01

Antennas and Plasma Engineering (PE)	EU.01.51.01	Ion Cyclotron Antenna	PA 5.1.P1.EU.01
	EU.01.52.01	Electron Cyclotron Upper Launcher	PA 5.2.P1B.EU.02
	EU.01.52.05	Electron Cyclotron Control System	PA 5.2.P1B.EU.01
	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	PA 5.2.P3.EU.01
	EU.01.52.03	Electron Cyclotron Power Supplies	PA 5.2.P4.EU.01
	EU.01.53.01	Neutral Beam Assembly and Testing	PA 5.3.P1.EU.01
	EU.01.53.02	Neutral Beam Source and High Voltage Bushing	PA 5.3.P2.EU.01
	EU.01.53.03	Beamline Components	PA 5.3.P3.EU.01
	EU.01.53.04	Pressure Vessel and Magnetic Shielding	PA 5.3.P4.EU.01
	EU.01.53.05	Active Correction and Compensation Coils	PA 5.3.P5.EU.01
	EU.01.53.06	Neutral Beam Power Supplies	PA 5.3.P6.EU.01
	EU.01.53.07	Neutral Beam Test Facility	PA 5.3.P9.EU.01
	EU.01.53.08	Neutral Beam non credited activities	
Diagnostics (DG)	EU.01.55.01	Magnetics	PA 5.5.P1.EU.01-02-16-17-19
	EU.01.55.02	Bolometers	PA 5.5.P1.EU.01-03
	EU.01.55.03	Plasma Position Reflectometry	PA 5.5.P1.EU.05
	EU.01.55.04	Pressure Gauges	PA 5.5.P1.EU.07
	EU.01.55.06	Tokamak Services	PA 5.5.P1.EU.01
	EU.01.55.07	Radial Neutron Camera - Gamma Spectrometer	PA 5.5.P1.EU.15
	EU.01.55.08	High Resolution Neutron Spectrometer	PA 5.5.P1.EU.15
	EU.01.55.09	Core-plasma Thomson Scattering	PA 5.5.P1.EU.01
	EU.01.55.10	Low Field Side Collective Thomson Scattering	PA 5.5.P1.EU.09
	EU.01.55.11	Core-Plasma Charge Exchange Recombination Spectrometer	PA 5.5.P1.EU.04
	EU.01.55.13	Equatorial Visible/Infrared Wide-Angle Viewing System	PA 5.5.P1.EU.06
	EU.01.55.14	Port Engineering Systems	PA 5.5.P1.EU.10-11-12-13-14
	EU.01.55.15	Diagnostics Common Activities	PA 5.5.P2.EU.01
TBM and Materials Development (TB)	EU.01.56.01	European Test Blanket System Arrangement	
	EU.01.56.02	Test Blanket Systems Research & Development	

Buildings infrastructure and Power supplies (BIPS)	EU.01.62.02	Buildings infrastructure and Power supplies	PA 4.1.P1A-8B.EU.01 PA 4.1.P8C.EU.01 PA 4.1.P8A.EU.01 PA 4.1.P1A-8B.EU.02 PA 6.2.P2.EU.01 PA 6.2.P2.EU.02 PA 6.2.P2.EU.03 PA 6.2.P2.EU.04 PA 6.2.P2.EU.05 PA 6.2.P2.EU.06
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.04	CE Marking	
	EU.01.NS.01	Nuclear Safety	
	EU.01.TR.08	Transportation	
Project Management (PI)	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	
	EU.01.PM.01	Programme Management -Quality Assurance	
	EU.PM.PM.09(*)	Additional Operational Expenditures (*)	
System Engineering (SE)	EU.01.PM.03	Technical Integration	
	EU.01.PM.05	Systems Engineering	
	EU.01.PM.06	Configuration Management	
Broader Approach Common (BA)	EU.BA.01.01	Transportation	
	EU.BA.01.02	On site activities	
	EU.BA.01.03	PA Monitoring	
	EU.BA.01.04	Legal Costs	
Satellite Tokamak JT-60SA (JT)	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	
	EU.BA.02.07	Cryostat	

IFMIF (IF)	EU.BA.03.01	IFMIF-EVEDA Project Common Activities	
	EU.BA.03.02	LIPAc Activities	
IFERC (BA)	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	
	EU.BA.04.04	DEMO Design	
Legal Service (LS)	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 Services Unit	

ANNEX V. Mapping of Action, WBS L3 and WP reference.

Action	F4E-WP Action	Project Name	WBS L3	WP ref
1	Magnets	Toroidal Field Coils	EU.01.11.01	WP17/11/01
		Pre Compression Rings	EU.01.11.02	
		Poloidal Field Coils	EU.01.11.03	
		Magnet Conductors	EU.01.11.04	
2	Vacuum Vessel	Main Vessel	EU.01.15.01	WP17/15/01
3	In Vessel - Blanket	Blanket Manifolds	EU.01.15.02	WP17/15/01
		Blanket and First Wall Panels	EU.01.16.01	WP17/16/01
4	In Vessel – Divertor	Divertor Cassette Body and Assembly	EU.01.17.01	WP17/17/01
		Divertor Vertical Target	EU.01.17.02	
		Divertor Rails	EU.01.17.03	
5	Remote Handling	Remote Handling Common Activities	EU.01.23.01	WP17/23/01
		Divertor Remote Handling System	EU.01.23.02	
		Cask & Plug Remote Handling System	EU.01.23.03	
		Neutral Beam Remote Handling System	EU.01.23.05	
		In Vessel Viewing System	EU.01.57.01	WP17/57/01
6	Cryoplant and Fuel Cycle	Cryopumps	EU.01.31.01	WP17/31/01
		Leak Detection and Localization System	EU.01.31.02	
		Hydrogen Isotope Separation System	EU.01.32.01	WP17/32/01
		Water Detritiation System	EU.01.32.02	
		Liquid Nitrogen Plant and Auxiliary Systems	EU.01.34.01	WP17/34/01
		Radiological and Environmental Monitoring System	EU.01.64.01	WP17/64/01
		Radiological and Conventional Waste Treatment and Storage	EU.01.66.01	WP17/66/01
7	RF Heating and Current Drive	Ion Cyclotron Antenna	EU.01.51.01	WP17/51/01
		Electron Cyclotron Upper Launcher	EU.01.52.01	WP17/52/01
		Electron Cyclotron Gyrotrons	EU.01.52.02	
		Electron Cyclotron Power Supplies	EU.01.52.03	
		Electron Cyclotron Control System	EU.01.52.05	

8	Neutral Beam Heating and Current Drive	Neutral Beam Assembly and Testing	EU.01.53.01	WP17/53/01
		Neutral Beam Source and High Voltage Bushing	EU.01.53.02	
		Beamline Components	EU.01.53.03	
		Pressure Vessel and Magnetic Shielding	EU.01.53.04	
		Active Correction and Compensation Coils	EU.01.53.05	
		Neutral Beam Power Supplies	EU.01.53.06	
		Neutral Beam Test Facility	EU.01.53.07	
		Neutral Beam Not Credited Activities	EU.01.53.08	
9	Diagnostics	Magnetics	EU.01.55.01	WP17/55/01
		Bolometers	EU.01.55.02	
		Plasma Position Reflectometry	EU.01.55.03	
		Pressure Gauges	EU.01.55.04	
		Tokamak Services	EU.01.55.06	
		Radial Neutron Camera - Gamma Spectrometer	EU.01.55.07	
		High Resolution Neutron Spectrometer	EU.01.55.08	
		Core-plasma Thomson Scattering	EU.01.55.09	
		Low Field Side Collective Thomson Scattering	EU.01.55.10	
		Core-Plasma Charge Exchange Recombination Spectrometer	EU.01.55.11	
		Equatorial Visible/Infrared Wide-Angle Viewing System	EU.01.55.13	
		Port Engineering Systems	EU.01.55.14	
		Diagnostics Common Activities	EU.01.55.15	
10	Test Blanket	European Test Blanket System Arrangement	EU.01.56.01	WP17/56/01
		Test Blanket Systems Research & Development	EU.01.56.02	
11	BIPS	Buildings Infrastructure and Power Supplies	EU.01.62.02	WP17/62/01
12	Cash Contributions	Cash Contributions to ITER Organization	EU.01.CC.01	WP17/CC/01
		Cash Contributions to Japan Domestic Agency	EU.01.CC.02	

13	Supporting Activities	ITER Programme Management	EU.01.PM	WP17/PM/01
		Transportation	EU.01.TR	WP17/TR/01
		Engineering Support and Integration	EU.01.ES.01	WP17/ES/01
		Engineering Analysis and Nuclear Data	EU.01.ES.02	
		Embedded Control Data Access and Communication	EU.01.ES.03	
		Materials and Fabrication Technologies	EU.01.MF.01	WP17/MF/01
		Nuclear Safety	EU.01.NS.01	WP17/NS/01
		Plasma Engineering	EU.01.PE.01	WP17/PE/01
		Plasma Control System	EU.01.PE.02	
		F4E Programme Management	EU.PM.PM	WP17/PM/02
14	Broader Approach	Common Activities	EU.BA.01	WP17/BA/01
		Satellite Tokamak (JT-60SA)	EU.BA.02	WP17/BA/02
		IFMIF-EVEDA Project	EU.BA.03	WP17/BA/03
		International Fusion Research Centre	EU.BA.04	WP17/BA/04

ANNEX VI. Risk and Opportunity Management

Risks associated to the Workprogramme 2017

As far as Workprogramme 2017 is concerned, the project managers of each in-kind procurement have been required to provide a list of the major risks they have identified for the activities they are planning to carry out under WP2017.

The following list of main risk has been derived (not in order of priority):

- Lack of clear definition of requirements from IO, especially for the safety ones
- Uncertainties in the manufacturing process
- Delay in the reception of the free-issued items from other DAs
- Company failed in passing either a qualification step or full-scale prototype acceptance tests
- Lack of competition resulting in overpriced bids
- Lack of adequate budget to carry out the activities
- Decrease in the human resources available in the team
- Delays due to lack of agreement with contractors on the consequence of changes received from IO through F4E
- Change in the amount of cash contribution for either IO-CT or Japan due to the modification of the activities / needs during the year
- Slippage in BA activities due to either delayed or no funding from Voluntary Contributors.

The procurement strategy and/or the follow-up of the contracts will ensure that the necessary mitigation actions are implemented in order to avoid that these risks materialize.

Risks associated to the Multi Annual Programme

The Risk Management at F4E currently consists of two different levels: Corporate implemented since 2012 and the bigger part Project Level, implemented in 2011. . All the risk are evaluated in schedule and cost on qualitative assessment and then the most relevant ones are used in the quantitative cost assessment (i.e. Estimate at Completion). Recently Project Risks registers have been moved to the Primavera planning tool which offers Risk Register management features and allows F4E to improve the available reporting and follow-up of the risk and the action plans

The Corporate Risk and Opportunity log is validated at Senior Management Meeting and the sources of risk identification are the following:

1. Critical Project Risks (local).
2. Project aggregated risks.
3. Risk from F4E horizontal activities.
4. Risk identified during Audits/Reviews.

Risks and opportunities specific to WP2017 are explained in such document.

From a multi-annual perspective, a large list of risks exists and they can be associated with each of the procurements depending on the phase of development.

Some of the risks that are considered for each system are the following ones:

1. Lack of Competition in the industry causing increase of costs.
2. Lack of expertise in industry or laboratories due to the long-lead procurements.
3. Lack of continuity in the fusion research causing lack of interest from industry.
4. First of a kind R&D project: technical requirements may not be met as expected.
5. Large number of deviations and non-conformities causing delays and over-costs.
6. Late input by IO-CT of design or late changes triggering delays and over-costs.
7. Possible claims from companies causing an increase of costs.
8. Damages of components during transportation causing delays.

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

Mid 2016, 45 Projects (with at least 1 PA each) were analysed from a risk point of view. Ten additional projects from Diagnostics and Neutral Beam areas have created their risk registers, thus increasing the global number of risks by almost 50%. The diagram below shows the number of the currently identified and assessed project risks compared with those of previous years, growing along with new projects' inclusion, and to a lesser extent to included projects' newly identified risks.

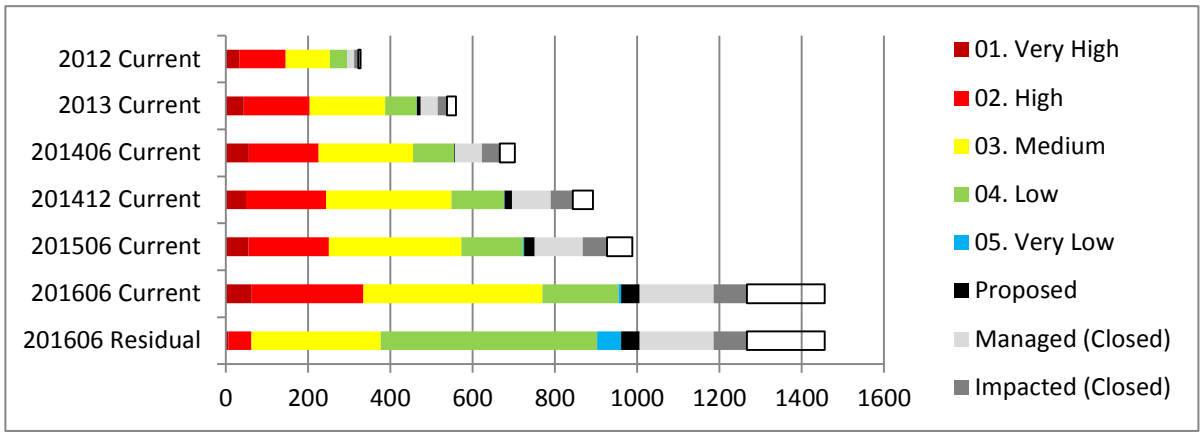


Figure 12. Number of the currently identified risks compared with those of previous years.

Following the F4E Risk management process, a Probability/Impact Diagram matrix (PID matrix) has been defined for the risk level ranking in order to define priorities on risk handling. In 2016 all Project risk registers were reviewed with the goal to keep the data both:

1. Consistent within each register.
2. Homogenized among all registers.
3. Effective action plans.

ANNEX VII. Quality management

Management System Framework

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

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

Quality Management will continue foster the quality approach and quality system in F4E, as well as to be part of the engine for process development and improvement in F4E.

As the project continues its evolution into manufacturing, further effort will be put on QA surveillance and quality control.

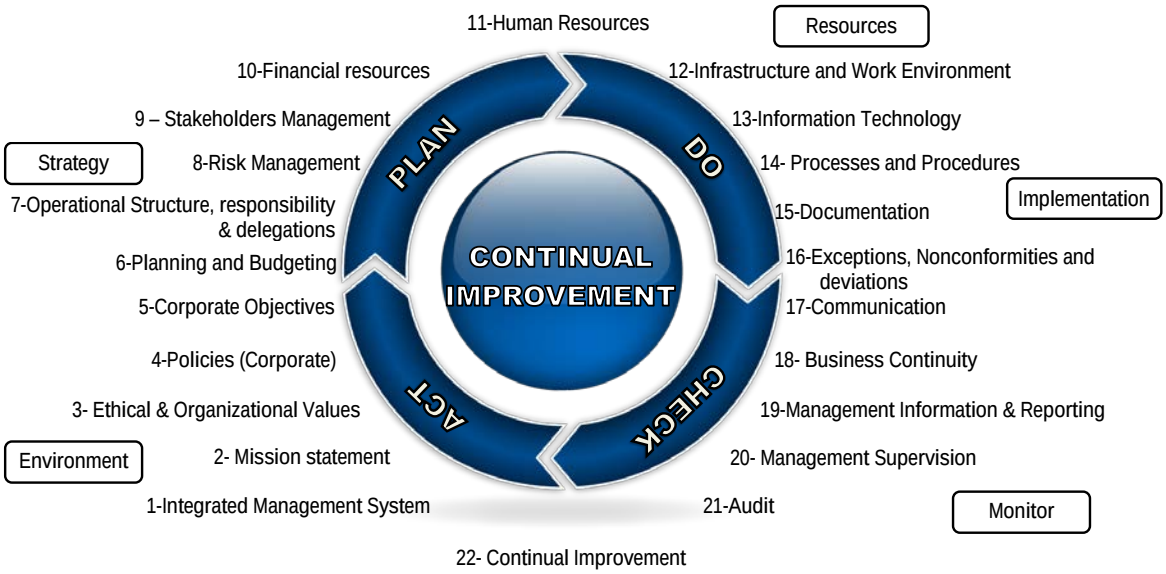


Figure 13. F4E Integrated Management System

Quality Related to ITER Procurements

The F4E Quality Management System implements, for safety relevant components and activities, the requirements of the INB Order of the 07 February 2012 (replaced from the 01 July 2013 the Quality Order of 10 August 1984), emphasizing putting the application of quality to assure safety.
The overall framework to achieve the quality criteria for items and services provided by F4E to the ITER project is established in the F4E QA Programme for the ITER Project (a specific project QA Programs of the quality system). This QA Programme (for the procurement of the EU in-kind components) is approved by the F4E Director and by IO.
As part of the formalization and approval of the F4E commitments toward the ITER Project, F4E develops a strategy proposal for each project. Based on this strategy, F4E issues a specific Project Management Plan describing and defining the implementing provisions, the interfaces and breakdown of the project.
Suppliers are bound to follow a Quality System for their work. They provide a dedicated Quality Plan that describes the quality provisions to be implemented in order to comply with the F4E *Supplier Quality Requirements* as defined in the call and contractual documentation. Once approved by F4E, it can be used and is physically transferred to F4E at the end of the collaboration in order to ensure traceability of the delivered products over the whole project life.

Quality Related to Broader Approach Procurements

For the BA projects a project-wide Common Quality Management System (CQMS) was introduced.
The CQMS describes general features of common work within each project, allowing the Integrated Project Team to function as a single team with shared procedures and tools. In addition the Home Teams in each project are bound by their respective JA and EU Quality Management Systems, which themselves point to the Quality Management Systems of the actual procuring institutions concerned.
The specific Procurements QA follow the same rules and principles as the ITER Project procurements.

Quality Assurance (QA) and the Quality Requirements

Quality Assurance (focused on providing confidence that quality requirements will be fulfilled) encompasses several tasks, including:

1. Support Project Teams in preparation and implementation of ITAs and PAs, ensuring compliance with the F4E QA Programme.
2. Support Project Teams in preparation and implementation of Contracts and Grants, ensuring compliance with the F4E QA Programme.
3. Ensure that quality processes and procedures are complied with, and in particular the configuration control and configuration management activities.
4. Training on QA and Nuclear Safety to all the operational officers and main Protection Important Components (PIC) Suppliers.
5. Verification of the Suppliers Quality Plans and all the contract implementation quality documentation, including supplier quality audits and surveillance.
6. Coordination of Nonconformities raised and registered in F4E.
7. Support to and liaison with the management in all topics involving QA.

The standard quality and management requirements are defined in the ‘Supplier Quality Requirements’ (F4E-QA-115). For every procurement, the contractual Management Specification refers to that specification, as a base for requirements, defining the applicability of each requirement to the Supplier’s project organization and the dispositions implemented to ensure a proper monitoring of the contract or grant agreement.

Quality Control (QC)

Quality Control (focused on fulfilling quality requirements) is applied during the whole project life cycle and includes the following:

1. Monitoring the quality of the deliverables and processes is being met and detecting defects by using the established tools, procedures and techniques.
2. Analyzing possible causes of defects.
3. Determining the preventive actions and deviation requests.
4. Communicating the corrective actions and deviation requests to the appropriate project organization members.

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

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

Quality Audit

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

The objective of the Quality Audits is to:

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

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

ANNEX VIII. Indicative Value of Financial Resources for the actions in WP2017

The WP2017 represents the financial decision to be adopted by the Governing Board in order to allow F4E to commit budget for the listed activities. The budget requested by F4E (see Annex I) is lower than the one covered by the planned activities.
The table below shows the following information:

- the most likely total level of commitments planned for the projects/actions in 2017 by taking into account the progress and the available manpower. This value is the target of the organization;
- the indicative share of the 2017 available budget assigned to each action (or group of actions).

The additional budget required to achieve the most likely level of commitments will be requested to the Governing Board during 2017 and will consist of unused appropriations that can be adjusted to match the final needs.
In any case, the GB will be kept informed on the evolution of the budget implementation (both in commitments and payments) through the monthly report that F4E delivers to its Governance bodies. This report will also provide an adequate warning if the additional budget from the unused appropriations will be needed.

Action No	Action	Assigned Financial Resources (Total)	Assigned Share of Available Budget
1	Magnets	€ 16,354,810	€ 11,300,000
2,3,4,10	Main Vessel systems	€ 29,406,510	€ 20,500,000
5	Remote Handling	€ 16,198,910	€ 11,000,000
6	Cryoplant & Fuel Cycle	€ 25,220,000	€ 17,500,000
7	RF Heating & Current Drive	€ 6,604,160	€ 4,500,000
8	Neutral Beam Heating & Current Drive	€ 31,360,520	€ 22,000,000
9	Diagnostics	€ 25,141,980	€ 17,300,000
11	Buildings, Infrastructures & Power Supplies	€ 279,101,570	€ 200,000,000
12	Cash Contributions	€ 186,854,580	€ 186,854,580
13	Supporting Activities	€ 18,952,440	€ 12,818,417
14	Broader Approach	€ 8,596,640	€ 8,600,000
	Total	€ 643,792,120	€ 512,372,997

List of Figures

List of Tables

List of Acronyms:

A/E	Architect Engineer
AGPS	Accelerator Ground Power Supplies
ANB	Authorized Notification Body
ANS	Analytical System
ASN	Autorité de Sûreté Nucléaire
ATS	Air Transfer System
BA	Broader Approach
BAUA	Broader Approach Unit of Account. In July 2012 the BAUA corresponded to the value of 783.503 Euros.
BA SC	Broader Approach Steering Committee
BSM	Blanket Shield Module
BtP	Build-to-Print
CD	Current Drive
CDR	Conceptual Design Review
CFC	Carbon Fibre Composites
CMM	Cassette Multifunctional Mover
CQMS	Common Quality management System
COSO	Internal Control standard
CVB	Cold Valve Boxes
CVD	Chemical Vapour Deposition
CXRS	Core plasma charge-exchange Recombination Spectroscopy
DA	Domestic Agency
DACS	Data Acquisition and Control System
DCLL	Dual Coolant Lithium Lead
DCR	Design Change Request
DEMO	Demonstration fusion reactor
DIV	Divertor
DNB	Diagnostic Neutral Beam
DTP	Divertor Test Platform
DT	Deuterium Tritium
DWS	Detailed Work Schedule
EAF	European Activation File
EB	Electron Beam
EBBTF	European Breeding Blanket Test Facilities
EC	Electron Cyclotron
EC UL	Electron Cyclotron Upper Launchers
ECH	Electron Cyclotron Heating
EFDA	European Fusion Development Agreement
EFF	European Fusion File
ELM	Edge Localized Mode
EPC	Engineering Procurement Contract
EUDA	European Domestic Agency
EURATOM	The European Atomic Energy Community
F4E	Fusion for Energy
FDR	Final design Review

FP	First Plasma
FS	Functional Specification
FW	First Wall
FWP	First Wall Panel
GB	Governing Board
HCLL	Helium Cooled Lithium-Lead
HCPB	Helium Cooled Pebble Bed
H&CD	Heating & Current Drive
HHF	High Heat Flux
HIP	Hot Iso-static Pressing
HNB	Heating Neutral Beam
HV	High Voltage
HVAC	Heating Ventilation &Air Conditioning
HVD	High Voltage Deck
HW	Hardware
HXR	Hard X-Ray
IC	Ion Cyclotron or ITER Council
I&C	Instrumentation and Control
ICH	Ion Cyclotron Heating
ICRG	ITER Council Review Group
IFERC	International Fusion Energy Research Center
IFMIF	International Fusion Materials Irradiation Facility
INB	Installation Nucleaire de Base
IO	ITER Organization
IR	Infra Red
IRS	Internal Reporting system
ISEPS	Ion Source and Extraction Power Supplies
ISO	International standards Organization
ISS	Isotope Separation System
ITA	ITER Task Agreement
ITER	International Thermonuclear Experimental Reactor
IUA	ITER Unit of Account. In July 2012, the IUA corresponded to 1619.65 Euros
IVT	Inner Vertical Target
IVVS	In-Vessel Viewing System
KPI	Key Performance Indicator
LD&L	Leak Detection and Localization
LFS-CTS	Low Field Side – Collective Thomson Scattering
LIPAc	Lithium target Facility
MAR	Materials Assessment Report
MDR	Modified Design Reference
MHB	Material Handbook
MHD	Magneto-Hydro-Dynamic
MV	Medium Voltage
NB	Neutral Beam
NBI	Neutral Beam Injector
NBPS	Neutral Beam Power System
NBTF	Neutral Beam Test Facility
NHF	Nominal Heat Flux

ORE	Occupational Radiation Exposure
P&ID	Process and Instrumentation Diagram
PA	Procurement Arrangement
PBS	Product Breakdown Structure
PCR	Project Change Request
PDR	Preliminary Design Review
PE	Plasma Engineering
PF	Poloidal Field
PFC	Plasma Facing Components
PFD	Process Flow Diagram
PIC	Protection transportation Components
PID	Probability Impact Diagram
PIE	Post Irradiation Examination
PM	Project Management Dept.
PMU	Prototypical Mock-Up
PP	Project Plan
PPC	Pre-Production Cryopump
PrSR	Preliminary Safety Report
PTC	Prototype Torus Cryopump
QA	Quality Assurance
QC	Quality Control
QST	Japanese Implementation Agency
R&D	Research & Development
RAFM	Reduced Activation Ferritic Martensitic
REC	Remote Export Center
REM	Radiological Environmental Monitoring
RF	Radio Frequency
RFCU	Radio Frequency Control Unit
RH	Remote Handling
RMP	Resonant Magnetic Perturbation
RNC	Radial Neutron Camera
RWF	RadWaste Facility
RWM	Resistive Wall Mode
SC	Specific Contract
SDC	Structural Design Criteria/Code
SHPC	Safety and Health Protection Coordination
SiC-Dual	SiC/SiC composite material for electrical and thermal Insulation
SMP	Strategic Management Planning
S-NHF	Standard Normal Heat Flux
SOLPS	Scrape Off Layer Plasma Simulation
SR2FP	Straight Road to First Plasma
SS	Steady State
STP	Satellite Tokamak Programme
SW	Software
TBM	Test Blanket Module
TCS	Transfer cask System
TES	Test Extraction System
TF	Toroidal Field

TFC	Toroidal Field Coils
TFWP	Toroidal Field Winding Pack
TH	Thermal Hydraulical
TO	Technical Officer
UT	Ultrasonic
VC	Voluntarily Contribution
VCDIS	Voluntarily Contribution Design Institutions
Vis	Visible
VS	Vertical Stability
VV	Vacuum Vessel
WAVS	Wide Angle Viewing System
WBS	Work Breakdown Structure
WDS	Water Detritiation System
WP	Work Program
WPO	Work Program Objectives