DRAFT DECISION OF THE GOVERNING BOARD ADOPTING THE ANNUAL AND MULTI-ANNUAL PROGRAMME (2018-2022) 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 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, last amended on 10 February 2015[2] by Council Decision Euratom 2015/224;

HAVING REGARD to Council Decision (Euratom) No 791/2013 of 13 December 2013 amending Council Decision (Euratom) No 198/2007 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 2 December 2015 (hereinafter "the Financial Regulation"), and in particular Title III thereof;

HAVING REGARD to the Implementing Rules of the Financial Regulation[5] adopted by the Governing Board on 2 December 2015 (hereinafter "the Implementing Rules"), and in particular Title III thereof;

HAVING REGARD to Commission Delegated Regulation (EU) No 1271/2013 for the bodies referred to in Article 208 of Regulation (EU, Euratom) No 966/2012 of the European Parliament and of the Council of 30 September 2013,[6] and in particular Title III thereof;

HAVING REGARD to the comments and recommendations of the Joint Undertaking's Administration and Management Committee and of the Technical Advisory Panel on the present Annual and Multi Annual Programme (2018-2022);

WHEREAS:

(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 shall, in accordance with Article 8a (2) of the Statutes, comment on and make recommendations to the Governing Board on the proposal for the project plan, the work programme, the resource estimates 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, in accordance with Article 6 (1) of the Statutes, 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;

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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(15)-GB34-12.9 adopted 02.12.2015.

5 F4E(15)-GB34-12.9 adopted 02.12.2015.

6 O.J. L 328, 7.12.2013.

(4) The Governing Board, in accordance with Article 6 (3) (d) of the Statutes, shall adopt the project plan, work programme, resource estimates plan, the staff establishment plan and the staff policy plan, now part of the Annual and Multi Annual Programme;

HAS ADOPTED THIS DECISION:

Article 1

The Annual and Multi-Annual Programme (2018-2022) of Fusion for Energy annexed to this Decision is hereby adopted.

Article 2

The Governing Board hereby delegates to the Director of Fusion for Energy the power to make non-substantial amendments to the annual Work Programme approved by the Governing Board. Amendments are considered to be "non-substantial" if

(a) they do not lead to an increase of

i. more than 10% of the Financial Resources allocated to the corresponding Action in the Annex VI of the annual Work Programme for the year, or more than EUR 0.2 million for Actions with allocation of below EUR 2 million for the year; and

ii. more than 3% of the total operational expenditure in Title 3 of the annual Budget for the given year;

and if

(b) any related changes to the scope of the annual Work Programme do not have significant impact on the nature of the Actions or on the achievement of objectives of the multiannual Project Plan.

Non-substantial amendments shall not lead to any increase in the total operational expenditure for Title 3 of the annual Budget approved by the Governing Board."

Article 3

This Decision shall have immediate effect.

Done in Barcelona, 1 December 2017.

For the Governing Board

Joaquin Sanchez
Chair of the Governing Board

Romina Bemelmans
Secretary of the Governing Board

Annex: F4E Annual and Multiannual Programme (2018-2022)

FUSION FOR ENERGY

Annual and Multiannual Programme

Years 2018-2022

Fusion for Energy

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TABLE OF CONTENTS

Due to the very large number of changes, both to the structure and to the content of the document, for a better readability the document is provided in a clean version and not in track-change.

Section I. General Context

1 Foreword

According to Article 32 (Annual and Multi-Annual Programming) of the F4E Financial Regulation (F4E(15)-GB34-12.9 Adopted on 02/12/2015), the F4E Annual and Multi-Annual Programme integrates three other documents requested by the F4E rules:

1. The Project Plan (PP);
2. The Resource Estimate Plan (REP);
3. The Work Programme (WP).

The PP, REP and the WP are documents that, according to the F4E Statutes and Financial Regulation, the Director shall prepare and submit to the Governing Board (GB) for adoption. The first step of the adoption process requests the preparation of a draft Annual and Multiannual programme for the year N – N+5 to be sent in January of the year N-1 to Commission, GB Chair, EU Parliament and Council.

The information inside this document is structured as follows.

- A general context section in which F4E mission and values are presented as well as the definition of the EU contribution to ITER and to Broader Approach (BA).
- The Multiannual section is composed by the PP and the REP.
  - The PP is providing a multi-annual (up to 2022) view of the F4E objectives for ITER, BA and DEMO projects. Furthermore, it also defines the strategy to achieve them and KPIs used to measure F4E performances.
  - 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 original document structure, previously agreed with the Commission's Services.
- The Annual section, the Work Programme 2018 (WP18), offers an exhaustive view of the F4E activities foreseen in 2018 with the necessary information to be considered a financial decision, including annual objectives, targets and resources.

The reference date for all figures in the present draft document is end of June 2017, corresponding to the last submission of the F4E schedule to the ITER International Organization (IO) before the finalization of the document, except where specifically mentioned.

The information provided is in line with the updated ITER Baseline foreseeing First Plasma (FP) in December 2025.

2 Introduction

This Annual and Multi-Annual Programme offers an overview of the activities of the European Joint Undertaking for ITER and the Development of Fusion Energy ("Fusion for Energy" or F4E) for the years 2018 to 2022.

Since its creation in 2007, Fusion for Energy is responsible to provide Europe's contribution to the work on ITER, the Broader Approach (BA) and the Demonstration Fusion Power Reactor (DEMO) projects according to the tasks entrusted to the organization.

ITER

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 advance many of the key technologies needed for future fusion reactors. Euratom (represented by the European Commission) is part of this large

project involving a total of seven parties 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 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 coordination is managed by the Central Team of the ITER Organization (IO).

Broader Approach (BA)

The Broader Approach agreement, concluded between Euratom and Japan, includes activities which complement the ITER project and accelerate the realization of fusion energy by carrying out Research and Development (R&D) and developing some advanced technologies for future demonstration reactors. 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, in the past, Switzerland).

DEMO

The task of F4E is to prepare and coordinate a programme of research, development and design activities in preparation for its construction. The objective included in the EU fusion roadmap Horizon 2020 is to lay the foundation of a reactor capable of generating several 100MW of net electricity to the grid around the middle of the century.

3 General background

3.1 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 on 19th April 2007 for 35 years with a Mission Statement composed of 3 main objectives:

1. To provide the contribution of the European Atomic Energy Community (Euratom) to the ITER International Fusion Energy Organization.
2. To provide the contribution of Euratom to the 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).

The achievement of these objectives requires the deployment of the following strategies:

1. Maintain the schedule for the Implementation of the EU ITER milestones, with main focus on the ITER Council and Governing Board ones, 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.

3.2 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 (i.e. that generates more energy than what is put in to ignite it) and to advance the technologies that are necessary for the production of fusion power.
The project will reach its ultimate operational configuration [the so-called Deuterium-Tritium (DT) operation] via a series of intermediate configurations of gradually increasing capability. This is referred to as the staged approach and reflects the approach commonly adopted on complex developments with a progressive step-by-step assembly and commissioning process, validating each phase before moving on to the next. The first stage is referred to as First Plasma which is due in December 2025. The full configuration of DT operation is scheduled 10 years later in 2035.
The operational activities commence at First Plasma and continue until 2037. There will then be a deactivation and decommissioning phase through 2042 and beyond.

3.2.1 Staged approach and Schedule to First Plasma (FP)

The updated Project Baseline (Baseline 2016) approved “ad referendum” (i.e. subject to domestic processes of obtaining approval incl. approval of budgetary authorities and/or parliament if required) by the ITER Council (IC) in November 2016 is based on the Staged Approach (Figure 1).

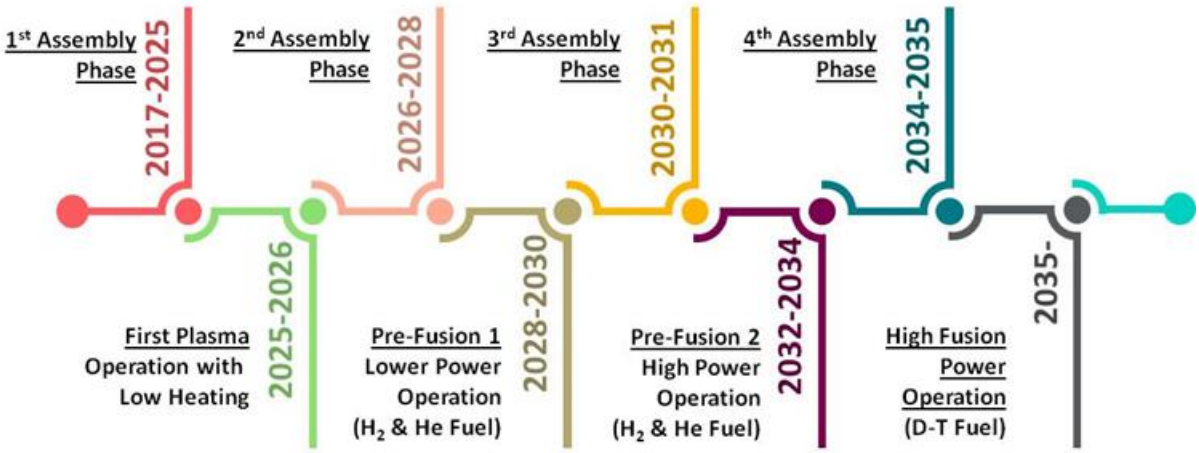

Figure 1 . Detail of the Staged Approach

The overall project is managed through a hierarchy of schedules with increasing granularity at lower (working) level. The F4E top-level schedule for ITER (Figure 2) gives an overview of the most significant and critical ITER and F4E activities.
The ITER Overall Project Schedule (OPS) is supported by a detailed Master Schedule maintained in a scheduling tool called Primavera P6. This Master Schedule is configuration-controlled centrally by the ITER Organization and Domestic Agencies, and forms the basis for project-wide performance monitoring and control by individual technical teams. The Master Schedule is under-pinned by a suite of comprehensive lower-level schedules (i.e. the DWS, Detailed Work Schedule) of 65,000 activities.
The F4E planning has taken into account the capped EU budget available up to 2020, and assumes an as smooth as possible 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 later - years will be subject to increasing uncertainty, and an increasing likelihood of changes in the future. Of course they will also 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 proposed to the ITER Council in November 2016 (IC-19).

3.2.2 Schedule after First Plasma

The achievement of the First Plasma at the end of 2025 is the first step in the operation of the machine. As shown in Figure 1, the Staged Approach foresees in the following years three additional assembly phases followed by three operation phases that culminate with the D-T Phase in 2035.
In Assembly Phase II, the in-vessel components (blanket, divertor and in-vessel coils) will be installed, the electron cyclotron heating system completed and a number of further diagnostics will become available.
In Assembly Phase III, the other heating systems (neutral beam and ion cyclotron) will be installed, and the diagnostic systems will be completed.
In the fourth and final Assembly Phase (Assembly Phase IV), referred to as DT operation, the ITER machine will have the full Tritium facility available. Any necessary repairs or modifications will still be possible at this point; afterwards this will become more complicated as human access will no longer be possible everywhere.
The beginning of the D-T Phase in 2035 will mark the beginning of the full exploitation of the ITER machine.

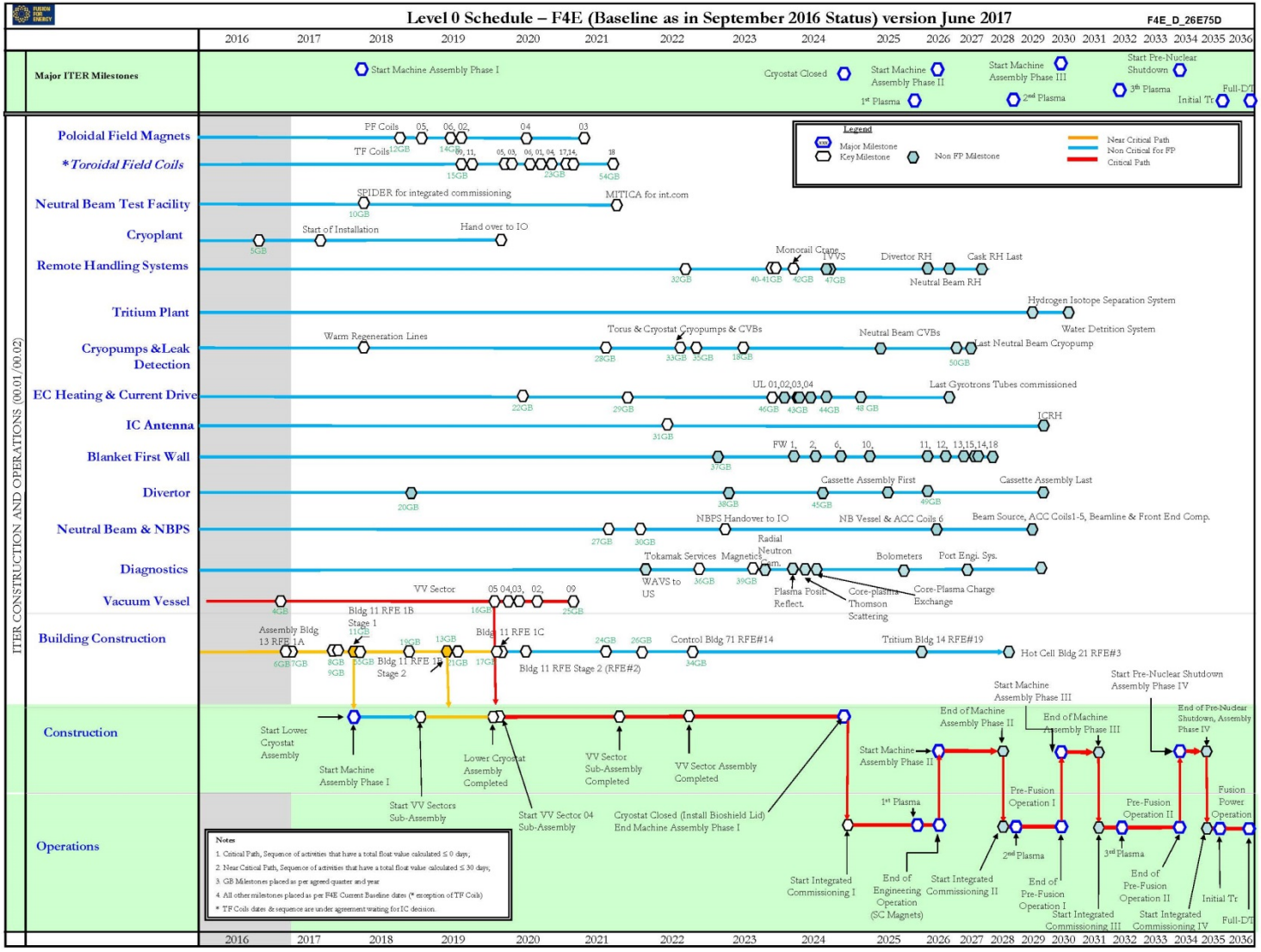

Figure 2 . F4E Top Level schedule for ITER with summary up to the DT Operation Phase

3.2.3 ITER Agreement, role of the domestic agencies and EU contribution to ITER

In 2006 the seven Parties signed the ITER International Agreement. Each of them has a Domestic Agency (DA) that has the obligation to provide components in-kind to build the machine and provides funds to finance the ITER International Organization (IO). The in-kind contribution consists of the delivery of components to be manufactured by each DA according to an agreed share (i.e. about 45% for the EU).

The Procurement Arrangements (PA), being progressively signed between the ITER Organization and each DA, define the specifications of the components to be provided in-kind. The level of detail of those specifications may vary depending on the level of development of the components. In some cases, Build-to-Print specifications will be provided, whilst in others, Detailed Design or only Functional Specifications will be available. This 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. Each component has its lifecycle with predefined stages of development and phase gates when the design has to be reviewed and approved in order to determine the readiness to move to the next stage (see par. 3.2.6).

The obligation of all the DAs and Euratom toward ITER IO are highlighted in yellow in ANNEX XII[1] and are summarized in Figure 3.

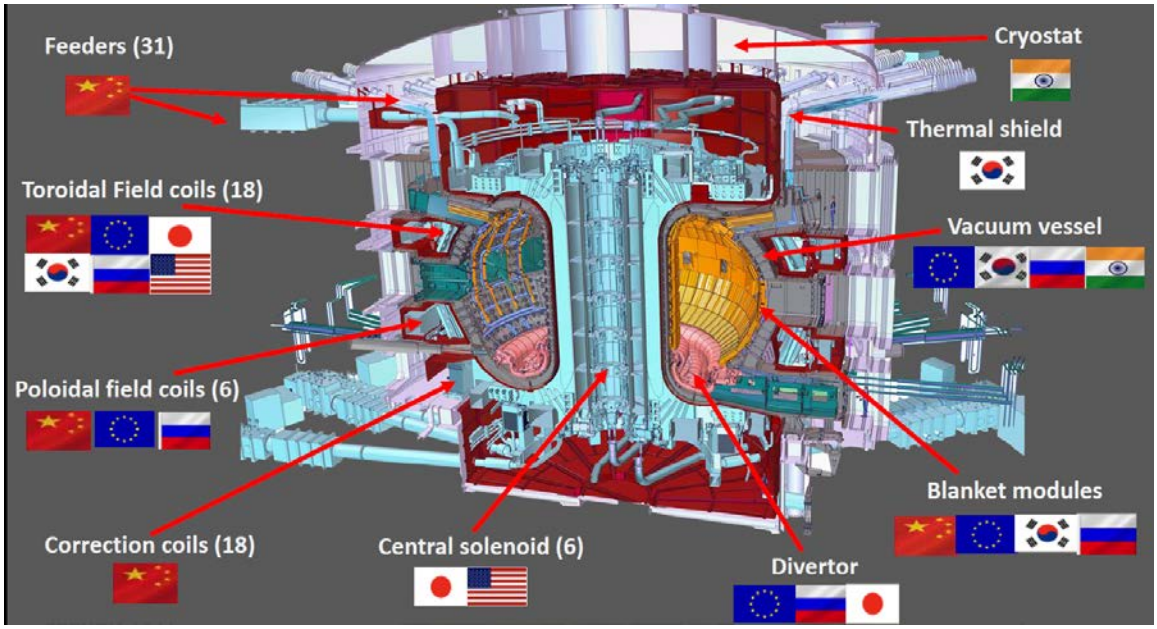

Figure 3 . DAs obligation toward ITER IO

3.2.4 The ITER Procurement arrangements (PA), the Work Breakdown Structure (WBS) and the ITER credit

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 centres, to be used for costing and

[1] IC-20/08.3.2 Proposal for the Update of the Overall Project Cost (OPC)- ITER_D_UVURYN v1.0

funding management purposes. F4E has used cost centres to control the different contract allocations against its estimates.

The table below shows how the PAs relate to the clustered activities, defined as “coherent areas of action with objectives and resources” called “Actions” in this document.

These Actions 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.

As explained above, the in-kind contribution is organized through Procurement Arrangements. Each of them represents specific work to be performed and delivered to IO, typically the manufacturing of components. When a Procurement Arrangement is defined, a total credit value is assigned to the work foreseen to be performed. In particular a Credit Allocation profile (CAS) is defined and a fraction of the total value is assigned to some important milestones.

F4E receives credit[2] from IO for successfully meeting specifically identified milestones. This is an earned value system. Credits do not correspond to the real costs in Euros borne by F4E for the procurement of that component. Nonetheless, F4E considers that credit milestones (CAS) agreed for each PA are the most relevant figures to define the progress of work with the final aim of discharging the EU obligations towards the project. They are the EVM used by F4E.

Table 1 shows the latest information concerning both the current and the signed credit values of the PAs for each area. The table shows the PA value at the time of signature and at the current date, which includes any credit modification (both negative and positive) due to the outcome of the Project Change Requests (PCR) approved by the ITER Council during the evolution of the PA.

[2] In the PA milestones are agreed to mark the progress in the execution of the work. Some of these milestones have a credit associated to them which is released by IO to the DA whenever the milestone is achieved. Obtaining the full credit means that the DA has achieved all milestones and therefore fully discharged its obligation towards IO for that PA.

ACTIONS	PAs relevant	WBS NAME	Current kIUA	Signed Value kIUA	Signed date
1-Magnets	PA 1.1.P1A.EU.01	Toroidal Field Coils	89.74000	85.20000	20 Jun 2008
	PA 1.1.P2A.EU.01	Pre Compression Rings	0.60000	5.14000	12 May 2010
	PA 1.1.P3A-B.EU.01	Poloidal Field Coils	40.86000	40.40000	19 Jun 2009
	PA 1.1.P6A.EU.01	Magnet Conductors	43.39000	43.00000	18 Dec 2007
	PA 1.1.P6C.EU.01		11.22881	9.65250	04 May 2009
2-Vacuum Vessel	PA 1.5.P1A.EU.01	Main Vessel	89.56000	99.36000	19 Nov 2009
3-In Vessel – Blanket	PA 1.5.P1A.EU.02	Blanket Manifolds	NA	NA	NA
	PA 1.6.P1A.EU.01	Blanket and First Wall Panels	NA	NA	NA
4-In Vessel – Divertor	PA 1.7.P1.EU.01	Divertor Cassette Body and Assembly	10.88000	11.20000	08 May 2012
	PA 1.7.P2B.EU.01	Divertor Vertical Target	19.62000	20.20000	12 Mar 2010
	PA 1.7.P2E.EU.01	Divertor Rails	NA	NA	NA
5-Remote Handling	PA 2.3.P2.EU.01	Remote Handling Common Activities	9.62000	12.00000	31 Oct 2012
	PA 2.3.P3.EU.01		17.31337	8.20000	03 Jun 2015
	PA 2.3.P5.EU.01		6.00000	6.00000	19 Jun 2013
	PA 5.7.P1.EU.01		6.80000	0.00000	19 Dec 2014
	PA 2.3.P2.EU.01	Divertor Remote Handling System	9.62000	12.00000	31 Oct 2012
	PA 2.3.P3.EU.01	Cask and Plug Remote Handling System	17.31337	8.20000	03 Jun 2015
	PA 2.3.P5.EU.01	Neutral Beam Remote Handling System	6.00000	6.00000	19 Jun 2013
	PA 5.7.P1.EU.01	In Vessel Viewing System	6.80000	0.00000	19 Dec 2014
6-Cryoplant and Fuel Cycle	PA 3.1.P1.EU.01	Cryopumps	0.20000	7.14480	26 Sep 2013
	PA 3.1.P1.EU.02		0.76518	2.71120	28 Apr 2017
	PA 3.1.P1.EU.03		NA	NA	NA
	PA 3.1.P1.EU.04		3.66400	0.00000	15 Jun 2016
	PA 3.1.P3.EU.01	Leak Detection and Localization System	NA	NA	NA
	PA 3.2.P3.EU.01	Hydrogen Isotope Separation System	NA	NA	NA
	PA 3.2.P5.EU.01	Water Detritiation System	3.25200	2.55200	19 Dec 2012
	PA 3.2.P5.EU.02		NA	NA	NA
	PA 3.4.P1.EU.01	Liquid Nitrogen Plant and Auxiliary Systems	26.37110	31.50000	15 Jun 2011
	PA 6.4.P1.EU.01	Radiological and Environmental Monitoring System	0.60000	0.60000	26 Sep 2013
	PA 6.4.P1.EU.02		NA	NA	NA
	PA 6.3.P1.EU.01	Waste Treatment Storage (Type A Radwaste System)	NA	NA	NA
7- Antennas and Plasma Engineering	PA 5.1.P1.EU.01	Ion Cyclotron Antenna	NA	NA	NA
	PA 5.2.P1B.EU.02	Electron Cyclotron Upper Launcher	NA	NA	NA
	PA 5.2.P1B.EU.01	Electron Cyclotron Control System	1.40000	4.69920	19 Dec 2014
	No PA	Plasma Engineering	NA	NA	NA
	No PA	Plasma Control System	NA	NA	NA
8-Neutral Beam and EC Power Supplies and	PA 5.2.P3.EU.01	Electron Cyclotron Gyrotrons	NA	NA	NA
	PA 5.2.P4.EU.01	Electron Cyclotron Power Supplies	11.62800	12.78800	24 May 2012

Sources	PA 5.3.P1.EU.01	Neutral Beam Assembly and Testing	NA	NA	NA
	PA 5.3.P2.EU.01	Neutral Beam Source and High Voltage Bushing	NA	NA	NA
	PA 5.3.P3.EU.01	Beamline Components	NA	NA	NA
	PA 5.3.P4.EU.01	Pressure Vessel and Magnetic Shielding	NA	NA	NA
	PA 5.3.P5.EU.01	Active Correction and Compensation Coils	NA	NA	NA
	PA 5.3.P6.EU.01	Neutral Beam Power Supplies	31.28571	23.75000	13 Jul 2009
	PA 5.3.P9.EU.01	Neutral Beam Test Facility	25.80000	0.00000	27 Oct 2010
	No PA	Neutral Beam Not Credited Activities	NA	NA	NA
9-Diagnostics	PA 5.5.P1.EU.01(*)	Magnetics	1.11200	1.11200	13 Dec 2011
	PA 5.5.P1.EU.02		0.02768	0.02768	17 May 2013
	PA 5.5.P1.EU.16		0.27714	0.00000	06 Feb 2017
	PA 5.5.P1.EU.17		NA	NA	NA
	PA 5.5.P1.EU.19		NA	NA	NA
	PA 5.5.P1.EU.01	Bolometers	see(*)	see(*)	see(*)
	PA 5.5.P1.EU.03		NA	NA	NA
	PA 5.5.P1.EU.05	Plasma Position Reflectometry	NA	NA	NA
	PA 5.5.P1.EU.07	Pressure Gauges	NA	NA	NA
	PA 5.5.P1.EU.01	Tokamak Services	see(*)	see(*)	see(*)
	PA 5.5.P1.EU.18		2.74824	0.00000	06 Feb 2017
	PA 5.5.P1.EU.15	Radial Neutron Camera - Gamma Spectrometer	NA	NA	NA
	PA 5.5.P1.EU.15	High Resolution Neutron Spectrometer	NA	NA	NA
	PA 5.5.P1.EU.01	Core-plasma Thomson Scattering	see(*)	see(*)	see(*)
	PA 5.5.P1.EU.09	Low Field Side Collective Thomson Scattering	NA	NA	NA
	PA 5.5.P1.EU.04	Core-Plasma Charge Exchange Recombination Spectrometer	NA	NA	NA
	PA 5.5.P1.EU.06	Equatorial Visible/Infrared Wide-Angle Viewing System	NA	NA	NA
	PA 5.5.P1.EU.10-11-12-13-14	Port Engineering Systems	NA	NA	NA
	PA 5.5.P1.EU.01	Diagnostics Common Activities	see(*)	see(*)	see(*)
10-Test Blanket Module	No PA	European Test Blanket System Arrangement	NA	NA	NA
	No PA	Test Blanket Systems Research & Development	NA	NA	NA
11-Site and Buildings and Power Supplies	PA 4.1.P1A-8B.EU.01	Buildings infrastructure and Power supplies	6.93810	7.00000	26 Oct 2009
	PA 4.1.P8C.EU.01		5.00000	5.00000	05 Dec 2013
	PA 4.1.P8A.EU.01		4.22273	5.70000	05 Dec 2013
	PA 4.1.P1A-8B.EU.02		29.48893	13.30000	05 Dec 2013
	PA 6.2.P2.EU.01		12.80000	323.50000	19 Nov 2008
	PA 6.2.P2.EU.02		55.75430	68.80000	04 May 2009
	PA 6.2.P2.EU.03		31.00000	0.00000	04 May 2009
	PA 6.2.P2.EU.04		6.20000	0.00000	04 May 2009

	PA 6.2.P2.EU.05		350.60689	0.00000	14 May 2010
	PA 6.2.P2.EU.06		13.85000	0.00000	04 Oct 2012
12-Cash Contributions	No PA	Cash Contribution to ITER Organization	NA	NA	NA
	No PA	Cash Contribution to Japan DA	NA	NA	NA
13-Supporting Activities	No PA	ITER Programme Management	NA	NA	NA
	No PA	Transportation	NA	NA	NA
	No PA	Engineering Support and Integration	NA	NA	NA
	No PA	Engineering Analysis and Nuclear Data	NA	NA	NA
	No PA	Embedded Control Data Access and Communication	NA	NA	NA
	No PA	Materials and Fabrication Technologies	NA	NA	NA
	No PA	Nuclear Safety	NA	NA	NA
	No PA	CE Marking	NA	NA	NA
	No PA	F4E Programme Management	NA	NA	NA

Table 1 . Action, WBS name and PA status (as of July 2017)

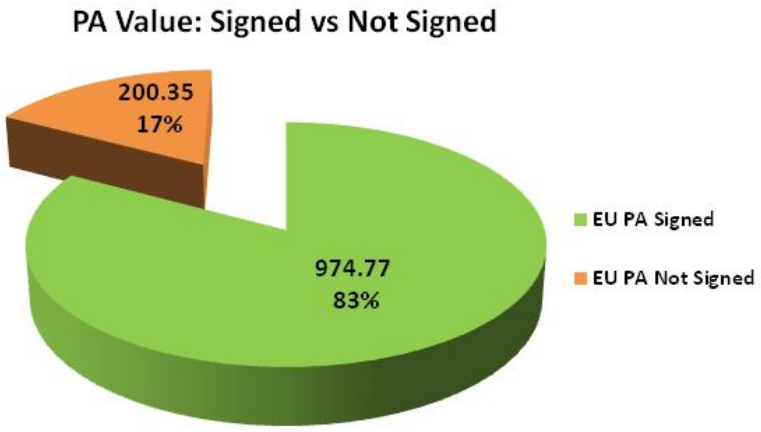

Figure 4 . Value of Signed/not Signed EU PA (status July 2017)

3.2.4.1 The ITER credit forecast

Table 2 shows the credit value that F4E should have earned up to end of July 2017 against the credit that was actually achieved and that IO should have already released as acknowledgement of the achieved milestones. A similar table, showing all details per PA is available in ANNEX XI. In addition, the yearly forecast credit up to end 2022 is shown.

The difference between the achieved and the released credits is explained by the fact that once F4E achieves a credit milestone, all necessary data, reports and other information has to be collected and provided to IO. This information is linked to the delivery by the supplier of all the necessary documents and to the F4E approval of these deliverables. Furthermore, IO has to revise and validate the whole set of documents provided in order to confirm such achievement. For this reason, the process can last some months.

Action	Baseline to end June 2017 (kIUA)	Achieved Credit (kIUA)	Released Credit (kIUA)	Forecast (kIUA) 2017	2018	2019	2020	2021	2022	2023+
	334.973	334.732	283.468	76.573	145.427	97.618	134.055	55.433	56.161	263.782
Magnets	76.739	76.739	78.819	14.450	35.900	29.508	19.719	9.503	0.000	0.000
Vacuum Vessel	59.460	30.080	27.600	3.953	37.107	10.184	6.636	1.600	0.000	0.000
In Vessel- Blanket	0.000	0.000	0.000	0.000	2.000	2.000	0.000	1.200	1.200	38.452
In Vessel- Divertor	1.800	1.800	1.660	0.120	0.420	1.340	0.100	0.900	1.150	27.050
Remote Handling	1.800	1.800	0.000	1.500	1.800	2.200	3.180	2.900	4.700	21.653
Cryoplant and Fuel Cycle	23.119	21.578	24.029	1.255	1.197	1.791	4.117	2.339	9.550	15.738
Antenna and Plasma Engineering	0.500	0.500	0.000	0.000	0.000	0.500	1.000	1.532	2.950	20.930
Neutral Beam and EC Power Supplies and Sources	17.105	17.905	18.355	5.611	8.950	8.695	7.669	9.323	6.733	39.064
Diagnostics	0.025	0.025	0.025	0.360	0.749	2.015	2.711	2.382	2.246	16.388
Site and Buildings and Power Supplies	154.425	154.925	107.580	47.277	69.051	36.738	83.138	23.354	27.632	84.507

Table 2 . ITER Credit per PA: achieved, released and forecast up to PA (end June 2017)[3]

[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.

3.2.5 ITER Council milestones

Following a request by the ITER Council (IC), IO defined a set of main milestones, for both IO and DAs, up to 2025 for measuring the progress of the project. These milestones were approved at IC-19 in November 2016 and it was also agreed that their list would be detailed on a rolling wave approach. At each November meeting the ITER Council will formally approve for monitoring and reporting purposes the milestone list for the coming two-year execution period (as was done for the currently approved IC Milestones).

In order to increase the granularity to allow a better monitoring by the GB of the progress in the EU, F4E complemented the IC milestones with additional ones, as proposed to the GB at its meeting in June 2016. Since that time F4E reports to the Governance on a monthly basis the status of those milestones that are becoming critical (i.e. where a noticeable slippage of the achievement date is visible).

At the IC-19 IO presented updated overall project schedule (OPS) and cost (OPC) together with the associated estimate of resources. The Council approved the updated OPS and the updated ITER Council milestones for the period 2018-2025 with the request of proposing additional ones to capture all key in-kind contributions from all DAs.

3.2.6 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, the project defines lifecycle phases with predefined levels of development by using specific dates to determine the readiness to move to the next phase. The different phases are referred to as CDR (Conceptual Design Reviews), PDR (Preliminary Design Reviews), FDR (Final Design Reviews), MRR (Manufacturing Design Reviews), DEL (Delivery) and C-O (Close-Out)[4].

For a given system, typically there is 1 CRD, 1 PDR, several FDR & MRR. When more of 1 FDR or MRR is planned, the table includes the date of the first and last of these reviews. The cells with a “-” show phases which dates are not part of F4E schedule.

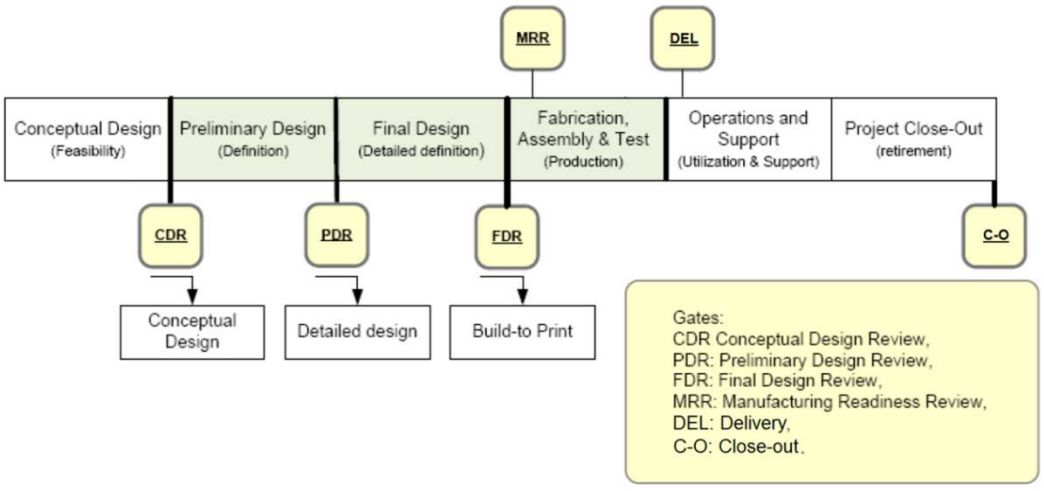

Figure 5 . Progress in the delivery of the EU contributions

In the following table the design review phases are shown per Action and per PA.

[4] Defined as the date of the last credit to be achieved for that specific PA.

		1.CDR	2.PDR	3.FDR	4.MRR	5.Delivery	6.Close-Out[5]
Magnets	Toroidal Field Coils	-	-	-	Feb-2013 Mar-2018	Apr-2021	Apr-2021
	Pre Compression Rings	-	-	-	Dec-2017	Oct-2019	Oct-2019
	Poloidal Field Coils	-	-	-	Oct-2017 TBD	Mar-2021	Mar-2021
	Magnet Conductors	-	-	Oct-2006 Mar-2008	Nov-2012	-	Nov-2016
Vacuum Vessel	Main Vessel (Sector 5)	-	-	Jul-2008	May-2013	May-2021	May-2021
In Vessel-Blanket	Blanket Manifolds	-	-	Jun-2016	Jan-2023	Apr-2027	Apr-2027
	Blanket and First Wall Panels	Feb-2010	Dec-2011	Apr-2013	Feb-2024 (Series production)	Dec-2027	Dec-2027
In Vessel-Divertor	Divertor Cassette Body and Assembly	-	-	Jun-2013	Jan-2020 (series production)	Jan-2029	Jan-2029
	Divertor Vertical Target	-	-	Jun-2013	Dec-2020 (Series production)	-	Aug-2028
	Divertor Rails	-	-	Sep-2018	Jun-2024	Nov-2025	Nov-2025
Remote Handling	Divertor Remote Handling System	Feb-2012	Sep-2018	Dec-2019 Apr-2022	Mar-2021 Oct-2023	Jan-2026	Jul-2026
	Cask & Plug Remote Handling System	Jan-2014	Mar-2020	Feb-2022 Jul-2024	Nov-2022 Aug-2025	Sep-2027	Jul-2028
	Neutral Beam Remote Handling System	Oct-2012	Mar-2021	Sep-2020 Mar-2024	Jul-2021 Jan-2025	Jul-2025	Jul-2027
	In Vessel Viewing System	Aug-2014	Oct-2019	Nov-2021	Jun-2022	Jan-2025	Jun-2025
Cryoplant and Fuel Cycle	Cryopumps	-	-	Nov-2013 Jul-2022	Jan-2018 Apr-2021	Jun-2027	Jun-2027
	Leak Detection and Localization System	Nov-2018	Mar-2021	Oct-2021	Mar-2022	Sep-2023	Sep-2023
	Hydrogen Isotope Separation System	-	-	Aug-2024	Aug-2026	Jul-2029	Jul-2029
	Water Detritiation System	-	Aug-2016	Jun-2025	Mar-2026	Jun-2030	Feb-2033
	Liquid Nitrogen Plant and Auxiliary Systems	-	Oct-2014	Nov-2015	Feb-2015 Feb-2016	Aug-2017	Aug-2020
	Radiological and Environmental Monitoring System	-	Sep-2024	Sep-2018 Jan-2027	Oct-2021 Dec-2028	Oct-2029	May-2027
	Radiological and Conventional Waste Treatment and Storage	Apr-2014	Aug-2020	Sep-2022	Apr-2024	-	Feb-2025
Antenna and Plasma Engineering	Ion Cyclotron Antenna	Mar-2011	Jul-2013	Dec-2022	May-2025 Jun-2027	Jul-2030	Dec-2029
	Electron Cyclotron Upper Launcher	-	Sep-2011	Jul-2017 Dec-2020	Feb-2019 Sep-2021	Nov-2024	Nov-2024

[5] Negotiations with IO on the distribution of credit along the PA duration are still in progress for some PAs. In those cases latest update proposals are not taken into account in the table. As a consequence, some inconsistencies may exist in the table that will be updated in the forthcoming issues of the document.

	Electron Cyclotron Control System	Jan-2014	-	Jun-2017 Mar-2026	Oct-2018 Feb-2027	-	Apr-2027
Neutral Beam and EC Power Supplies and Sources	**Electron Cyclotron Gyrotrons**	-	Jan-2018	Mar-2022	Jun-2023	Sep-2026	Jan-2027
	Electron Cyclotron Power Supplies	-	-	Dec-2014	May-2015	Jul-2020	Feb-2021
	Neutral Beam Source and High Voltage Bushing	-	-	-	Oct-2025	Aug-2029	Sep-2029
	Beamline Components	-	-	-	Apr-2025	Jul-2029	Sep-2029
	Pressure Vessel and Magnetic Shielding	-	Dec-2014	Jun-2022	May-2023 Nov-2023	Oct-2029	Oct-2029
	Active Correction and Compensation Coils	-	-	Jul-2021	Sep-2023	Aug-2029	Aug-2029
	Neutral Beam Power Supplies	-	Aug-2015	Nov-2010 Jul-2021	Dec-2022	Jan-2022	Jul-2024
	Neutral Beam Test Facility	Feb-2013	Jan-2020	Jun-2013 May-2022	Apr-2013 TBD	-	Jul-2022
Diagnostics	**Magnetics**	Sep-2018	Jul-2020	Apr-2024	Apr-2024	Feb-2023	Nov-2025
	Bolometers	-	Nov-2022	Aug-2023	Jul-2026	Sep-2027	Jul-2027
	Plasma Position Reflectometry	-	Jun-2023	Sep-2024	Jul-2026	Jan-2029	Aug-2027
	Pressure Gauges	-	Aug-2019	Jan-2021	Jul-2026	Apr-2028	Apr-2028
	Radial Neutron Camera - Gamma Spectrometer	Jan-2018	Aug-2020	Dec-2022	Jun-2026	Sep-2027	Sep-2027
	Core-plasma Thomson Scattering	-	Mar-2022	Apr-2023	May-2026	Jun-2028	Jun-2028
	Low Field Side Collective Thomson Scattering	Mar-2013	Apr-2018	Feb-2019	Aug-2020	Jun-2021	Jun-2021
	Core-Plasma Charge Exchange Recombination Spectrometer	-	Feb-2026	Feb-2026	Jun-2027	Jul-2028	Jul-2028
	Equatorial Visible/Infrared Wide-Angle Viewing System	-	Dec-2025	Nov-2027	Nov-2027	Aug-2028	Aug-2028
	Port Engineering Systems	-	Feb-2020	Apr-2022	Jan-2024	Jan-2029	Aug-2029

	Nr and Name of Building	**RFOC Date**	**RFE Date**	**Completion Date**
11-Site and Buildings and Power Supplies	**11 - Tokamak Building**	Jul-2018	Sep-2018 RFE 1B stage 1	Mar-2022
		Central Pit		
		Mar-2020	Mar-2020 RFE 1B stage 2	
		Crane Hall	Aug-2020 RFE 1C	
	13 - Assembly Building	Sep-2016	Jun-2017	Jun-2018

	14 - Tritium Building	Apr-2018	Dec-2024	Nov-2026
		B2 Level		
	15 - RF Heating Building	Sep-2017	Sep-2018	Jul-2019
	21 - Hot Cell	N/A, no RFOC as Design & Built contract	Nov-2028	Dec-2028
	23 - Radwaste Building	N/A, no RFOC as Design & Built contract	Feb-2027	Sep-2027
	24 - Personnel Access Control Building	N/A, no RFOC as Design & Built contract	Mar-2027	Oct-2027
	32 - Magnets Power Conversion Building	N/A, no RFOC as Design & Built contract	Jul-2017 (IO Early access)	Aug-2018
			Dec-2017 (RFE)	
	33 - Magnets Power Conversion Building	N/A, no RFOC as Design & Built contract	24/07/2017 (IO Early access)	Aug-2018
			Dec-2017 (RFE)	
	34 - NB Power Supply Building	N/A, no RFOC as Design & Built contract	Apr-2022	Nov-2022
	37 - NB High-Voltage Power Supply Building	N/A, no RFOC as Design & Built contract	Sep-2022	Apr-2023
	51 - Cryoplant Compressor Building	Aug-2017	Sep-2017	Jul-2019
			RFE8A	
	52 - Cryoplant Coldbox Building	Aug-2017	Sep-2017	Jul-2019
			RFE8A	
	53 - Cryoplant Infrastructure Building	Jan-2018	Sep-2017	Dec-2018
			RFE8A	
	61 - Site Services Building	Aug-2016 Early Access	Apr-2017	Mar-2018
	71 - Control Building	Sep-2021	Jun-2022	May-2023
	74 - Diagnostics Building	Feb-2018	Feb-2020	Dec-2020

Table 3 . Life cycle of the EU procurements (as of 30 June 2017)

The table above shows the F4E status in the life cycle of each Action/PA as of 30 June 2017. Any date before 30 June 2017 indicates an achieved phase. Future dates (post 30 June 2017) are the current forecast for phases to be achieved in the future.

3.2.7 Cash contribution to IO

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.
F4E pays its share in yearly contributions.
The table below shows the yearly cash contribution already paid to IO and the current forecast up to 2022.

Contribution	Net in-Cash	In-Cash from Staff Secondments to IO	In-Cash from ITAs	Total In-Cash Contribution to IO	
	Amount (EUR)	Amount (EUR)	Amount (EUR)	Amount (EUR)	Value (IUA)
2006	2,046,000.00	-	-	**2,046,000.00**	**1,416.90**
2007	19,948,000.00	5,814,255.00	-	**25,762,255.00**	**17,532.47**
2008	36,234,990.34	4,174,642.71	149,815.55	**40,559,448.60**	**27,070.13**
2009	41,011,930.34	4,220,556.69	309,518.00	**45,542,005.03**	**30,297.42**
2010	55,717,039.12	3,510,933.10	6,019,586.72	**65,247,558.94**	**42,149.41**
2011	68,863,226.00	3,155,372.37	10,519,813.89	**82,538,412.26**	**53,035.02**
2012	87,274,631.00	2,810,278.03	7,714,938.77	**97,799,847.80**	**61,838.18**
2013	62,373,352.00	2,092,787.90	6,108,338.78	**70,574,478.68**	**42,510.90**
2014	79,418,854.00	2,412,032.00	14,618,812.00	**96,449,698.00**	**57,445.10**
2015	80,011,153.00	2,247,024.00	3,855,001.00	**86,113,178.00**	**51,051.81**
2016	117,818,538.01	1,914,730.00	5,630,831.00	**125,364,099.01**	**74,174.63**
2017	133,251,099.36	1,550,905.00	4,727,379.00	**139,529,383.36**	**82,533.69**
2018 (Forecast)	187,455,149.00	1,554,007.00	1,720,228.00	**190,729,384.00**	**112,399.38**
2019 (Forecast)	204,104,569.00	1,557,115.00	877,326.00	**206,539,010.00**	**121,716.20**
2020 (Forecast)	242,088,178.00	1,560,229.00	13,126,881.00	**256,775,288.00**	**151,321.12**
2021 (Forecast)				**269,600,000.00**	**158,878.89**
2022 (Forecast)				**265,500,000.00**	**156,462.71**
Total	**1,417,616,709.17**	**38,574,867.80**	**75,378,469.71**	**2,066,670,046.68**	**1,241,833.96**

Table 4 . EU cash contribution to IO (in-year value)

3.2.8 Cash contribution to Japan

According to the ITER Agreement, there is a transfer of 10% 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 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. The full payments of two PAs have already been completed. Commitments

of two new PAs (one of them split into two phases) are foreseen in 2018, 2019 and after 2020. In addition, F4E will pay a specific contribution to Japan 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 June 2017 (kIUA)
Magnets	Toroidal Field Magnet windings 1B	8.96%	7.7362	**0.8865**
	Toroidal Field Magnet Structure 2A-B	54.92%	49.3605	**45.8505**
	Toroidal Field Magnet Conductors	40.14%	21.5000	**21.500**
	Central Solenoid Magnet Conductors	100%	90.000	**86.65**
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	46.5%	22.6220	**21.8972**
	Padova		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	Q2/2018
	Atmospheric Detritiation (second part)	12.80 kIUA	Q2/2022
Neutral Beam H&CD	Power Supply for Heating Neutral Beam Cadarache	20.2960 kIUA	Q2/2019
	Settlement Agreement between EU and Japan agreed in 2014	66.6 $MEuro_{2008}$	Q2/2022

Table 5 . EU cash contribution to Japan.

3.3 Broader Approach

3.3.1 Overall scenario

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).
To a large extent the activities to be undertaken in the frame of the BA agreement are eventually 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. In turn, each VC channels its contributions through the procurement arm of "Designated Institutions" (VC-DIs). F4E integrates activities and 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 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.
The table below defines a summary of the BA action value. Further details are available in ANNEX XIII.

ACTIONS	WBS Name	Signed Value kBAUA	Current kBAUA
14 - Broader Approach	Common Activities	491	500
	Satellite Tokamak (JT-60SA)		
	IFMIF-EVEDA Project		
	International Fusion Research Centre		

Table 6 . Correspondence between Actions, WBS and WP ref for BA

3.3.2 Satellite TOKAMAK programme

3.3.2.1 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 20-7.4 Project Plan v1.0 (F4E_D_29SHY5 v1.0).

The baseline schedule of construction and assembly of JT-60SA foresees the first plasma in September 2020 as shown below.

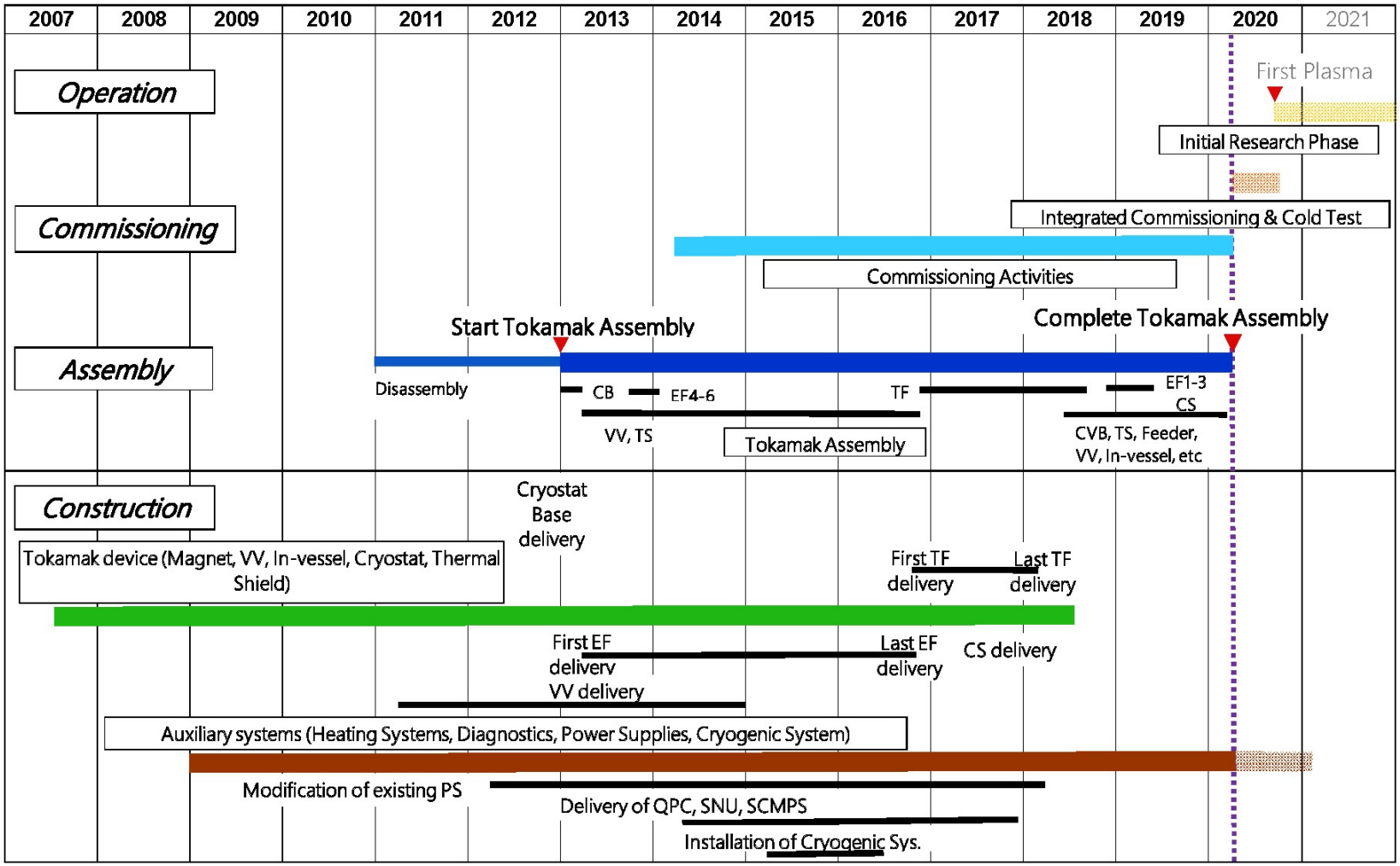

Figure 6 . High-level Schedule (as approved by BASC 20th April 2017) (Project Baseline Schedule)

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.
The facility is going to be completed by March 2020 within the presently agreed Broader Approach (BA) period. The integrated commissioning of the system including initial plasma operation from September 2020 is foreseen to be part of BA Phase 2, presently under negotiation. In addition, a collaboration between F4E (through EUROfusion) is on-going with QST (i.e. the Japanese Implementing Agency) for the preparation of the research plan and the BA Phase 2 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.After 2020 the JT-60SA facility will start its joint EU-JA scientific exploitation phase, which will include joint operation as well as machine enhancements. The close collaboration between F4E, VC-Dis, as well as EUROfusion is envisaged to continue in that phase as well. If agreed between Euratom and Japan, within Europe F4E and VC-Dis would jointly focus on the integration, enhancements and hardware operation while EUROfusion is instead going to focus on the scientific use of the facility.

3.3.2.2 PA Credit Summary

The total commitment for the EU corresponding to the STP (JT-60SA) amounts to 236,413 BAUA. At present date (17 July 2017) the credit awarded to EU is 152,619 BAUA. The remaining credits to be earned amount to 83,794 BAUA (from now until March 2020).

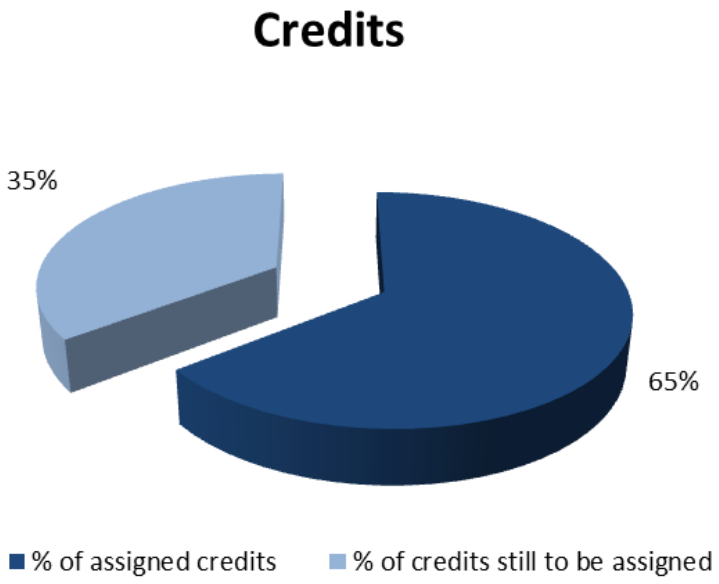

Figure 7 . Percentage of assigned/not yet assigned credits in BAUA (Status July 2017)

3.3.3 IFMIF/EVEDA

3.3.3.1 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 in 2010 and an extension until March 2020 approved by the BA Steering Committee in April 2017. Its mission is to produce the engineering design of IFMIF (International Fusion Materials Irradiation Facility) and to establish an experimental data base to support such design. The R&D facilities built to that end are:

- the Accelerator Facility ("LIPAc"),
- the Lithium Target Facility,
- the Test Facilities.

The schedule for completing the IFMIF/EVEDA Project by the end of March 2020 is shown in Figure 8.

Indeed, the engineering design of IFMIF as well as all the deliverables associated with the Lithium Target facility and Test Facilities have been achieved. Validation activities of the LIPAc accelerator remain underway. These will take place over 4 phases:

- Phase A: Commissioning of the ion source (Injector).
- Phase B: Commissioning of the Injector + RF Quadrupole + Medium Energy Beam Transport line + Diagnostics Plate + Low Power Beam Dump planned until the end of 2018.
- Phase C: Integrated commissioning of the LIPAc accelerator (with its Superconductive Cavities, High Energy Beam Transport and its Beam Dump) at low duty cycles – planned until March 2020.
- Phase D: Integrated commissioning of the LIPAc accelerator and performance validation under continuous wave conditions, completing the IFMIF/EVEDA Project within the presently agreed Broader Approach (BA) period by March 2020.

In addition to the above activities F4E is engaged with EUROfusion for the preparation of 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). If decided within the EU and at international level with Japan, we expect the construction of this facility to start after 2020.

In that timeframe, the LIPAc facility should be used for developing advanced operational procedures and for constant beam operation (CW) over extended periods, to prove both reliability and availability. This will be instrumental to achieve the required reliability and availability of the IFMIF-DONES neutron source and is foreseen to be part of BA Phase 2, presently under discussion between Euratom and JA.

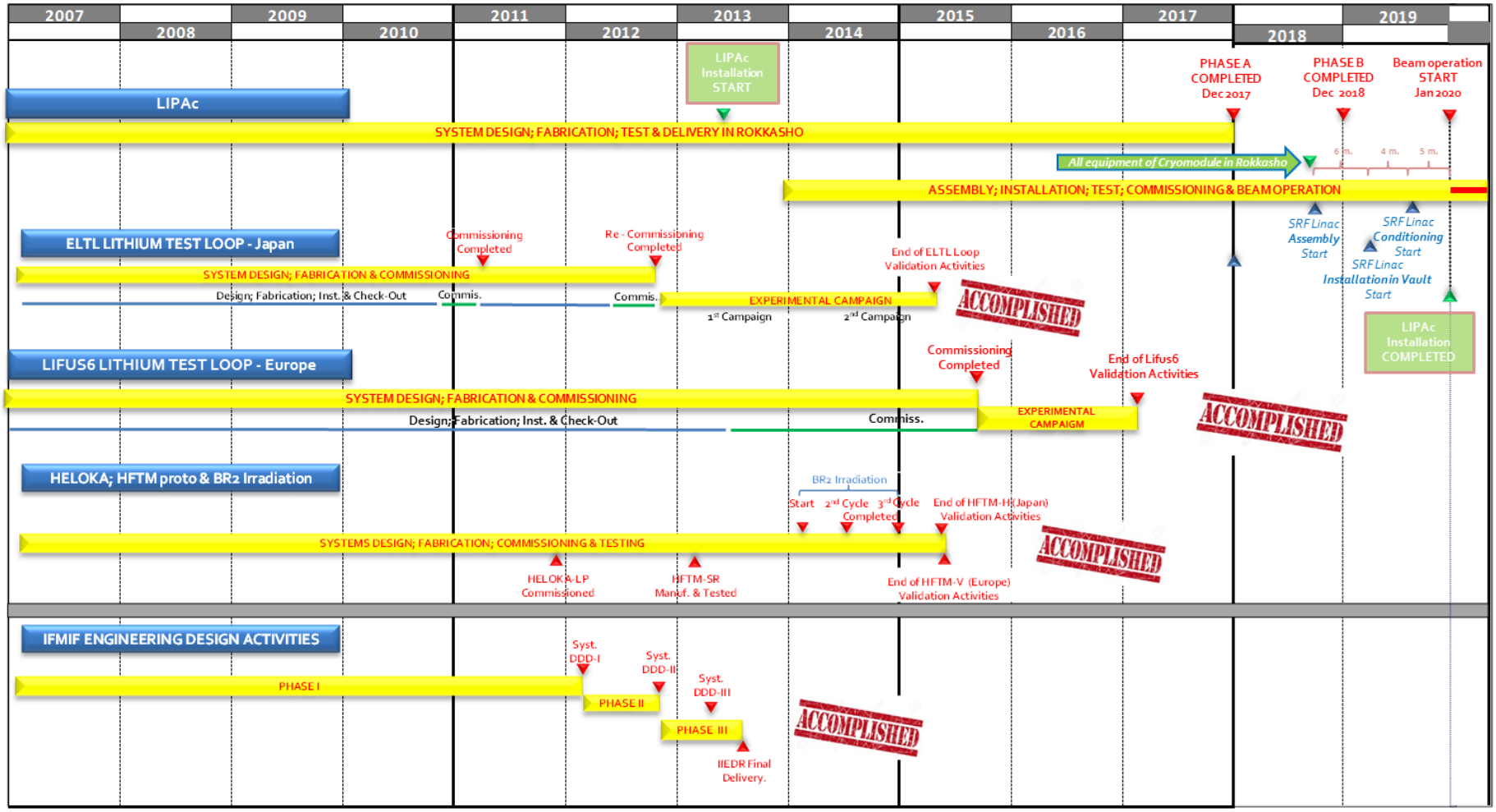

Figure 8 . High-level Project Schedule (as approved by BASC-20th April 2017)

3.3.3.2 PA Credit Summary

The global total commitment for the EU corresponding to the IFMIF/EVEDA amounts to 147,330 BAUA. At present date (17 July 2017) the credit awarded to EU is 117,588 BAUA. The remaining credits to be earned amount to 29,742 BAUA (from now till March 2020).

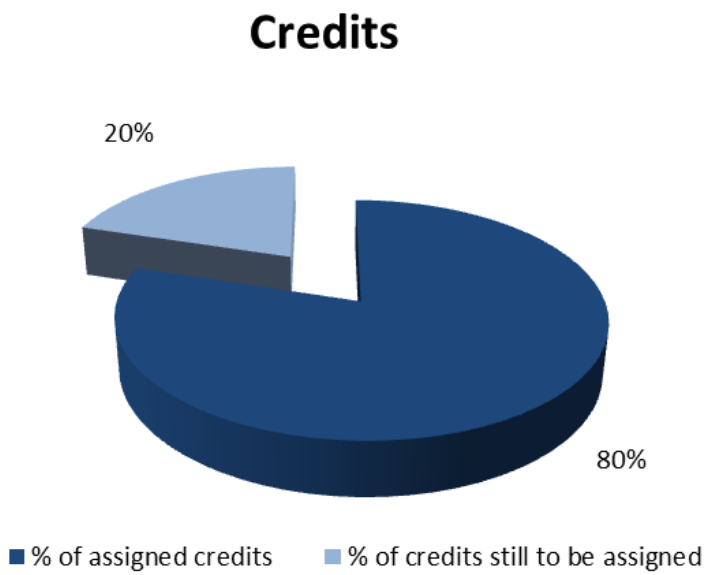

Figure 9 . Percentage of assigned/not yet assigned credits in BAUA (Status January 2017)

3.3.4 IFERC

3.3.4.1 Scope and Schedule

The IFERC activities include three sub projects:

- DEMO Design and R&D activities,
- establishment and operation of a Computer Simulation Centre (CSC),
- establishment and operation of a Remote Experimentation Centre (REC)

DEMO Design and R&D

EUROfusion acts as a voluntary contributor in performing DEMO Design Activities.. After an initial phase of analysis (common elements for DEMO in EU and JA, 2007-2010), the work moved on to more detailed studies to: a) follow-up work on key design issues and options and narrow down design options; b) define design criteria; c) evaluate ranges of DEMO parameters..

DEMO R&D Activities

Included in the BA Agreement, focus on materials in order to establish a common basis for a DEMO design from the technology viewpoint.
Five R&D task areas were defined:

- 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 currently continue with EUROfusion acting as voluntary contributor.

Computer Simulation Centre (CSC)

The EU procured and delivered the Helios supercomputer for the Rokkasho CSC. Operation of Helios started on schedule in January 2012, and was carried out until until the end of 2016. The system had minor upgrades in 2014, 2015 and 2016, and has been used as main supercomputing tool by the EU fusion community. It was 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. Most of the contribution to REC is provided by F4E.

	2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		2017		2018		2019		2020
	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	Q1
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 7 . IFERC High Level Project Schedule

3.3.4.2 PA Credit Summary

The total commitment for the EU corresponding to the IFERC amounts to 116,250 BAUA. At present date (17 July 2017) the credit awarded to EU is 112,995 BAUA. The remaining credits to be earned amount to 3,955 BAUA (from now till March 2020).

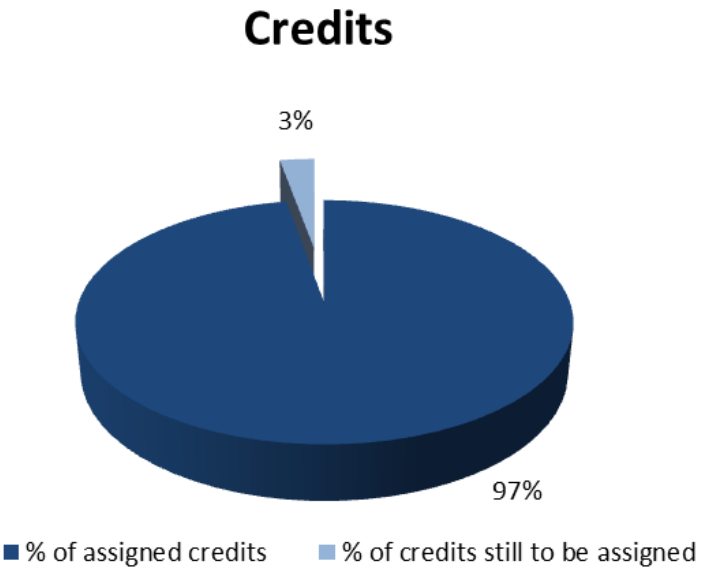

Figure 10 . Percentage of assigned/not yet assigned credits in BAUA (Status July 2017)

3.4 DEMO and IFMIF preparatory activities

The Statutes of F4E include amongst its tasks (Art 1. 2-c) the execution of preparatory activities for the construction of DEMO and related facilities such as IFMIF.
In line with the present priorities of the Joint Undertaking for ITER and the BA Projects, all preparatory activities for DEMO are currently confined to those included in the frame of the IFERC project within the BA Agreement itself (see 3.3.4), as well as to a limited support function (1 FTE) to EUROfusion, who is now carrying forward such preparatory work in F4E's stead, with a view to take over from EUROfusion when the ITER first plasma will be achieved.
Finally F4E is also carrying out interactions with its governance to prepare the possible construction of IFMIF-DONES, this being done in-line with the activities being performed in the frame of the BA Agreement (i.e. IFMIF/EVEDA, see 3.3.3)

3.5 Progress, Achievement and performance indicators.

F4E has identified specific Key Performance Indicators (KPI) in order to measure how effectively the organization achieves the target set in different areas (i.e. schedule, cost, risk, budget consumption, etc.). F4E monitors these KPIs and reports to the Project Steering Meeting (PSM) to discuss any possible event or risk that could threaten their achievement.
The basis of comparison for the adopted KPIs is the F4E current baseline, in schedule, cost and budget. The current baseline is continuously kept updated through the change control process. A Change Control Board (CCB) meets on a weekly basis to discuss the requested changes and decide on whether or not to implement them.
Dashboards are available with the possibility of drilling down for more details, both at a global F4E level and individually per PT. KPIs information is included in many F4E documents and reports.
How KPIs are defined and used at F4E is further illustrated in par. 4.2.6 and 4.2.7.

3.6 Changes and developments over the last year

During the last year F4E and ITER IO management launched multiple initiatives and actions to stabilize and optimize the ITER project plan and schedule. The following more significant points should be mentioned:

- The 'Straight Road to First Plasma' focused resources (both funding and staff) on the activities and scope needed for ITER's First Plasma at the end 2025 (see 4.3.2).
- The ITER Council agreed an updated schedule for the ITER project for the period 2016-2035 based on a strong collaboration between IO and all Domestic Agencies, among them F4E, taking into account the financial and human resources constraints of the various DAs;
- A large amount of management attention went into the turnaround of the two most critical F4E projects: Buildings and Vacuum Vessel. F4E has adopted extensive measures, in consultation with the Governing Board, to mitigate cost and schedule risks for these two projects. In addition, the ITER Council agreed to transfer responsibility for fabricating two of the seven EU Vacuum Vessel sectors to IO, who, in turn, passed this responsibility to the Korean Domestic Agency, which was already fabricating two sectors for ITER. This action required a modification in the annual plans of both F4E commitments and payments;
- The Director re-organized the F4E structure to focus on the delivery of projects and financial control through the creation of a flatter hierarchy and stronger management team with two new departments. This modified organizational structure is the framework to strengthen the matrix organization and focus even more on project performance and execution.

Section II. Multi-annual programming 2018-2022

4 Project Plan

4.1 Introduction

In accordance with the Financial Regulation of F4E and its Implementing Rules, this Multiannual programming document is composed of a Project Plan (PP) that lays down an overall strategic programing foreseen to cover five years (i.e. 2018-2022). The Resource Estimate Plan (REP) complements it.
Within the scope of the Broader Approach programme, this document includes three individual projects: Satellite Tokamak Programme, IFMIF/EVEDA and IFERC.
DEMO, still in a far earlier stage if compared to ITER or BA, is also presented here with the provision of high level information.

4.1.1 Input timeframe

The Project Plan covers 5 years; from 2018-2022 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.

4.1.2 Schedule

The dates provided in this document are according to the F4E Detailed Work Schedule (DWS) submitted to IO at the end of June 2017.

4.2 Multiannual Objectives

This section of the document describes the strategic medium term objectives of F4E and the way the progress in their achievement is monitored.
F4E's objectives are divided in two types:

- Technical Objectives;
- Non-technical objectives or, so called, Corporate Objectives.

This paragraph describes the criteria used to select these objectives, the KPIs used to monitor them, the way KPIs are computed and their thresholds (where applicable). In addition, the strategy to achieve them will be presented as well as the way F4E manages them whenever they become critical.
F4E has a number of additional corporate objectives covering other important areas, including Health & Safety and nuclear safety. The ones included here are the most relevant ones to measure the progress of the project.

4.2.1 Selection Criteria

It is important to pick objectives which are not only top-level ones but also representatives of the work to be performed in the forthcoming years. The IC/GB milestones are ideal for the purpose as they are not only critical path oriented but they cover a larger group of components at different stages of their development. Most of them are key to achieve FP, but some of them also relate to non-FP systems due to be delivered in other phases of the Staged Approach. The IC Milestone list is updated each year with a rolling wave approach. This is why F4E has decided that its technical objectives would have been the achievement on time of the IC/GB milestones.
In order to increase the granularity of the objectives in the short term, F4E has selected some additional ones among previous technical milestones leading to the IC/GB ones (i.e. the predecessors) and in the chain of all critical and near-critical paths. Therefore such milestones will act as an alert against the increasing risk of missing any critical and near-critical path milestones.
Furthermore, in the annual plan, some predecessors of the IC/GB milestones are defined and monitored so to anticipate any possible delay in the achievement of the IC/GB milestones.
Regarding the non-Technical Objectives, F4E has selected them to monitor those activities that have been identified during the last years as being most relevant for F4E stakeholders, both external (Commission, EU Member States, IO, etc…) and internal (F4E staff). Some of them have been defined after specific request from Commission, other ones from audit survey and others because defined after staff surveys or suggested by the F4E Staff Committee.

4.2.2 Technical objectives for the ITER project

As anticipated, the technical objective is the achievement on time of the IC-GB milestones.
In the table below the latest status of the IC-GB list is shown, considering all recent changes until the ITER Council and the F4E Governing Board at the end of June 2017.

IC/GB Reference	Action	Milestone	Type of Milestone	Agreed Quarter	PA
GB00/IC02	11-Buildings Infrastructure and Power Supplies	Start of B1 civil works in Tokamak building	IC	Q1 2016	6.2.P2.EU.05
GB01/IC04	11-Buildings Infrastructure and Power Supplies	Erection of Tokamak Main Cranes in Assembly Hall	IC	Q2 2016	6.2.P2.EU.05
GB02/IC05	1-Magnets	TF Coil: Completion of first EU TF winding pack	IC	Q2 2016	1.1.P1A.EU.01
GB03/IC09	11-Buildings Infrastructure and Power Supplies	Installation of WDS tanks in Tritium building	IC	Q2 2016	6.2.P2.EU.05
GB04/IC13	2- Vacuum Vessel	First Sub Segment Assembly of VV Sector 5 completed	IC	Q4 2016	1.5.P1A.EU.01
GB05/IC14	6-Cryoplant & Fuel Cycle	First Liquid Nitrogen Refrigerator equipment Factory Acceptance Tests completed	IC	Q4 2016	3.4.P1.EU.01
GB06/IC19	11-Buildings Infrastructure and Power Supplies	Energisation of 400KV switch yard	IC	Q1 2017	4.1.Pn.EU
GB07/IC21	11-Buildings Infrastructure and Power Supplies	Completion of RFE 1A (Assembly Hall)	IC	Q2 2017	6.2.P2.EU.05
GB08/IC24	11-Buildings Infrastructure and Power Supplies	Tokamak Concrete crown civil works achieved	IC	Q4 2017	6.2.P2.EU.05

GB09/IC25	11-Buildings Infrastructure and Power Supplies	Civil works and finishing performed in B2 level allowing TB04 installation to begin in tokamak building B2 level	IC	Q4 2017	6.2.P2.EU.05
GB10/IC30	8-Neutral Beam Heating & Current Drive	Neutral Beam Test Facility (NBTF): Start of integrated commissioning of SPIDER beam	IC	Q1 2018	5.3.P9.EU.01
GB11/IC33	11-Buildings Infrastructure and Power Supplies	First limited access to Tokamak pit for installation without large crane availability (RFE 1B stage 1)	IC	Q2 2018	6.2.P2.EU.05
GB12/IC42	1-Magnets	PF Coil: EU PF 5 coil ready for cold test	IC	Q4 2018	1.1.P3A-B.EU.01
GB13/IC50	11-Buildings Infrastructure and Power Supplies	Limited crane access between Assembly Hall and Tokamak Building (RFE 1B stage 2)	IC	Q3 2019	6.2.P2.EU.05
GB14/IC54	1-Magnets	PF Coil: Manufacturing complete for EU PF 6 Coil and delivery to site	IC	Q4 2019	1.1.P3A-B.EU.01
GB15/IC53	1-Magnets	TF Coil: First EU TF Coil delivery to site	IC	Q3 2019	1.1.P1A.EU.01
GB16/IC58	2- Vacuum Vessel	First EU Vacuum Vessel Sector delivery to site	IC	Q4 2020	1.5.P1A.EU.01
GB17/IC55	11-Buildings Infrastructure and Power Supplies	Full crane access between Assembly Hall and Tokamak Building to allow lowering of Vacuum Vessel Sectors into Pit (RFE 1C)	IC	Q2 2020	6.2.P2.EU.05
GB18/IC76	6-Cryoplant & Fuel Cycle	Commissioning: Cryostat Leak Detection and Localization System delivery to site	IC	Q3 2023	3.1.P3.EU.01
GB19	11-Buildings Infrastructure and Power Supplies	Cryoplant Compressor Building (51) RFE (RFE #8B)	GB	Q4 2018	6.2.P2.EU.05
GB20	4-Divertor	Delivery of the first all-Tungsten prototype test assembly of the Divertor Inner Vertical Target to the RF test facility.	GB	Q4 2018	1.7.P2B.EU.01
GB21	11-Buildings Infrastructure and Power Supplies	Construction of Cryoplant Coldbox Building (52) Completed	GB	Q3 2019	6.2.P2.EU.05
GB22	7-RF Heating & Current Drive	Manufacturing of 1st batch of Diamond Disks for EC Upper Launcher 1 finished	GB	Q2 2020	5.2.P1B.EU.02
GB23	1-Magnets	TF Coil : Delivery of TF04 (EU 07) by EU-DA to ITER Site	GB	Q4 2020	1.1.P1A.EU.01
GB24/IC64	11-Buildings Infrastructure and Power Supplies	Medium Voltage distribution LC1A Ready for Equipment	IC	Q3 2021	6.2.P2.EU.05 4.1.Pn.EU

GB25	2- Vacuum Vessel	Delivery of Sector 9 by EU-DA to ITER Site	GB	Q2 2021	1.5.P1A.EU.01
GB26	11-Buildings Infrastructure and Power Supplies	Medium Voltage Distribution Building LC/2B (47) RFE (RFE #10)	GB	Q2 2021	6.2.P2.EU.05 4.1.Pn.EU
GB27	8-Neutral Beam Heating & Current Drive	Start of Installation of Acceleration Grid Power Supplies - Converter System of Neutral Beam Injector-1 Q2	GB	Q3 2021	5.3.P6.EU.01
GB28	6-Cryoplant & Fuel Cycle	Delivery of Cold Valve Boxes and Cryojumpers 5-8 (4 no.) Batch 2 by EU-DA to Site	GB	Q3 2021	3.1.P1.EU.02
GB29	7-RF Heating & Current Drive	Manufacturing of 1st batch of Waveguides for EC Upper Launcher 1 finished	GB	Q4 2021	5.2.P1B.EU.02
GB30	8-Neutral Beam Heating & Current Drive	Start of Installation of High Voltage Dec 1 of Neutral Beam Injector -1	GB	Q1 2022	5.3.P6.EU.01
GB31	7-RF Heating & Current Drive	Manufacturing of the Ion Cyclotron RF Window Prototype finished	GB	Q2 2022	5.1.P1.EU.01
GB32	5-Remote Handling	Task Order Signed for Manufacturing for Cask and Plug Remote Handling System (CPRHS)	GB	Q3 2022	2.3.P3.EU.01
GB33	6-Cryoplant & Fuel Cycle	Delivery of Torus & Cryostat Cryopumps by EU-DA to ITER Site	GB	Q3 2022	3.1.P1.EU.03
GB34	11-Buildings Infrastructure and Power Supplies	Control Building (71) RFE (RFE #14)	GB	Q4 2022	6.2.P2.EU.05
GB35	6-Cryoplant & Fuel Cycle	Delivery of Primary (VV)Leak Detection and Localisation by EU-DA to ITER Site	GB	Q4 2022	3.1.P3.EU.01
GB36	9-Diagnostics	In-V Elec Feedthroughs Delivered to ITER Site	GB	Q4 2022	5.5.P1.EU
GB37	3-Blanket	Completion of the qualification phase prior to start of Blanket First Wall series production	GB	Q1 2023	1.6.P1A.EU
GB38	4-Divertor	Completion of Stage I of the series production of Divertor Cassette Bodies.	GB	Q2 2023	1.7.P1.EU.01
GB39	9-Diagnostics	Electronics and Software for Magnetics Delivered to ITER Site	GB	Q3 2023	5.5.P1.EU
GB40	5-Remote Handling	Equatorial Port Plug First Assembly Cask Delivered to ITER Site	GB	Q4 2023	2.3.P3.EU.01

GB41	5-Remote Handling	Upper Port Plug First Assembly Cask Delivered to ITER Site	GB	Q4 2023	2.3.P3.EU.01
GB42	5-Remote Handling	Monorail crane of Neutral Beam Remote Handling System and Delivered to ITER Site	GB	Q1 2024	2.3.P5.EU.01
GB43	7-RF Heating & Current Drive	8th Set of Main High Voltage Power Supplies & Body Power Supplies (MHVPS & BPS) Delivered to ITER Site by EU-DA	GB	Q2 2024	5.2.P4.EU.01
GB44	7-RF Heating & Current Drive	EC Upper Launcher Control System ITER Site Acceptance completed	GB	Q3 2024	5.2.P1B.EU.01
GB45	4-Divertor	Completion of Stage I of the series production of Divertor Inner Vertical Target.	GB	Q3 2024	1.7.P2B.EU.01
GB46	7-RF Heating & Current Drive	Delivery 1st EC Upper Launcher from EU-DA to IO	GB	Q4 2023	5.2.P1B.EU.02
GB47	5-Remote Handling	In Vessel Viewing System Unit #1 Delivered to ITER Site	GB	Q4 2024	5.7.P1.EU.01
GB48	7-RF Heating & Current Drive	Delivery of 1st Set (1MW) of Gyrotrons Tubes by EU-DA to ITER Site	GB	Q1 2025	5.2.P3.EU
GB49	4-Divertor	Delivery of the Divertor Rails to the ITER Site.	GB	Q1 2026	1.7.P2E.EU.01
GB50	6-Cryoplant & Fuel Cycle	Delivery of Heating Neutral Beam Cryopumps 1 from EU-DA to ITER Site	GB	Q1 2027	3.1.P1.EU.04
GB51/IC43	11-Buildings Infrastructure and Power Supplies	Assembly building complete	IC	Q4 2018	6.2.P2.EU.05
GB53/IC66	11-Buildings Infrastructure and Power Supplies	Tokamak building construction complete	IC	Q4 2021	6.2.P2.EU.05
GB54/IC67	1-Magnets	TF Coils: Complete deliveries to Site for 18 TF Coils	IC	Q4 2021	1.1.P1A.EU.01
GB55/IC32	11-Buildings Infrastructure and Power Supplies	Cryostat support bearings full scale prototype delivery to site	IC	Q2 2018	6.2.P2.EU.05

Table 8 . Technical objectives on the ITER project (IC-GB milestones).

4.2.3 Technical Objectives for the Broader Approach

The technical objective for the European part of the BA projects, as presently defined in the Project Plan approved by the BA Steering Committee, is the achievement on time of the milestones that are listed, project by project, in the tables 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. These simplified tables are largely based on the grouping of the relevant project milestones, originally defined and valorized in the EU relevant Procurement Arrangements.

Beyond the completion of the presently agreed BA scope, i.e. beyond 2020 F4E is preparing plans for the Joint Exploitation Phase with JA of the JT-60SA device, on the follow-up of the commissioning phase for the LIPAc accelerator as well as the preparation of the IFMIF-DONES.

Related PA (BA)	Description	Baseline[6] Achievement Date	Forecast Achievement 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 - 2017 Part	Dec-17	Dec-17	1.128
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 - 2017 Part	Dec-17	Dec-17	1.280
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 -2017 part	Jun-17	Jun-17	1.062
STP-EU-SCMPS	Transport and installation of the SCMPSs - 2017 part	Dec-17	Dec-17	7.229
STP-EU-SCMPS	Transport and installation of the SCMPSs - 2018 part	Mar-18	Mar-18	2.410
STP-EU-RWMPS	Design and manufacturing of RWMPSs	Jun-17	Jun-17	0.575
STP-EU-RWMPS	Transport and installation of the RWMPSs	Sep-18	Sep-18	0.575
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-CR02	Transport of the Cryostat Vessel Body Cylindrical Section	Dec-16	Dec-17	10.433

Table 9 . Technical objectives JT-60SA

[6] The baseline achievement date of the technical objectives has been defined in the Project Plan of each project and approved by the BA Steering Committee on 27th April 2017.

Objectives IFMIF/EVEDA:

Related PA (BA)	Description	Baseline Achievement Date	Forecast Achievement Date	Credit Allocation (kBAUA)
IFMIF-EU-PA-04	SRF Linac with its Delivery Report at BA site in Rokkasho	May-17	Mar-19	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	Dec-17	17.400
IFMIF-EU-PA-07	HEBT & Beam Dump components with its delivery report at the BA site in Rokkasho	Mar-17	Apr-18	3.843
IFMIF-EU-PA-10-A	Phase A: Completion commissioning @ 100 keV	Oct-16	Dec-17	1.410
IFMIF-EU-PA-10-B	Phase B: Completion commissioning @ 5 MeV	Apr-17	Dec-18	3.470
IFMIF-EU-PA-10-C	Phase C: Commissioning of the full LIPAc @ 9 MeV at low duty cycle	Jan-19	Mar-20	3.890
IFMIF-EU-PA-10-D	Phase D: Commissioning of the full LIPAc @ 9 MeV in Continuous Wave	Jul-19	Mar-20	2.590
IFMIF-EU-PA-12	Cryoplant Installation and Acceptance Test Report at Rokkasho BA Site	Jun-16	Sep-17	1.870

Table 10 . Technical oobjectives IFMIF/EVEDA

Objectives IFERC:

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	Oct-19	Oct-19	1.64
(Remote Exper. Centre) RECPA01-EU	Delivery of software codes and reports on remote participation tests	Jun-19	Jun-19	1.5

Table 11 . Technical objectives IFERC

4.2.4 Technical Objectives for DEMO

The scope of the activities to be carried out in the period up to 2022[7], includes:

a) Convergence on main design requirements, general plant functions, configuration, and layout;
b) Definition of functions and main requirements for all plant systems;
c) Identify and solve design integration and safety issues. Study critical design and technology issues which could impact feasibility or compromise system performance or safety;
d) Identify and address physics basis development needs;
e) Key trade studies to settle major design features. Plant systems architecture studies (e.g, systems code, physics simulations, and engineering assessments). Sensitivity analyses to understand the impact of uncertainties on physics assumptions;
f) Study alternative design concepts. Multiple plant design concepts assessed in parallel, and compared against a reference concept (referred to as the “baseline”). Emphasis should be on engineering and operational challenges, safety, power conversion aspects of the power plant;
g) Concept evaluation and screening of most promising options. Definition of selection criteria. Evaluate architecture design options and select best candidate(s) to be further assessed and taken in the conceptual design phase;
h) Determine and address critical DEMO R&D requirements (e.g., potential showstopper or issues that propagate throughout the all plant), by involving more industry).

The activities (a) through (g) are also partially conducted as part of the BA effort. This phase shall culminate in the selection of a concept with the highest likelihood of success (the baseline at the time of down-selection) by the end of 2020, and potentially one back-up alternative design for risk mitigation and exploitation of potential opportunities (e.g. enabling technology dependent). The selected architectures are taken into the conceptual design phase and further assessed and compared, with a single architecture (still with sub-variants) to be selected in the mid 2020’s, in preparation for a concept design review by 2027. Targeted technology R&D expected during this phase shall be driven by requirements of the DEMO system and respond to critical design feasibility and integration risks. Large scale demonstration R&D and testing are not foreseen during the conceptual design phase. Nevertheless, some initial manufacturing tests or system component performance tests would be required. This phase culminates in a rigorous CDR process where the key design features of the DEMO power plant are frozen and a consistent nuclear safety case is defined, the systems that are considered safety related or important to safe plant operations are designed, the plant licensing strategy is established, and the remaining plant systems, structures, and components will be further defined.

[7] For the scope of the Multi Annual Planning (2018-2022)

4.2.5 Non-Technical Objectives

Despite the fact that F4E is an agency with obvious technical objectives, F4E acknowledges that the same attention shall to be granted to other relevant tasks that are non-technical but still very important for the organization to run smoothly. They are then translated into objectives to be achieved by the organization. The Non-Technical Objectives are the ones shown in Table 12. They are Corporate Objectives and for this reason they are related both to ITER and BA.

AREA	OBJECTIVE
Overall Costs	- Cost estimation until 2020 should be less than total budget available until 2020
Annual budget	- Implementation of Annual budget achieved [+/- x%]
Annual payment	- Implementation of payment fully achieved. [+/- x%]
Quality	- To reduce the number of Long Non Conformity Report (NCRs) compared to the previous year. IO defines Long NCRs the ones open for more than 180 Days.

Table 12 . Non-technical Objectives (Corporate objectives)

4.2.6 KPI Calculation

Technical milestones

The KPI for the technical milestone is the variance, i.e. the comparison of the forecast milestone date with the last day of the agreed target quarter. E.g, if the agreed target quarter for a milestone is Q1 2019, then the KPI is the number of days before 31 March 2019.
The basis of measurement is the currently agreed list of target quarters. If the target quarter is changed after agreement with IC/GB, then the new target quarter is taken as the baseline and as basis of measurement. The target quarters are recorded in the Primavera Detailed Working Schedule in the fields F4E-IC Milestones and F4E-GB Milestones.

$$\text{Achieved Date - Foreseen Date}$$

Equation 1: Variance

Non-technical Milestones

$$\frac{\text{Budget available to F4E}}{\text{Cost estimation until 2020}}$$

Equation 2: Overall Costs

$$\frac{\text{Actual commitment executed to date +}\\ \text{remaining commitment planned to be executed between date and year's end}}{\text{Latest approved annual commitment budget}}$$

Equation 3: Annual commitment

$$\frac{\text{Actual payment executed to date + remaining payment which is planned to be executed between date and year's end}}{\text{Latest approved payment appropriation for the year}}$$

Equation 4: Annual payment

$$\frac{\text{Number long pending open NCRs in 2018}}{\text{Number long pending open NCRs in 2017}}$$

Equation 5: Quality

4.2.7 Thresholds

Each KPI has thresholds:

Green	The KPI is within the accepted range.
Amber	The KPI is at risk of moving outside of the accepted range.
Red	The KPI is outside of the accepted range.

A project manager may choose to flag a KPI as at risk whenever there is a risk that the KPI may move outside of the accepted range. This step should be reflected in the identification of specific risks in the risk log with a consequent tracking and mitigation actions.
The objective of the KPIs is to ensure that the IC/GB milestones are delivered on-time with their target dates so that

1. The long-term project schedule and deliverables are on schedule.
2. F4E can demonstrate to its stakeholders that the project schedule is under control.

List of main KPIs and associated Thresholds

- Variance (IC-GB Milestones)

Green	Forecast date in or before second month of quarter
Amber	Concern that milestone may not be achieved by agreed quarter
Red	Forecast/Achieved later than end of agreed quarter

- Overall Costs

Green	KPI >=1.02
Amber	1.02 > KPI ≥ 1
Red	KPI < 1

- Annual Commitment

Green	0.9 ≤ KPI ≤ 1.1
Amber	0.8 ≤ KPI < 0.9 - 1.1 < KPI ≤ 1.2
Red	KPI <0.8 - KPI > 1.2

- Annual Payment

Green	0.95 ≤ KPI ≤ 1.05
Amber	0.85 ≤ KPI < 0.95 - 1.05 < KPI ≤ 1.15
Red	KPI <0.85 - KPI > 1.15

- Quality

Green	KPI <=0.9
Amber	KPI >0.9 and KPI <1
Red	KPI >=1

4.3 Multiannual Programme

4.3.1 Overview

F4E is facing a number of significant challenges, which will continue for the coming years. These may be considered in terms of the technical and procurement challenges, the organisational evolution and the consequential impact on the human resources.

4.3.1.1 Technical and Procurement Challenges

The most significant challenges for F4E are related to its major task of delivering its in-kind contributions to ITER. The nature of the F4E activities with respect to ITER is changing throughout its lifecycle. While at the beginning the focus was on the launching of the procurement of the EU in-kind components, the work has evolved into the follow-up of the manufacturing activities and will further evolve in the coming years with a higher degree of involvement in the assembly and testing of the machine.

The next years, covered by this MAP, represent the peak workload for the organization. Very significant efforts will be required to maintain the programme through to the major milestone of First Plasma and in view of the preparatory work for the subsequent assembly phases. F4E will face the parallel activities of launching a large number of new contracts, while at the same time managing the ongoing delivery of the running contracts.

Regarding the procurement activities, the workload is compounded by an evolution of the F4E contract strategy. Historically, F4E has tended to place large enveloping contracts on a fixed price basis. Experience is showing that this does not always deliver the most cost effective outturn, for two major reasons:

- The requirements and interfaces have not always been stable, and any changes will necessarily lead to a cost increase
- Given the high technical challenge and the one-of-a-kind nature of ITER, the risk to the contractors is significant. If asked to bid on a fixed price basis the contractor will naturally include a substantial risk provision in its offer.

In consideration of the above F4E has been increasingly moving to:

a) Smaller contracts, where the risk is more manageable
b) Contracts with a more variable nature [time and materials, measurable,…], reducing the need for the contractor to include large cost contingencies.
c) Incentivised contracts to more closely align the financial interests of the contractor with F4E.

Whilst F4E considers that this evolving contract strategy is showing benefits, and will ultimately deliver a lower final outturn cost, the consequence is a need for significantly stronger contract management capacity in F4E, both in terms of the number of project management and commercial staff and their capability.

From a practical point of view, an increasing fragmentation of contracts is expected in comparison with past years when large procurements have been awarded. In combination with the foreseen increase of total commitment value in the early post-2020 years this means that F4E will require a more than proportional increase of manpower to place all the forecasted contracts.

In addition, looking ahead F4E can anticipate the need for more technical integration staff. In the past F4E has been largely procuring a series of independent components. F4E is now receiving the first deliveries, and the integration and assembly phase at ITER will shortly be underway. Experience indicates that there will be some significant technical integration issues to resolve as the various components are integrated into the machine, and with each other.

4.3.1.2 Organisational Evolution

The Governing Board approved a revised organisational structure for F4E in June 2016. This comprised the introduction of two new departments – Commercial and ITER-Programme – and the further improvement of the matrix structure that had already been the basis for the Project Teams operation. The new organisation has now been effective since October 1st, of the same year. The

expected benefits of the new organization will only take full effect after the hiring of new management is complete and the comprehensive revision of the various internal processes, responsibilities and communication lines is concluded and well entrenched. Ensuring that staff understand the different changes and receive revised job descriptions and objectives that effectively cascade the new corporate objectives is therefore a key activity.

4.3.1.3 Human Resources Implications

4.3.1.3.1 Human Resource Capacity

The current Establishment Plan grants to F4E a resourcing level of 467, including 45 short term positions granted in 2014 under the conditions that they are phased out by the end of 2019. For 2018 the budgetary authority has confirmed this resourcing level, enabling F4E to maintain the staffing with the full use of all the 45 short term positions, as reflected in the corresponding resource planning.

The significant challenge pertains to workforce planning for the years beyond 2018 and the requirement to resource the various activities with an adequate number of suitably trained staff. As noted above in 4.3.1.1 the forthcoming work for ITER will be more focused on:

- A more detailed and intensive follow-up of the procurement contracts for the manufacturing of the various components
- the progress in the design of those components still at an earlier stage of maturity
- the support to the integration of the various European components into the ITER machine.

Looking to the period beyond 2018, F4E foresees the need to maintain the staffing level at at-least the level of 467. Consequently F4E is preparing for the GB and Commission an analysis to support the request for maintaining the 45 short term positions for some years beyond 2018, in order to support the level of activities as indicated in this MAP.

Furthermore, F4E has recently performed first draft of a long term resourcing analysis which shows a staffing requirement in excess of 467. This is largely the consequence of the delays to the overall schedule since the previous analysis, and the increasing efforts required for contract placement and contract management. F4E will refine this analysis and develop the associated resourcing strategy to address this, which it anticipates to be mature enough for discussion and review in Q2, 2018.

4.3.1.3.2 Human Resource Optimization

In addition to the staffing challenge noted above, the need to motivate the staff to the maximum extent coupled with the introduction of the new organisational structure requires a number of adaptations to the human resources management.

Various HR processes, which were developed in earlier stages, will need to be adapted to reflect the enhanced matrix based approach. The aim here is to inject more flexibility into the workforce and facilitate a more integrated and collaborative way of working. As such, and in order to allow for increased responsiveness to project contingencies, efforts will be directed at (re-)assigning staff to projects with high priority rather than to teams or units. A key HR process that will be impacted by this will be the performance appraisal mechanism which is being modified to better accommodate the dual reporting lines of staff working in matrix formation and embed collective rather than individual ownership of performance management.

In the same vein, processes related to transfers, mobility and re-assignments need to be streamlined. A better definition and standardization of responsibility assignments is also needed under this heading.
F4E recognises that it must carry out its activities following its statutes annexed to the legal basis, in particular regarding staffing and financial regulations, and the associated implementing rules.

Balancing the strict requirements of the regulatory framework with the flexibility needed to efficiently respond to the project's HR needs will therefore remain a key endeavour for the organisation.

4.3.2 ITER

F4E is now operating within the classical project 'iron triangle' of time, cost and quality, with quality interpreted in the general sense of achieving all the project scope objectives. This requires a continual balance of prioritisations made at management level, and in the daily work of all the staff.
The prioritisations are judged in line with the so-called 'Straight Road to First Plasma' (SR2FP) project, which has now been fully integrated into F4E's planning and operations. This project, conducted in 2016, had the single objective to focus the available F4E resources on the achievement of First Plasma in December 2025. This objective is fully consistent with the IO Overall Project Schedule [OPC], and is considered as an essential enabler to maximize the chance of project success.
In line with the SR2FP project the F4E strategy for ITER may be summarized as follows:

- To prioritise the available resources, both human and financial, together with the associated management effort, on the components required for first plasma.
- To maintain, to the extent possible, the progress on other activities required in preparation for the subsequent project stages
- To implement risk mitigation actions towards protecting the first plasma schedule

F4E will be ready to implement risk mitigation measures, and where necessary schedule recovery measures, based on the following criteria:

- The expected benefit in terms of schedule recovery is adequate to justify the investment
- F4E must remain within the capped budget of €6.6bn [2008] to end 2020

4.3.3 Broader Approach

For what concerns the presently agreed BA scope, all project are in an advanced implementation stage. The early defined strategy to implement these projects has proven to be successful and hence continues to be employed. This is underpinned by the very close collaboration with QST in Japan and all other European stakeholders: the EU Voluntary Contributors (EU-VCs) as well as EUROfusion. The management model follows the agreed Common Quality Management System, defining resources and processes crossing the lines between organizations. Such an approach has allowed avoiding any significant cost overruns by the EU-VCs as well as F4E and will continue to be pursued. For JT60-SA the same strategy is planned also for the period beyond 2020, that is when the facility will be jointly operated and enhanced by the EU and JA. For the IFMIF the R&D results planned to be achieved by the beam commissioning of the full LIPAc accelerator - first in low duty cycle, then in continuous wave should provide good grounds for the full experimental phases to follow in LIPAc after 2020 as well as the final design and specifications of the IFMIF-DONES. For IFERC F4E will continue to rely on the full support of EUROfusion whereby the EU-JA joint DEMO design activities led by EUROfusion will be firstly completed for the extent planned within the present BA phase, and carried forward also in BA phase 2 with QST in JA.

4.3.4 DEMO

DEMO activities are currently being carried out by EUROfusion with a view of taking a stronger role once ITER activities will decrease. Still, as F4E has higher maturity in project and technical management processes and flexibility in securing industrial investment that can strengthen and support DEMO project implementation a continued and even strengthened coordination between F4E and the EUROfusion PPPT activities has been suggested in recent reviews[8]. In particular, it will be

[8] Management / Governance Assessment of EUROfusion & Industry Engagement, 11/07/2016, Ernst & Young.

desirable that F4E gradually becomes more involved on key design decisions, and cost & schedule parameters during the DEMO pre-conceptual/conceptual design phase and is linked in the EUROfusion Project Governance of the DEMO design activities and other associated supporting technology projects (e.g., ITER TBM and DEMO breeding blanket work packages).

4.3.5 Implementation of the F4E Strategy to achieve the objectives and define recovery plans

The achievement of the objectives is based on the strategies defined in the previous paragraphs. The schedule has been reorganized so to minimize the risks of delay for the delivery of the components on the critical path. Furthermore, resources have been redistributed so to better support the areas where more effort is needed.
The forum for reviewing project progress and taking any necessary actions to maintain or recover the project status is the Project Steering Meeting (PSM), held once a month with the participation of both senior and middle management. On top of scheduled presentations on progress, KPIs and milestones trend analyses, the Project team leaders who have identified a specific issue in their areas are requested to present the reason of the issue and to propose a strategy to recover it. The proposal is discussed and an agreement is reached for the implementation which may involve reallocation of staff and/or funds.
Actions are assigned to support the decision taken and due dates for the actions are agreed.
The record of recovery plans and issues arising from KPIs are the Record of Decisions (RoD) of the PSM.

4.3.5.1 “Red-flagging” and KPI Control Process

The Project Management KPI process runs on a monthly basis in the background of the PSM.
In the case that a KPI is either amber of red, the Project Manager may propose one of the following alternatives.

- Accept: The Project Manager proposes in the PSM that the KPI value is accepted. This may be, e.g. because the milestone is not critical, a global commitment is allowed instead of an individual one, etc. If the Director accepts the proposal, the decision is recorded in the PSM RoD. The Project Manager will continue to monitor the KPI and either he/she or the Project Planning and Controlling group may raise the issue again at a subsequent PSM if the situation regarding the KPI changes or worsens.
- Recover: The Project Manager presents in the PSM the recovery actions launched to bring back the KPI within the accepted range. A due date is also assigned for the completion of the action.

The Project Manager will report on its progress in subsequent PSMs. When reporting on a recovery plan, the Project Manager may propose the following alternatives:

- Close: The Project Manager demonstrates in the PSM that the KPI has returned within the agreed range;
- Accept: The Project Manager proposes in the PSM that the current KPI value is accepted. If the Director accepts this proposal, it is recorded in the PSM RoD. The Project Manager will continue to monitor the KPI and either he/she or the Project Planning and Controlling group may raise the issue again at a subsequent PSM if the situation regarding the KPI changes or worsens;
- Continue to recovery: The Project Manager presents the progress on the existing recovery actions in the PSM and updates the PSM on the time period in which the recovery will be complete.

5 Resource Estimates Plan

5.1 Introduction

The information presented in the Resource Estimates Plan (REP) is based on the assumptions detailed in Section I of this document and in specific assumptions as follows:

- For Staff: Maintain the current staff count (467 staff) beyond 2019 and over the whole period covered by this plan (2018-2022)
- The escalation rate used to convert between current Euro and 2008 Euro value is set to 2.6% for operational commitment expenditure for the period 2007 to 2020, the standard factor of 2% applies to administrative expenditure until 2020 and to all expenditure after 2020.
- Planning: The present REP is based on F4E needs as planned with the responsible Project Teams. For ITER it implements EURATOM's scope as defined by the ITER agreement, on a timescale defined by the ITER baseline of IC 19 November 2016, with some deviations agreed with ITER IO for the IC 20 MAC in May 2017.
  Likewise, for Broader Approach Projects, until 2020 F4E will execute activities in line with the scope defined in the BA Agreement while, beyond 2020, F4E plan to undertake activities foreseen in the forthcoming BA Agreement Phase-2. No resources are foreseen over the whole period covered by this plan on IFMIF-DONES.

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 revenue and expenditure of the Joint Undertaking for the following five financial years with reference to the previous and current years.
3. Detailed forecast in revenue and expenditure for the following 2 years according to:
   a. The planned revenue from the contributors
   b. The Expenditure planned in commitment according to the corresponding Work Programme
   c. The detailed payment forecast.

The MFF(2014-2020) provides the reference celling of EUR 6.6 billion in 2008 euro value. The information provided for 2021 and 2022 is therefore purely indicative and the final EU budgetary allocation for 2021 and 2022 will be subject to the final decision by the EU Budgetary Authority on the next Multiannual Financial Framework.

5.2 Definitions

5.2.1 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.

5.2.2 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[9] 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[10] 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.
The revenue received from Euratom is earmarked for operational expenditure and for administrative expenditure (running costs). The Euratom revenue covers the main part of the administrative expenditure.

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[11].
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 is assigned to the implementation of change orders originating from IO which take place in the framework of the contractual relationships between F4E and the various suppliers.
The revenue from the Reserve Fund is earmarked for financing the corresponding requests for change from IO introduced after 05/03/2015.
The forecasts are indicative and refer only to Project Change Requests (PCR) already initiated by IO.

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

[10] 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).

[11] 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.

5.2.3 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, 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:

1. 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.
    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.
    d. The ITER site support activities.
2. 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 for 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 and approved for financing from the Reserve Fund.

The Administrative Expenditure

Administrative expenditure is composed of F4E functioning and operating costs, mainly related to Staff.

5.3 Budget forecasts and ceiling

5.3.1 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[12] based on the 2001 final design are 1 278.4 kIUA[13] for the ITER operation phase and EUR 304 million (value 2005) for the decommissioning and de-activation phase.

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

13 IUA (ITER Unit of Account with 1 IUA= 1.2889 kEUR (2001 Conversion rate).

5.3.2 Estimates of revenue and expenditure for the period 2007-2022

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 euro value.

Figures are quoted in 2008 economic conditions. When converting from current year values to 2008 economic conditions are vice versa the following escalation/de-escalation rates are applied:

Item/Year	≤ 2020	2021 and above
Operational Expenditure linked to the delivery of in-kind contributions	2.6%	2%
Cash Contribution (IO, Japan, NBTF, BA etc.)	2%	2%
Administration (Title I and II)	2%	2%
Reserve Fund	2%	2%

Table 13 . 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 values provided beyond 2020 are based on F4E planned needs. It is further assumed that F4E will succeed at mitigating the reduction of escalation coefficient from 2.6% to 2% after 2020 by implementing suitable procurement strategies[14].

5.3.2.1 The estimate of revenue

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.

The present edition of the REP includes the decrease of a total current EUR 80.0 million for the years 2019 and 2020, corresponding to the transfer from the ITER project to the European Defence Industrial Programme Initiative proposed by the EU Commission[15].

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 to the actual cost for the domain of participation of the ITER Host State and is taking in account the decrease of the Euratom contribution as per paragraph above.

Membership Contribution:

This revenue is calculated with reference to an earlier stage in the planning process, thus avoiding changes along the budgetary procedure and 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 the frame defined in F4E statutes.

[14] For long duration contracts in which payments are subject to adjustments linked to variation in market indexes (“indexation”) this means that F4E assumes to put in place future contracts which will minimize the time gap between the budget year when the commitment is booked and the budget year when the payment is performed (by using options and/or staging of the contracts).

[15] COM 2017/294 final of 07/06/2017

Revenue from the ITER Reserve Fund and Refunds:

The revenue from the Reserve Fund and refunds are excluded from the EUR 6.6 billion (2008 value) ceiling, due to the fact that both correspond to reimbursements or reimbursements like revenue already accounted against the EUR 6.6 billion.

Utilisation of unused commitment appropriations

Commitment Appropriations Current Value MEUR		2007-2013 FP VII	2014 Executed	2015 Executed	2016 Executed	2017 Budget	2018 Draft Budget	2019 Indicative Forecast	2020 Indicative Forecast	TOTAL
Commitment Appropriation	Cancelled (situation for GB 38)	272.109	277.720	48.217	0.000	-	-	-	-	**598.046**
	Cancelled new (since GB 38)	27.956	0.806	0.746	0.511	-	-	-	-	**30.019**
	Made available again	9.760	-	-	-	96.000	93.707	209.281	219.318	**628.065**
	Total CA still to be made available again	**290.305**	**568.831**	**617.794**	**618.306**	**522.306**	**428.599**	**219.318**	**0.000**	**0.000**

Table 14 . Revenue made available again (in current value)

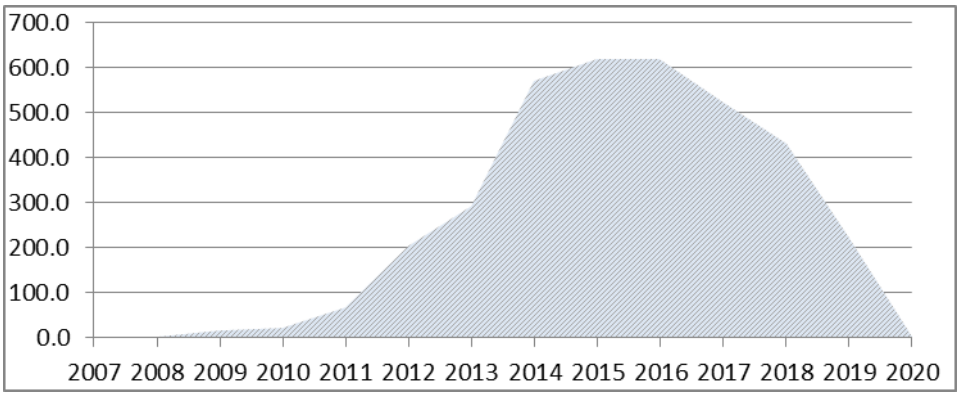

Figure 11 . Origin and estimated evolution of the cancelled appropriations

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 Financial Regulation foresees the possibility to make those appropriations available again in subsequent budgets according to the needs for the project. 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 Figure 11.
F4E anticipates requiring the full EUR 6.6 billion budget for the period until 2020. Consequently all previously cancelled appropriations are planned to be reintroduced before the end of 2020.
The reference date for the cancelled appropriation is end of May 2017.

Corrections to available revenues

The amount of reference for the period until 2020, EUR 6.6 billion in 2008 euro value has been modified as follows:

- About EUR -70 million due to the frozen escalation effect in the process of reutilization of unused appropriation (see above paragraph). About EUR -75 million from the reductions to EURATOM's and Host State contributions due to the European Defence initiative.
- About EUR +45 million from the recalculation of the French contribution based on actual expenditure to date

Current Value MEUR		< 2007 Preparation	2007-2013 FP VII	2014-2020	2021-2022	TOTAL <2007-2020	TOTAL
Commitment Appropriations	Euratom contribution	40.645	3 272.633	2 840.002	1 692.780	**6 153.279**	**7 846.059**
	France contribution	1.484	516.202	876.600	360.000	**1 394.287**	**1 754.287**
	F4E Members contribution	-	21.008	34.670	12.000	**55.678**	**67.678**
	Miscellaneous revenue	-	1.697	0.442	-	**2.140**	**2.140**
	F4E Total Budget	**42.129**	**3 811.540**	**3 751.715**	**2 064.780**	**7 605.384**	**9 670.164**
	Reserve Fund and Refund	-	0.010	78.816	13.020	**78.826**	**91.846**
	F4E Total Revenue	**42.129**	**3 811.550**	**3 830.530**	**2 077.800**	**7 684.210**	**9 762.010**
Payment Appropriations	Euratom contribution	40.645	1 196.410	4 079.241	1 351.950	**5 316.296**	**6 668.246**
	France contribution	1.484	261.802	830.000	260.000	**1 093.287**	**1 353.287**
	F4E Members contribution	-	21.393	34.747	12.000	**56.140**	**68.140**
	Miscellaneous revenue	-	1.697	0.442	-	**2.140**	**2.140**
	F4E Total Budget	**42.129**	**1 481.303**	**4 944.430**	**1 623.950**	**6 467.862**	**8 091.812**
	Reserve Fund and Refund	-	0.010	78.791	13.020	**78.801**	**91.821**
	F4E Total Revenue	**42.129**	**1 481.313**	**5 023.221**	**1 636.970**	**6 546.663**	**8 183.633**

Table 15 . Revenue in payment and commitment appropriations (yearly details in ANNEX XIV)

5.3.2.2 The Estimate of expenditure

The administrative expenditure:

This expenditure is recurrent and mainly based on the establishment plan (salaries).
The forecast is based on the following main assumptions:

- Annual salary adjustment: 2% (based on Brussels reference with correction for Spain cost of living),
- Vacancy rate: 3%,
- Inflation on other administrative expenses: 2%,
- Barcelona building refurbishment included in the 2018 budget.

The operational expenditure:

This expenditure is based on the needs for the execution of the ITER and Broader approach projects as described in the "Final Report of Negotiations on ITER Implementation, 1 April 2006 (Attachment 2_C)" and in the Broader Approach Agreement F4E_D_22FTK5.

In commitment appropriations, in Current value and 2008 reference value:

Constant Value MEUR(2008)		< 2007 Preparation	2007-2013 FP VII	2014-2020	2021-2022	TOTAL <2007-2020	TOTAL
Commitment Appropriations	ITER Construction	M€ 43.913	M€2 990.089	M€2 910.981	M€1 393.664	M€ 5 944.982	M€ 7 338.646
	Of which Transportation		*M€ 1.646*	*M€ 78.649*	*M€ 26.278*	*M€ 80.295*	*M€ 106.573*
	Technologies		M€ 45.953	M€ 74.022	M€ 83.930	M€ 119.975	M€ 203.905
	Technology for ITER		M€ 26.358	M€ 32.235	M€ 23.930	M€ 58.593	M€ 82.523
	(Of which Test Blanket Modules)		*M€ 16.041*	*M€ 16.036*	*M€ 23.930*	*M€ 32.077*	*M€ 56.007*
	Technology for Broader Approach		M€ 19.595	M€ 41.787	M€ 60.000	M€ 61.382	M€ 121.382
	Other Expenditure		M€ 4.930	M€ 23.416	M€ 7.655	M€ 28.346	M€ 36.001
	F4E Administration		M€ 173.555	M€ 301.749	M€ 92.589	M€ 475.304	M€ 567.893
	F4E Total Budget	M€ 43.913	M€3 214.527	M€3 310.168	M€1 577.837	M€ 6 568.608	M€ 8 146.445
	Reserve Fund			M€ 63.050	M€ 10.065	M€ 63.050	M€ 73.115
	F4E Total Expenditure	M€ 43.913	M€3 214.527	M€3 373.218	M€1 587.902	M€ 6 631.658	M€ 8 219.560

Current Value MEUR		< 2007 Preparation	2007-2013 FP VII	2014-2020	2021-2022	TOTAL <2007-2020	TOTAL
Commitment Appropriations	ITER Construction	42.129	3 241.516	3 604.104	1 824.190	6 887.749	8 711.938
	Of which Transportation	*-*	*1.853*	*102.324*	*34.220*	*104.177*	*138.397*
	Technologies	-	48.730	90.558	109.620	139.288	248.908
	Technology for ITER	-	28.137	38.609	31.228	66.746	97.974
	(Of which Test Blanket Modules)	*-*	*17.350*	*19.410*	*31.228*	*36.760*	*67.987*
	Technology for Broader Approach	-	20.593	51.949	78.393	72.542	150.934
	Other Expenditure	-	*5.319*	*29.988*	10.000	*35.307*	*45.307*
	F4E Administration	-	*183.991*	361.984	120.970	*545.976*	*666.946*
	F4E Total Budget	42.129	3 479.556	4 086.634	2 064.780	7 608.320	9 673.100
	Reserve Fund	-	-	75.890	13.020	75.890	88.910
	F4E Total Expenditure	42.129	3 479.556	4 162.524	2 077.800	7 684.210	9 762.010

Table 16 . Expenditure in commitment appropriations (yearly details in ANNEX XV)

In payment appropriations:

Current Value MEUR		< 2007 Preparation	2007-2013 FP VII	2014-2020	2021-2022	TOTAL <2007-2020	TOTAL
Payment Appropriations	ITER Construction	42.129	1 221.090	4 485.647	1 451.280	5 748.867	7 200.147
	Of which Transportation	-	*6.417*	*25.421*	*10.500*	*31.838*	*42.338*
	Technologies	-	29.005	116.405	41.700	145.410	187.110
	Technology for ITER	-	15.231	65.783	10.500	81.014	91.514
	(Of which Test Blanket Modules)	-	*17.350*	*19.410*	*31.228*	*36.760*	*67.987*
	Technology for Broader Approach	-	13.774	50.622	31.200	64.395	95.595
	Other Expenditure	-	4.283	26.238	10.000	30.521	40.521
	F4E Administration	-	183.991	361.984	120.970	545.976	666.946
	F4E Total Budget	42.129	1 438.370	4 990.275	1 623.950	6 470.774	8 094.724
	Reserve Fund	-	-	75.890	13.020	75.890	88.910
	F4E Total Expenditure	42.129	1 438.370	5 066.164	1 636.970	6 546.663	8 183.633

Table 17 . Expenditure in payment appropriations (yearly details in ANNEX XVI)

5.4 Estimates of revenue and expenditure for the next five years (current value)

5.4.1 Revenue in commitment appropriations

REVENUE Commitment appropriations (EUR)	2016 Budget Execution	2017 Budget		Envisaged in 2018			Envisaged in 2019		Envisaged in 2020		Envisaged in 2021		Envisaged in 2022	
		Second Amendment	Planned needs (1)	Draft Budget (2)	Planned needs	VAR 2018/17	Forecast	VAR 2019/18	Forecast	VAR 2020/19	Forecast	VAR 2021/20	Forecast	VAR 2022/21
1 REVENUE FROM FEES AND CHARGES														
2. EU CONTRIBUTION	**324 297 788.01**	**315 112 996.60**	**316 236 996.60**	**370 308 018.32**	**370 308 098.32**	**17.1%**	**385 929 000.00**	**4.2%**	**343 361 000.00**	**-11.0%**	**707 540 000.00**	**106.1%**	**985 240 000.00**	**39.2%**
of which Administrative (Title 1 and 2)	*44 737 000.00*	*47 547 440.00*	*48 671 440.00*	*48 016 981.00*	*48 016 981.00*	-1.3%	*49 700 000.00*	3.5%	*48 880 000.00*	-1.6%	*59 930 000.00*	22.6%	*61 040 000.00*	1.9%
of which Operational (Title 3)	*278 532 742.00*	*266 512 997.00*	*266 512 997.00*	*321 108 018.00*	*321 108 018.00*	20.5%	*336 229 000.00*	4.7%	*294 481 000.00*	-12.4%	*647 610 000.00*	119.9%	*924 200 000.00*	42.7%
of which recovery from previous years admin	*1 028 046.01*	*1 052 559.60*	*1 052 559.60*	*1 183 019.32*	*1 183 099.32*	-		-		-		-		-
of which rec. from previous years operational						-		-		-		-		-
3 THIRD PARTIES CONTRIBUTION	**134 600 000.00**	**149 860 000.00**	**149 860 000.00**	**146 920 000.00**	**146 920 000.00**	**-2.0%**	**135 700 000.00**	**-7.6%**	**101 400 000.00**	**-25.3%**	**149 600 000.00**	**47.5%**	**222 400 000.00**	**48.7%**
Of which ITER Host State contribution	*130 000 000.00*	*145 000 000.00*	*145 000 000.00*	*142 000 000.00*	*142 000 000.00*	-2.1%	*130 000 000.00*	-8.5%	*95 600 000.00*	-26.5%	*143 700 000.00*	50.3%	*216 300 000.00*	50.5%
Of which Membership contribution	*4 600 000.00*	*4 860 000.00*	*4 860 000.00*	*4 920 000.00*	*4 920 000.00*	1.2%	*5 700 000.00*	15.9%	*5 800 000.00*	1.8%	*5 900 000.00*	1.7%	*6 100 000.00*	3.4%
4 MISCELLANOUS REVENUE	*20 835.45*		*658.04*			-		-		-		-		-
5 ADMINISTRATIVE OPERATIONS														
6 REVENUES FROM SERVICES RENDERED AGAINST PAYMENT														
7 CORRECTION OF BUDGETARY IMBALANCES														
8 INTERESTS GENERATED	*3 611.16*					-		-		-		-		-
9 UNUSED APPROPRIATIONS FROM PREVIOUS YEARS - CARRIED OVER	*13 436 039.03*	*22 009 115.00*	*25 831 115.00*											
9 BIS UNUSED APPROPRIATIONS FROM PREVIOUS YEARS - MADE AVAILABLE AGAIN		*96 000 000.00*	*96 000 000.00*	179 381 000.00	93 706 781.00	-2.4%	209 281 000.00	123.3%	219 317 794.06	4.8%		-		-
TOTAL REVENUE	**472 358 273.65**	**582 982 111.60**	**587 928 769.64**	**696 609 018.32**	**610 934 879.32**	**3.9%**	**730 910 000.00**	**19.6%**	**664 078 794.06**	**-9.1%**	**857 140 000.00**	**29.1%**	**1 207 640 000.00**	**40.9%**
RESERVE FUND AND REFUND	**15 443 651.02**	**19 465 948.00**	**19 465 948.00**	**0.00**	**37 900 000.00**	**-**	**3 440 000.00**	**-**	**0.00**	**-**	**13 020 000.00**	**-**	**0.00**	**-**
of which Reserve Fund	*14 983 791.90*	*18 264 581.55*	*18 264 581.55*		*37 900 000.00*		*3 440 000.00*		*0.00*		*13 020 000.00*		*0.00*	
of which Reserve Fund Carried over	*0.00*	*735 418.45*	*735 418.45*											
of which Refund	*435 059.22*	*465 948.00*	*465 948.00*											
of which Refund carried over	*24 799.90*	*0.00*	*0.00*											
TOTAL REVENUE AVAILABLE	**487 801 924.67**	**602 448 059.60**	**607 394 717.64**	**696 609 018.32**	**648 834 879.32**	**6.8%**	**734 350 000.00**	**13.2%**	**664 078 794.06**	**-9.6%**	**870 160 000.00**	**31.0%**	**1 207 640 000.00**	**38.8%**

VAR: Variation compared to the previous budget (F4E request for 2018)

(1) For 2017, the planned needs correspond to the revised estimates of F4E as of end of September 2017.

(2) For 2018, the draft budget corresponds to F4E request in January 2017 according to the previous edition of the MAP.

Table 18 . Revenue in Commitment for 2016-2022

5.4.2 Revenue in payment appropriations

REVENUE Payment appropriations	2016 Budget Execution	2017 Budget		Envisaged in 2018			Envisaged in 2019		Envisaged in 2020		Envisaged in 2021		Envisaged in 2022	
		Second amendment	Planned needs (1)	Draft Budget (2)	Planned needs (3)	VAR 2018/17	Forecast	VAR 2019/18	Forecast	VAR 2020/19	Forecast	VAR 2021/20	Forecast	VAR 2022/21
1 REVENUE FROM FEES AND CHARGES														
2. EU CONTRIBUTION	**595 328 553.81**	**685 760 707.74**	**703 884 707.74**	**499 200 000.32**	**702 368 000.00**	**2.4%**	**652 010 000.00**	**-7.2%**	**653 621 045.78**	**0.2%**	**654 030 000.00**	**0.1%**	**697 920 000.00**	**6.7%**
of which Administrative (Title 1 and 2)	*44 737 000.00*	*47 547 440.00*	*48 671 440.00*	*48 016 981.00*	*48 016 981.00*	*1.0%*	*49 700 000.00*	*3.5%*	*48 880 000.00*	*-1.6%*	*59 930 000.00*	*22.6%*	*61 040 000.00*	*1.9%*
of which Operational (Title 3)	*522 302 661.93*	*637 140 000.00*	*654 140 000.00*	*445 301 679.00*	*648 469 598.68*	*1.8%*	*602 310 000.00*	*-7.1%*	*604 741 045.78*	*0.4%*	*594 100 000.00*	*-1.8%*	*636 880 000.00*	*7.2%*
of which recovery from previous years admin	*1 028 046.01*	*1 052 559.60*	*1 052 559.60*	*1 183 019.32*	*1 183 099.32*	*-*		*-*		*-*		*-*		*-*
of which rec. from previous years operational	*27 260 845.87*	*20 708.14*	*20 708.14*	*4 698 321.00*	*4 698 321.00*	*-*		*-*		*-*		*-*		*-*
3 THIRD PARTIES CONTRIBUTION	**124 600 000.00**	**129 937 000.00**	**129 937 000.00**	**134 920 000.00**	**134 920 000.00**	**3.8%**	**135 700 000.00**	**0.6%**	**130 800 000.00**	**-3.6%**	**130 900 000.00**	**0.1%**	**141 100 000.00**	**7.8%**
Of which ITER Host State contribution	*120 000 000.00*	*125 000 000.00*	*125 000 000.00*	*130 000 000.00*	*130 000 000.00*	*4.0%*	*130 000 000.00*	*0.0%*	*125 000 000.00*	*-3.8%*	*125 000 000.00*	*0.0%*	*135 000 000.00*	*8.0%*
Of which Membership contribution	*4 600 000.00*	*4 937 000.00*	*4 937 000.00*	*4 920 000.00*	*4 920 000.00*	*-0.3%*	*5 700 000.00*	*15.9%*	*5 800 000.00*	*1.8%*	*5 900 000.00*	*1.7%*	*6 100 000.00*	*3.4%*
4 MISCELLANOUS REVENUE	*20 835.45*		*658.04*			*-*		*-*		*-*		*-*		*-*
5 ADMINISTRATIVE OPERATIONS														
6 REVENUES FROM SERVICES RENDERED AGAINST PAYMENT														
7 CORRECTION OF BUDGETARY IMBALANCES														
8 INTERESTS GENERATED	*3 611.16*					*-*		*-*		*-*		*-*		*-*
9 UNUSED APPROPRIATIONS FROM PREVIOUS YEARS	*0.13*	*876 532.60*	*876 532.60*			*-*		*-*		*-*		*-*		*-*
TOTAL REVENUE	**719 953 000.55**	**816 574 240.34**	**834 698 898.38**	**634 120 000.32**	**837 288 000.00**	**2.5%**	**787 710 000.00**	**-5.9%**	**784 421 045.78**	**-0.4%**	**784 930 000.00**	**0.1%**	**839 020 000.00**	**6.9%**
RESERVE FUND AND REFUND	**4 580 593.09**	**4 586 681.99**	**21 426 681.99**	**0.00**	**15 530 000.00**	**-**	**18 000 000.00**	**-**	**21 398 954.22**	**-**	**0.00**	**-**	**13 020 000.00**	**-**
of which Reserve Fund	*4 120 733.99*		*16 840 000.00*		*15 530 000.00*		*18 000 000.00*		*21 398 954.22*		*0.00*		*13 020 000.00*	
of which Reserve Fund Carried over	*0.00*	*4 120 733.99*	*4 120 733.99*		*0.00*									
of which Refund	*435 059.22*	*465 948.00*	*465 948.00*		*0.00*									
of which Refund carried over	*24 799.88*	*0.00*	*0.00*		*0.00*									
TOTAL REVENUE AVAILABLE	**724 533 593.64**	**821 160 922.33**	**856 125 580.37**	**634 120 000.32**	**852 818 000.00**	**3.9%**	**805 710 000.00**	**-5.5%**	**805 820 000.00**	**0.0%**	**784 930 000.00**	**-2.6%**	**852 040 000.00**	**8.5%**

VAR: Variation compared to the previous budget (F4E request for 2018)

(1) For 2017, F4E Planned needs includes the reinforcement of operational revenue through internal transfer on EU General Budget

(2) For 2018, the draft budget corresponds to F4E request in January 2018 according to the previous edition of the MAP.

(3) For 2018 the difference between the revenue available and the planned needs in expenditure is **indicatively** assigned to Euratom

Table 19 . Revenue in Payment for 2016-2022

5.4.3 Expenditure in commitment appropriations

EXPENDITURE In Commitment Appropriations (EUR)	2016 Execution	2017		2018			2019		2020		2021		2022	
		Second amendment	Planned needs (1)	Draft Budget (2)	Planned needs (3)	VAR 2018/17	Planned needs	VAR 2019/18	Planned needs	VAR 2020/19	Planned needs	VAR 2021/20	Planned needs	VAR 2022/21
Title 1 Staff Expenditure	**42 001 488.03**	**41 320 299.60**	**47 343 000.00**	**42 285 000.00**	**47 964 000.00**	**1.3%**	**49 597 000.00**	**3.4%**	**50 546 000.00**	**1.9%**	**51 491 000.00**	**1.9%**	**52 433 000.00**	**1.8%**
Salaries & allowances	35 790 533.28	35 799 999.60	40 100 000.00	36 600 000.00	42 138 000.00	5.1%	43 653 000.00	3.6%	44 482 000.00	1.9%	45 306 000.00	1.9%	46 124 000.00	1.8%
Of which establishment plan posts	*26 763 755.71*	*26 899 999.60*	*30 100 000.00*	*27 400 000.00*	*31 394 000.00*	*4.3%*	*32 268 000.00*	*2.8%*	*32 897 000.00*	*1.9%*	*33 521 000.00*	*1.9%*	*34 139 000.00*	*1.8%*
Of which external personnel	*9 026 777.57*	*8 900 000.00*	*10 000 000.00*	*9 200 000.00*	*10 744 000.00*	*7.4%*	*11 385 000.00*	*6.0%*	*11 585 000.00*	*1.8%*	*11 785 000.00*	*1.7%*	*11 985 000.00*	*1.7%*
Expenditure relating to Staff recruitment	1 167 537.28	720 300.00	1 000 000.00	670 000.00	1 137 000.00	13.7%	1 160 000.00	2.0%	1 183 000.00	2.0%	1 207 000.00	2.0%	1 231 000.00	2.0%
Mission expenses	2 245 153.35	2 000 000.00	3 000 000.00	2 100 000.00	1 400 000.00	-53.3%	1 428 000.00	2.0%	1 457 000.00	2.0%	1 486 000.00	2.0%	1 516 000.00	2.0%
Socio-medical infrastructure	310 108.58	412 000.00	364 500.00	420 000.00	372 000.00	2.1%	379 000.00	1.9%	387 000.00	2.1%	395 000.00	2.1%	403 000.00	2.0%
Training	705 764.12	820 000.00	815 000.00	880 000.00	831 000.00	2.0%	848 000.00	2.0%	865 000.00	2.0%	882 000.00	2.0%	900 000.00	2.0%
External Services														
Receptions, events and representation	10 000.00	10 000.00	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%	10 000.00	0.0%
Social welfare	48 385.00	40 000.00	50 737.00	41 300.00	52 000.00	2.5%	53 200.00	2.3%	54 500.00	2.4%	55 700.00	2.2%	56 900.00	2.2%
Other Staff related expenditure	1 724 006.42	1 518 000.00	2 002 763.00	1 563 700.00	2 024 000.00	1.1%	2 065 800.00	2.1%	2 107 500.00	2.0%	2 149 300.00	2.0%	2 192 100.00	2.0%
Title 2 Infrastructure and operating expenditure	**6 611 331.20**	**7 280 000.00**	**6 996 750.00**	**6 915 000.00**	**7 854 000.00**	**12.3%**	**8 113 000.00**	**3.3%**	**8 274 000.00**	**2.0%**	**8 439 000.00**	**2.0%**	**8 607 000.00**	**2.0%**
Rental of buildings and associated costs	1 375 000.00	1 459 000.00	1 340 000.00	1 360 000.00	1 653 000.00	23.4%	1 784 000.00	7.9%	1 815 000.00	1.7%	1 847 000.00	1.8%	1 879 000.00	1.7%
Information, communication technology and data proc.	2 817 566.00	2 859 000.00	2 859 000.00	2 920 000.00	3 500 000.00	22.4%	3 570 000.00	2.0%	3 641 000.00	2.0%	3 714 000.00	2.0%	3 788 000.00	2.0%
Movable property and associated costs	198 000.00	530 000.00	268 750.00	245 000.00	279 000.00	3.8%	284 000.00	1.8%	289 000.00	1.8%	294 000.00	1.7%	299 000.00	1.7%
Current administrative expenditure	1 282 965.32	1 354 000.00	1 354 000.00	1 345 000.00	1 384 000.00	2.2%	1 406 000.00	1.6%	1 428 000.00	1.6%	1 450 000.00	1.5%	1 472 000.00	1.5%
Postage / Telecommunications	390 000.00	387 000.00	405 000.00	400 000.00	425 000.00	4.9%	443 000.00	4.2%	462 000.00	4.3%	482 000.00	4.3%	503 000.00	4.4%
Meeting expenses	276 000.00	296 000.00	355 000.00	350 000.00	314 000.00	-11.5%	320 000.00	1.9%	326 000.00	1.9%	332 000.00	1.8%	339 000.00	2.1%
Running costs in connection with operational activities														
Information and publishing	19 956.93	20 000.00	28 000.00	15 000.00	29 000.00	3.6%	30 000.00	3.4%	31 000.00	3.3%	32 000.00	3.2%	33 000.00	3.1%
Studies														
Other infrastructure and operating expenditure	251 842.95	375 000.00	387 000.00	280 000.00	270 000.00	-30.2%	276 000.00	2.2%	282 000.00	2.2%	288 000.00	2.1%	294 000.00	2.1%
Title 3 Operational expenditure	**424 186 137.50**	**534 847 760.00**	**534 054 967.64**	**647 409 018.32**	**555 116 879.32**	**3.9%**	**673 200 000.00**	**21.3%**	**605 258 794.06**	**-10.1%**	**797 210 000.00**	**31.7%**	**1 146 600 000.00**	**43.8%**
ITER construction including site preparation	265 593 480.95	341 199 645.00	340 406 852.64	474 639 018.32	391 478 879.32	15.0%	530 100 000.00	35.4%	498 358 794.06	-6.0%	592 328 664.04	18.9%	871 861 110.10	47.2%
Technology for ITER and DEMO	6 754 310.85	5 497 000.00	5 497 000.00	16 100 000.00	6 468 000.00	17.7%	2 200 000.00	-66.0%	700 000.00	-68.2%	17 373 137.05	2382%	13 854 527.01	-20.3%
Technology for Broader Approach	6 367 221.45	12 460 000.00	12 460 000.00	12 550 000.00	6 693 000.00	-46.3%	5 900 000.00	-11.8%	5 600 000.00	-5.1%	38 808 198.91	593.0%	39 584 362.89	2.0%
Other Expenditure	2 031 474.06	4 860 000.00	4 860 000.00	2 120 000.00	8 477 000.00	74.4%	5 000 000.00	-41.0%	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	143 439 650.19	170 831 115.00	170 831 115.00	142 000 000.00	142 000 000.00	-16.9%	130 000 000.00	-8.5%	95 600 000.00	-26.5%	143 700 000.00	50.3%	216 300 000.00	50.5%
TOTAL BUDGET	**472 798 956.73**	**583 448 059.60**	**588 394 717.64**	**696 609 018.32**	**610 934 879.32**	**3.8%**	**730 910 000.00**	**19.6%**	**664 078 794.06**	**-9.1%**	**857 140 000.00**	**29.1%**	**1 207 640 000.00**	**40.9%**
Reserve Fund	14 248 373.45	19 000 000.00	19 000 000.00		37 900 000.00		3 440 000.00		0.00		13 020 000.00		0.00	
TOTAL EXPENDITURE	**487 047 330.18**	**602 448 059.60**	**607 394 717.64**	**696 609 018.32**	**648 834 879.32**	**6.8%**	**734 350 000.00**	**13.2%**	**664 078 794.06**	**-9.6%**	**870 160 000.00**	**31.0%**	**1 207 640 000.00**	**38.8%**

VAR: Variation compared to the previous budget, based on 'planned needs'

(1) For 2017, the planned needs correspond to the revised estimates of F4E as of end of september 2017.

(2) For 2018, the draft budget corresponds to F4E request in January 2017 according to the previous edition of the MAP.

(3) For 2018, the planned needs correspond to the last revised estimates of F4E.

Table 20 . Expenditure in Commitment for 2016-2022

5.4.4 Expenditure in payment appropriations

EXPENDITURE In Payment Appropriations (EUR)	2016 Execution	2017		2018			2019		2020		2021		2022	
		second amendment	Planned needs (1)	Draft Budget (2)	Planned needs (3)	VAR 2018/17	Planned needs	VAR 2019/18	Planned needs	VAR 2020/19	Planned needs	VAR 2021/20	Planned needs	VAR 2022/21
Title 1 Staff Expenditure	**42 001 488.03**	**41 320 299.60**	**47 343 000.00**	**42 285 000.00**	**47 964 000.00**	**1.3%**	**49 597 000.00**	**3.4%**	**50 546 000.00**	**1.9%**	**51 491 000.00**	**1.9%**	**52 433 000.00**	**1.8%**
Salaries & allowances	35 790 533.28	35 799 999.60	40 100 000.00	36 600 000.00	42 138 000.00	5.1%	43 653 000.00	3.6%	44 482 000.00	1.9%	45 306 000.00	1.9%	46 124 000.00	1.8%
Of which establishment plan posts	*26 763 755.71*	*26 899 999.60*	*30 100 000.00*	*27 400 000.00*	*31 394 000.00*	*4.3%*	*32 268 000.00*	*2.8%*	*32 897 000.00*	*1.9%*	*33 521 000.00*	*1.9%*	*34 139 000.00*	*1.8%*
Of which external personnel	*9 026 777.57*	*8 900 000.00*	*10 000 000.00*	*9 200 000.00*	*10 744 000.00*	*7.4%*	*11 385 000.00*	*6.0%*	*11 585 000.00*	*1.8%*	*11 785 000.00*	*1.7%*	*11 985 000.00*	*1.7%*
Expenditure relating to Staff recruitment	1 167 537.28	720 300.00	1 000 000.00	670 000.00	1 137 000.00	13.7%	1 160 000.00	2.0%	1 183 000.00	2.0%	1 207 000.00	2.0%	1 231 000.00	2.0%
Mission expenses	2 245 153.35	2 000 000.00	3 000 000.00	2 100 000.00	1 400 000.00	-53.3%	1 428 000.00	2.0%	1 457 000.00	2.0%	1 486 000.00	2.0%	1 516 000.00	2.0%
Socio-medical infrastructure	310 108.58	412 000.00	364 500.00	420 000.00	372 000.00	2.1%	379 000.00	1.9%	387 000.00	2.1%	395 000.00	2.1%	403 000.00	2.0%
Training	705 764.12	820 000.00	815 000.00	880 000.00	831 000.00	2.0%	848 000.00	2.0%	865 000.00	2.0%	882 000.00	2.0%	900 000.00	2.0%
External Services														
Receptions, events and representation	10 000.00	10 000.00	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%	10 000.00	0.0%
Social welfare	48 385.00	40 000.00	50 737.00	41 300.00	52 000.00		53 200.00		54 500.00		55 700.00		56 900.00	
Other Staff related expenditure	1 724 006.42	1 518 000.00	2 002 763.00	1 563 700.00	2 024 000.00	1.1%	2 065 800.00	2.1%	2 107 500.00	2.0%	2 149 300.00	2.0%	2 192 100.00	2.0%
Title 2 Infrastructure and operating expenditure	**6 611 331.20**	**7 280 000.00**	**6 996 750.00**	**6 915 000.00**	**7 854 000.00**	**12.3%**	**8 113 000.00**	**3.3%**	**8 274 000.00**	**2.0%**	**8 439 000.00**	**2.0%**	**8 607 000.00**	**2.0%**
Rental of buildings and associated costs	1 375 000.00	1 459 000.00	1 340 000.00	1 360 000.00	1 653 000.00	23.4%	1 784 000.00	7.9%	1 815 000.00	1.7%	1 847 000.00	1.8%	1 879 000.00	1.7%
Information, communication technology and data proc.	2 817 566.00	2 859 000.00	2 859 000.00	2 920 000.00	3 500 000.00	22.4%	3 570 000.00	2.0%	3 641 000.00	2.0%	3 714 000.00	2.0%	3 788 000.00	2.0%
Movable property and associated costs	198 000.00	530 000.00	268 750.00	245 000.00	279 000.00	3.8%	284 000.00	1.8%	289 000.00	1.8%	294 000.00	1.7%	299 000.00	1.7%
Current administrative expenditure	1 282 965.32	1 354 000.00	1 354 000.00	1 345 000.00	1 384 000.00	2.2%	1 406 000.00	1.6%	1 428 000.00	1.6%	1 450 000.00	1.5%	1 472 000.00	1.5%
Postage / Telecommunications	390 000.00	387 000.00	405 000.00	400 000.00	425 000.00	4.9%	443 000.00	4.2%	462 000.00	4.3%	482 000.00	4.3%	503 000.00	4.4%
Meeting expenses	276 000.00	296 000.00	355 000.00	350 000.00	314 000.00	-11.5%	320 000.00	1.9%	326 000.00	1.9%	332 000.00	1.8%	339 000.00	2.1%
Running costs in connection with operational activities														
Information and publishing	19 956.93	20 000.00	28 000.00	15 000.00	29 000.00	3.6%	30 000.00	3.4%	31 000.00	3.3%	32 000.00	3.2%	33 000.00	3.1%
Studies														
Other infrastructure and operating expenditure	251 842.95	375 000.00	387 000.00	280 000.00	270 000.00	-30.2%	276 000.00	2.2%	282 000.00	2.2%	288 000.00	2.1%	294 000.00	2.1%
Title 3 Operational expenditure	**665 885 886.22**	**768 439 888.74**	**780 825 096.38**	**584 920 000.00**	**781 470 000.00**	**0.1%**	**730 000 000.00**	**-6.6%**	**725 601 045.78**	**-0.6%**	**725 000 000.00**	**-0.1%**	**777 980 000.00**	**7.3%**
ITER construction including site preparation	530 022 000.63	596 863 356.14	611 248 563.78	436 420 000.00	627 970 000.00	2.7%	566 400 000.00	-9.8%	560 841 045.78	-1.0%	579 300 000.00	3.3%	611 980 000.00	5.6%
Technology for ITER and DEMO	8 575 606.14	28 000 000.00	28 000 000.00	9 000 000.00	9 000 000.00	-67.9%	4 200 000.00	-53.3%	4 760 000.00	13.3%	3 400 000.00	-28.6%	7 100 000.00	108.8%
Technology for Broader approach	5 861 571.98	12 700 000.00	12 700 000.00	6 500 000.00	6 500 000.00	-48.8%	7 400 000.00	13.8%	7 000 000.00	-5.4%	12 300 000.00	75.7%	18 900 000.00	53.7%
Other Expenditure	2 299 628.78	5 000 000.00	3 000 000.00	3 000 000.00	8 000 000.00	166.7%	5 000 000.00	-37.5%	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	119 127 078.69	125 876 532.60	125 876 532.60	130 000 000.00	130 000 000.00	3.3%	147 000 000.00	13.1%	148 000 000.00	0.7%	125 000 000.00	-15.5%	135 000 000.00	8.0%
TOTAL BUDGET	**714 498 705.45**	**817 040 188.34**	**835 164 846.38**	**634 120 000.00**	**837 288 000.00**	**0.3%**	**787 710 000.00**	**-5.9%**	**784 421 045.78**	**-0.4%**	**784 930 000.00**	**0.1%**	**839 020 000.00**	**6.9%**
Reserve Fund	0.00	4 120 733.99	20 960 733.99		15 530 000.00	-	18 000 000.00	-	21 398 954.22	-	0.00	-	13 020 000.00	-
TOTAL EXPENDITURE	**714 498 705.45**	**821 160 922.33**	**856 125 580.37**	**634 120 000.00**	**852 818 000.00**	**-0.4%**	**805 710 000.00**	**-5.5%**	**805 820 000.00**	**0.0%**	**784 930 000.00**	**-2.6%**	**852 040 000.00**	**8.5%**

VAR: Variation compared to the previous budget, based on 'planned needs'

(1) For 2017, the planned needs correspond to the revised estimates of F4E

(2) For 2018, the draft budget corresponds to F4E request in January 2018 according to the previous edition of the MAP.

(3) For 2018, the planned needs correspond to the last revised estimates of F4E.

Table 21 . Expenditure in Payment for 2016-2022

5.4.5 Information on previous outturn

The outturn is 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	2014	2015	2016
Revenue actually received (+)	550 569 824.09	526 207 476.99	724 418 966.10
Payments made (-)	502 620 822.79	520 107 959.73	710 869 498.62
Carry-over of appropriations (-)	37 684 370.53	5 932 046.73	8 843 632.49
Cancellation of appropriations carried over (+)	1 024 717.48	925 783.04	1 202 662.37
Adjustment for carry over of assigned revenue appropriations from previous year (+)			
Exchange rate differences (+/-)	- 22 130.70	- 19 985.83	- 27 076.85
Adjustment for negative balance from previous year (-)	17 021 674.33		
Total	**28 288 891.88**	**1 073 267.74**	**5 881 420.51**

Table 22 . 2014, 2015 and 2016 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 2016 outturn:

- There were no carry over in payment appropriation from 2016 to 2017, beyond the automatic cases for assigned revenue and non-dissociated appropriations.
- Unused carried-over non dissociated appropriations (administrative expenditure) from 2016 was cancelled at the end of 2016 and included in the budget outturn.

5.4.6 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 2017, this service in-kind amounts to EUR 3 million.

5.5 Human Resources – Outlook for 2018 – 2022

5.5.1 Strategic perspective

Section 4.3.1.3 of the document already featured the wider strategic objectives in the area of human resources. The key change initiatives currently on-going and leading to the former objectives include:

- Review of the selection and recruitment processes and reducing of the time to hire;
- Review of the F4E contract policy;
- Development of an HR metrics and reporting system;
- Better alignment of learning and development initiatives with strategic priorities;
- Establishment of a career management and competency framework;
- Enhancement of performance management and corresponding link with corporate performance;

Taken together these improvement initiatives are also expected to help promulgate a stronger corporate culture while at the same time be beneficial for the engagement levels of staff.

5.5.2 Staff population overview

Staff population and its evolution, overview of all categories of staff

Staff population (1)		Actually filled as of 31.12.2015	Authorised under 2016 EU budget (2)	Actually filled as of 31.12.2016 (3)	Authorised under 2017 EU budget	Requested for 2018 (9)	Envisaged in 2019	Envisaged in 2020	Envisaged in 2021	Envisaged in 2022 (8)
Officials	AD	37	40	37	39	39	39	39	39	39
	AST	15	15	15	12	12	12	12	12	12
	AST/SC	-	-		-					
TA	AD	174	201	183	205	204	204	204	204	204
	AST	26	27	27	27	28	28	28	28	28
	AST/SC	-	-	-	-	-	-	-	-	
Sub Total[4] Establishment Plan		**252**	**283**	**262**	**283**	**283**	**283**	**283**	**283**	**283**
CA GFIV		98	106	100	107	107	107	107	107	107
CA GF III		49	50	48	50	50	55	55	55	55
CA GF II		20	24	19	24	24	19	19	19	19
CA GFI										
Sub Total CA[5]		**167**	**180**	**167**	**181**	**181**	**181**	**181**	**181**	**181**
SNE		2	4	2	3	3	3	3	3	3
TOTAL		**421**	**467**	**431**	**467**	**467**	**467**	**467**	**467**	**467**
Structural service providers (6)		7		18.33	23	tbd	tbd	tbd	tbd	tbd
External staff for occasional replacement (7)		15.8		12.83	16	16	16	16	16	16

[1] All F4E staff is EU-Financed.

[2] As authorised for officials and temporary agents (TA) and as estimated for contract agents (CA) and seconded national experts (SNE).

[3] Of which 5 sent (and accepted) Temporary Agent offer letters, and 9 sent (and accepted) Contract Agent offer letters.

[4] Headcounts.

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

[6] Filled in and envisaged FTE. Service providers are contracted by a private company selected through framework contracts /specific task orders. They have individual contracts with F4E .They carry out specialised outsourced tasks of horizontal/support nature, for instance in the area of information technology.

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

[8] The 2021 and 2022 forecasts are purely indicative, considering that there is no budget assigned yet to F4E beyond the MFF 14-20.

(9) Conversion of 1 TA AD6 into 1 TA AST3.

Table 23 . Overview of staff population and its evolution

5.5.3 Multiannual staff policy plan

Multi-annual staff policy Plan 2016-2022

Category and grade	2016 Budget				2017 Budget		2018 Draft Budget		Forecast 2019		Forecast 2020		Forecast 2021		Forecast 2022	
	Authorised Establishment plan		Filled as of 31/12/2016		Authorised Establishment plan		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
AD 16																
AD 15		1				1		1		1		1		1		1
AD 14	1			1	1		3	1	5	2	7	3	9	5	11	7
AD 13	14	5	8	3	13	6	14	7	14	9	14	11	14	12	14	14
AD 12	16	8	9	1	17	13	15	17	14	19	13	21	12	24	10	26
AD 11	5	19	6	15	5	21	4	21	3	22	2	24	1	26	1	28
AD 10	3	27	2	22		25		26		29		32	0	34		36
AD 9	1	20	1	30		29		35	1	39		41	1	42	1	41
AD 8		34	8	43	1	40	1	40		37	1	33	0	27	1	22
AD 7		47	2	32		37		28		21	1	15	1	11		8
AD 6		40		36		33	1	28	1	25	1	23	1	22	1	21
AD 5			1		2		1		1				0			
Total AD	**40**	**201**	**37**	**183**	**39**	**205**	**39**	**204**	**39**	**204**	**39**	**204**	**39**	**204**	**39**	**204**
AST 11	3				4		4		4		5		5		6	
AST 10	3		1		2		2		2		1		1			
AST 9	3		1		3		3		4		4		5		5	1
AST 8	1		2		1		2	1	1	1	1	2	1	3	1	4
AST 7	3		2		2	1	1	1	1	3	1	4		6		6
AST 6	1	3	3	1		5		8		9		10		9		9
AST 5	1	13	0	9		14		12		11		9		8		6
AST 4		11	3	7		7		5		3		2		1		1
AST 3			1	10				1		1		1		1		1
AST 2			2													
AST 1																
Total AST	**15**	**27**	**15**	**27**	**12**	**27**	**12**	**28**	**12**	**28**	**12**	**28**	**12**	**28**	**12**	**28**
Tot	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
TOTAL	**55**	**228**	**52**	**210**	**51**	**232**	**51**	**232**	**51**	**232**	**51**	**232**	**51**	**232**	**51**	**232**

[1] Conversion of TA AD6 into TA AST3

Notes:

- The requested posts for 2018 and the forecasts in 2019, 2020, 2021 and 2022 are calculated according to the promotions slots percentages of Annex I of the Staff Regulations. The excess of TA AD 14 posts over the posts needed for the F4E Director will be used in lower category slots.
- 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 and 2022 forecasts are purely indicative, considering that there is no budget assigned yet to F4E beyond the MFF 14-20.

Table 24 . Multi-annual staff policy Plan 2016-2022

5.5.4 Recruitment policy

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

All F4E recruitments are consistent with article 53 of the CEOS for Temporary Agents and article 80 of CEOS for Contract Agents, as well as their Model Decision on the engagement and use of Temporary staff under article 2.f.

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:

- FGII, who are in charge of clerical and secretarial tasks
- FGIII, who are in charge of administrative and financial 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 is 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 in 2016. Under this agreement the contract offered was for a single three year 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 in 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.

This portfolio of different contract and employment types and the need to safeguard the long term skill requirements of the project, underpin an on-going review of the F4E contract policy. The revised policy is anticipated in September 2017 and will clarify F4E's position in respect of a number of questions such as: are the 5+5+indefinite and 3+4+indefinite models adequate for TAs and CAs, respectively? What part of the workforce should become indefinite? Should F4E maintain the current policy of phasing out FO employments? How can F4E ensure adequate flexibility to efficiently match the supply and demand for project skills? How much discrimination is appropriate in the responsibilities assigned to different employment types? And how much reliance is needed on insourced external expertise?

5.5.5 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 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[16]. 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 as 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. The increased reliance on social media is part of a sourcing strategy emphasizing a more tailored approach to filling vacancies. As such, F4E is increasingly trying to reach skilled candidates that are not necessarily looking for new employments or who would not typically be exposed to EU employment opportunities. The selection process is one of several on-going F4E improvement initiatives being implemented. As part of this work, it is envisaged that the time to hire will be reduced by circa 30%.

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 1 – AST 4 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[17].
- AD14 for the F4E Director.

5.5.6 Performance management

Staff performance is assessed annually based on an F4E-wide performance appraisal. The latter serves the purposes of improving individual staff performance by establishing and subsequently

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

[17] 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).

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 career development and training objectives addressing agreed areas of improvement and career aspirations. 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, ability 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 ahead, and in keeping with its project nature, F4E further optimise the annual performance appraisal system to increase the effectiveness of the matrix structure. One 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 2018 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, 2018 will also see the definition 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. These are major steps forward in optimizing performance management, however F4E will continue to hone the system in the subsequent years.
Other information on Advancement, Reclassification and balances are provided in ANNEX VII.

5.5.7 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 enrolment for their dependent children. The agreements also provide a framework for the direct settlement of school fees by the Agency. The number of international schools making up the F4E schooling offer has gradually grown over the years and is currently a prominent part of F4E's employee value proposition. In addition, F4E continues to be involved in the governance of the International School of Manosque where it is part of the international Advisory Council and where it strives to uphold the interests of its staff with dependent children in that establishment. While, F4E does not currently envisage any further actions at this time, it will endeavor to maintain its appeal in this domain for both existing and prospective staff members.
Taken together, 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.	Lycée Français de Barcelona
6.	Saint Paul's School
7.	Istituto Statale Italiano Comprensivo
8.	St. Peter's School
9.	Escoles Pérez Iborra
10.	The British School
11.	Scuola Materna Montessori
12.	École Ferdinand de Lesseps
13.	Kensington School
14.	Col.legi Paideia
15.	Swiss School
16.	Highlands School
17.	École Bel Air Sitges
18.	Benjamin Franklin
19.	Agora Sant Cugat
20.	Escoles Betlem
21.	La Miranda
22.	Bon Soleil
23.	Santa Clara International School
24.	Fundación Akua
25.	Sainte Victoire International School (SVIS) - Cadarache
26.	CIPEC - Cadarache
27.	IBS - Cadarache
28.	EPIM - Cadarache

Table 25 . Service Level Agreements with international schools

5.5.8 Staff mobility

1. Internal mobility

Increased career mobility consistently features as the foremost concern of staff. In recognition of this wish, the agency adopted an internal mobility policy in June 2015 foreseeing that all vacancies are subject to internal selections prior to opening them 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. As part of this endeavor F4E will seek to progressively 'flatten' its structure and reduce the number of vertical levels currently in place. In parallel F4E will increase the number of clearly visible project manager roles thereby creating more attractive internal development paths.

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.

5.6 Other information

5.6.1 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)	Rent paid by Spain
Type and duration of rental contract	N/A
Host country grant or support	Rent paid by Spain
Present value of the building	N/A

Table 26 . F4E building

In accordance with the 2007 Host Agreement, Spain (Host State) shall provide permanent premises in Barcelona. After several suggestions for a new building, the Spanish Ministry offered in April 2016 to fix F4E's permanent premises at its current location, which was deemed to be of temporary nature only. This offer consisted of a long-term lease agreement until 2042 for the current premises and an extension of approximately 1 000m2 of additional space[18]. A small cafeteria for staff is planned at the ground floor. The offer also included that Spain will cover the costs of the refurbishment works of this additional space. In May 2016, the long term agreement was signed by the Spain, the building owner, and F4E.

In 2018, the expenditure for the refurbishment of the additional space is foreseen at an estimated cost of EUR 1.3 million plus an annually recurrent expenditure for this additional space and the running of the Cafeteria. This expenditure does also foresee a possibility to allow for a measured subsidy in case this would be needed to keep a competitive price level for the meals. Spain and the building owner have already committed themselves for an amount of EUR 1.3 million for the refurbishment of the ground floor and one standard floor of the additionally rented space.

Following a decision taken by the GB, discussions with the Host State will be held concerning the associated refurbishment costs for all the other floors of the building. The multi-annual planning will then be up-dated accordingly.

5.6.2 Privileges and immunities

Joint undertaking privileges	Protocol of privileges and immunities (PPI) / 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)

[18] Works will be carried out in 2018. Early 2019 it will be available for offices/meeting rooms/main reception and canteen.

	- No privilege granted regarding education/day care

Table 27 . Privileges and Immunities

5.6.3 Evaluations, Internal monitoring and Assessment

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 fulfillment 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 organization and ITER Project, the progress related to the fulfillment 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.

The first of these assessments by Deloitte Touche Tohmatsu was forwarded to the Council in September 2012. A second assessment, also by Deloitte Touche Tohmatsu, was forwarded to the Council in October 2013.

Three independent experts working under the supervision of the GB Chair with the assistance of Commission have prepared the third annual assessment. 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 was 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 1st and 2nd December 2015. The GB welcomed the overall positive assessment, and in particular the actions taken in response of the previous year´s assessment. The fifth annual assessment has been prepared by independent experts working under the supervision of the GB Chair. The GB discussed the assessment at its meeting on 1st and 2nd December 2016 and welcomed the overall positive assessment, in particular the outcome that F4E`s new management is considered to be performing well. The GB requested the assessment team to extract a list of recommendations that would result in a list of actions to be proposed by the Bureau. The GB also agreed that the governance of F4E needs to be revised in order to simplify it and make it

more efficient and requested the Chair to make a proposal for actions in this direction to aim at adopting a proposal at the June 2017 GB.
The sixth annual assessment is in progress. Three independent experts work under the supervision of the GB Chair.

5.6.4 Organization chart (2017)

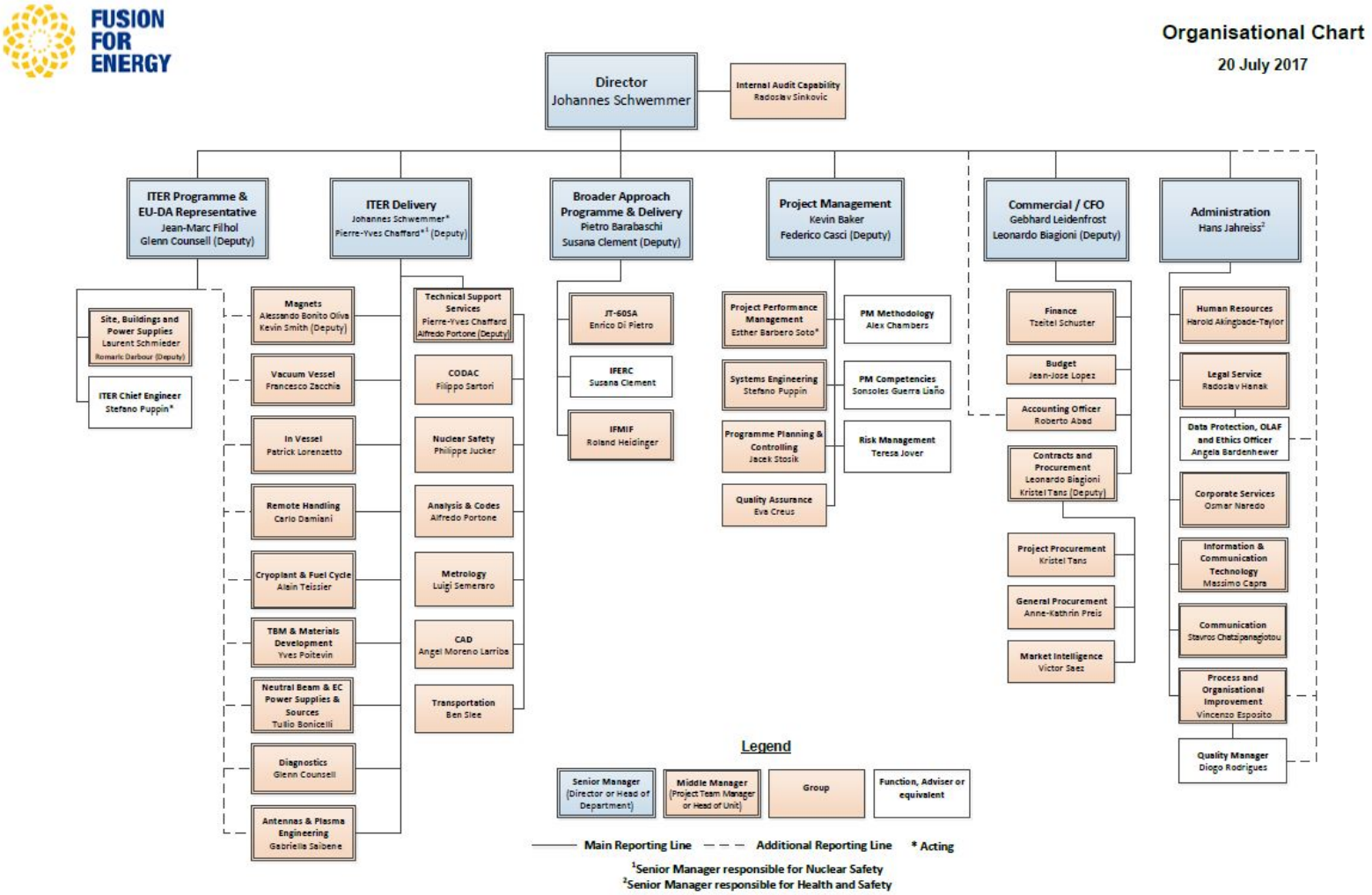

Figure 12 . Organization chart (2017)

Section III. Work Programme Year 2018

6 Annual Programme

6.1 Executive summary for the annual Work Programme 2018

This Work Programme 2018 (WP18) offers an overview of the objectives of the European Joint Undertaking for ITER and the Development of Fusion Energy (F4E) for 2018 and also identifies the financial decisions for the actions that are planned to be carried out in 2018 with the available budget.
It covers the work on both ITER and Broader Approach (BA) according to the tasks entrusted to the organization.
Concerning 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 ITER Organization (IO) 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 by F4E in early 2016 and the outcome of the 19th meeting of the ITER Council (IC-19) in November 2016 have both focused F4E and IO on prioritising resources for the activities required to achieve First Plasma (FP) in 2025; accomplished by slowing down other projects until after 2020. A suitable scenario was selected for the other, non-FP systems, in order to minimize delays to the later machine phases and minimize costs associated with the slowdown. SR2FP has led to significant changes in the planning of non-FP systems and to a staged approach of the project.
The 2018 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.
2018 is mostly focused on the following activities (FP-relevant areas are shown):

- Magnets (FP): All major contracts have been signed. For the pre-compression rings the series production will start along two different manufacturing routes. Additional contracts will be placed for testing and for inspection services of qualification and follow-up of manufacturing activities for both Toroidal Field Coils and Poloidal Field Coils.
- Main Vacuum Vessel (FP): Inspectors task orders will be placed according to the need of the various manufacturing locations. In addition, specific contracts will be executed for design analysis, in support of design changes generated by non-conformities or Deviation Requests.
- Blanket System (non-FP): High heat flux (HHF) testing will be performed on the first blanket First Wall (FW) Full Scale Prototype. Three contracts will be placed with each of the potential blanket FW suppliers in view of developing designs of all the main and minor variants and preparing the industrial organization for the series production. If needed, F4E will investigate and validate via analysis, further changes to be included in the final design of the FW panels. Further HHF testing activities are planned in order to qualify either new material grades e.g. for beryllium or new design solutions to demonstrate they fulfill the manufacturing requirements.
- Divertor (non-FP): for the divertor inner vertical target (IVT), the main activities will be devoted to the follow-up of the on-going manufacture of full-scale prototypes. For the divertor cassette, the main activities will concern the award of Stage I of the contract for the series production of the cassette bodies. All manufacturing activities will need the support of inspectors through the on-going framework contract.

- Remote Handling (partly FP): The procurement of the Remote Handling Systems (RHS) will mainly focus on the continuation of preliminary design activities and starting, in some areas, the final design activities. For all systems tasks will be mainly performed through 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.
- Vacuum Pumping (Partly FP): The pre-production cryopump will be tested with a view to holding the Final Design Review of the torus and cryostat cryopumps in 2018 and allow signature of the Procurement Arrangement for the torus and cryostat by the end of 2018. Manufacturing of the MITICA Cryopump will begin. The first two contracts for the Front End Cryopump Distribution System will be awarded in 2018. The Procurement Arrangement for Primary Leak Detection and Localisation will be signed mid-2018, and then the corresponding call for tender will be prepared.
- Fuel Cycle (non-FP): The Water Detritiation System holding and feeding tanks will be delivered to Cadarache in the course of 2018 in order to be installed in the tritium plant building.
- Cryoplant (FP): The installation of the LN2 Plant and Auxiliary Systems will start in the Cryoplant building. The last contracts for installation and test will be placed.
- RF Heating & Current-Drive (partly FP): During 2018, specific contracts will be signed for additional final design work on the Electron Cyclotron (EC) Upper Launcher (e.g. for cooling systems), for testing of prototypes and for associated analyses. Contracts for manufacturing of window and valve prototypes will be signed, as will contracts and task orders supporting final design of EC Control System. As for the Ion Cyclotron Heating (ICH) antenna, final design, analysis and verification work will continue in 2018 by means of specific contracts and additional support contracts as necessary. Contracts will be signed for R&D on RF Windows, such as testing specific aspects of the window joints and development of critical technologies for the RVTL. Finally, regarding the EC Power Supplies, the 2nd set of MHVPS & BPS required for the first plasma will be assembled, and the manufacturing of the 3rd set will be started.
- Neutral Beam Heating and Current Drive (non-FP): specific contracts for NBTF instrumentation & control, assembly and diagnostics will be signed. At the end of 2018 it is planned to sign with RFX the NBTF Agreement 2019 mainly to cover R&D, modeling and physics activities, project integration, provision of NBTF Host services and support to F4E in the follow-up of procurements contract related to the exploitation of SPIDER and construction and preparation for exploitation of MITICA. Options for procuring the Ion Source Extraction PS (ISEPS) for the ITER NBIs will be released.
- Diagnostics (partly FP): Procurement procedures for manufacturing of several Diagnostic components and systems essential for First Plasma will be signed during 2018. Further design and prototyping (if needed) will continue during 2018 mainly in the form of specific grants under running Framework Partnership Agreements (FPAs), as well as design activities on the diagnostic systems needed after First Plasma. A contract will be signed for design and manufacture of the core-plasma Thomson scattering system, completing the portfolio of all EU Diagnostics major systems. Signature of all remaining Procurement Arrangements will be completed in 2018. A significant number of contracts for engineering analysis, manufacturing and testing of prototypes and production of manufacturing specifications will be signed to support the design of Diagnostics systems.
- Test Blanket Systems (TBM – non-FP): A Framework Contract (FwC) concerning radioactive waste management will be signed in 2018 and calls for tenders will be launched for three FwCs concerning the development of the Preliminary Design of the TBM Sets, of the Ancillary Systems and of the related analysis of accident scenarios. In addition development of

preliminary welding procedures will continue with the signature of a Specific Contract focused on the TBM Box Manifold Area.

- Site, Buildings and Power supply: work is in progress on the site on both the electrical power supplies and the buildings through the existing contracts. The first part of the Electrical Power Supply and Distribution will be completed and the design of the Emergency Power Supply Distribution buildings and equipment will start after signature of the TB13 contract covering B44/45 (Emergency Power Supply Buildings) and B46/47 (Medium Voltage Distribution Buildings).

  The Tokamak Central Pit will be delivered for use to IO. Installation of the Building Services will continue in the Auxiliary Buildings before granting access to IO (Ready For Equipment (RFE) Milestones). The TB12 contract will be signed covering B34 (NB Power Supply Building), B37 (NB high Voltage Power Supply Building), B71 (Control building – non Safety relevant [PIC] part), B75 (Fast Discharge Reactor Building). Specific contracts will be signed under ongoing framework services support contracts and under a new framework contract for procurement of services and works in support to the main activities. Changes and exercise of options to the ongoing services and construction contracts in relation with Project Changes Requests (PCRs), input data delays, and re-allocation of scope between contracts will be implemented through amendments to the ongoing contracts.

Concerning 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. 2018 is mostly focused on the following activities:

- Satellite Tokamak (JT-60SA): In 2018, the remaining share of EU contribution will be delivered to the JT-60SA site. The actions will focus on the completion of fabrication, testing, transportation and on-site installation done either by Voluntary Contributors (VC) or F4E. The activities under the responsibility of F4E are carried out through task orders of existing/new framework contracts or existing/new supply and service contracts. Cash contribution will be made to the Common Fund for integration and commissioning activities. Reimbursements are also reserved for possible compensation and transport costs to EU VCs according to the provisions of the respective Agreement of Collaborations.
- IFMIF/EVEDA: In 2018 the LIPAc (Linear IFMIF Prototype Accelerator) operation is planned to be validated in short pulses (up to 5 MeV), which constitutes completion of the first two phases of commissioning. Additional contracts will have to be placed for services and hardware to support the SRF Linac assembly, and subsequently to support the continuing installation and commissioning activities. F4E will be continuously 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 two activities, DEMO design and R&D activities, and REC (Remote experimentation Centre). The REC activities are mostly under the financial responsibility of F4E, and are performed under F4E contracts or agreements of collaboration with EUROfusion, to provide software and services. Integrated tests (participation in the operation of a European Tokamak from Rokkasho) will take place in 2018.

6.2 Introduction to the Annual Work Programme 2018[19]

The 2018 Work Programme takes into account to the extent possible the EU Commission guidelines for the Programming document as requested by the Financial Regulation. It comprises a general overview of the procurement activities that will be committed during 2018, detailed objectives, expected results and target for each WP Action (see 6.2.2). The main information due to be presented according to the provided Commission guideline are explained and detailed in par.6.2.2.

6.2.1 Main assumptions

The following assumptions are considered as the basis of the Work Programme 2018:

- The F4E schedule used for the preparation of this document is the one submitted to IO at the end of June 2017.
- 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, taking into account the agreed fabrication routes and showing the real development of the work.
    - 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, taking 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 input 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 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.
- 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 Framework Partnership Agreements (FPA), in order to streamline and channel R&D funding, improve its effectiveness and decrease the administrative burden to beneficiaries and F4E alike.
- Procurements which require a very close coordination between F4E and other entities will be implemented, whenever appropriate, through the Joint Procurement procedure.

[19] To be noticed that, as this part of the document is focused on a specific year, its content is totally different compared to the Work programme of the previous year. Only few tasks, delayed from the previous year to this year, will be the same.

- All the activities described in the overview of each Action and the list of contracts in ANNEX VIII is 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 is provisional and depends on the authorization of changes given by IO Director General as Chair of the ITER Executive Project Board (EPB).
- Regarding the WP2018 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.
- The Art. 5 of the F4E Statutes 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 II.

6.2.2 Definitions and supporting information

1. "Action" for the purposes of Work Programme means “a coherent area of action with objectives and resources”. The list of the Actions and their definition is available in Table 1.
2. Each Action of WP2018 comprises:
   (a) General overview that covers the scope of the procurements/grants and cash expenditures foreseen to be financed under the budget 2018. Furthermore, it includes (even if not explicitly mentioned):
      i. Provisions for 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[20]. These tasks will be mainly implemented through specific contracts under existing framework contracts.
      ii. Provisions 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. Provisions for amendments to ongoing contracts covered by a previous financing decision(s) in accordance with the Implementing Rules.
   (b) Annual objectives defined as the achievement on time of the following milestones:
      i. ITER Council/Governing Board (IC/GB) milestones in 2018 – see 4.2.2 (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. Key milestones marking significant schedule progress (only in the event that none of the above are applicable).
      iv. Link with the ITER Project multi-annual objectives (defined as the whole set of IC/GB milestones): when a WP annual objective is a predecessor of a multi-annual objective (IC/GB milestones), it is clearly identified to which milestone is linked in the column “type of milestone”.
   (c) The expected results define the main outcomes of the Actions.

[20] 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

(d) The target is defined, when applicable, as the cumulative CAS foreseen to be achieved by the end of 2018 per PA (PAs associated with each Action are listed in Table 1). The value is according to the CAS profile proposed by F4E to IO and implemented in the F4E DWS. Some of these values are still under negotiation with IO.

(e) Human resources (see ANNEX X). The table shows an indicative estimate of the Full Time Equivalent (FTE) staff assigned to the specific Action to cover all the activities carried out during 2018. Per each Action it is identified the "core" team, which is directly involved in the technical tasks (291 FTEs) while staff from the Commercial Dept., Admin. Dept. and Office of the Director is allocated pro-rata per Action, depending on the size of the core team. In particular, while the Commercial department (76 FTEs) and the Legal Unit (19 FTEs) will provide support on procurement-related topics (i.e. signature of operational contracts and their follow-up for claims, amendments, payments, etc.), the rest of the Administration Dept. and the Director office (81 FTEs) will perform tasks of a more administrative nature.

(f) Procurement plan:

i. Main Procurement Initiatives (see ANNEX VIII): these are, per Action, the list of the foreseen contracts with value higher than 135,000 Euros[21]. Amendments, claims, reimbursement, indexation, late interest and budget reserve are grouped together due to the sensitivity of this information. The list is based on the current information at the time of writing the Work Programme. 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 WP2018. Contracts that do not fulfill the Work Programme scope identified for each Action are not covered by this financial decision and therefore will not be authorized. 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 2018 within the limit of the flexibility rule.

ii. Value per Action: ANNEX VI presents an indicative value of financial resources corresponding to each Action. F4E has evaluated the level of commitments planned for the Actions in 2018 by taking into account the progress of the project and the available manpower. A good implementation of the annual commitment is one of the objectives for F4E (see par.4.2.5). Any additional budget required and exceeding the currently available one will consist of unused appropriations adjusted to match the final needs.

iii. Indicative timeframe for launching the procurement and type of procedure/contract: the foreseen time of publication of calls and type of contracts is shown in ANNEX III. The 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 as no formal publication will take place (the signature date is used to give anyway an indication of time). 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).

iv. The plan may cover some activities moved from previous years into WP2018 due to changes in the overall planning and priorities.

[21] The threshold has been selected so to be in line with the FR.

v. The plan does not (and cannot) include the consequences for the Action of PCRs and deviations approved by the IO Director General or his delegates in the frame of Reserve Fund Management Plan. As a result, these will be implemented under the budget line 3.6. For information, 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.
vi. Grants and specific Grants are clearly identified and information is provided to fulfill art.58 of the Financial Regulation (see ANNEX IX).
vii. 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.

3. 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 the financing decision will does not change significantly from one year to the next.

6.2.3 Objectives and Key performance Indicators

The objectives for the WP are:

Technical: F4E defines as its technical objectives the achievement on time of the selected milestones (see definition in par. 6.2.2). The technical objectives are provided in each Action (see par. 6.3).

Non-technical: F4E defines as its non-technical objective the implementation of the budget allocated to each Action (see ANNEX VI). As this definition is applicable to all the Actions, this objective is not repeated in the description of each Action.

The KPI for technical objectives is the variance (as defined in par. 4.2.6Equation 1: Variance) while the KPI for the budget is the annual commitment (as defined in Equation 3: Annual commitment).

6.3 Actions

6.3.1 Action 1. Magnets

Action 1	Magnets

Overview

Pre-compression rings and conductors
Series production of the pre-compression rings is foreseen to start in 2018 in two different manufacturing routes. In addition, the contracts to provide inspection services during manufacturing will continue. Expert contracts are also foreseen to be signed.
Whilst manufacture of the Toroidal Field (TF) and Poloidal Field (PF) conductors is expected to be complete in 2017, there will be a final TF strand characterization activity, executed through a specific contract, at the beginning of 2018.

Toroidal Field Coils
All major contracts for production of TF Coils have been signed and are well in progress.

During 2018 the manufacturing of TF Winding Packs will continue. The contract for insertion of the first WP into the TF coil case will enter the manufacturing stage as long as the TF coil case from JADA is delivered by November 2017. Expert contracts are also foreseen to be signed and inspection services will be renewed.

Poloidal Field Coils
All major contracts for the Poloidal Field Coils have been signed. By 2018, all remaining tooling will be delivered on-site. The series manufacturing of Double Pancake assemblies (DP) will continue through 2018 in Cadarache and impregnation of the Winding Packs (WP) will be completed by ASIPP in China. Specific contracts for further tests and a further contract for inspection services will be signed in 2018 to follow up the manufacturing activities for the project.

ANNUAL OBJECTIVES

Milestone ID/	Scope Description	Forecast achievement date	Type of milestone	PA
EU11.3B.527810	PF Coil: EU PF 5 coil ready for cold test	Q3 2018	IC42/GB12	1.1.P3A-B.EU.01
EU11.1A.22822	Completion of TF-EU01 WP Insertion	Q2-Q4 2018[22]	Predecessor of IC53/GB15	1.1.P1A.EU.01
EU11.3B.536460	Vacuum Pressure Impregnation of PF6 Winding Pack (including tests) finished	Q3 2018	Predecessor of IC54/GB14	1.1.P3A-B.EU.01

EXPECTED RESULTS AND TARGET

The expected results for this Action are:
1. Five TF Winding Packs completed.
2. Manufacturing of at least one Pre-compression ring with each technology.
3. All Magnets-related tooling commissioned except the cryostat for PF3 and PF4.

The target per PA for 2018 is the achievement of the following cumulative value of credit (in kIUA):

PA 1.1.P1A.EU.01 Procurement of Toroidal Field Magnets	51.4
PA 1.1.P2A.EU.01 Pre Compression Rings	0.45

[22] The range in the Forecast achievement date is due to the likely impact from the IO integrated schedule.

PA 1.1.P3A-B.EU.01 Poloidal Field Magnets 2,3,4,5,6	20.62
PA 1.1.P6A.EU.01 Toroidal Field Conductors	43.39
PA 1.1.P6C.EU.01 Poloidal Field Conductors	11.22879982

6.3.2 Action 2. Vacuum Vessel

Action 2	Vacuum Vessel

Overview

In 2017 new manufacturing capacity has been made available to the VV project with the increase in the subcontracting for the manufacturing of the PS2 and PS4, electron beam welding and VV ports. Full ramp-up is expected to be achieved by the end of 2017 and in 2018 all the sectors will have fully entered the manufacturing phase, with manufacturing design completed, all material delivery to workshop achieved and all 20 poloidal segments being in production in the different manufacturing sites.
Inspectors' contracts will be placed according to the need of the various manufacturing locations. In addition, design tasks may be required in support of design changes generated by nonconformities or Deviation Requests. Other provisions as legal support or project management support may be requested for the follow-up of the main vacuum vessel contract.

ANNUAL OBJECTIVES

Milestone ID	Scope Description	Forecast achievement date	Type of milestone	PA
EU15.1A.06660	Sector 5 PS2 Central Global Segment Subassembly – closure of CP 132	Q4 2018	Predecessor of IC58/GB16	EU.01.15.01
EU15.1A.06680	Sector 9 PS4 First Segment Subassembly – closure of CP 9	Q4 2018	Predecessor of GB25	EU.01.15.01

EXPECTED RESULTS AND TARGET

The expected results for this Action are:
1. Completion of the Sector 5 PS2 Central Global Segment Subassembly – closure of CP 132
2. Completion of Sector 9 PS4 First Segment Subassembly – closure of CP 9

The target per PA for 2018 is the achievement of the following cumulative value of credit (in kIUA):

PA 1.5.P1A.EU.01 Vacuum Vessel - Main Vessel	71.14

6.3.3 Action 3. In Vessel – Blanket

Action 3	In Vessel - Blanket

Overview

The overall procurement consists in the supply of 215 panels of the Blanket First Wall.
In 2018 the manufacturing of the first blanket First Wall (FW) Full Scale Prototype is planned to be completed. This component will then be high heat flux (HHF) tested in the frame of the corresponding Task Order of contract OPE-319. Further HHF testing activities are planned in order to qualify either new material grades or new design solutions. In parallel to the launch of the call for tender for the series production, contracts will be placed with each of the potential blanket FW suppliers in view of developing the manufacturing design of all the main and minor variants, with the target to maximize the adoption of automation and preparing the industrial organization for the series production. A side activity is foreseen to start in 2018 in relation to the development of a technique that would allow to repair FW panels in case of defects detected in the Be/copper alloy interface during manufacture or during operation. In view of assessing potential benefits in terms of cost and time, a contract will be placed for the manufacturing of FW beam by additive manufacturing. The irradiation of material specimens produced via this technology is subject of a TO. Provisions have been made for inspectors and resources via insourcing.
Regarding the Blanket Cooling Manifolds, activities will be ongoing regarding the manufacturing and testing of a complementary Blanket Cooling Manifolds (BCM) support design in view of addressing questions regarding the readiness of the manifold support design. The BCM Procurement Arrangement is foreseen to be signed in the last quarter of 2018.

ANNUAL OBJECTIVES

Milestone ID	Scope Description	Forecast achievement date	Type of milestone	PA
EU.16.01.20870	Delivery of the first Blanket First Wall full scale prototype to the high heat flux testing facility	Q2 2018	Predecessor of GB 37	N/A

EXPECTED RESULTS AND TARGET

The expected results for this Action are:
1. Signature of PA 1.5.P1A.EU.02 Blanket Cooling Manifolds
2. Final Non Destructive Examination of the Full Scale Prototype (OPE-443 Lot 1)
3. Call publication for the procurement of the NHF First Wall Panels
4. End of the manufacturing of Cassette Body Prototype (OMF-444 Lot 1)
5. End of the manufacturing of Cassette Body Prototype (OMF-444 Lot 3)
6. Completion of the fabrication of IVT prototype test assembly (OPE-138 Lot 1)

The target per PA for 2018 is the achievement of the following cumulative value of credit (in kIUA):

PA 1.5.P1A.EU.02 Blanket Manifolds	0.2
PA 1.6.P1A.EU.01 Blanket First Wall	1.8

6.3.4 Action 4. In Vessel – Divertor

Action 4	In Vessel – Divertor

Overview

For the divertor inner vertical target (IVT), the main activities for 2018 will be devoted to the follow-up of the on-going manufacture of 4 full-scale prototypes for the pre-qualification of manufacturers before start of series production. For the divertor cassette body, the main activities will concern the completion of the on-going manufacture of 2 full-scale prototypes and the award of Stage I of the contract for the series production following the reopening of competition between the companies which will have successfully completed their full scale prototype. All the above manufacturing activities will need the support of inspectors and additional resources taken in the frame of the on-going framework contracts.

ANNUAL OBJECTIVES

Milestone ID	Scope Description	Forecast achievement date	Type of milestone	
EU.17.2B.010733	Delivery of the first all-tungsten prototype test assembly of the Divertor Inner Vertical Target to the RF test facility	Q3 2018	GB20	1.7.P2B.EU.01
EU.17.01.100050	Contract signed for the Cassette Body series production	Q2 2018	Predecessor of GB 38	1.7.P1.EU.01

EXPECTED RESULTS AND TARGET

The expected results for this Action are:
1. Signature of PA 1.5.P1A.EU.02 Blanket Cooling Manifolds
2. Final Non Destructive Examination of the Full Scale Prototype (OPE-443 Lot 1)
3. Call publication for the procurement of the NHF First Wall Panels
4. End of the manufacturing of Cassette Body Prototype (OMF-444 Lot 1)
5. End of the manufacturing of Cassette Body Prototype (OMF-444 Lot 3)
6. Completion of the fabrication of IVT prototype test assembly (OPE-138 Lot 1)

The target per PA for 2018 is the achievement of the following cumulative value of credit (in kIUA):

PA 1.7.P1.EU.01 Cassette Body and Assembly	0.24
PA 1.7.P2B.EU.01 Inner Vertical Target	2.1
PA 1.7.P2E.EU.01 Divertor Toroidal and Radial Rails	0

6.3.5 Action 5. Remote Handling

Action 5	Remote Handling

Overview

The procurement of the Remote Handling Systems (RHS) will mainly focus on the continuation of preliminary design activities and starting in some areas the final design activities.
In case of the Divertor RHS (DRHS) Preliminary Design (PD) is foreseen to finish in 2018, and thanks to an early start of the preparatory activities for the Final Design (FD), a smooth transition across the procurement phases will be ensured. These tasks will be mainly performed through specific contracts under the on-going framework contract.
During the first half of the year, for the Cask and Plug RHS (CPRHS) it is foreseen to generate the preliminary design of one cask variants. Second half of the year will be dedicated to start the PD activities of other cask typologies. Like for the DRHS, also in this case the implementation will be mainly through specific contracts under the on-going framework contract.
Neutral Beam RHS (NBRHS) also will be focusing 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 advance greatly with PD of first priority items. In parallel, PD of second priority items will be progressing.
The activities of In-vessel Viewing System (IVVS) will be dedicated to the PD activities during the whole year to complete the main design effort 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

Milestone ID	Scope Description	Forecast achievement date	Type of milestone	PA
EU23.03.14044622	Task Order Signed for Preliminary Design (other variants) for CPRHS	Q2 2018	Predecessor of GB32	2.3.P3.EU.01
EU23.05.02105	ADP approved for NBRHS Preliminary Design Phase 2	Q4 2018	Predecessor of GB42	2.3.P5.EU.01

EXPECTED RESULTS AND TARGET

The expected results for this Action are:
1. Preliminary design review of Divertor remote handling system that is the main achievement before turning into the final design phase.
2. Generate preliminary design of one cask variants of Cask and Plug remote handling system, which is needed for the first assembly phase of the tokamak.
3. Advanced preliminary design of the monorail crane of Neutral Beam remote handling system that is a first plasma component and will be installed during the first assembly phase.

The target per PA for 2018 is the achievement of the following cumulative value of credit (in kIUA):

PA 2.3.P2.EU.01 Divertor Remote Handling System	1.8
PA 2.3.P3.EU.01 Cask and Plug Remote Handling System	1.7
PA 2.3.P5.EU.01 Neutral Beam Remote Handling System	0.4
PA 5.7.P1.EU.01 In-Vessel Viewing System	1.2

6.3.6 Action 6. Cryoplant and Fuel Cycle

Action 6	Cryoplant and Fuel Cycle

Overview

Cryoplant

In 2018, the LN2 Plant and Auxiliary Systems will be installed in the Cryoplant building. Quench line components will be designed, manufactured and delivered. The last contracts for installation and test will be placed. In order to control coactivity and cope with the site rules, an integrated coordination team, in which F4E will assume a major role together with IO, will manage all the activities performed in the Cryoplant building.

Fuel Cycle

The pre-production cryopump will be tested at KIT with a view to holding the Final Design Review of the Torus and Cryostat Cryopumps and PA signature in 2018 and subsequently prepare the call for procuring that set of pumps.

The Warm Regeneration lines will be assembled and delivered.

During 2018, Mitica cryopump will be awarded and manufactured (including Johnston coupling contract, part of Mitica cryopump, that will be manufactured and tested).

In 2018, two contracts of the Procurement Arrangement for the Front End Cryopump distribution cold valve boxes and warm regeneration box will be awarded and designed (Factory Testing of Torus and cryostat Front End Cryodistribution and Johnston Couplings and Cryojumpers), and another one (I&C and Software design) will start the preparatory phase of call for tender

The Procurement Arrangement for Primary Leak Detection and Localization System will be signed in 2018 and call for tender will be launched. In the meantime, IO conceptual design review and PA documentation and negotiation will take place for for the second set of Leak Detection and Localization components, specific to the cryostat.

The Water Detritiation System holding and feeding tanks will be manufactured, tested and finally delivered to Cadarache in the course of 2018 in order to be installed in the tritium plant building.

The Final Design reviews of Beryllium and environmental monitors for the PA of Radiological end environmental monitoring system will take place in 2018.

ANNUAL OBJECTIVES

Milestone ID	Scope Description	Forecast achievement date	Type of milestone	
EU.31.01.125640	Contract Signed for Manufacturing and Factory Testing of Torus and cryostat Front End Cryodistribution	Q3 2018	Predecessor of GB28	PA 3.1.P1.EU.02
EU.31.01.10550	PA 3.1.P1.EU.03 Documentation received from IO	Q1 2018	Predecessor of GB33	PA 3.1.P1.EU.03
EU.31.03.10120	PA 3.1.P3.EU.01 Primary Leak Detection & Localisation System Signed	Q3 2018	Predecessor of GB35	PA 3.1.P3.EU.01

EXPECTED RESULTS AND TARGET

The expected results for this Action are:
1. Delivery of Warm Regeneration lines to ITER site

2. Review by IO Factory Acceptance Test of HL HOLDING TANKS 32.WD.70-TA-0004 and TA-0005 3. Kick of Meetings for Mitica contracts The target per PA for 2018 is the achievement of the following cumulative value of credit (in kIUA):	
PA 3.1.P1.EU.03 Torus and Cryostat Cryopumps	0
PA 3.1.P1.EU.04 Neutral Beam Cryopumps	0.18
PA 3.1.P1.EU.01 Warm Regeneration Lines	0.2
PA 3.1.P1.EU.02 Front End Cryopump Distribution Cold Valve Boxes and Warm Regeneration Box	0.0766
PA 3.1.P3.EU.01 Primary Leak Detection and Localization System	0.2
PA 3.1.P3.EU.01 Cryostat Leak Detection and Localization System (phase II)	0
PA 3.2.P3.EU.01 Isotope Separation System	0
PA 3.2.P5.EU.01 Water Detritiation System - Tanks & Main system	3.252
PA 3.4.P1.EU.01 Liquid Nitrogen Plant and Auxiliary Systems	20.1211001
PA 6.4.P1.EU.01 for Design of REMS	0
PA 6.4.P1.EU.01 Amendment for REMS Design to procure Be-EN monitors	0
PA 6.3.P1.EU.01 Type A Radwaste Treatment and Storage System	0

6.3.7 Action 7. Antennas and Plasma Engineering

Action 7	Antennas and Plasma Engineering

Overview

Ion Cyclotron Antenna– not FP

The ICH antenna project is in final design phase. The design is in progress 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 in ICH Antenna project 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 continue in 2018 by means of specific contracts for final design, analysis and requirement management and verification (under the existing framework contracts), as well as necessary support contracts. The R&D will be developed during 2018 by the signature of contracts for RF Windows R&D, such as testing specific aspects of the window joints and development of critical technologies for the RVTL.

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

The EC Upper Launcher project is in the final design phase. Main on-going activities are related to design, prototype fabrication and testing as well as qualification and requirements identification & verification. Management of changes (requirements, and interfaces) as well as 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, as well as additional design work (i.e. for cooling systems) that will be performed through specific contracts, as part of an existing framework contract. Support for Build-to-print design will also be ongoing during 2018 in preparation of some of the FDRs. On prototyping, Window and Valve prototyping programmes will be further developed with the signature of a contract for manufacturing of Window prototype units, and a contract for manufacturing and vacuum qualification of Valve prototype. Specific contracts under the existing framework contract for setup and operation of the EC components test facility (FALCON) are envisaged in 2018, including mm-wave testing of waveguide mock-ups and manufacturing of mirrors and steering mechanism components. The testing programme will also be carried out with specific contracts for testing under a framework contract for Testing of Windows and Disks to be signed in 2017. A contract for diagnostics and sensors prototypes will also be signed during 2018. On engineering support, specific contracts for nuclear safety, analysis and engineering verification will be signed.

Electron Cyclotron Control System - FP

The Electron Cyclotron Control System is in Final design phase, with current activities mainly related to the collection and consolidation of requirements, and design and prototyping. The main challenge in the EC Control System activity consists in the clear definition of the interfaces. An interesting opportunity is found from the synergies with the development of the control system for the ECT-Falcon facility which will allow testing extensively the concepts developed for the EC Plant Controller.

The main activities for 2018 will mainly regard to: a) the procurement of the EC Plant Controller Stage 2, by placing contracts and task orders for hardware procurement and implementation of ECPC, and b) the design of the EC-UL-SCU (Stage 1), by the signature of task orders for support to design. In addition, task orders will be placed for specification of EC Instrumentation for ITER, under a new ITA for EC Instrumentation.

Plasma Engineering

A relevant part of the PE activity responds to (often urgent) requests and hence it is difficult to plan in advance. PE group in 2018 is going to focus on transversal activities in support to F4E procurements,

as well as in providing In-sourcing for Engineering Support in this Action.
As for 2018, Plasma Engineering Studies and Engineering Support for PE and Antennas will mainly not be credited trough PAs.

ANNUAL OBJECTIVES

Milestone ID	Scope Description	Forecast achievement date	Type of milestone	ITA
EU51.01.204392	ADP Approval for Development of Titanium-stainless steel rotary friction welding	Q1 2018	Predecessor of GB31	C51TD38FE
EU52.01.115190	Final documentation for EC UL Diamond Disk FDR closure accepted by F4E	Q2 2018	Predecessor of GB22	C52TD39FE
EU52.01.340285	Independent review of Qualification programme for EC UL Isolation Valve performed	Q2 2018	Predecessor of GB46	C52TD43FE, C52TD52FE

EXPECTED RESULTS AND TARGET

The expected results for this Action are:
1. Intermediate review of the optimised design for the ICH Antenna carried out
2. First tests of EC component prototypes carried out at ECT-FALCON test facility
3. Final Design Review of EC Diamond Disks approved
4. Final Design Review of EC Control System Stage 2 approved

The target per PA for 2018 is the achievement of the following cumulative value of credit (in kIUA):

PA 5.1.P1.EU.01 Ion Cyclotron Antenna	0
PA 5.2.P1B.EU.02 Electron Cyclotron Upper Launcher	0
PA 5.2.P1B.EU.01 Electron Cyclotron Control System	0.5

6.3.8 Action 8. Neutral Beam and EC Power Supplies and Sources

Action 8	Neutral Beam and EC Power Supplies and Sources

Overview

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

For the EC Power Sources (Gyrotrons), actions in support to IO for the integration with the EC system are planned in 2018. For the EC Power Supplies, the 2nd set of MHVPS & BPS required for the first plasma will be assembled, and the manufacturing of the 3rd set will be started.

Test facility at RFX-Padua

In 2018, the integrated commissioning of SPIDER will be finalised and first experiments will start. For MITICA, in 2018, Assembly and Testing activities will continue with the vessel, the auxiliaries (Vacuum and Gas Injections Plants, Cooling, Cryoplant) and power supplies (HVD1, ISEPS, AGPS, GRPS). In parallel, specific contracts for NBTF I&C, assembly and diagnostics will be signed. At the end of 2018 it is planned to sign with RFX the NBTF Agreement 2019 mainly to cover R&D, modelling and physics activities, project integration, provision of NBTF Host services and support to F4E in the follow-up of procurements contract related to the exploitation of SPIDER and construction and preparation for exploitation of MITICA.

NB at ITER-Cadarache

In 2018, options for procuring the Ion Source and Extraction Power Supplies (ISEPS) for the ITER NBIs will be released. Taking into account the IO priorities and needs, the PAs Pressure Vessel and Magnetic Shielding (PBS 53.04) and the Active Compensation Correction Coils Vessel (PBS 53.05) will be signed for Vessels, Drift Duct, PMS, pending the availability of the PA documents, in particular Tech Specs, from IO.

ANNUAL OBJECTIVES

Milestone ID	Scope Description	Forecast achievement date	Type of milestone	PA
EU52.04.11603	Start of manufacturing of PS set#3	Q2 2018	Predecessor of GB 43	5.2.P4.EU.01
EU53.TF.05500	SPIDER Ready for Integrated Commissioning	Q1 2018	IC30/GB20	5.3.P9.EU.01

EXPECTED RESULTS AND TARGET

The expected results for this Action are:

1. EC Power Supplies: Manufacturing of the 3rd set of MHVPS & BPS (first plasma component) will start
2. NB Test Facility : the integrated commissioning of SPIDER will start
3. NB for ITER: Options for the procurement of the Ion Source and Extraction Power Supplies (ISEPS) will be released
4. Depending on the IO priorities and needs, the PAs Pressure Vessel and Magnetic Shielding (PBS 53.04) and the Active Compensation Correction Coils Vessel (PBS 53.05) could be signed for Vessels, Drift Duct, PMS (pending the availability of the PA documents, in particular Tech Specs, from IO).

The target per PA for 2018 is the achievement of the following cumulative value of credit (in kIUA):

PA 5.2.P3.EU.01 Electron Cyclotron Gyrotrons	0
PA 5.2.P4.EU.01 Electron Cyclotron High Voltage Power Supply	3.556
PA 5.3.P1.EU.01 Neutral Beam Assembly and Testing	0
PA 5.3.P2.EU.01 Heating Neutral Beam Beam Source	0

PA 5.3.P3.EU.01 Heating Neutral Beam Beamline Components	0
PA 5.3.P4A-C.EU.01 Heating Neutral Beam Vacuum Vessel, Passive Magnetic Shield & Front-End Components &Heating Neutral Beam Absolute Valve (BtP)	0
PA 5.3.P5.EU.01 Heating Neutral Beam Active Correction Coils	0
PA 5.3.P6.EU Neutral Beam Power Supply	13.96
PA 5.3.P9.EU.01 Neutral Beam Test Facility Components	14.95

6.3.9 Action 9. Diagnostics

Action 9	Diagnostics

Overview

Procurement procedures for manufacturing of several Diagnostic components and systems, most of them essential for First Plasma will be signed or initiated during 2018, including for manufacturing of in-vessel cables, clips and connectors, in-vessel and ex-vessel captive components of the plasma position reflectometer, magnetics sensors, platforms for bolometer cameras and the instrumentation hardware required for the magnetics diagnostics.
Design of the upper and equatorial port structures and associated integration of diagnostics from Europe, IO and five other Domestic Agencies will advance during 2018 in preparation of the preliminary design review foreseen in early 2019.
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 2018 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. In 2018, a contract will be signed for the design of the core-plasma Thomson scattering system, completing the portfolio of all EU Diagnostics major systems.
Signature of Procurement Arrangements will be completed for all Diagnostics systems in 2018.
Deliveries of components to IO will continue during 2018 mainly related to magnetic sensors.
A significant number of contracts for engineering analysis, manufacturing and testing of prototypes and production of manufacturing specifications will be signed in 2018 to support of the design of Diagnostics systems. In-sourcing of personnel staff to support activities of the Diagnostics project team is also foreseen.

ANNUAL OBJECTIVES

Milestone ID	Scope Description	Forecast achievement date	Type of milestone	PA
EU55.01.75260	Contract Signed for Analysis Software Algorithm Design	Q2 2018	Predecessor of GB 39	PA 5.5.P1.EU.01
EU55.06.681260	Preliminary Design Review Meeting for Feedthroughs (PDR meeting) closed	Q2 2018	Predecessor of GB 36	PA 5.5.P1.EU.01

EXPECTED RESULTS AND TARGET

The expected results for this Action are:
1. FDR meeting for PPR Captive Ex-Vessel Transmission lines held
2. PDR meeting for In-Divertor Components for Tokamak services held
3. CDR meeting for RGRS held
4. PDR for Low Field Side Collective Thomson Scattering held
5. PDR meeting for Wide Angle Viewing System (x-Vessel Optical-Mechanical , Port Integration Test Alignment equipment, Port Plug Components) held
6. FDR meeting for In-Vessel Discrete Sensor Head for Magnetics diagnostic held

The target per PA for 2018 is the achievement of the following cumulative value of credit (in kIUA):

PA 5.5.P1.EU.01-02-16-17-19 Diagnostics - Magnetics	0.54735
PA 5.5.P1.EU.01-03 Diagnostics - Bolometers	0
PA 5.5.P1.EU.05 Diagnostics - Plasma Position Reflectometry	0.09503
PA 5.5.P1.EU.07 Diagnostics - Pressure Gauges	0
PA 5.5.P1.EU.01-18 Diagnostics - Tokamak Services	0
PA 5.5.P1.EU.15 Diagnostics - Radial Neutron Camera/Gamma Spectrometer	0

PA 5.5.P1.EU.01 Diagnostics - Core-plasma Thomson Scattering 55.C1	0
PA 5.5.P1.EU.09 Diagnostics - Low Field Side Collective Thomson Scattering	0.14877
PA 5.5.P1.EU.04 Diagnostics - Core-Plasma Charge Exchange Recombination Spectrometer	0
PA 5.5.P1.EU.06 Diagnostics - Equatorial Visible/Infrared Wide-Angle Viewing System	0.34301
PA 5.5.P1.EU.10-11-12-13-14 Diagnostics - Port Engineering Systems	0

6.3.10 Action 10. Test Blanket Module

Action 10	Test Blanket Module

Overview

A Framework Contract (FwC) regarding radioactive waste management will be signed in 2018 as well as associated specific contracts. The call for tender of three FwCs concerning the development of the Preliminary Design of the TBM Sets, of the Ancillary Systems and of the related Safety Analysis will be published in 2018.
In addition the activities concerning the development of preliminary welding procedures focused on the TBM Box Manifold Area will continue with the signature of a Specific Contract.
Some purchase orders for the transportation of steel samples and mock-ups from the supplier premises to the storage facility might be needed.
Various activities launched in 2017 will continue in 2018 such as: new developments of the ECOSIMPRO code for Tritium transportation (Grant); handling and storage of EUROFER (Specific Contract); EUROFER samples irradiation and post-irradiation.

The Test Blanket Module procurement plan is not in response to PA or ITA but to the TBM Arrangements (TBMAs).

ANNUAL OBJECTIVES

Milestone ID	Scope Description	Forecast achievement date	Type of milestone	PA
EU56.02.1218560	TO Signed for PWPS of TBM Box Manifold Area	Q1 2018	WP18 objective	N/A

EXPECTED RESULTS AND TARGET

The expected results for this Action are:
1. Development of preliminary Welding Procedures Specifications for the Manifolds located on the back of the Test Blanket Module (TBM) Box;
2. Publication of the Call for Tender of a Framework Contract for the Preliminary Design (PD) of the TBM Sets;
3. Publication of the Call for Tender of a Framework Contract for the PD of the Ancillary Systems;
4. Publication of the Call for Tender of a Framework Contract for the performance of Safety and Accidental Analysis in support to the PD activities
5. Perform the required tests for the physical and chemical acceptability of Pb-Li radioactive waste at the disposal facility.

The target for 2018 is the full operational deployment in the F4E TBM Team of the new organizational conditions at European or International level (e.g. EUROfusion-F4E coordinated programs, TBM Project Team to be created following decision of the ITER Council) and, on this basis, the engagement into the Preliminary Design Phase that will start with the publication of the call for tender for a set of new FwC for the Preliminary Design of the TBM Sets, the Ancillary Systems and the Safety Analysis.

6.3.11 Action 11. Site and Buildings and Power Supplies

Action 11	Site and Buildings and Power Supplies

Overview

The first part of the Electrical Power Supply and Distribution is due for Completion (Taking Over). The design of the Emergency Power Supply Distribution buildings and equipment is due to be started for Buildings 44(Emergency Power Supply Building Train A), 45 (Emergency Power Supply Building Train B), 46 (Medium Voltage Distribution Building LC/1A), 47(Emergency Power Supply Building Train B), 48 (Medium Voltage Distribution Building LC/2B).
Civil Works for B74 (Diagnostic Building), B11 (Tokamak Building) and B14 (Tritium Building) will continue. Building services works will continue in B74 (Diagnostic Building) and will start in B11 and 14 (Tokamak and Tritium Building).
The Tokamak Central Pit will be delivered for use to IO.
Building Services installation for the Auxiliary Buildings will continue with the remaining RFE milestones for B51/52 (Cryoplant Buildings) and B61 (Site Services Building) achieved and the Completion (Taking Over) process beginning.
TB12 contract will be signed covering B34 (NB Power Supply Building), B37 (NB high Voltage Power Supply Building), B71 (Control building – non PIC part), B75 (Fast Discharge Reactor Building – non PIC part).
Upon confirmation of the validity of IO input data received end July 2017, TB13 contract will be signed covering B44 (Emergency Power Supply Building (Train A)), B45 (Emergency Power Supply Building (Train B)), B46 (Medium Voltage Distribution Building LC/1A) and B47 (Medium Voltage Distribution Building LC/2B).
Specific contracts will be signed under ongoing framework services support contracts and under a new framework contract to be signed in 2017 for procurement of services in support to the main activities (technical and contractual). This includes, for example, Facility Management, Site Security and Reception Services, Structural analysis, Building HMI Development, Engineering and Contract Management Consultancy Services (with special respect to cost and schedule assessment) and consultancy for advice on interpretation of French Regulatory Law 2012.
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 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 TB03
In 2018 the construction of level 3 of B14 (Tritium Building), level 4 of B74 (Diagnostic Building) and level L5 of B11 (Tokamak Building) will progress.
The Tokamak Central Pit will be delivered for use to IO.
The Civil Works and Finishes are due to be completed in the Auxiliary Buildings; B15 (RF Heating Building) and B51/52 (Cryoplant Buildings).

Overview on TB04
Building services works will start in B74 (Diagnostic Building), B11 and 14 (Tokamak and Tritium Buildings).
Installation works within B13 (Assembly Building), B15 (RF Heating Building) and B17 (Cleaning Facility Building) should be achieved with Completion (Taking Over). The following RFE's should be achieved; B51/52 (Cryoplant Buildings)-RFE#8B, B61 (Site Services Building)- RFE#17B.
The installation of Load Centre's 01, 02, 03 and 14 should be achieved, with the Completion (Taking Over) of LC's 03, 05 and 14.

Overview on Remaining TBs
TB05: In 2018 the Installation of the systems for Buildings 32 (Magnet Power Conversion Building 1), 33 (Magnet Power Conversion Building 2) and 38 (Reactive Power Control Building) should be achieved, with the Completion (Taking Over) of all the buildings.
TB06: In 2018 the installation works for electrical distribution will continue in Area 35 with 400kV and

66kV networks, across the ITER site with the installation and testing of the low voltage load centres (LC06/10/11) and medium voltage load centres (MV01/02/03) and for B36 (Main AC distribution systems). The completion (Taking Over) of the Area 41 (400kV), the Area 35 (400kV), the LCs (LC06/10/11), the MVs (MV01/02/03) and the building 36 (including 22kV networks) is forecasted in 2018.
TB07: In 2018 the Installation of the systems of Buildings 67 (Cold Basin & Cooling Towers), 68A Cooling Water Pump Station) and 69 (Heat Exchangers) should be achieved, with the Completion (Taking Over) of B67 (Cold Basin & Cooling Towers) and 69 (Heat Exchangers).
TB11: The first task order of the completion works Contract is planned to be signed early 2018.
TB12: Contract forecast to be signed early 2018 with Final Design works on B34 (NB Power Supply Building) and B37 (NB high Voltage Power Supply Building) to commence.
TB13: Upon confirmation of the validity of IO input data received end July 2017, Contract forecast to be signed in 2018 with Final Design works on B44 (Emergency Power Supply Building Train A), B45 (Emergency Power Supply Building Train B), B46 (Medium Voltage Distribution Building LC/1A), B47 (Emergency Power Supply Building Train B), B48 (Medium Voltage Distribution Building LC/2B) to commence.
TB16: In 2018 the infrastructure works will continue on zone by zone basis with design and construction works. The foundations for Load Centres 01 and 02 in addition to Medium Voltage centres 04, 05 and 06, should be completed ready for the installation of the Load Centre equipment by others.

ANNUAL OBJECTIVES

Milestone ID	Scope Description	Forecast achievement date	Type of milestone	PA
EU62.05.010	IPL > Tokamak Building (11) RFE 1B - Stage 1 (RFE #1)	17-Sep-18	GB11/ IC33	PA05
EU62.05.435	IPL > Cryoplant Compressor Building (51) RFE (RFE #8B)	04-Oct-18	GB19	PA05
EU62.05.060	IPL > Construction of Assembly Building (13) Completed	19-Jun-18	GB51/ IC43	PA05
IO.1435.882190	IPL > Cryostat Support Bearings ready for installation	06-Mar-18	GB55/ IC32	PA05
EU62.05.20916	NPC- RFOC Tokamak Building (11) Central Pit	24-Jul-18	GB09/ IC25	PA05
EU62.052910	NPC- TB03 RFOC Tokamak Building (11) level B2	28-Feb-18	IC25	PA05

EXPECTED RESULTS AND TARGET

The expected results for this Action are:
1. TB11: The first task order of the completion works Contract is planned to be signed early 2018.
2. TB12: Tender Batch for B34 (NB Power Supply Building), B37 (NB high Voltage Power Supply Building), B71 (Control building – non PIC part), B75 (Fast Discharge Reactor Building – non PIC part). Contract to be signed with design works to commence.
3. TB13: Upon confirmation of the validity of IO input data received end July 2017, Tender Batch for B44 (Emergency Power Supply Building (Train A)), B45 (Emergency Power Supply Building (Train B)), B46 (Medium Voltage Distribution Building LC/1A) and B47 (Medium Voltage Distribution Building LC/2B). Contract to be signed with design works to commence.
4. In 2018 the construction of level 3 of B14 (Tritium Building), level 4 of B74 (Diagnostic Building) and level L5 of B11 (Tokamak Building) will progress.
5. The Tokamak Central Pit will be delivered for use to IO.
6. The Civil Works and Finishes are due to be completed in the Auxiliary Buildings; B15 (RF Heating Building) and B51/52 (Cryoplant Buildings).
7. Building services installation works will start within the Tokamak Complex.

The target or 2018 is the achievement of the following cumulative value of credit (in kIUA):

COMMON	28.975
TOKAMAK COMPLEX	61.62654555
AUX BUILDINGS TB03/TB04	85.46393994

AUX BUILDINGS D&B TB05	17.15
AUX BUILDINGS D&B TB06	6.48
AUX BUILDINGS D&B TB07	7
AUX BUILDINGS TB09/TB10	0
AUX BUILDINGS D&B TB12	0
AUX BUILDINGS D&B TB13/TB17	0
BRIDGES	0.2
LOAD CENTERS	6.91699992
INTERCONNECTING ACTIVITIES	1.5
COMMON CONTRACTUAL ACTIVITIES	42.09
PA 6.2.P2.EU.06 Headquarters Building	13.85

6.3.12 Action 12. Cash Contributions

Action 12	Cash Contributions

Overview

Cash Contribution to IO

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	
	2018
Cash to IO – Commitment (in MEuros)[23]	204.10
Cash to Japan – Commitment (in MEuros)	3.90

EXPECTED RESULTS AND TARGET

The expected result for this Action 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.

As far as the cash to IO is concerned, the target for 2018 is to commit the cash contribution for 2019 according to the decisions due to be taken by the ITER Council in November 2018.
As far as the cash to Japan is concerned, the target for 2018 is to commit the amount agreed in the Annex C to the Japanese PA 3.2.P4.JA.01 (1st Phase) due to be signed in Spring 2018.

[23] The cash contribution required by IO for the year N is committed by F4E at the end of the year (N-1). E.g. the commitment shown here in WP 2018 is the cash contribution to IO for 2019.

6.3.13 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 Support Service Unit (TSS) during 2018 will continue supporting the ITER Departments project Teams (and to a limited extend the BA department) by providing them technical expertise in the key domains of engineering and fusion technologies.

The unit will provide technical expertise in the following areas:

Design office activities, Analysis: Mechanical, Structural Dynamics, Civil engineering, Fluid Dynamics, Electro Magnetism, Nuclear Analyses; Design Codes and Standards; Instrumentation and Control; Metrology; Nuclear Safety.

Beyond the preparation of task orders, the procurement activities in TSS will be mainly focused on renewing Framework Contract providers, for keeping the same level of support to project teams.

Material and Fabrication

For 2018 the Materials and Fabrication group at the Technical Support Services has the aim to support the ITER Department's Project Teams (and to a limited extent the BA department) by providing technical expertise in the domains of Materials Science, Materials Technologies and Manufacturing Processes.

The group supervises development and qualification of material and joints. The group also supports material procurement and fabrication follow-up.

The focus for 2018 will be to support critical component fabrication for Magnets, Vacuum Vessel and In-Vessel

Transportation

During 2018, TSS/Transportation will be in charge of the management, on the F4E side, of technical aspects of the joint procurement with IO for the transportation of ITER components to the site in Cadarache. The scope includes the transportation of all ITER Components from the port/airport of entry (Fos or Marignane) to ITER site.

During 2018, this activity will mainly cover transportation of NON EU loads between Fos and Cadarache (EU-leg). The main cost driver is for Highly Exceptional Loads (HEL) that follow the dedicated ITER itinerary.

In 2018 focus will be again put on the optimization of the number of HELs and the related number of convoys, this jointly with IO, all DA's and Daher.

Nuclear Safety

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

Quality Assurance, Quality Control

Ensure that F4E's QA processes are aligned with ITER requirements and properly followed internally and in the whole supply chain, to ensure the correct propagation and implementation of ITER project

requirements.

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 the area is covering three main activities: 1. to develop and implement Systems Engineering practices, processes and tools and to support their correct deployment by the Project Teams; 2. to manage and coordinate any transversal technical issue relevant to F4E; 3. to provide support to the Head of ITERP Department and the Chief Engineer in their respective functions, to ensure consistency across subsystems and projects under F4E procurement responsibilities.
To cover the above mentioned scope, external man power is needed across several areas, including Requirements Management and Verification (RMV), Configuration Management, Project Change Requests (PCR) management, Interface Management, Deviations control, etc.
According to that, a set of specific contracts will be signed during the year to support F4E staff both at Barcelona and Cadarache sites.

Assembly Integration and Validation (AIV)
Support to F4E management on review and assessment of proposed AIV policies and plan. 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 AIV responsibilities on site (e.g. logistics, deliveries portal); supporting decisions on transfer of F4E AIV responsibilities to IO.
In this area a possible development of a contract for supporting technical coordination and integration could be envisaged.

Programme Management
Main focus will be the performance monitoring and reporting, scheduling support, the maintenance and update of the costing, the further improvement of the risk registers in all project areas, the increase in the number of standard reports available to the organization the implementation of the Internal Compliance Programme for export control. Overall project management support. Support to related tools is included.
A general provision is foreseen for experts and consultancy service (e.g. participation to specific committees, support/advice to F4E Management, technical support, management retreat, etc.) as well as provision for interim management services, missions and audit.

Information and Communication Technology
Provision of ICT support (hardware, software and services) for the specific benefit of the operational activities.
Provision of logistic support.
Provision of legal support.

ANNUAL OBJECTIVES

Milestone ID	Scope Description	Forecast achievement date	Type of milestone	PA
EU.ES.01.40600	F4E-OMF-0871: Framework Contract Signed for Engineering Support Contract	Q1 2018	WP18 objective	N/A
EU.ES.01.42020	F4E-OMF-0878: Framework Contract	Q2 2018	WP18	N/A

	Signed for Metrology Support Services of the ITER components		objective	
EU.PM.3026200	Dispatch of the Invitation to Tender for Support in the area of Technical Integration	Q2 2018	WP18 objective	N/A
EU.PM.3028010	TO.01 Lot 1 - Task Order Signed in Support of CM & SE Requirement Management Verification - Senior	Q4 2018	WP18 objective	N/A
EU.PM.3051190	Framework Contract signed for risk management support	Q2 2018	WP18 objective	N/A

EXPECTED RESULTS AND TARGET

The expected results for this Action are:
1. Implementation of the framework contract F4E-OMF-0871 which will provide Fusion for Energy with Engineering Support Services in the fields of mechanical, electrical, systems, design and civil engineering
2. Implementation of Nuclear Safety actions stemming from Technical Advisory Panel
3. Transportation of KO-DA Sub-Assembly tooling including up-ending tool (2 HEL) between Maritime Port of Marseille and ITER site and transportation of CN-DA and KO-DA transformers (HEL) between Maritime Port of Marseille and ITER site
4. Commissioning of the Pre compression ring test facility
5. Substantial increase of the use of DOORS for RMV throughout F4E and IO
6. Partial deployment of the new ITER PLM (Project Life cycle Management system) in F4E
7. Update of most ICDs (Interface Control Documents), IS (Interface Sheets), and IDD (Interface Definition Documents) relevant to F4E.

The target for 2018 is the successful execution of the planned supporting activities in order to help the teams reaching their individual targets for their actions listed in this document.

6.3.14 Action 14. Broader Approach

Action 14	Broader Approach

Overview

JT-60SA

In 2018, the remaining share of EU contribution will be delivered to the JT-60SA site. The actions will focus on the completion of 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 specific contracts under existing/new framework contracts or existing/new supply and service contracts. The installation and commissioning of the second half of the ENEA contribution to the Super Conducting Magnets Power Supplies will be carried out. The manufacturing of the Electron Cyclotron Resonance Heating power supplies will be finalised. 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 and transport costs to EU VCs according to the provisions of the respective Agreement of Collaborations.

IFMIF/EVEDA

Since Engineering Validation for the Lithium Target and Test Facilities were successfully completed in 2016, all work will be devoted to the LIPAc (Linear IFMIF Prototype Accelerator) installation and commissioning. In 2018 the LIPAc operation is planned to be validated in short pulses (up to 5 MeV), which constitutes completion of the first two phases of commissioning. The subsequent phases of installation and commissioning of the SRF linac (Superconducting Radio Frequency Linac), HEBT (High Energy Beam Transport) and Beam Dump, increasing the deuteron energy to the final target value of 9 MeV, will commence. In order to proceed to these commissioning phases, the SRF Linac must be assembled in the clean room facility at Rokkasho, under F4E cost and responsibility. Additional contracts will have to be placed for services and hardware to support the SRF Linac assembly, and subsequently to support the continuing installation and commissioning activities. F4E will be continuously 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 two activities, DEMO design and R&D activities, and REC (Remote experimentation Centre). 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 mostly under the financial responsibility of F4E, and are performed under F4E contracts or agreements of collaboration with EUROfusion, to provide software and services. Integrated tests (participation in the operation of a European Tokamak from Rokkasho) will take place in 2018.

ANNUAL OBJECTIVES				
Milestone ID	**Scope Description**	**Forecast achievement date**	**Type of milestone**	**PA**
STP-EU-TFC	Contract signed for fabrication of additional spare coil - insertion, impregnation, machining	Q1 2018	WP18 objective	STP-EU-TFC
IFMIF-EU-PA-04-A	Task order signed for SRF Linac transportation Part 2	Q1 2018	WP18 objective	IFMIF-EU-PA-04-A
REC (Remote Experimentation Centre)	Contract signed for JET tests (preparations + missions)	Q2 2018	WP18 objective	REC-EU-PA-01

EXPECTED RESULTS AND TARGET

The expected results for this Action are:
1. Acceptance test of electron cyclotron heating power supply
2. Transport and delivery of resistive wall mode power supply
3. Completion of superconducting magnet power supplies ENEA installation and commissioning 2nd part
4. Delivery of Cryomodule sub-components
5. Perform integrated tests with EU tokamak.

The target for 2018 is the achievement of a cumulative value of 485.65 kBAUA.

ANNEXES

ANNEX I 2018 Work Programme Budget Summary

Budget article		Work Programme Commitment appropriations (EUR)
3 1	ITER construction including site preparation	391,478,879.32
3 2	Technology for ITER	6,468,000.00
3 3	Technology for Broader Approach & DEMO	6,693,000.00
3 4	Other expenditure	8,477,000.00
3 5	Appropriations from the ITER Host State contribution	142,000,000.00
Total Title III of the Budget		**555,116,879.32**
3 1 to 3 4	Additional non-budgeted revenue	0.00
3 5	Host State contribution carried over from previous year (Available in July)	0.00
3 6	Additional revenue from the Reserve Fund Allocation scheme with ITER Organization	37,900,000.00
Total amount available for the operational expenditure		**593,016,879.32**

Work Programme		Fist amendment to the Work Programme Commitment appropriations (EUR)		
		Grants	Procurement	Cash
3 1+3 5	Expenditure in support of ITER Project credited by IO	5,034,000.00	318,777,729.32	209,667,150.00
	Sub total ITER construction		**533,478,879.32**	
3 2	Design and R&D in support of ITER, not credited	0.00	1,468,000.00	5,000,000.00
	Sub total technology for ITER		**6,468,000.00**	
3 3	Expenditure in support of Broader Approach	0.00	5,900,000.00	793,000.00
	Sub total Technology for Broader Approach and DEMO		**6,693,000.00**	
3 4	Other Expenditure (EU.PM.PM)		8,477,000.00	
	Sub total Other Expenditure		**8,477,000.00**	
3.6	Reserve Fund		37,900,000.00	
	Sub total Reserve Fund		**37,900,000.00**	
Totals Operational Expenditure		***5,034,000.00***	***372,522,729.32***	***215,460,150.00***
		593,016,879.32		

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 Time of call for the procurement plan

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

Procurement Procedures	Q1 2017	Q2 2017	Q3 2017	Q4 2017	Q1 2018	Q2 2018	Q3 2018	Q4 2018
P Serv - Contract			2	3	5	2	1	
P Supply - Contract	1		7	11	3	5	1	
Pserv - Specific Contracts					23	21	26	38
PSupply - Specific Contracts		2	3	3		1		1

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 WP2018.
- When a call for tender is not defined yet, the call is indicatively assigned to 6 months before the signature of the contract.
- For the specific contract, as they do not have call for tender, the table refers to its signature date.

ANNEX IV Risk and Opportunity Management

F4E Risk Management Framework

The Risk Management at F4E currently consists of 3 different levels: Corporate (implemented since 2012), Project Level (the bigger part implemented since 2011) and the Supplier Risk Management. All risks and opportunities are evaluated in probability, schedule and cost. The information of the risk exposure is used to calculate the risk provision of the Estimate at Competition.
Suppliers risk registers are provided by the different suppliers once the contract is signed in order to share and inform F4E of the identified risks and the planned mitigation actions.

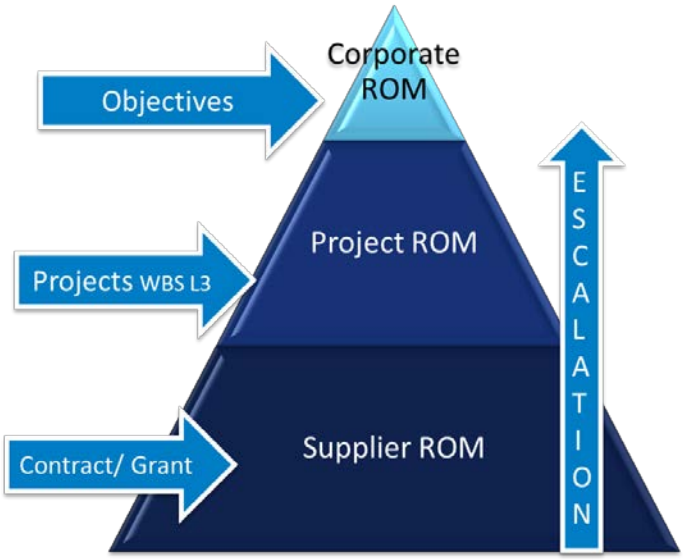

Figure 13 .F4E Risk Management levels

Corporate Risks

The Corporate Risk and Opportunity log is validated at the 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.

The summary as per Q2 2017 update is as follows, F4E has 4 Very High risks as per table reported below. The action plans to control those risks are critical for F4E and the cost impact specified is the result of the identified cost impact by the probability of the risk.

ID	Description	Cost Impact	Residual Cost Impact
CR-065	Delay in the reception of data/items from the IO or other DA's during the implementation of the PA's	**127 M€**	35 M€
CR-061	Delay of systems in Critical Path to FP in 2025	**104 M€**	104 M€
CR-071	Lack of Payment appropriation (2017-2020)	**104M€**	64M€
CR-053	Requirements not properly propagated	**89 M€**	89 M€

Table 28 . List of F4E Very High risks

Risks associated to the Multi Annual Programme

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:

Threat	Mitigation Action
Lack of Competition in the industry causing increase of costs.	Reinforce market analysis. Procurement with negotiated procedure. In specific cases, qualify additional suppliers to create competition.
Lack of expertise in industry or laboratories due to the long-lead procurements.	These two risks are considered as directly linked to the previous one and therefore that mitigation applies.
Lack of continuity in the fusion research causing lack of interest from industry.	
First of a kind R&D project: technical requirements may not be met as expected.	Risk accepted. Testing in place where needed.
Large number of deviations and non-conformities causing delays and over-costs.	Enhancement of follow-up and quality control at factory.
Late input by IO of design or late changes triggering delays and over-costs.	Strict configuration management of all packages by Project Teams. Put on hold procurement of equipment until all systems have reached construction design.
Possible claims from companies causing an increase of costs.	Implement working group in claims management (BIPS)
Lack of payment appropriations (2017-2020)	Global Transfer procedure to provide F4E with more cash by Dec 2017 to cover the gap. For 2018 onwards, more budget to be requested to align the needs through the MAP.

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 2017, 55 Projects (with at least 1 PA each) were analysed from a risk point of view.

Risks associated to the Work Programme 2018

As far as Work Programme 2018 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 WP2018 and the provision for those risks included in the WP when necessary.

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

Threat	Mitigation Action
Lack of clear definition of requirements from IO, especially for the safety ones	Increase awareness among Project Team members and harmonise and challenge requirements, with special attention to the Safety ones.
Uncertainties in the manufacturing process	Include an appropriate buffer in the planning to clarify possible issues.
Delay in the reception of the free-issued items from other DAs	Plan regular meeting with the DAs and directly involve IO in the topic. Agree delivery dates with both DAs and IO.
Company failed in passing either a qualification step or full-scale prototype acceptance tests	Prepare plans to launch new contracts in parallel for manufacturing the item with different technology.
Lack of competition resulting in overpriced bids	Qualify additional suppliers to create competition (multi-annual activity)
Lack of adequate budget to carry out the activities	Request GB to allow the use of unused appropriations.
Decrease in the human resources available in the team	Use external contractors available through operational service contracts.
Delays due to lack of agreement with contractors on the consequence of changes received from IO through F4E	Implement working group in claims management.
Change in the amount of cash contribution for either IO or Japan due to the modification of the activities / needs during the year	Accept. However, F4E to keep in contact with both IO and JA DA to monitor potential modifications of the cash requirements early in the year.
Slippage in BA activities due to either delayed or no funding from Voluntary Contributors.	Contingency planning.

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.

ANNEX V 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.

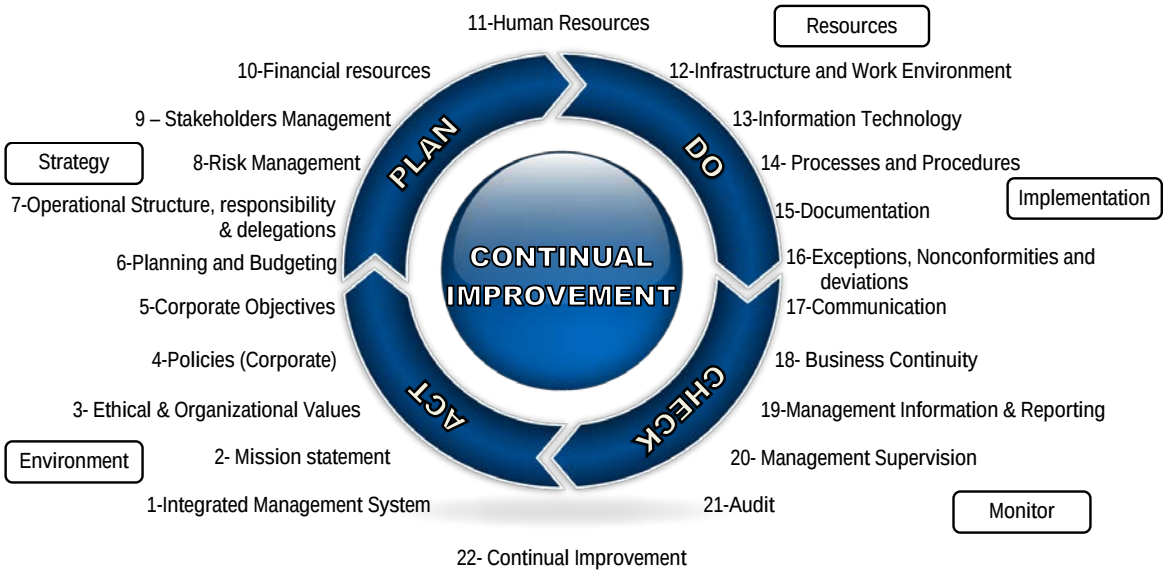

Figure 14 . F4E Integrated Management System

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 are aligned with customer requirements and procedures are followed and implemented.
4. Training on QA to all the operational officers and 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 and corresponding remedial actions and corrective and preventive action plans raised and registered in F4E.
7. Perform audits and surveillance activities at F4E and supply chain.
8. 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.
5. Perform surveillance activities at supply chain.
6. Coordinating on-site inspection activities

The Quality Control of the contracts/grants implementation is under the responsibility of the Quality Assurance team with the technical support and guidance of the Project Teams, ensuring the adequate monitor and surveillance of the contract/grant implementation by the Supply chain. This includes regular visits and telecoms, scheduled quality surveillance 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 managed by the Quality Assurance Group.

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 requirements propagation, the implementation of the quality system 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 quality audits are one of the main inputs of the quality improvement.

Quality Target

During 2017, Quality assurance group has defined several activities to improve the performance of the supply chain. To monitor the effectiveness of these actions, a goal has been established for 2017 of a maximum of 50 long pending open NCRs. For 2018, the target is to improve the performance of 2017. Based on this, it has been defined the KPI in Equation 5.

ANNEX VI Indicative Value of Financial Resources for the actions in WP2018

The WP2018 represents the financial decision to be adopted by the Governing Board in order to allow F4E to commit budget for the listed activities.
The table below shows the commitment forecast for the projects/actions in 2018 by taking into account the progress and the available manpower.
This value is the goal of the organisation.
If necessary, F4E will submit an amending budget to the Governing Board during 2018, recalling 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 a timely indication in the case that additional budget needs to be recalled from the unused appropriations.

Action #	Action	Assigned Share of Available Budget
1	Magnets	7,847,990
2,3,4,10[24]	Main Vessel	42,943,516.87
5	Remote Handling	15,133,570
6	Cryoplant & Fuel Cycle	13,102,020
7	Antennas and Plasma Engineering	4,030,000
8	Neutral Beam and EC Power Supplies and Sources	24,571,450
9	Diagnostics	18,265,970.79
11	Site and Buildings and Power Supplies	220,006,401.66
12	Cash Contributions	207,987,160
13	Supporting Activities	32,385,800
14	Broader Approach	6,743,000
	Total	**593,016,879.32**

[24] The Actions of Vacuum Vessel, In-Vessel Blanket, In-Vessel Divertor and Test Blanket Module are presented merged in one single line due to commercial sensitive information.

ANNEX VII HR Snapshot

1. 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). In recognition of the need to be in alignment with the promotion rates foreseen in the relevant implementing rule F4E will endeavor to bring down the rate of CA promotions. The Tables below provide an overview of the number of promotions awarded in each grade during the last exercise.

Reclassification of temporary staff / promotion of officials in 2016

Category and grade	Staff in activity at 01.01.2015		Number of staff members promoted / reclassified in 2016[1]		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	1	8	3.7
AD 9	2	18	1	2	3
AD 8		24		12	2.3
AD 7	7	50	2	16	2.3
AD 6	2	39	1	11	2.3
AD 5	1				
Total AD	**37**	**164**	**5**	**49**	**-**
AST 11					
AST 10	1				
AST 9	1				
AST 8	1				
AST 7	2				
AST 6	3		2		3.5
AST 5	2	1	1	1	2.5
AST 4	3	14		6	2.3
AST 3	1	10	1	2	3.5
AST 2	2				
AST 1	1		1		3.1
Total AST	**17**	**25**	**5**	**9**	**-**
Total AST/SC	**0**	**0**	**0**	**0**	-
Total	**54**	**189**	**10**	**58**	**-**

[1] As some promotions are pending of thrid language requirement, the final figures may change.

Reclassification of temporary staff / promotion of officials in 2017

Category and grade	Staff in activity at 01.01.2016		Number of staff members promoted / reclassified in 2017		Average number of years in grade of reclassified/promoted staff members
	officials	TA	officials	TA	
AD 16					
AD 15					
AD 14		1			
AD 13	8	2			
AD 12	9	2			
AD 11	3	5			
AD 10	4	25			
AD 9	2	20			
AD 8	1	23			
AD 7	7	47			
AD 6	2	41			
AD 5	1				
Total AD	**37**	**166**	**0**	**0**	**-**
AST 11					
AST 10	1				
AST 9	1				
AST 8	1				
AST 7	1				
AST 6	3				
AST 5	2	1			
AST 4	2	13			
AST 3	1	11			
AST 2	2				
AST 1	1				
Total AST	**15**	**25**	**0**	**0**	**-**
AST/SC6					
AST/SC5					
AST/SC4					
AST/SC3					
AST/SC2					
AST/SC1					
Total	**0**	**0**	**0**	**0**	-
Total	**52**	**191**	**0**	**0**	**-**

Reclassification of contractual agents in 2016

Function Group	Grade	Staff in activity at 01.01.2015	How many staff members were reclassified in 2016(1)	Average number of years in grade of reclassified staff members
CA IV	18			
	17			
	16	4		
	15	14	6	2.2
	14	35	9	2
	13	25	7	2.3
CA III	12			
	11	5		
	10	15	2	2.5
	9	19	4	2
	8	5		
CA II	7			
	6	6	2	2.4
	5	11	2	3.5
	4	3		
CA I	3			
	2			
	1			
Total		**142**	**32**	**-**

Reclassification of contract staff

Function Group	Grade	Staff in activity at 01.01.2016	How many staff members were reclassified in 2017	Average number of years in grade of reclassified staff members
CA IV	18			
	17			
	16	4		
	15	14		
	14	42		
	13	32		
CA III	12			
	11	5		
	10	16		
	9	20		
	8	7		
CA II	7			
	6	5		
	5	11		
	4	2		
CA I	3			
	2			
	1			
Total		**158**	**0**	**-**

Table 29 . Reclassification of temporary staff and contractual agents /promotion of officials

Note: the light blue columns in the previous tables indicate not yet available data. The promotion exercise for 2017 is ongoing and pending finalization. Final result is foreseen for end 2017.

2. Gender balance

The Table below shows the gender balance as at 31.12.2016 based upon the filled in posts on 31.12.2016 (accepted job offers are 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. F4E will continue to try to address the issue and try to increase the representation of female staff. Special efforts will be made for the managerial positions where F4E has only three female staff members.

Staff	EU Official		TA		CA	SNE	TOTAL
	AD	*AST*	*AD*	*AST*			
Female	11	9	38	11	89		**158**
Male	26	6	145	16	78	2	**273**
Total	**37**	**15**	**183**	**27**	**167**	**2**	**431**

Table 30 . Gender balance on 31/12/2016

3. Geographical balances

The table below provides the geographical distribution as at 31.12.2016 based upon the filled in posts on 31.12.2016 (accepted job offers are included).
The over representation of Spanish nationals follows from the Agency being headquartered in Spain and from the large proportion of short-term non-renewable positions which typically do not entice non-Spaniards to apply. A diversity policy is being developed to address the imbalance.
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**
British	1		14	2	6		**23**
Bulgarian			1		3		**4**
Czech			2		2		**4**
Dutch			3		1		**4**
Estonian					2		**2**
Finnish			3		1		**4**
French	5	4	47	6	15		**77**
German	3		6	1	10	1	**21**
Greek	1	1	3		3		**8**
Hungarian	2		1	1	3		**7**
Irish			2	1			**3**
Italian	13	4	35	4	32		**88**
Lithuanian		1		1	2		**4**
Maltese	1						**1**
Peruvian					1		**1**
Polish			2		2		**4**
Portuguese		1	4		6		**11**
Romanian			5	1	4		**10**
Slovak	1						**1**
Spanish	8	3	47	5	66	1	**130**
Swedish	1		2				**3**
Total	**37**	**15**	**183**	**27**	**167**	**2**	**431**

Table 31 . Geographical balance on 31/12/2016

NB: figures are based on filled in posts including staff in place and employment offers.

ANNEX VIII Main procurement activities per Action

Action	Signature (2018)	Type of contract
1-Magnets		
Release of Option for Additional Working Shift. Standard Effective Working Hours/Number of Workers in 2018	Q4	Option
Task Order Signed for Inspection Services for TF Coils Winding Pack. Resident Inspector 03 in ASG (renewal)	Q1	SC-PServ
Provision for Amendments, claims, reimbursement, indexation, late interest and budget reserve	N/A	N/A
2-Vacuum Vessel		
Commitment and Task Order Signed - TO #14 for 1 VV Resident Inspectors	Q3	SC-PServ
Commitment and Task Order Signed - TO #13 for 1 VV Resident Inspectors	Q3	SC-PServ
Commitment and Task Order Signed - TO #12 for 1 VV Resident Inspectors	Q3	SC-PServ
Commitment and Task Order Signed - TO #11 for 1 VV Resident Inspectors	Q3	SC-PServ
Commitment and Task Order Signed - TO #10 for 1 VV Resident Inspectors	Q3	SC-PServ
Commitment and Task Order Signed - TO #9 for 1 VV Resident Inspectors	Q2	SC-PServ
Commitment and Task Order Signed - TO #8 for 1 VV Resident Inspectors	Q2	SC-PServ
Provision for Amendments, claims, reimbursement, indexation, late interest and budget reserve	N/A	N/A
3-InV-Blanket		
Contract Signed for Manufacturing of FW beam by additive manufacturing	Q2	PSupply
Summary of Commitments - Options mock-ups without SS pipes - OPE-443 - 2018	Q4	Option
Task Order Signed for Irradiation and PIE of In-Vessel material specimens (OFC-413-01-02)	Q3	SC-PServ
Task Order Signed TO#01 - HHFT of FW components	Q4	SC-PServ
Release of Option 1 (OPE-652)	Q2	Option
Contract Signed for Qualification of the Be bond repair technique	Q1	PServ
Contract Signed for Manufacturing design and automation implementation - Company 3	Q3	PServ
Contract Signed for Manufacturing design and automation implementation - Company 2	Q3	PServ
Contract Signed for Manufacturing design and automation implementation - Company 1	Q3	PServ
Task order signature for High Heat Flux Testing of FW full scale-prototype (OPE-319-01)	Q2	SC-PServ
Provision for Amendments, claims, reimbursement, indexation, late interest and budget reserve	N/A	N/A
4-InV-Divertor		
Release of Stage for Pre-Series and Stage 1 of Series Fabrication	Q2	SC-PSupply
Task Order Signed for Resources 2018 - IVT	Q1	SC-PServ
Task Order Signed for Task order 01 for Test of W Mock-Up	Q2	PServ
Provision for Amendments, claims, reimbursement, indexation, late interest and budget reserve	N/A	N/A
5-Remote Handling		
Task Order Signed for Preliminary Design Phase 2 for IVVS	Q3	SC-PServ
Task Order Signed for Preliminary Design Phase 3 first-priority items for NBRHS	Q3	SC-PServ
Task Order Signed for Genrobot integration in the Manipulator Arm	Q4	SC-PSupply

Task Order Signed for Final Design Phase 1 & 2 for DRHS	Q2	SC-PSupply
Task Order Signed for Preliminary Design (other variants) for CPRHS	Q2	SC-PServ
Provision for Amendments, claims, reimbursement, indexation and budget reserve	N/A	N/A
6-Cryoplant & Fuel Cycle		
Contract Signed for Final design, manufacturing and delivery of Johnston Couplings and Cryojumpers	Q4	PSupply
Contract Signed for Procurement of the MITICA Cryopump Assembly	Q2	PSupply
Contract Signed for Manufacturing and Factory Testing of Torus and cryostat Front End Cryodistribution	Q3	PSupply
Provision for Amendments, claims, reimbursement, indexation, late interest and budget reserve	N/A	N/A
7-Antennas and Plasma Engineering		
Task Order 2 Signed for Engineering Support for PE and Antennas (Credited)	Q3	SC-PServ
Task Order 1 Signed for Engineering Support for PE and Antennas (Credit 0)	Q3	SC-PServ
Task Order Signed for Design of ATLIS & Transition frame for the ICH Antenna - Part 2 (TO 08)	Q4	SC-PServ
Contract Signed for Testing of Hydrogen embrittlement of Ti-SS joints	Q4	PServ
Task Order Signed for Neutronic, seismic and RF analysis of the ICH Antenna (TO 07)	Q4	SC-PServ
Task Order Signed for Design and analysis of FS bar (TO 05)	Q2	SC-PServ
Task Order Signed for Implementation of ECPC Stage 2	Q3	SC-PSupply
Contract Signed for Hardware procurement for EC Plant Control System (Stage 2)	Q3	PSupply
Contract Signed for Fabrication of EC UL Window prototype unit	Q2	PSupply
Task Order Signed for Testing of Waveguide mock-ups and prototypes	Q2	SC-PServ
Task Order Signed for Testing of EC Window prototypes	Q3	SC-PServ
Contract Signed for Manufacturing and vacuum qualification of EC Isolation Valve prototype	Q4	PSupply
Task Order Signed for Procurement of Mirrors and Steering Mechanism prototypes	Q4	SC-PSupply
Provision for Amendments, claims, reimbursement, indexation, late interest and budget reserve	N/A	N/A
8-Neutral Beam and EC Power Supplies and Sources		
Release of options for spares for Cooling Plant MITICA and SPIDER Experiments	Q2	Option
Release of Option B - Stage #4 - ISEPS of NBI-2	Q1	Option
Release of Option A - Stage #3 - ISEPS of NBI-1	Q1	Option
Release of Options - SC#1 MITICA Beam Source	Q2	Option
Task Order Signed for NBTF MITICA CODAS 0 and SPIDER Control 4	Q2	SC-PSupply
Task Order Signed for Services for NBTF Site Supervision and Support - 06	Q4	SC-PServ
NP - Contract Signed - PRIMA#3 Assembly, Assembly	Q4	SC -PServ
Contract Signed for FWC Technical Follow-up BPS & MHVPS	Q3	FWC
Provision for Amendments, claims, reimbursement, indexation, late interest and budget reserve	N/A	N/A
9-Diagnostics		
Baseline Signed for Preliminary Design CPTS	Q4	SC-PServ
Task Order Signed for Irradiation Testing for Feedthroughs	Q3	SC-PServ
Task Order Signed for Plant Controller Design - Final Design #4	Q2	SC-PServ
Commitment for Contract for Procurement and Delivery for Inner-Vessel Sensor Head (HF) - Lot 2	Q3	PSupply

Contract Signed for Procurement and Delivery for mechanical platforms for diagnostics Magnetics Inner Vessel coils	Q2	PSupply
Contract Signed for Procurement and Delivery for Bespoke Instrumentation Hardware for Magnetics	Q3	PSupply
Contract Signed for Procurement and Delivery for Inner-Vessel Coils - Sensor Heads (LTCC) - Lot 1	Q3	PSupply
Task Order Signed for Irradiation Testing for Neutron Detector & Associated components - Phase 2 (neutron/gamma)	Q1	SC-PServ
Task Order Signed for Irradiation Testing for CXRS components (Refractive Optics)	Q1	SC-PServ
Contract Signed for Design and Manufacturing of VV-Mounting Platforms for VV-Mounted Bolometer Cameras	Q3	PSupply
Commitment for TO for Irradiation Testing for Bolometer Sensor Prototype & Electrical Connections	Q4	SC-PServ
Commitment for Contract for Procurement and Delivery for Bolometer Sensor Prototype	Q1	PSupply
Commitment for TO for Irradiation Testing for WAVS Shutter Mechanism	Q1	SC-PServ
Task Order Signed for Development of Mfg Specs for Front-End components	Q4	SC-PServ
Contract Signed for Single Framework Contract for Services for Design for CPTS	Q4	FWC
Provision for Amendments, claims, reimbursement, indexation, late interest and budget reserve	N/A	N/A
10-Test Blanket Module		
Signature of TO2 for Test Implementation	Q3	SC-PServ
TO Signed for PWPS of Box Manifold Area	Q1	SC-PServ
Contract Signed for FwC Radwaste Management Feasibility Study	Q2	FWC
Provision for Amendments, claims, reimbursement, indexation, late interest and budget reserve	N/A	N/A
11-Site and Buildings and Power Supplies		
Commitment for TB11 Option for FM scope - TO 2019	Q4	Option
TB16 - Contract Option 8 (Deposite Area) signed	Q2	Option
TB06 - Contract Options 5, 9 & 10 signed	Q2	Option
TO 05 OFC-0811 signed for Integration of SSEN available system to Mini CODAC Part 2	Q4	SC-PServ
TOs for AMF-0796 Eng & contract management consultancy services with special respect to cost and schedule assessment	Q4	SC-PServ
Commitment for TB11 - Completion works Contract - TO 2019	Q4	SC-PSupply
Commitment for TB11 - Completion works Contract - TO 2018	Q1	SC-PSupply
TB13 - Commitment for Contract for Design & Construction of Bldgs 44, 45, 46 & 47	Q3	PSupply
TB12 - Commitment for Contract for Design & Build of Bldgs 34, 37, 71 non PIC, 75 non PIC	Q2	PSupply
Facility management 2019 (Worksite common services) signed	Q4	SC-PServ
Site Security and Reception Services for the ITER Site 2018 signed	Q1	SC-PServ
Option 1 year Contract for Architect Engineer (for Duration Extension to the Contract for AE)	Q2	Option
Provision for Amendments, claims, reimbursement, indexation, late interest and budget reserve	N/A	N/A
13-Supporting Activities		
Task Order Signed for Support in the area of Chief Engineer for 2018	Q4	SC-PServ
Task Order Signed for TO 02 for FwC F4E-OMF Lot 2	Q3	SC-PServ
Task Order Signed for TO 01 for FwC F4E-OMF Lot 2	Q3	SC-PServ
Task Order Signed for TO02 for OMF-PMS Lot 1: PPM services	Q3	SC-PServ

Task Order Signed for TO01 for OMF-PMS Lot 1: PPM services	Q3	SC-PServ
Contract signature Milestone EXP in LIPAC Expertise 2018	Q1	Exp
Contract signature Milestone EXP in TF Coils Expertise 2018	Q1	Exp
Task Order Signed for TO 09 for FwC F4E-OMF-436 Lot 1 Support in Risk Management to VV and BIPS	Q1	SC-PServ
Commitment for Experts for Site and Buildings and PS 2018	Q4	Exp
Task Order Signed for TO01 for OMF-PMS Lot 3: Planning services	Q3	SC-PServ
Task Order Signed for TO02 for OMF-PMS Lot 3: Planning services	Q3	SC-PServ
Task Order Signed for TO 09 for Convention 4 for Real Convoys for Gendarmerie Services	Q4	SC-PServ
Task Order Signed for TO 08 for Convention 4 for Real Convoys for Gendarmerie Services	Q2	SC-PServ
Commitment 2018 - Global transportation of CEL-CL ITER components	Q4	SC-PServ
Contract Signed for Single Framework Contract for Services for Design for CPTS	Q4	FWC
FWC OMF-0878 for Metrological Support Services 2018-2022 signed	Q2	FWC
FwC OMF-0871 Signed for Engineering Support Contract	Q1	FWC
FWC OMF for Provision of Support in the Area of Nuclear Analysis 2018-2022 signed	Q2	FWC
FWC OMF-0825-02 for Mechanical analyses of ITER components 2017-2021 signed	Q1	FWC
FWC OMF-0825-01 for Mechanical analyses of ITER components 2017-2021 signed	Q1	FWC
Contract Signed for FwC Project Management Services - Lot 3: Planning Management	Q2	FWC
Contract Signed for FwC Project Management Services - Lot 2: Risk Management	Q2	FWC
Contract Signed for FwC Project Management Services - Lot 1: PPM	Q2	FWC
Contract Signed for FWC Technical Follow-up BPS & MHVPS	Q3	FWC
Contract Signed for FwC Radwaste Management Feasibility Study	Q1	FWC
Provision for Amendments, claims, reimbursement, indexation, late interest and budget reserve	N/A	N/A
14-Broader Approach		
Contract signed for CVBCS possible repair and remachining	Q3	PServ
Contract signed for Cryoplant spare/replacement parts	Q2	PSupply
Contract for Fabrication of additional spare coil casing	Q1	PSupply
Contract for Fabrication of additional spare coil - insertion, impregnation, machining	Q1	PSupply
Contract signed for Materials and components for LIPAC installation 2018	Q4	PSupply
Contract signed for Engineering support for installation in Rokkasho 2018	Q4	PServ
Provision for Amendments, claims, reimbursement, indexation, late interest and budget reserve	N/A	N/A

ANNEX IX Grants per Action

Action	Value (Euros)	Time of call	Budget line
5-Remote Handling			
Grant Agreement Signed for High Level Control System and Genrobot Integration at DTP2	970,000	Q4 2017	3.1+3.5
Grant Agreement Signed for Validation of Digital Valve	250,000	Q2 2018	3.1+3.5
Grant Agreement Signed for Final Design of General Maintenance Tools	200,000	Q2 2018	3.1+3.5
9- Diagnostics			
Specific Grant Signed for Design and R&D for Pressure Gauges SG6	548,547	Q3 2018	3.1+3.5
Specific Grant Signed for Design and R&D for Bolometers - Phase 1 SG5	1,765,738	Q1 2018	3.1+3.5
Specific Grant Signed for Eng. Design of IPP (G3 & G5), IP (all gaps) and back-end TLS for PPR. SG07	844,288	Q3 2018	3.1+3.5
Specific Grant Signed for Design and R&D and Eng. design of In-vessel components. SG06	454,917	Q2 2018	3.1+3.5
TOTAL	**5,033,490**		

NB: For the specific grants, as they do not have call for tender, the table refers to their signature date.

ANNEX X Human resources per action for WP2018

1-Magnets
F4E will be supporting this action during the year 2018 with 25 FTEs within the core operational team plus 15.12 FTEs of support.
2-Vacuum Vessel
F4E will be supporting this action during the year 2018 with 21 FTEs within the core operational team plus 12.70 FTEs of support
3-InV-Blanket
F4E will be supporting this action during the year 2018 with 6 FTEs within the core operational team plus 3.63 FTEs of support
4-InV-Divertor
F4E will be supporting this action during the year 2018 with 6 FTEs within the core operational team plus 3.63 FTEs of support
5-Remote Handling
F4E will be supporting this action during the year 2018 with 14 FTEs [25] within the core operational team plus 8.47 FTEs of support
6-Cryoplant & Fuel Cycle
F4E will be supporting this action during the year 2018 with 13 FTEs within the core operational team plus 7.86 FTEs of support
7- Antennas and Plasma Engineering
F4E will be supporting this action during the year 2018 with 11 FTEs[26] within the core operational team plus 6.65 FTEs of support
8- Neutral Beam and EC Power Supplies and Sources
F4E will be supporting this action during the year 2018 with 17 FTEs within the core operational team plus 10.28 FTEs of support
9-Diagnostics
F4E will be supporting this action during the year 2018 with 14 FTEs within the core operational team plus 8.47 FTEs of support
10-Test Blanket Module
F4E will be supporting this action during the year 2018 with 8 FTEs within the core operational team plus 4.84 FTEs of support
11-Site and Buildings and Power Supplies
F4E will be supporting this action during the year 2018 with 23 FTEs within the core operational team plus 13.91 FTEs of support
13-Supporting Activities
F4E will be supporting this action during the year 2018 with 106 FTEs within the core operational team plus 64.11 FTEs of support
14-Broader Approach
F4E will be supporting this action during the year 2018 with 27 FTEs within the core operational team plus 16.33 FTEs of support

[25] 0.5 FTE is supporting nuclear integration activities

[26] The FTEs supporting this action will be 10 for the core team if the long-term sick leave of a member continues during 2018

ANNEX XI Credits per PA

**Current year includes only part not yet achieved*

					Forecast (kIUA) Current year includes only part not yet achieved						
Action	**PA**	**Baseline to end June 2017 (kIUA)**	**Achieved Credit (kIUA)**	**Released Credit (kIUA)**	**2017***	**2018**	**2019**	**2020**	**2021**	**2022**	**2023+**
		334.973	**334.732**	**283.468**	**76.573**	**145.427**	**97.618**	**134.055**	**55.433**	**56.161**	**263.782**
Magnets	PA 1.1.P1A.EU.01 Procurement of Toroidal Field Magnets	20.900	20.900	24.200	8.000	22.500	17.108	13.724	7.508	0.000	0.000
	PA 1.1.P2A.EU.01 Pre Compression Rings	0.000	0.000	0.000	0.300	0.150	0.150	0.000	0.000	0.000	0.000
	PA 1.1.P3A-B.EU.01 Poloidal Field Magnets 2,3,4,5,6	1.220	1.220	0.000	6.150	13.250	12.250	5.995	1.995	0.000	0.000
	PA 1.1.P6A.EU.01 Toroidal Field Conductors	43.390	43.390	43.390	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	PA 1.1.P6C.EU.01 Poloidal Field Conductors	11.229	11.229	11.229	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Vacuum Vessel	PA 1.5.P1A.EU.01 Vacuum Vessel - Main Vessel	59.460	59.460	53.000	6.000	25.360	12.830	12.420	2.000	0.000	0.000
In Vessel-Blanket	PA 1.5.P1A.EU.02 Blanket Manifolds	0.000	0.000	0.000	0.000	0.200	0.200	0.000	0.000	0.000	4.122
	PA 1.6.P1A.EU.01 Blanket First Wall	0.000	0.000	0.000	0.000	1.800	1.800	0.000	1.200	1.200	34.330
In Vessel-Divertor	PA 1.7.P1.EU.01 Cassette Body and Assembly	0.000	0.000	0.000	0.120	0.120	0.000	0.100	0.700	0.900	8.940
	PA 1.7.P2B.EU.01 Inner Vertical Target	1.800	1.800	1.660	0.000	0.300	1.140	0.000	0.000	0.050	16.330
	PA 1.7.P2E.EU.01 Divertor Toroidal and Radial Rails	0.000	0.000	0.000	0.000	0.000	0.200	0.000	0.200	0.200	1.780
Remote Handling	PA 2.3.P2.EU.01 Divertor Remote Handling System	0.600	0.600	0.000	0.000	1.200	0.200	0.400	0.300	1.700	5.220
	PA 2.3.P3.EU.01 Cask and Plug Remote Handling System	0.800	0.800	0.000	0.900	0.000	0.500	1.600	0.600	2.000	10.913
	PA 2.3.P5.EU.01 Neutral Beam Remote Handling System	0.200	0.200	0.000	0.000	0.200	0.700	0.700	0.500	0.600	3.100
	PA 5.7.P1.EU.01 In-Vessel Viewing System	0.200	0.200	0.000	0.600	0.400	0.800	0.480	1.500	0.400	2.420
Cryoplant and Fuel Cycle	PA 3.1.P1.EU.03 Torus and Cryostat Cryopumps	0.000	0.000	0.000	0.000	0.000	0.522	0.000	0.000	4.000	0.000
	PA 3.1.P1.EU.04 Neutral Beam Cryopumps	0.000	0.000	0.000	0.000	0.180	0.000	1.020	0.000	0.000	2.464

	PA 3.1.P1.EU.01 Warm Regeneration Lines	0.060	0.060	0.020	0.000	0.140	0.000	0.000	0.000	0.000	0.000
	PA 3.1.P1.EU.02 Front End Cryopump Distribution Cold Valve Boxes and Warm Regeneration Box	0.000	0.000	0.000	0.000	0.077	0.153	0.000	0.383	0.000	0.153
	PA 3.1.P3.EU.01 Primary Leak Detection and Localization System	0.000	0.000	0.000	0.000	0.200	0.200	0.500	0.500	0.000	0.800
	PA 3.1.P3.EU.01 Cryostat Leak Detection and Localization System (phase II)	0.000	0.000	0.000	0.000	0.000	0.000	0.200	1.000	0.000	0.800
	PA 3.2.P3.EU.01 Isotope Separation System	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.456	0.500	4.500
	PA 3.2.P5.EU.01 Water Detritiation System - Tanks	2.652	2.652	2.582	0.000	0.600	0.000	0.000	0.000	0.000	0.000
	PA 3.2.P5.EU.02 Water Detritiation System - Main System	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.431
	PA 3.4.P1.EU.01 Liquid Nitrogen Plant and Auxiliary Systems	20.407	18.866	21.427	1.255	0.000	0.856	2.397	0.000	0.000	0.000
	PA 6.4.P1.EU.01 for Design of REMS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.540
	PA 6.4.P1.EU.01 Amendment for REMS Design to procure Be-EN monitors	0.000	0.000	0.000	0.000	0.000	0.060	0.000	0.000	0.000	0.000
	PA 6.3.P1.EU.01 Type A Radwaste Treatment and Storage System	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	5.050	5.050
Antenna and Plasma Engineering	PA 5.1.P1.EU.01 Ion Cyclotron Antenna	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	14.730
	PA 5.2.P1B.EU.02 Electron Cyclotron Upper Launcher	0.000	0.000	0.000	0.000	0.000	0.000	1.000	1.532	2.950	5.800
	PA 5.2.P1B.EU.01 Electron Cyclotron Control System	0.500	0.500	0.000	0.000	0.000	0.500	0.000	0.000	0.000	0.400
Neutral Beam and EC Power Supplies and Sources	PA 5.2.P3.EU.01 Electron Cyclotron Gyrotrons	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.193	5.170
	PA 5.2.P4.EU.01 Electron Cyclotron High Voltage Power Supply	2.325	2.325	2.325	1.231	0.000	4.935	1.974	1.163	0.000	0.000
	PA 5.3.P1.EU.01 Neutral Beam Assembly and Testing	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	4.560
	PA 5.3.P2.EU.01 Heating Neutral Beam Beam Source	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.893

	PA 5.3.P3.EU.01 Heating Neutral Beam Beamline Components	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.900
	PA 5.3.P4A.EU.01 Heating Neutral Beam Vacuum Vessel, Passive Magnetic Shield & Front-End Components	0.000	0.000	0.000	0.000	0.000	0.000	0.595	0.000	0.200	9.876
	PA 5.3.P4C.EU.01 Heating Neutral Beam Absolute Valve (BtP)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.200	1.029
	PA 5.3.P5.EU.01 Heating Neutral Beam Active Correction Coils	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.220	0.440	3.960
	PA 5.3.P6.EU Neutral Beam Power Supply	8.350	9.150	9.150	1.760	3.050	1.000	4.150	5.500	0.000	6.676
	PA 5.3.P9.EU.01 Neutral Beam Test Facility Components	6.430	6.430	6.880	2.620	5.900	2.760	0.950	2.440	4.700	0.000
Diagnostics	PA 5.5.P1.EU.01-02-16-17-19 Diagnostics - Magnetics	0.025	0.025	0.025	0.360	0.162	0.714	0.288	0.093	0.000	0.757
	PA 5.5.P1.EU.03 Diagnostics - Bolometers	0.000	0.000	0.000	0.000	0.000	0.172	0.197	0.394	0.363	1.107
	PA 5.5.P1.EU.05 Diagnostics - Plasma Position Reflectometry	0.000	0.000	0.000	0.000	0.095	0.095	0.253	0.000	0.253	0.792
	PA 5.5.P1.EU.07 Diagnostics - Pressure Gauges	0.000	0.000	0.000	0.000	0.000	0.132	0.000	0.132	0.104	0.292
	PA 5.5.P1.EU.18 Diagnostics - Tokamak Services	0.000	0.000	0.000	0.000	0.000	0.379	0.000	0.000	0.568	1.801
	PA 5.5.P1.EU.15 Diagnostics - Radial Neutron Camera/Gamma Spectrometer	0.000	0.000	0.000	0.000	0.000	0.239	0.239	0.000	0.096	0.621
	PA 5.5.P1.EU.01 Diagnostics - CPTS 55.C1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.523	2.353
	PA 5.5.P1.EU.09 Diagnostics - Low Field Side Collective Thomson Scattering	0.000	0.000	0.000	0.000	0.149	0.149	0.149	0.298	0.000	0.000
	PA 5.5.P1.EU.04 Diagnostics - Core-Plasma Charge Exchange Recombination Spectrometer	0.000	0.000	0.000	0.000	0.000	0.136	0.016	0.143	0.000	1.671
	PA 5.5.P1.EU.06 Diagnostics - Equatorial Visible/Infrared Wide-Angle Viewing System	0.000	0.000	0.000	0.000	0.343	0.000	0.182	0.273	0.000	1.100
	PA 5.5.P1.EU.10-11-12-13-14 Diagnostics - Port Engineering Systems	0.000	0.000	0.000	0.000	0.000	0.000	1.387	1.048	0.339	5.894
Site and Buildings	COMMON	25.220	25.220	23.320	0.500	3.255	1.425	4.275	0.350	2.425	10.724
	TOKAMAK COMPLEX	37.415	37.415	27.900	6.918	17.293	13.981	61.226	0.935	8.812	16.770

and Power Supplies	AUX BUILDINGS TB03/TB04	35.280	35.780	0.000	29.053	20.631	12.180	0.000	0.000	0.000	0.000
	AUX BUILDINGS D&B TB05	1.000	1.000	0.000	6.076	10.074	0.000	0.000	0.000	0.000	0.000
	AUX BUILDINGS D&B TB06	0.000	0.000	0.000	2.800	3.680	1.651	0.000	0.000	0.000	0.000
	AUX BUILDINGS D&B TB07	0.700	0.700	0.000	0.000	6.300	0.000	0.200	0.210	0.000	0.000
	AUX BUILDINGS TB09/TB10	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.200	42.863
	AUX BUILDINGS D&B TB12	0.000	0.000	0.000	0.000	0.000	1.400	6.610	2.885	11.525	2.360
	AUX BUILDINGS D&B TB13/TB17	0.000	0.000	0.000	0.000	0.000	0.800	1.600	2.940	4.670	9.690
	BRIDGES	0.200	0.200	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	LOAD CENTERS	0.000	0.000	0.000	0.000	6.917	5.301	0.000	1.667	0.000	0.000
	INTERCONNECTING ACTIVITIES	0.500	0.500	0.000	1.000	0.000	0.000	9.228	13.728	0.000	0.000
	COMMON CONTRACTUAL ACTIVITIES	40.260	40.260	42.510	0.930	0.900	0.000	0.000	0.640	0.000	2.100
	PA 6.2.P2.EU.06 Headquarters Building	13.850	13.850	13.850	0.000	0.000	0.000	0.000	0.000	0.000	0.000

ANNEX XII European obligation to ITER project

Procurement Package			Package Total (kIUA)	Funding Source	IC-20 Value kIUA	Notes
1.1 Magnets	P1A	Toroidal Field Magnet Windings	89.74000	EU	89.74000	
	P1B	Toroidal Field Magnet Windings	86.38600	EU-JA	7.73620	
				JA	78.64980	
	P2A	Toroidal Field Magnet Structures	46.86000	EU	0.60000	
				EU-JA	46.26000	
	P2B	Toroidal Field Magnet Structures	43.85280	EU-JA	3.10050	
				JA	40.75230	
	P2C	Magnet Supports	22.86000	CN	22.86000	
	P3A	Poloidal Field Coil PF1	6.80000	RF	6.80000	
	P3A-B	Poloidal Field Coil PF2, PF3, PF4, PF5 & PF6	40.86000	EU	40.86000	
	P3C	Correction Coils	5.51000	CN	5.51000	
	P4A-B	Central Solenoid Magnet & Magnet Assembly	52.38836	US	49.84000	
				IO	2.54836	(3)
	P5A	Feeders	31.98556	CN	31.98556	
	P5B	Feeder Sensors	31.93540	IO	31.93540	
	P5C	Magnets and feeders workshop	15.83652	IO	15.83652	
	P6A	Toroidal Field Magnet Conductors	215.01000	CN	16.15000	
				EU	43.39000	
				EU-JA	21.50000	
				JA	32.23000	
				KO	43.39000	
				RF	41.54000	
				US	16.81000	
	P6B	Central Solenoid Magnet Conductors	90.00000	EU-JA	90.00000	
	P6C	Poloidal Field Magnet Conductors & Feeders/Correction Coils Conductors	83.02744	CN	54.83576	
				EU	11.22881	

				RF	16.96287	
1.5 Vacuum Vessel	P1A	Vacuum Vessel - Main Vessel, Vacuum Vessel - Blanket Manifolds & Hydraulic Connectors, and Vacuum Vessel	118.50911	EU	89.56000	
				KO	25.20000	
				IO	3.74911	(3)
	P1B	In-Wall Shielding (VV-IWS) Block Assemblies - Divertor Pipe Enclosures	38.14396	IN	37.50791	
				IO	0.63605	
	P2A	Equatorial and Lower Ports	56.12643	KO	56.12643	
	P2B	Upper Ports	20.85615	RF	20.85615	
	P3A	ELM and VS Coils	33.35113	IO	33.35113	
	P3B	Power Supplies for IV Coils	47.76387	IO	43.78387	(1)
				KO	3.98000	
	P4	VV In-Service Inspection	13.24248	IO	13.24248	
1.6 Blanket System	P1A	Blanket First Wall	84.52000	CN	10.69000	
				EU	40.33000	
				RF	33.50000	
	P1B	Blanket Shield Blocks	56.34000	CN	28.27000	
				KO	28.07000	
	P1C	Diagnostic First Wall	0.00000	IO	0.00000	
	P2	Port Limiters	0.00000	US	0.00000	
	P3	Blanket Module Connections	9.71000	RF	9.71000	
	P4	Vacuum Vessel Protection System First Plasma	6.06823	IO	6.06823	
	P5	Diagnostic Neutral Beam Liner	2.07086	IO	2.07086	
	P6	Blanket Manifolds	4.42901	EU	4.42901	
1.7 Divertor	P1	Cassette Body and Assembly	10.88000	EU	10.88000	
	P2A	Outer Targets	27.69000	JA	27.69000	
	P2B	Inner Targets	19.62000	EU	19.62000	
	P2C	Dome	14.57000	RF	14.57000	
	P2D	Plasma-Facing Component Testing	8.00000	RF	8.00000	
	P2E	Divertor Rail	2.33061	EU	2.33061	
	P3	Tungsten Divertor	12.64449	IO	12.64449	

2.2 Machine Assembly	P1	Assembly Operations	955.38925	IO	955.38925	(3)
	P2A	Machine Assembly Tooling 3-11	23.01300	KO	23.01300	
	P2B	Assembly Tooling 1-2, 12-13	0.00000	IO	0.00000	(3)
	P3	Assembly Steel Platforms	0.00000	IO	0.00000	(3)
2.3 Remote Handling Equipment	P1	In-Vessel Blanket Remote Handling Equipment	42.50000	JA	42.50000	
	P2	In-Vessel Divertor Remote Handling Equipment	9.62000	EU	9.62000	
	P3	Cask and Plug Remote Handling System	17.31337	EU	17.31337	
	P4	In-Vessel Remote Handling Viewing & Metrology	0.00000	EU	0.00000	
	P5	Ex-Vessel Neutral Beam Remote Handling Equipment	6.00000	EU	6.00000	
	P6	Hot Cell Maintenance Equipment	64.25541	IO	64.25541	(1)
	P7	Tokamak Remote Handling Equipment	23.63738	IO	23.63738	
2.4 Cryostat	P1A	Cryostat	76.26075	IN	73.23222	
		Cryostat Rectangular Bellows		IO	3.02853	(2)
	P1B	Vacuum Vessel Pressure Suppression System	8.86366	IN	8.78812	
				IO	0.07554	
	P1C	Cryostat Support Bearings	4.08856	IO	4.08856	
2.6 Cooling Water	P1A-B	Tokamak Cooling Water System: Material & Transportation	64.47842	US	64.47842	
	P1C	Tokamak Cooling Water System: Engineering, On-Site	0.02904	IO	0.02904	(3)
	P2A	Heat Rejection System (HRS) & Comp Cooling Water System	50.59206	IN	50.59206	
	P2B	Heat Rejection & Comp Cooling Water: Engineering, On-Site	0.97709	IO	0.97709	(3)
	P3	Piping inside site buildings beyond 10 m	8.21205	IO	8.21205	
2.7 Thermal Shield	P1	Thermal Shield	26.88300	KO	26.88300	
				IO	0.00000	(3)
3.1 Vacuum Pumping & Fuelling	P1	Torus & Cryostat Cryopumps, Valveboxes and NB Cryopumps and Cryopumps	9.60040	EU	9.45118	
				IO	0.14922	(3)
	P2	Roughing Pumps and Roughing Pumps (VS-RP)	6.56583	US	5.85348	
				IO	0.71235	(3)
	P3	Leak Detection (VS-LD) and Leak Detection	4.40000	EU	4.40000	

				IO	0.00000	(3)
	P4	Standard Components, Vacuum Auxiliary Systems Early Delivery, and Vacuum Auxiliary Systems Late Delivery	5.75908	US	3.19800	
				IO	2.56108	(3)
	P5	Pellet Injector and Pellet Injection System	6.41887	US	3.81993	
				IO	2.59894	
	P6	Gas Injection System & GDC and Gas Injector Valve Boxes & Glow Discharge Cleaning Cond System	6.77985	CN	6.77985	
				IO	0.00000	(3)
	P7	Vacuum Laboratory	4.18840	IO	4.18840	
3.2 Tritium Plant	P1	Tokamak Exhaust Processing System	9.94276	US	9.89259	(1)
				IO	0.05017	(3)
	P2	Storage & Delivery and Fuel Storage & Delivery (SDS) System	12.50494	KO	11.78630	
				IO	0.71864	(3)
	P3	Isotope Separation System (ISS) and Hydrogen Isotopes Separation	6.67324	EU	5.19406	(1)
				IO	1.47918	(3)
	P4	Atmosphere Detritiation and Detritiation Core System	85.23026	EU-JA	14.06213	(1)
				IO	71.16813	
	P5	Water Detritiation System Tanks, Water Detritiation System Main System, and Water Detritiation	16.46166	EU	11.52114	(1)
				IO	4.94052	
	P6	Tritium Analysis & Control	20.51861	IO	20.51861	
	P7	Tritium Plant Equipment	16.09353	IO	16.09353	
3.4 Cryoplant & Distribution	P1	Cryoplant (LN2 and Auxiliary Systems) and Cryoplant	84.65470	EU	26.37110	
				IO	58.28360	(1)
	P2	Lower Pipe Chase Cryolines and Later Delivery Cryolines	17.68000	IN	17.68000	
	P3	Cryodistribution Components	18.45929	IN	18.45929	
4.1 Electrical Power Supply & Distribution System	P1A-8B	SSEN & PPEN Design	6.93810	EU	6.93810	
	P1B	Pulsed Power Electrical Network (PPEN)	21.89000	CN	21.89000	
	P2	AC/DC Convertors and RPC-HF	123.58320	CN	77.51960	
				KO	46.06360	
	P3	Switching Network, Fast Discharge Units, DC Busbar & Instrumentation	70.32444	RF	64.12426	
				IO	6.20018	(2)

	P8A	Emergency Power System	4.22273	EU	4.22273	
	P8B	SSEN & PPEN Assembly	29.48893	EU	29.48893	
	P8C	SSEN Components	20.00000	EU	5.00000	
				US	15.00000	
	P9	Cable Procurement	30.29109	IO	30.29109	(2)
4.5 CODAC	P1	Control and Data Access & Communication	65.64793	IO	65.64793	
5.1 IC H&CD	P1	IC Antenna	20.06798	EU	14.73000	(1)
				IO	5.33798	(3)
	P2	IC Transmission Lines	8.32629	US	7.31807	(1)
				IO	1.00822	(3)
	P3	IC RF Power Sources	20.04593	IN	18.00000	
				IO	2.04593	(3)
	P4	IC RF HV Power Supply	12.66791	IO	5.80076	(1)
				IN	6.86715	
5.2 EC H&CD	P1A	EC Equatorial Launcher	6.42250	JA	5.26874	
				IO	1.15376	(3)
	P1B	EC Upper Launcher PTB Window, EC Upper Launcher PTB Main Plug, and EC Upper Launcher	15.99560	EU	12.68200	
				IO	3.31360	(3)
	P2	EC Main Transmission Line	14.07038	US	12.69906	
				IO	1.37132	(3)
	P3	EC RF Gyrotrons	31.74301	EU	7.95511	
				IN	2.44985	
				JA	11.49219	
				RF	9.84586	
	P4	EC HV Power Supply	15.99467	EU	11.62800	
				IN	4.20100	
				IO	0.16567	(3)
5.3 NB H&CD	P1	NB Assembly and Testing	3.80000	EU	3.80000	
	P2	NB Beam Source and HV Bushing, Accelerator	11.50000	EU	3.89300	
				EU-JA	2.07500	
				JA	5.53200	
	P3	NB Beamline Components	3.90000	EU	3.90000	
	P4	NB Pressure Vessel, Magnetic Shielding	11.90000	EU	11.90000	
				EU-JA	0.00000	

	P5	NB Active Correction and Compensation Coils	4.40000	EU	4.40000	
	P6	NB Power Supply	92.14579	EU	31.28571	
				EU-JA	42.91800	
				JA	17.94208	
	P7A	Diagnostic Neutral Beam Power Supply	9.67475	IN	9.67475	
	P7B	Diagnostic Neutral Beam Beamline	13.10000	IN	13.10000	
	P8	SF6 Gas System	6.21258	JA	0.00000	
				IO	6.21258	
	P9	Neutral Beam Test Facility Components	26.71000	EU	25.80000	
				IN	0.91000	
				JA	0.00000	
	P10	Heat Protection Panels in VV CD	0.70060	IO	0.70060	
	P11	Temporary Items from Four-Staged Approach	0.88267	IO	0.88267	
5.5 Diagnostics	P1	Diagnostic Systems	199.75934	CN	3.90042	
				EU	31.69861	(1)
				IN	3.98417	
				JA	19.50047	
				KO	4.11268	
				RF	17.86483	
				US	15.94669	(1)
				IO	102.75147	
5.7 IVVS	P1	In-Vessel Viewing System	6.80000	EU	6.80000	
5.8 Port Plug Test Facility	P1	Port Plug Test Facility	11.67516	RF	8.72983	
				IO	2.94533	
6.2 Buildings	P1/01	Concrete Buildings	505.74821	EU	0.00000	
	P2/01	PF Coil Winding Building		EU	12.80000	
	P2/02	AE Services		EU	55.75430	
	P2/03	Tokamak Excavation & Ground Support Structure		EU	31.00000	
	P2/04	Anti-Seismic Bearings		EU	6.20000	
	P2/05	Buildings Construction		EU	350.60689	

	P2/06	Office Building		EU	13.85000	
	P2	Building		IO	35.53702	
6.3 Waste	P1	Waste Treatment Storage (Type A Radwaste System)	10.05610	EU	10.05610	
6.4 Radiological	P1	Radiological Protection	4.20000	EU	4.20000	
6.9 Access Control	P1	Access Control and Security Systems	10.65036	IO	10.65036	
		In-Kind PA (a)			**2,924.46093**	
		Transfers from the Reserve Fund to In-Kind (b)			**3.00380**	
		IO Fund (c)			**1,691.03819**	
		Transfers from the Reserve Fund to IO Fund for IO and DAs (d)			**14.14658**	
		TBM (e)			**50.38308**	
		Total Direct Capital Cost (a + b + c + d + e)			**4,683.03258**	

Notes:

1) Includes previously deferred items.

2) Represents a new Procurement Package introduced in this report.

3) Costs of Installation and Assembly have been centralized and moved to 2.2.P1.IO. The remaining amount, if any, reflects the cost of minor components.

4) EU obligation is highlighted in yellow.

ANNEX XIII PAs, cash contributions, secondment agreements for Broader Approach

Title	Signed Value BAUA	Current BAUA	Signed date
Supply of the Toroidal Field Magnet (EU-TFC)	88940	99413	12/07/2010
Supply of One Spare Toroidal Field Coil (EU-STFC)	5197	5197	13/03/2014
Toroidal Field Coil Pre-assembly (EU-PAS)	2950	2950	06/06/2014
Supply of HTS Current Leads for the TF, CS and EF coils (EU-HTSCL)	3420	3420	08/02/2010
Setup of a Cryogenic Test Facility and the Performance of Tests of the TF coils (EU-TFCTF)	18603	18603	24/01/2012
Supply of the Quench Protection Circuits for Poloidal and Toroidal Field Coils (EU-QPC)	19150	19150	03/12/2009
Supply of Toroidal Field, Poloidal Field, and Fast Plasma Position Control Coils Power Supplies (EU-SCMPS)	20080	20080	16/02/2011
Supply of the Switching Network Units for Central Solenoids (EU-SNU)	7080	7080	28/12/2010
Supply of the Resistive Wall Mode Control Coil Power Supply system (EU-RWMPS)	1150	1150	21/04/2015
Supply of Cryostat Base (EU-CR01)	4348	4348	07/12/2009
Supply of Cryostat Vessel Body Cylindrical Section (EU-CR02)	13042	13042	25/07/2011
Supply of the Cryogenic System (EU-CRYO)	35250	35250	29/11/2012
Supply of the ECRF Power Supply system (EU-ECRFPS)	3730	3730	22/07/2015
Integrated commissioning / initial operation, Commissioning (EU)	3000	3000	21/04/2015
TF01 Engineering Design of HFTM (EU)	2065	1465	13/06/2011
TF01bis Engineering Design of HFTM (EU)	600	600	02/09/2014
TF02 Irradiation Tests in Fission Reactor (EU)	1850	1850	30/09/2014
TF04 Other Engineering Validation Tasks (EU)	5260	4660	11/11/2011
TF04bis Other Engineering Validation Tasks (EU)	600	600	20/11/2014
LF01 EVEDA Li Test Loop (EU)	800	800	23/07/2010
LF03 Erosion/Corrosion (EU)	1220	1220	23/07/2010
LF04 Purification (EU)	490	490	23/07/2010
LF05 Remote Handling (EU)	1710	1710	22/04/2011
AF01 Tranversal Activities of the Accelerator Prototype (EU)	16700	16700	27/01/2014
AF02 Injector (EU)	4580	4580	18/12/2009
AF03 Radiofrequency Quadrupole (EU)	25370	25370	14/12/2010
AF03.2 Backup Set of RFQ Couplers (EU)	1000	1000	07/10/2014
AF04 First Cryomodule of SRF LINAC (EU)	6110	6110	26/04/2011
AF05 Medium Energy Beam Transport line MEBT (EU)	3470	3470	24/06/2011
AF06 RF Power (EU)	23200	23200	18/05/2010

AF07 High Energy Beam Transport line HEBT and Beam Dump (EU)	5490	5490	24/06/2011
AF08 Auxiliary Systems (Control Systems and support) (EU)	1600	1600	04/10/2010
AF09 Diagnostics (EU)	1520	1520	14/11/2012
AF10-WP1 Installation, Checkout, Startup and Commissioning (EU)	4150	4150	27/01/2014
AF10-WP2 Installation, Checkout, Startup and Commissioning (EU)	2540	2540	20/06/2014
AF10-WP3 Installation, Checkout, Startup and Commissioning (EU)	3570	3570	02/09/2014
AF10-WP4 Installation, Checkout, Startup and Commissioning (EU)	1150	1590	22/07/2015
AF12 Supply of the Cryoplant of the Prototype Accelerator	2490	2490	23/03/2015
ED01 Eng. Design of IFMIF Plant (EU)	2610	2610	28/03/2013
ED02 Eng. Design of Accelerator Facility (EU)	6360	6360	29/03/2013
ED03 Eng. Design of Lithium Target Facility (EU)	800	800	18/03/2013
ED04 Eng. Design of Test Facility (EU)	4270	4270	27/03/2013
Secondments Professional Staff (EU)	13160	13460	15/11/2007
Common Expenses (EU)	1200	1450	15/05/2008
Common Fund (EU)	840	1600	15/12/2010
IFERC-DPA01-JA.EU (Phase Two DEMO Design Activities (DDA) for the IFERC Project)	5000	6040	17/06/2011
IFERC-T2PA01-JA.EU (R&D on Tritium Technology in phase 2-3 part 2 for the DEMO R&D for IFERC)	400	550	16/07/2014
IFERC-T1PA01-EU.CIEMAT (DEMO R&D Activities on SiC/SiC Composites for the IFERC Project)	2849	2849	14/12/2010
IFERC-T1PA01-EU.ENEA (DEMO R&D Activities on SiC/SiC Composites for the IFERC Project)	442	442	25/01/2011
IFERC-T1PA02-EU.ENEA (DEMO R&D on SiC/SiC Composites for the IFERC Project: erosion/corrosion of SiC and SiC/SiC in liquid metal)	1032	1032	31/01/2012
IFERC-T3PA01-EU.CRPP (DEMO R&D Activities in DEMO Blanket for the IFERC Project)	510	425	14/12/2010
IFERC-T3PA01-EU.SCK.CEN (DEMO R&D Activities in DEMO Blanket for the IFERC Project)	885	825	14/12/2010
IFERC-T3PA01-EU.KIT (DEMO R&D Activities in DEMO Blanket for the IFERC Project)	2647	2647	14/12/2010
IFERC-CSCPA01-EU.CEA (Supply of the supercomputer and peripheral equipment for the IFERC project (CSC activity))	91500	91500	28/04/2010
IFERC-CSCPA02-EU.CEA (Enhancement of the Computational Simulation Centre in IFERC)	6320	6320	01/11/2013
IFERC-RECPA01-JA.EU (Outline of the Requirements for REC for the IFERC Project)	100	100	26/08/2013

IFERC-RECPA01-EU (Supply Remote Data Access Software Framework & Integrated Software Platform)	1400	1500	28/01/2014
Secondments by EU	4890	1320	15/11/2007
Cash Contributions by EU	400	700	15/12/2010
TOTAL EU BA contribution	**491090**	**499988**	
	rounded up	**500kBAUA**	

ANNEX XIV Revenue in commitment and payment appropriations

	Current Value MEUR	< 2007 Final Execution	2007 Executed	2008 Executed	2009 Executed	2010 Executed	2011 Executed	2012 Executed	2013 Executed	2014 Executed	2015 Executed	2016 Executed	2017 Budget	2018 Draft Budget	2019 Planned needs	2020 Planned needs	2021 Planned needs	2022 Planned needs	*Total <2007-2020*	*Total*
Commitment Appropriations	Euratom contribution	40.645	73.503	142.710	282.720	374.240	387.660	1 106.900	904.900	720.918	382.215	323.270	315.184	369.125	385.929	343.361	707.540	985.240	**6 153.279**	**7 846.059**
	France contribution	1.484	2.658	48.945	61.200	66.500	90.700	141.200	105.000	170.000	64.000	130.000	145.000	142.000	130.000	95.600	143.700	216.300	**1 394.287**	**1 754.287**
	F4E Members contribution	-	-	2.683	2.890	3.400	3.835	3.900	4.300	4.400	4.390	4.600	4.860	4.920	5.700	5.800	5.900	6.100	**55.678**	**67.678**
	Miscellaneous revenue	-	-	0.978	0.252	0.105	0.186	0.069	0.109	0.210	0.207	0.024	0.001	-	-	-	-	-	**2.140**	**2.140**
	F4E Total Budget	**42.129**	**76.160**	**195.315**	**347.062**	**444.245**	**482.381**	**1 252.069**	**1 014.309**	**895.528**	**450.813**	**457.894**	**465.045**	**516.045**	**521.629**	**444.761**	**857.140**	**1 207.640**	**7 605.384**	**9 670.164**
	Reserve Fund	-	-	-	-	-	-	-	-	-	1.301	14.984	18.265	37.900	3.440	-	13.020	-	**75.890**	**88.910**
	Refund (Reimbursement)	-	-	-	-	-	-	-	0.010	0.004	1.996	0.460	0.466	-	-	-	-	-	**2.936**	**2.936**
	F4E Total Revenue	**42.129**	**76.160**	**195.315**	**347.062**	**444.245**	**482.381**	**1 252.069**	**1 014.319**	**895.531**	**454.110**	**473.338**	**483.776**	**553.945**	**525.069**	**444.761**	**870.160**	**1 207.640**	**7 684.210**	**9 762.010**
Payment Appropriations	Euratom contribution	40.645	1.113	123.500	131.790	207.600	226.166	261.240	245.002	421.101	386.171	567.040	702.811	696.487	652.010	653.621	654.030	697.920	**5 316.296**	**6 668.246**
	France contribution	1.484	2.658	25.145	30.400	13.600	12.000	48.000	130.000	123.000	77.000	120.000	125.000	130.000	130.000	125.000	125.000	135.000	**1 093.287**	**1 353.287**
	F4E Members contribution	-	-	2.683	3.275	3.400	3.835	3.900	4.300	4.400	4.390	4.600	4.937	4.920	5.700	5.800	5.900	6.100	**56.140**	**68.140**
	Miscellaneous revenue	-	-	0.865	0.364	0.105	0.186	0.069	0.109	0.210	0.207	0.024	0.001	-	-	-	-	-	**2.140**	**2.140**
	F4E Total Budget	**42.129**	**3.770**	**152.193**	**165.829**	**224.705**	**242.187**	**313.208**	**379.411**	**548.711**	**467.768**	**691.664**	**832.749**	**831.407**	**787.710**	**784.421**	**784.930**	**839.020**	**6 467.862**	**8 091.812**
	Reserve Fund	-	-	-	-	-	-	-	-	-	-	4.121	16.840	15.530	18.000	21.399	-	13.020	**75.890**	**88.910**
	Refund (Reimbursement)	-	-	-	-	-	-	-	0.010	0.004	1.996	0.435	0.466	-	-	-	-	-	**2.911**	**2.911**
	F4E Total Revenue	**42.129**	**3.770**	**152.193**	**165.829**	**224.705**	**242.187**	**313.208**	**379.422**	**548.714**	**469.765**	**696.220**	**850.055**	**846.937**	**805.710**	**805.820**	**784.930**	**852.040**	**6 546.663**	**8 183.633**

Notes - Revenue is made of annual contributions, without carry over, recovery of outturn and commitments made available again.

- EU Contributions for administrative expenditure in 2019 and 2020 are the balance to the ceiling of EUR 325.0 million foreseen for the period 2014-2020

ANNEX XV Annual expenditure in commitment appropriations

Constant Value MEUR(2008)		< 2007 Final Execution	2007 Executed	2008 Executed	2009 Executed	2010 Executed	2011 Executed	2012 Executed	2013 Executed	2014 Executed	2015 Executed	2016 Executed	2017 Planned needs	2018 Planned needs	2019 Planned needs	2020 Planned needs	2021 Planned needs	2022 Planned needs	*Total <2007-2020*	*TOTAL*
Commitment Appropriations	**ITER Construction**	**M€ 43.91**	**M€ 75.62**	**M€ 158.06**	**M€ 272.04**	**M€ 364.82**	**M€ 336.92**	**M€ 996.37**	**M€ 786.26**	**M€ 486.19**	**M€ 300.20**	**M€ 325.72**	**M€ 413.86**	**M€ 422.45**	**M€ 511.62**	**M€ 450.95**	**M€ 568.97**	**M€ 824.69**	**M€ 5 944.98**	**M€ 7 338.65**
	(Of which Transportation)						*M€ 0.33*	*M€ 0.01*	*M€ 1.31*	*M€ 3.20*	*M€ 5.38*	*M€ 4.35*	*M€ 7.23*	*M€ 16.58*	*M€ 21.90*	*M€ 20.00*	*M€ 17.52*	*M€ 8.76*	**M€ 80.30**	**M€ 106.57**
	Technology			**M€ 3.99**	**M€ 16.24**	**M€ 8.17**	**M€ 6.77**	**M€ 1.77**	**M€ 9.01**	**M€ 14.02**	**M€ 13.32**	**M€ 10.79**	**M€ 14.68**	**M€ 10.45**	**M€ 6.13**	**M€ 4.63**	**M€ 43.43**	**M€ 40.50**	**M€ 119.97**	**M€ 203.90**
	Technology for ITER			M€ 3.88	M€ 6.36	M€ 2.31	M€ 6.15	M€ 0.72	M€ 6.94	M€ 8.36	M€ 6.23	M€ 5.65	M€ 4.59	M€ 5.24	M€ 1.66	M€ 0.51	M€ 13.43	M€ 10.50	M€ 58.59	M€ 82.52
	(Of which TBM)			*M€ 3.19*	*M€ 0.69*	*M€ 0.63*	*M€ 5.62*	*M€ 0.06*	*M€ 5.85*	*M€ 7.10*	*M€ 3.26*	*M€ 2.27*	*M€ 0.15*	*M€ 1.06*	*M€ 1.66*	*M€ 0.54*	*M€ 13.43*	*M€ 10.50*	*M€ 32.08*	*M€ 56.01*
	Technology for BA, DEMO & IFMIF			M€ 0.11	M€ 9.88	M€ 5.86	M€ 0.62	M€ 1.05	M€ 2.08	M€ 5.66	M€ 7.10	M€ 5.14	M€ 10.09	M€ 5.21	M€ 4.47	M€ 4.12	M€ 30.00	M€ 30.00	M€ 61.38	M€ 121.38
	Other Expenditure			**M€ 0.45**	**M€ 0.44**	**M€ 0.71**	**M€ 1.57**	**M€ 0.96**	**M€ 0.81**	**M€ 1.63**	**M€ 2.28**	**M€ 1.65**	**M€ 3.86**	**M€ 6.56**	**M€ 3.77**	**M€ 3.67**	**M€ 3.87**	**M€ 3.79**	**M€ 28.35**	**M€ 36.00**
	F4E Administration		**M€ 1.14**	**M€ 13.88**	**M€ 23.78**	**M€ 28.29**	**M€ 33.86**	**M€ 36.44**	**M€ 36.17**	**M€ 37.87**	**M€ 38.33**	**M€ 41.49**	**M€ 45.47**	**M€ 45.79**	**M€ 46.41**	**M€ 46.38**	**M€ 46.33**	**M€ 46.26**	**M€ 475.30**	**M€ 567.89**
	F4E Total Budget	**M€ 43.91**	**M€ 76.76**	**M€ 176.39**	**M€ 312.50**	**M€ 401.97**	**M€ 379.11**	**M€ 1 035.54**	**M€ 832.25**	**M€ 539.70**	**M€ 354.13**	**M€ 379.65**	**M€ 477.87**	**M€ 485.25**	**M€ 567.93**	**M€ 505.63**	**M€ 662.60**	**M€ 915.24**	**M€ 6 568.61**	**M€ 8 146.45**
	Reserve Fund										**M€ 1.13**	**M€ 12.16**	**M€ 15.90**	**M€ 31.09**	**M€ 2.77**		**M€ 10.06**		**M€ 63.05**	**M€ 73.11**
	F4E Total Expenditure	**M€ 43.91**	**M€ 76.76**	**M€ 176.39**	**M€ 312.50**	**M€ 401.97**	**M€ 379.11**	**M€ 1 035.54**	**M€ 832.25**	**M€ 539.70**	**M€ 355.26**	**M€ 391.81**	**M€ 493.76**	**M€ 516.34**	**M€ 570.70**	**M€ 505.63**	**M€ 672.66**	**M€ 915.24**	**M€ 6 631.66**	**M€ 8 219.56**

Current Value MEUR		< 2007 Final Execution	2007 Executed	2008 Executed	2009 Executed	2010 Executed	2011 Executed	2012 Executed	2013 Executed	2014 Executed	2015 Executed	2016 Executed	2017 Planned needs	2018 Planned needs	2019 Planned needs	2020 Planned needs	2021 Planned needs	2022 Planned needs	*Total <2007-2020*	*TOTAL*
Commitment Appropriations	**ITER Construction**	**42.129**	**73.656**	**158.059**	**278.766**	**383.010**	**362.019**	**1 097.361**	**888.646**	**564.803**	**353.869**	**386.656**	**511.238**	**533.479**	**660.100**	**593.959**	**736.029**	**1 088.161**	**6 887.749**	**8 711.938**
	(of Which Transportation)						*0.352*	*0.010*	*1.491*	*3.731*	*6.438*	*5.347*	*9.114*	*21.436*	*29.038*	*27.220*	*22.663*	*11.557*	*104.177*	*138.397*
	Technology			**3.995**	**16.658**	**8.593**	**7.308**	**1.956**	**10.220**	**16.303**	**15.744**	**12.993**	**17.957**	**13.161**	**8.100**	**6.300**	**56.181**	**53.439**	**139.288**	**248.908**
	Technology for ITER			3.883	6.526	2.431	6.640	0.794	7.863	9.713	7.277	6.754	5.497	6.468	2.200	0.700	17.373	13.855	66.746	97.974
	(of which TBM)			*3.188*	*0.709*	*0.660*	*6.065*	*0.072*	*6.656*	*8.278*	*3.844*	*2.791*	*0.192*	*1.365*	*2.200*	*0.739*	*17.373*	*13.855*	*36.760*	*67.987*
	Technology for BA, DEMO & IFMIF			0.112	10.132	6.162	0.669	1.162	2.357	6.590	8.467	6.238	12.460	6.693	5.900	5.600	38.808	39.584	72.542	150.934
	Other Expenditure			**0.452**	**0.450**	**0.743**	**1.691**	**1.060**	**0.923**	**1.899**	**2.724**	**2.028**	**4.860**	**8.477**	**5.000**	**5.000**	**5.000**	**5.000**	**35.307**	**45.307**
	F4E Administration		**1.113**	**13.884**	**24.258**	**29.428**	**35.932**	**39.445**	**39.932**	**42.653**	**44.031**	**48.613**	**54.340**	**55.818**	**57.710**	**58.820**	**59.930**	**61.040**	**545.976**	**666.946**
	F4E Total Budget	**42.129**	**74.769**	**176.390**	**320.132**	**421.774**	**406.950**	**1 139.821**	**939.721**	**625.658**	**416.368**	**450.290**	**588.395**	**610.935**	**730.910**	**664.079**	**857.140**	**1 207.640**	**7 608.320**	**9 673.100**
	Reserve Fund										**1.301**	**14.248**	**19.000**	**37.900**	**3.440**	**-**	**13.020**	**-**	**75.890**	**88.910**
	F4E Total Expenditure	**42.129**	**74.769**	**176.390**	**320.132**	**421.774**	**406.950**	**1 139.821**	**939.721**	**625.658**	**417.669**	**464.538**	**607.395**	**648.835**	**734.350**	**664.079**	**870.160**	**1 207.640**	**7 684.210**	**9 762.010**

Note: the Transportation and TBM domains are show n for the purpose of establishment of the ITER Host State contribution

ANNEX XVI Annual expenditure in payment appropriations

Current Value - MEUR		< 2007 Final Execution	2007 Executed	2008 Executed	2009 Executed	2010 Executed	2011 Executed	2012 Executed	2013 Executed	2014 Executed	2015 Executed	2016 Executed	2017 Planned needs	2018 Planned needs	2019 Planned needs	2020 Planned needs	2021 Planned needs	2022 Planned needs	*Total 2007-2020*	*Total*
Payment Appropriations	**ITER Construction**	**42.129**	**2.658**	**83.822**	**109.308**	**157.077**	**209.784**	**314.272**	**344.170**	**451.465**	**467.697**	**649.149**	**737.125**	**757.970**	**713.400**	**708.841**	**704.300**	**746.980**	**5 748.867**	**7 200.147**
	(Transportation)	-	-			*0.342*	*2.283*	*2.515*	*1.277*	*4.702*	*4.255*	*5.564*	*4.900*	*2.800*	*1.700*	*1.500*	*3.400*	*7.100*	*31.838*	*42.338*
	Technology	**-**	**-**	**0.112**	**1.361**	**4.293**	**9.207**	**6.469**	**7.563**	**11.350**	**11.058**	**14.437**	**40.700**	**15.500**	**11.600**	**11.760**	**15.700**	**26.000**	**145.410**	**187.110**
	Technology for ITER	-	-	-	1.229	4.027	4.282	3.415	2.279	5.905	5.342	8.576	28.000	9.000	4.200	4.760	3.400	7.100	81.014	91.514
	(TBM)	-	-	*3.188*	*0.709*	*0.660*	*6.065*	*0.072*	*6.656*	*8.278*	*3.844*	*2.791*	*0.192*	*1.365*	*2.200*	*0.739*	*17.373*	*13.855*	*36.760*	*67.987*
	Technology for BA, DEMO & IFMIF	-	-	0.112	0.132	0.266	4.925	3.054	5.285	5.445	5.715	5.862	12.700	6.500	7.400	7.000	12.300	18.900	64.395	95.595
	Other Expenditure	**-**	**-**	**0.085**	**0.539**	**0.645**	**0.647**	**1.118**	**1.249**	**0.912**	**2.027**	**2.300**	**3.000**	**8.000**	**5.000**	**5.000**	**5.000**	**5.000**	**30.521**	**40.521**
	F4E Administration	**-**	**1.113**	**13.884**	**24.258**	**29.428**	**35.932**	**39.445**	**39.932**	**42.653**	**44.031**	**48.613**	**54.340**	**55.818**	**57.710**	**58.820**	**59.930**	**61.040**	**545.976**	**666.946**
	F4E Total Budget	**42.129**	**3.770**	**97.903**	**135.466**	**191.443**	**255.570**	**361.304**	**392.914**	**506.379**	**524.813**	**714.499**	**835.165**	**837.288**	**787.710**	**784.421**	**784.930**	**839.020**	**6 470.774**	**8 094.724**
	Reserve Fund	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**20.961**	**15.530**	**18.000**	**21.399**	**-**	**13.020**	**75.890**	**88.910**
	F4E Total Expenditure	**42.129**	**3.770**	**97.903**	**135.466**	**191.443**	**255.570**	**361.304**	**392.914**	**506.379**	**524.813**	**714.499**	**856.126**	**852.818**	**805.710**	**805.820**	**784.930**	**852.040**	**6 546.663**	**8 183.633**

Notes: - The Transportation and TBM domains are shown for the purpose of establishment of the ITER Host State contribution

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NB:

1. The source used for Table 1 is the IO PA Database, while the one for Table 2, ANNEX XI and the target for the WP2018 Actions is the F4E DWS. Minor differences in the credit values are possible due to a different timing of update of the two sources.
2. The credit in Table 2, ANNEX XI and for the WP2018 Actions target for the still not signed PAs is a preliminary value that needs to be consolidated during the negotiations for the finalization of the PA documents.

List of Acronyms

AGPS	Accelerator Ground Power Supplies
ANS	Analytical System
ASN	Autorité de Sûreté Nucléaire
ATS	Air Transfer System
BA	Broader Approach
BAUA[27]	Broader Approach Unit of Account.
BA SC	Broader Approach Steering Committee
C-O	Close-Out
CD	Current Drive
CDR	Conceptual Design Review
CQMS	Common Quality management System
COSO	Internal Control standard
CXRS	Core plasma charge-exchange Recombination Spectroscopy
DA	Domestic Agency
DEL	Delivery
DEMO	Demonstration fusion reactor
DIV	Divertor
DT	Deuterium Tritium
DWS	Detailed Work Schedule
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
ELM	Edge Localized Mode
Euratom	The European Atomic Energy Community
F4E	Fusion for Energy
FAT	Factory Acceptance Test
FDR	Final design Review
FP	First Plasma
FW	First Wall
GB	Governing Board
HCLL	Helium Cooled Lithium-Lead
HCPB	Helium Cooled Pebble Bed
H&CD	Heating & Current Drive
HHF	High Heat Flux

[27] 1,000 BAUA equal to 678,000 EUR (value 5 May 2005).

HV	High Voltage
HVD	High Voltage Deck
IC	Ion Cyclotron or ITER Council
I&C	Instrumentation and Control
ICH	Ion Cyclotron Heating
IFERC	International Fusion Energy Research Center
IFMIF	International Fusion Materials Irradiation Facility
INB	Installation Nucleaire de Base
IO	ITER Organization
IR	Infra-Red
IRS	Internal Reporting system
ISEPS	Ion Source and Extraction Power Supplies
ISS	Isotope Separation System
ITA	ITER Task Agreement
ITER	International Thermonuclear Experimental Reactor
IUA[28]	ITER Unit of Account.
IVT	Inner Vertical Target
IVVS	In-Vessel Viewing System
KPI	Key Performance Indicator
LIPAc	Lithium target Facility
MAR	Materials Assessment Report
MV	Medium Voltage
NB	Neutral Beam
NBI	Neutral Beam Injector
NBTF	Neutral Beam Test Facility
ORE	Occupational Radiation Exposure
PA	Procurement Arrangement
PBS	Product Breakdown Structure
PCR	Project Change Request
PDR	Preliminary Design Review
PE	Plasma Engineering
PF	Poloidal Field
PIC	Protection Important Components
PID	Probability Impact Diagram
PM	Project Management Dept.
PP	Project Plan
QA	Quality Assurance
QC	Quality Control
QST	Japanese Implementation Agency
R&D	Research & Development

[28] In 2008, the IUA exchange rate approved by the ITER Council corresponded to 1498.16 Euros.

REC	Remote Export Center
REM	Radiological Environmental Monitoring
RF	Radio Frequency
RFCU	Radio Frequency Control Unit
RFE	Ready For Equipment
RFOC	Ready for other contractors
RFE	Ready for equipment
RH	Remote Handling
RWM	Resistive Wall Mode
SAT	Site Acceptance Test
SC	Specific Contract
SiC-Dual	SiC/SiC composite material for electrical and thermal Insulation
SR2FP	Straight Road to First Plasma
SS	Steady State
STP	Satellite Tokamak Programme
TBM	Test Blanket Module
TES	Test Extraction System
TF	Toroidal Field
TFC	Toroidal Field Coils
TFWP	Toroidal Field Winding Pack
TH	Thermal Hydraulical
TO	Technical Officer
UT	Ultrasonic
VAR	Variation
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 Programme