FUSION FOR ENERGY

Consolidated Annual Activity Report (CAAR) of

The European Joint Undertaking for ITER

Development of Fusion Energy

(Fusion for Energy – F4E)

[In pursuance of FR 1605/2002, FFR No 1271[1]/2013]

[1] REGULATION (EU) No 1271/2013 of 30 September 2013 on the framework financial regulation for the referred to in Article 208 of Regulation (EU, Euratom) No 966/2012 of the European Parliament and of the Council

Fusion for Energy

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List of Acronyms

A/E	Architect Engineer
AC	Audit Committee
AMC	Administration and Management Committee
ANB	Authorised Notification Body
BA	Broader Approach Agreement
BAUA	Broader Approach Units of Account
BCM	Blanket Cooling Manifold
BIPS	Buildings, Infrastructures and Power Supplies
Body PS & MHVPS	Body Power Supply and Main High Voltage Power Supply
BSM	Blanket Shield Module
CA	Contract Agent
CAAR	Consolidated Annual Activity Report
CAD	Computer Aided Design
CAS	Credit Allocation Scheme
CB	Cryostat Base
CER coils	Continuous External Rogowski coils
CMM	Cassette Multifunctional Mover
CN-DA	Chinese ITER Domestic Agency
CPRHS	Cash and Plug Remote Handling System
CS	Central Solenoid
CSC	Computational Simulation Centre
CVB	Cold Valve Boxes
CVBCS	Cryostat Vessel Body Cylindrical Section
CW	Continuous Wave
CW gyrotron	Continuous Wave gyrotron
CW pumping station	Cooling Water pumping station
DA	Domestic Agency
DC	Direct Current
DCC	Document Comment Communication
DEMO	Demonstration Fusion Reactors
DG ENER	Directorate-General for Energy
DNB	Diagnostic Neutral Beam
DP	Double Pancake
DR	Deviation Request
DTP	Divertor Test Platform
EAC	Estimate At Completion
EBBTF	European Breeding Blanket Test Facilities
EC	Electron Cyclotron
ECA	European Court of Auditors
ECH	Electron Cyclotron Heating
ECPS	Electron Cyclotron Power Supplies
ECRH	Electron Cyclotron Resonance Heating

ECT	Electron Cyclotron
EU	European Union
EU-DA	European Union ITER Domestic Agency (Fusion for Energy)
EUROFER	A 9% Chromium reduced activation ferritic-martensitic steel
EUROfusion	European Consortium for the Development of Fusion Energy
EVEDA	Engineering Validation and Engineering Design Activities
F4E	Fusion for Energy
FAT	Factory Acceptance Test
FC	Framework Contract
FO	Official
FP7 grants	Seventh Framework Programme for Research and Technological Development European Union grants
FSP	Full-Scale Prototype
FW	First Wall
FWC	Framework Contract
GB	Governing Board
GHe tank	Gas Helium Tank
H&CD	Heating and Current Drive
HCLL	Helium-Cooled Lithium-Lead
HFTM	High Flux Test Module
HHF	High Heat Flux
HIP	Hot Isostatic Pressing
HNB	Heating Neutral Beam
HPC	Hold Point Clearance
HP-EU	Hold Point – European Union
HR	Human Resources
HRS Water treatments	Heat Rejection Water treatments
HTS CL	High Temperature Superconducting Current Leads
HV	High Voltage
HVPS	High Voltage Power Supply
I&C	Instrumentation and Control
IAC	Internal Audit Capability
IAEA	International Atomic Energy Agency
IAS	Internal Audit Service
IC	Ion Cyclotron
ICH	Ion Cyclotron Heating
ICRH	Ion Cyclotron Resonance Heating
ICT	Information and Communication Technology
IDM	ITER Document Management (software)
IFERC	International Fusion Energy Research Centre
IFMIF	International Fusion Materials Irradiation Facility
IMSS	Integrated Management System Standards
IN-DA	Indian ITER Domestic Agency
IO	International Organisation
IP	Intellectual Property
IPTs	Integrated Project Teams

IPR	Intellectual Property Rights
ISEPS	Ion Source and Extraction Power Supplies
ISS	Isotope Separation System
ITER IO	ITER International Fusion Energy Organization
IUA	ITER Unit of Account
IVT	Inner Vertical Target
IVVS	In-Vessel Viewing System
JAEA	Japanese Implementing Agency
JET	Joint European Torus
JP-DA	Japanese ITER Domestic Agency
KO-DA	Korean ITER Domestic Agency
LC	Load Centre
LIFUS	Lithium for Fusion
LIPAc	Linear International Fusion Materials Irradiation Facility Prototype Accelerator
LN2	Liquid Nitrogen
MAD	Material Acceptance Document
MAP	Multi-Annual Plan
MITICA	Megavolt ITER Injector and Concept Advancement
MS	Management Standards
MV DC	Mega Volt Direct Current
NB	Neutral Beam
NBI	Neutral Beam Injector
NBTF	Neutral Beam Test Facility
NbTi	Niobium Titanium
NHF	Normal Heat Flux
NPC	Notice to Commence work
PA	Procurement Arrangement
PBS	Plant Breakdown Systems
PCC	Procurement and Contracts Committee
PF	Poloidal Field
PGM M/IMP	Programme Management and Implementation
PoE	Port of Entry
PPEN	Pulsed Power Electrical Network
PRIMA	Padova Research on ITER Megavolt Accelerator
PS	Power Supply
PTC	Prototype Torus Cryopump
Q1/2/3/4	Quarter
QA	Quality Assurance
QC	Quality Control
QMS	Quality Management System
QPC	Quench Protection Circuit
R&D	Research and Development
RASCI	Responsible, Accountable, Support, Consulted and Informed
RF	Radio Frequency
RFE	Ready for Equipment
RFQ	Radio Frequency Quadrupole

RH	Remote Handling
RU-DA	Russian ITER Domestic Agency
RWM	Resistive Wall Mode Control
RWMPS	Resistive Wall Modes (Coils) Power Supplies
SCMPS	Superconducting Magnets Power Supplies
SF6 gas	Sulphur hexafluoride gas
SMEs	Small and Medium Enterprises
SNE	Seconded National Expert
SPIDER	Source for Production of Ions of Deuterium Extracted from Radio Frequency plasma
SR2FP	Straight Road to First Plasma
SRF Linac	Superconducting Radio Frequency Linear Accelerator
SSEN	Steady State Electrical Network
TA	Temporary Agent
TAP	Technical Advisory Panel
TB	Tokamak Building
TF	Toroidal Field
TSS	Technical Support Services
US-DA	United States ITER Domestic Agency
VC	Voluntary Contributor
VV	Vacuum Vessel
WBS	Work Breakdown Structure
WDS	Water Detritiation System
WP	Work Programme
WRL	Warm Regeneration Lines
WRS	Warm Regeneration System

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Governing Board's Analysis and Assessment

The Governing Board,

- Having regard to the Council Decision 2007/198/Euratom establishing the European Joint Undertaking for ITER and the Development of Fusion Energy;
- Having regard to Article 43 of the F4E Financial Regulation;
- Having regard to the F4E 2016 Annual Work Programme adopted by the Governing Board in December 2015;
- Having regard to the Annual Activity Report 2015 of the Authority adopted by the Governing Board in July 2016;

1. Notes that the ITER Cost and Schedule review started in 2015 by the new ITER Director-General, Bernard Bigot, to re-baseline the ITER project was brought to a successful conclusion in 2016 with significant input from F4E and the other ITER Domestic Agencies;
2. Welcomes that the ITER Council at its meeting on November 2016 approved *ad referendum* a revised cost and schedule for the ITER project, including a set of key milestones leading to a First Plasma at the end of 2025 and full operation in 2035;
3. Notes that as part of this process F4E has had to revise its planning (the 'Straight Road to First Plasma' project – SR2FP) to focus efforts on the components needed for First Plasma to ensure that the required components can be delivered on time while respecting the € 6.6 bn cap on commitment appropriations until 2020;
4. Notes that the 'Straight Road to First Plasma' project formed the basis of the first Multi-Annual Plan (MAP), which was developed by F4E Management in consultation with Euratom in 2016. The Governing Board notes that the format and content of the 2017 Multi-Annual Plan needs to be improved and recommends that the required improvements are implemented in the 2018 Multi-Annual Plan;
5. Welcomes the excellent progress made on existing and new contracts in 2016 despite having to devote a significant amount of effort to developing and iterating the 'Straight Road to First Plasma' project with the ITER Organisation. Specifically:
    a. A 99.8% utilisation of the commitment budget and a 98.1% of the payments budget;
    b. Achieving all except one of the top level ITER Council milestones. (The one milestone not achieved on time was successfully achieved in March 2017).
6. Notes that the much improved utilisation of the payments appropriations budget compared to previous years will require closer attention to the prediction of the total amount and the profile of the payment appropriation required in future years. The Governing Board requests regular progress reports in this regard;
7. Regarding progress made on F4E action plans:

a. Welcomes that most of the actions in the Action Plan established by the Interim Director, Pietro Barabaschi, in 2015 were completed;

b. Notes the good progress made on the 2016 Action Plan implemented by the new Director, Johannes Schwemmer.

8. Notes the progress made to implement the new organisational structure proposed by the Director and welcomes the recruitment of individuals into most of the newly created positions to strengthen the Senior Management team.

9. Notes that the European Court of Auditors has expressed an unqualified opinion on the 2015 financial accounts;

10. Welcomes the significant progress in the development of the European in-kind contributions to ITER. In particular the Governing Board celebrates the successful completion of the first Toroidal Field coil winding pack, one of core high technology systems of the project;

11. Continues to be attentive to the realisation of the Tokamak Building, which shows also visible progress, and of the of the Vacuum Vessel sectors. Both of them are on the critical path for the construction of ITER;

12. Welcomes the progress of the projects under the Broader Approach. The cold test of five Toroidal Field coils were successfully performed and the first coils were integrated to the JT-60 SA Tokamak in Naka, Japan. Concerning IFMIF/EVEDA, the project progresses in a satisfactory manner, with the delivery of the Radio Frequency Quadrupole at the Rokkasho site in Japan. The Helios Computer continues its outstanding operation, with an availability of over 98%;

13. Welcomes the overall positive opinion by an Independent Review Panel, who analysed in September – November 2016 the implications of the new ITER schedule for F4E, the strategy proposed by F4E to establish the requirements for European contributions to ITER under the new schedule, and the ability of F4E to comply with these requirements;

14. Encourages F4E Management to implement the recommendations given by the Independent Review Panel.

For the Governing Board

Joaquín Sánchez
Chair of the F4E Governing Board
23 June 2017

Introduction

F4E in Brief

Fusion for Energy (F4E) is a Joint Undertaking created under the Euratom Treaty by a decision of the Council of the European Union (EU)[2]. F4E was established for a period of 35 years from 19 April 2007 and its seat is located in Barcelona, Spain.

The main tasks of F4E are as follows:

- In relation to the obligations stemming from the ITER International Agreement: **to provide the contribution of the European Atomic Energy Community (Euratom) to the ITER International Organisation for ITER**, the world's largest scientific partnership that aims to demonstrate fusion as a viable and sustainable source of energy;
- In relation to the obligations stemming from the Broader Approach Agreement with Japan: to provide components, equipment, materials and other resources for **Broader Approach activities** and to prepare and coordinate Euratom's participation in the implementation of Broader Approach activities.
- In relation to a demonstration fusion reactor (DEMO): to prepare and coordinate a programme of research, development and design activities other than ITER and Broader Approach activities, **in preparation for the construction of a demonstration fusion reactor and related facilities,** including the International Fusion Materials Irradiation Facility.

F4E has the following members which can be likened to "shareholders":

- Euratom, represented by the European Commission;
- The member states of Euratom;
- Third countries which have concluded cooperation agreements with Euratom in fusion that associate their respective research programmes with the Euratom programmes and which have expressed their wish to become members.

The current members are therefore the 28 Member States of the European Union, Euratom and Switzerland as a third country.

[2] Council decision 2013/791/Euratom of 13 December 2013 Amending Decision 2007/198/Euratom establishing the European Joint R and the Development of Fusion Energy and conferring advantages upon it.

Each member sits in the **Governing Board**, the main body which supervises F4E. The he following committees assist the Governing Board and/or the F4E Director: The **Bureau** assists the Governing Board in the preparation of decisions; the **Administration and Management Committee** which provides advice or recommendations to the Governing Board or the F4E Director on specific matters related to the administrative and financial planning of F4E; The **Procurement and Contracts Committee** provides the F4E Director with recommendations on procurement, contract and grant activities; the **Technical Advisory Panel** assists the Governing Board and Director in engineering, scientific and technological matters related to ITER, the Broader Approach and preparations for demonstration fusion reactors (DEMO); and the **Audit Committee** is an advisory committee to the Governing Board and has an overview of financial reporting and accounting; governance, Internal Control and Risk Management; external audit and internal audit.

The Year in Brief

Main Changes in 2016

During the period covered by this report there have been some important changes at the ITER Organization and F4E. **A new Director, Johannes Schwemmer, took up his duties on 1 January 2016.**

The F4E Director took over the **Action Plan** prepared and used by the Acting Director to implement the necessary actions in F4E. He closely collaborated with the ITER Organization Director General to carry out further improvements to the project.

He also modified the existing F4E structure and a **new Organization Breakdown Structure was effective as of 1 October 2016.** The new structure includes three new Departments, one of them fully dedicated to Project Management.

The close collaboration with the ITER Organization led to the **approval of the updated overall project schedule (in November 2016 at the ITER Council-19).** As for the overall ITER project cost and the associated estimate of resources for the overall period 2016-2035, it was approved "ad referendum" (i.e. subject to domestic processes of obtaining approval including approval of budgetary authorities and/or parliament if required). A staged approach is now foreseen for the project with first plasma in December 2025. These decisions were in line with the conclusions from the independent review of the Updated ITER Long Term Schedule and with the conclusions of the work carried out by F4E as explained below.

Key Quantitative Data of the Reporting Year

Europe has budgeted €$_{2008}$ 6.6bn until the end of 2020 according to the July 2010 decision of the Council of which most is earmarked for contracts placed by F4E with European industry, SMEs and research laboratories. In 2016, **F4E launched 40 new procurements and awarded 87**

contracts for a total value of just over € 190m. The cumulative value of contracts and grants placed by F4E up to end 2016 reached €$_{2008}$ 3.2bn.

Main Achievements During 2016

Taking into account the significant uncertainties about the capability for F4E to deliver on-time and within budget the components for the first plasma, including high financial risks in the Site and Buildings and Vacuum Vessel projects, **the F4E Director launched a project called 'Straight Road to First Plasma' (SR2FP) in January 2016.** The overall objective of the 'Straight Road to First Plasma' project was to concentrate resources (funding and staff) on the activities critical to the achievement of first plasma at the end of 2025. And so slowing down or suspending other projects until after 2020 in order to improve the confidence of remaining within the EUR 6.6 billion (2008 value) budget and allowing for a reserve. Due to the complex interdependencies of ITER components, this resulted in an extensive re-planning exercise which required several iterations with the ITER Organization.

In parallel, the ITER Organization was developing the longer term schedule to Deuterium-Tritium operations based on a four phase approach from first plasma at the end of 2025 up to Deuterium-Tritium operations in 2035. **ITER's 'Staged Approach' (also referred to as the 'Iteration Modelling Approach')** is based upon incorporating research operation periods as early as possible in the schedule depending on the availability of the additional components procured by the Domestic Agencies consistent with their annual and long-term budgets.

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

Among the main achievements during the year 2016 the following ones should be highlighted:

Site Building and Power Supplies

Electrical Power Supply and Distribution: The Construction Design Review for Building 36 as well as Areas 35 and 41 were closed successfully, allowing the start of their construction. The civil works and electrical equipment installation for Bay 4 of the PBS43 400kV Substation were completed, allowing a forecasted connection to the RTE (400kV) grid early in 2017.

Buildings and Civil Infrastructures: the level B1 civil works of the Tokamak Building were almost completed, and the L1 civil works were well advanced. All the cranes (750t and 50t) have been installed in the Assembly building. Building services works have started in auxiliary buildings (Assembly Hall and Site Services Building).

Magnets

The **first Toroidal Field Coils Winding Pack and the preparation for its cold test have been completed.** The first part of the qualification of the Pre-Compression Ring manufacturing process (the slice fabrication) with the current automated filament placement solution has been completed. In addition, a tendering phase for the manufacture of a number of back-up Pre-Compression Rings utilising an alternative technology was prepared and the contract has been signed in December 2016. A joint ITER Organization-F4E project for building a Pre-Compression Ring test facility was initiated.

Poloidal Field Coils: the main contracts have been signed and the adaptation works of the Poloidal Field Building have been completed. This has allowed the delivery of the tools for the Double Pancake Manufacturing and the start of the winding activities on the ITER site.

Vacuum Vessel

Production activities have started for three of the five released sectors and this has represented a significant increase of workload for both supplier and F4E, requiring an additional effort on increasing efficiency and streamlining coordination at the European consortium AMW. The main technical challenges were related to the quality of complex welds and to the control of distortions during the fabrication process in order to guarantee the compliance with fabrication Codes and Standards and the final tolerances of the Vacuum Vessel.

In-Vessel

Blanket First Wall: Significant progress has been made with the manufacturing of the full-scale prototypes by the three supplier candidates and on the First Wall pre-qualification programme with the successful High Heat Flux testing of First Wall semi-prototypes.

Divertor: Significant progress has been made in the manufacturing of the cassette bodies full-scale prototypes allowing the reopening of competition for the series production to be launched by the end of 2017. The manufacture of Inner Vertical Target pre-qualification mock-ups by the three new supplier candidates has successfully been completed. The high heat flux testing of these mock-ups is in progress.

Remote Handling

The resources were focused on the follow up and the coordination of the major suppliers of the Remote Handling systems (Cask and Plug Remote Handling System, Divertor Remote Handling System, Neutral Beam Remote Handling System and In-Vessel Viewing Systems) during preliminary design, paying attention to the complementary cross cutting technological developments and to the harmonisation between the different developments.

With regards to the Cask and Plug Remote Handling System, F4E was able to sign and start the first task order of the framework contract. Concerning the Divertor Remote Handling System, the team worked on the implementation of the third task order signed at the end of 2015 (and closed

and paid the previous ones). Concerning the Neutral Beam Remote Handling System, the team launched the second task order and completed and paid the first one. With regards to the In-Vessel Viewing Systems, F4E has worked on the implementation of the first task order signed at the end of 2015.

Cryoplant and Fuel Cycle

Vacuum Pumping and Fuelling: The final design of the Warm Regeneration Lines has been completed and the manufacturing has started. The manufacturing of the main subassemblies of the Pre-Production Cryopump has started, too. The procurement arrangement for the Cryopumps for Heating & Diagnostic Neutral Beam and MITICA has been signed. The tendering for the MITICA Cryopump has been launched and the preparation of the Front-End Cryopump Distribution System Procurement Arrangement has started.

Tritium Plant: The preliminary design of the Water Detritiation System “Main” has been completed. Assistance has been provided to the installation of the Large Tritiated Water Holding tanks and Emergency Water Detritiation Systems tanks in the tritium plant building. The contract for the holding and feeding Water Detritiation System tanks procurement has been signed.

Cryoplant: Manufacturing, performance of factory acceptance tests and start of deliveries to site for the LN2 Plant and Auxiliary Systems components have been completed. The contract for the MITICA Cryoplant procurement has been signed.

Radiological and Environmental Monitoring Systems: The preparation of the Preliminary Design Review for Tokamak Radiological and Environmental Monitoring Systems has started.

Breeding Blanket Modules

All problems identified during the Conceptual Design Review of the He-Cooled Lithium-Lead and the He- Cooled Pebble-Bed Breeding Blanket Modules have been solved, thus resulting in Conceptual Design Review approval. The activities for the development and characterization of the preliminary Welding Procedure Specification for the Breeding Blanket Module box and of EUROFER irradiation and characterization have progressed. The first task orders for the Preliminary Design of the Breeding Blanket Module Sets and of the Ancillary Systems and associated R&D activities have been signed and implemented.

Neutral Beam

The Neutral Beam Test Facility Assembly Framework was signed (the first task order was signed in December). The SF6 gas handling plant contract was signed. The SPIDER Ion Source and Extraction Power Supplies successfully passed the factory acceptance tests and the site acceptance tests. The first design reviews were successfully completed for MITICA Accelerator Ground Power Supplies and Ground Related Power Supplies and MITICA Vacuum Vessel. The Neutral Beam Test Facility Agreement for 2017 was signed in December 2016. The contract for the production of the SPIDER High Voltage Deck and Transmission Line was completed. Acceptance of the SPIDER Vacuum Vessel was completed and the procurement for the Ion

Source and Extraction Power Supplies of MITICA was started. Site acceptance tests started on SPIDER Vacuum and Gas Introduction systems. The installation work of the Neutral Beam Test Facility main components (cooling system, SPIDER, etc.) progressed significantly.

Diagnostics

Eighteen contracts have been signed for engineering analysis and design, manufacturing and testing of prototypes in support of the design of Diagnostics systems. Five grants were signed to continue the design of Diagnostics systems, mostly covering work to complete preparatory design activities prior to signature of the procurement arrangements. A Call for tender was launched for series manufacturing of Magnetics Outer Vessel Coils.

Radio Frequency Heating and Current Drive

Ion Cyclotron Heating and Current Drive: The R&D for the Ion Cyclotron Heating Radio Frequency window design has progressed with the contracts for cold spraying of Copper on Titanium and for rotary friction welding of Titanium and Stainless Steel. The signature of the design task order (framework contract for the antenna design) is now foreseen in 2017 and the offer is being evaluated.

Electron Cyclotron Power Sources and Supplies: A hold point for Electron Cyclotron Power Sources (gyrotrons) was passed successfully to evaluate the results of the tests on the industrial gyrotron prototype. For Electron Cyclotron Power Supplies, the first set was manufactured and factory acceptance tests started.

Electron Cyclotron Launchers: Final Design has progressed through the existing grant, while requirements identification & verification has been carried out by supporting contracts. Prototyping activities have focused on the ex-vessel components: brazing mock-ups for the diamond window have been manufactured and tested, specifications for valve prototype and waveguide mock-ups have been prepared. A framework contract for the set-up and operations of the FALCON Electron Cyclotron launcher components test facility has been signed, and design and specific components for the facility have been procured.

Electron Cyclotron Control System: The main activities have been related to the collection and consolidation of the requirements, as well as specific contracts for the procurement of Instrumentation & Control and protection hardware and software to be tested in FALCON.

Broader Approach

Overall progress on the Broader Approach projects is good as indicated by the ratio of credit awarded under the Broader Approach to credit planned at that date which is above 88% on average. Concerning the specific Broader Approach projects:

JT-60SA Project: Europe is providing critical components such as the 18 large (8 m height 4 m width) superconducting Toroidal Field coil magnets which are presently in advanced phase of manufacturing and testing. The first three coils were delivered to the Naka (Japan) site in 2016;

the majority of the coils will arrive in 2017. In 2016 the assembly of the machine has progressed, further EU components were successfully delivered and commissioned, such as part of the power supply and the cryogenic system;

The International Fusion Materials Irradiation Facility/Engineering Validation and Engineering Design Activities (IFMIF/EVEDA) Project: The key objective of validating the Lithium Target by prototyping was achieved in 2016. Commissioning of the Linear IFMIF Prototype Accelerator - LIPAc was continued in 2016 with advanced commissioning of the injector, the assembly of the Radio Frequency Quadrupole module, and its ancillaries on site. This will be followed in 2017 by the commissioning of the modules for accelerating the beam up to 5 MeV. It is planned to have all hardware components for the full Linear IFMIF Prototype Accelerator - LIPAc delivered to Rokkasho (Japan) by the end of 2017;

The International Fusion Energy Research Centre (IFERC) Programme: The Helios supercomputer, provided by France, has completed very successfully its scheduled five years in operation since its start date in January 2012, with around 400 published papers by European Union scientists in fusion. In addition, progress has been made on a number of collaborative activities in testing and development of materials for future breeder blankets, joint work on pre-conceptual Demonstration Reactor (DEMO) design, and the preparation of hardware and software for the Remote Experimentation Centre in Rokkasho.

Executive Summary

In late 2015, F4E's Governing Board appointed Johannes Schwemmer as the Director of Fusion for Energy (F4E) who took up his duties on 1 January 2016 and brought substantial project management experience from the private sector.

Building on the improvements introduced through F4E's 2015 Action Plan, he started a change programme to improve on-schedule execution of F4E projects within cost and influence the ITER project towards stabilising scope. This required increased focus on the management of critical projects and optimising the organisation of F4E. The following main achievements and change programmes have characterised the period covered by this report:

- The introduction of the **'Straight Road to First Plasma'** focus strategy by F4E to all of ITER, concentrating resources (funding and staff) on the activities and scope needed for ITER's First Plasma at the end 2025. At the same time the ITER Organization introduced the 'Staged Approach' strategy in which the project has several operation and assembly phases;
- The agreement on an **updated schedule for the ITER project** for the period 2016-2035 based on a strong collaboration between the ITER International Organization and all Domestic Agencies, among them F4E, taking into account the two strategies mentioned above and available financial and human resources;
- A large amount of management attention went into the **turnaround of the two most critical F4E projects**: The ITER Buildings and the EU Vacuum Vessel segments. Extensive measures have been taken in consultation with F4E's Governing Board to mitigate cost and schedule risks for these two projects;
- Update of F4E's **Cost Estimate at Completion** up to 2035 to include both ITER construction and operation phases. Although F4E committed to remain within the capped budget of €6.6bn (in constant 2008 values[3]) until 2020, cost Increases in several projects due to issues like past change requests, supplier weaknesses and updated nuclear safety requirements used up a significant part of the contingencies;
- Greater focus on project performance and decisions to resolve escalations has been achieved through monthly **Project Steering Meetings** in the presence of the Director and Senior Management where management decisions are taken jointly on the spot, based on clear factual information including milestone trend analyses, schedule performance indices, budgetary data as well as cost estimate at completion and risks;
- **Re-organising F4E** created a structure more focussed on the delivery of projects and financial control through the creation of a flatter hierarchy and stronger management team with two new departments;
- **Visible progress was made in many areas where F4E is contributing to ITER**, including the Buildings (completion of basement levels of the Tokamak Complex, completion of the Assembly Hall construction including the installation of the main

[3] In this report the symbol $€_{2008}$ indicates constant 2008 monetary values otherwise current values will be used

cranes); Magnets (production of the first-ever Toroidal Field coil Winding Pack); Neutral Beam (infrastructure of the Neutral Beam Test Facility), Tritium System (delivery and installation of the Water Detritiation System tanks); and Broader Approach (successful cold test of five JT-60SA Toroidal Field coils);

- **New opportunities were provided to European industries and laboratories** by the award of 87 contracts and grants in 2016 for a total value of just over € 190m increasing the overall investment by F4E to € 3.750bn. In addition, during 2016 the ITER Organization awarded € 338m of contracts to European industries and laboratories;
- **Improved budgetary planning and controllin**g enabled F4E to fully utilise its annual commitment and payment appropriations (respectively 99.8 % and 98.1 % of the final budgets). Recognising the significant efforts and improvements to the management of the ITER Project, in October 2016 the European Parliament granted 'discharge' to the F4E Director for the 2014 annual accounts of F4E;
- In June 2016, F4E reported to the Audit Committee the **achievement of all pending actions in response to the internal audit recommendation**s – for the first time in F4E's history. This indicates how F4E's management and internal control systems have matured.
- F4E Management has reasonable assurance that, overall, suitable controls are in place and function as intended; risks are being appropriately monitored and mitigated and continual improvements are being implemented. **The F4E Director**, in his capacity as Authorising Officer, **has signed the Declaration of Assurance without reservation**.

Part I. Achievements of the Year

1.1 Contributions to the ITER Project

1.1.1 Introduction

ITER is under construction in Cadarache in the south of France. Europe as the Host Party and France, as Host State, have special responsibilities for the success of the Project. Europe bears 45% of the construction cost including all the buildings. It will provide 34% of the cost of operation, deactivation and decommissioning of ITER[4].

The following subsections present a brief report on a selection of the activities undertaken in 2016 on the major systems needed to achieve 'First Plasma' in ITER (marking the start of ITER operations), namely Site and Buildings (subsection 1.1.2), Vacuum Vessel (1.1.3) and Magnets (1.1.4).

The subsequent subsections within this chapter deal with the many other complex, first-of-a-kind technological systems for ITER, most of which are still in the design and development phase, which Europe is responsible for. The ITER schedule requires installation of some of these systems, fully or partially, before First Plasma, although delivery, in most cases, is only required for subsequent assembly phases[5].

1.1.2 Site and Buildings

Thirty-nine buildings and areas will house the systems necessary for the operation of ITER. The 'Tokamak Complex' will house the main ITER components, and will be one of the largest buildings of its type ever constructed: 60 metres tall (with an additional 20 metres underground), 120 metres long and 80 metres wide; requiring 16,000 tons[6] of iron reinforcement bars, 150,000 m³ of concrete and 7,500 tons of steel.

As shown in fig. 1, the two levels of the Tokamak Complex below ground are complete and work has now reached the ground level. The thick cylindrical concrete bio-shield, which will surround ITER, has risen to the second and third floors.

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[4] Final Report of Negotiations on ITER Implementation, 1 April 2006. Attachment 2_C

[5] The tables which are included in sections 1.1, 1.2 and 1.3 refer to milestones declared as Annual Objectives in the F4E Work Programme 2016 Second Amendment, June 2016. The codes are listed in order to be able to identify the milestones in F4E's Primavera schedule.

[6] In this document we have used the following definition: 1 ton = 1000 kg

Civil construction works on the 60 metres tall Assembly Hall, adjacent to the Tokamak Complex, are complete and installation of the distinctive, reflective cladding is finished. Installation of the main cranes in the building, capable of lifting a combined weight of 1,500 tons, successfully met one of the high-level milestones set by the ITER Council. Two auxiliary cranes, able to lift 50 tons each, are also in place.

Both the cost of the buildings works to date and the scheduled duration have substantially exceeded initial estimates as a result of numerous changes to the design, to the scope and to the implementation of design development, in particular for the Tokamak Complex. These changes were mostly at the request of ITER Organization, prior to 2015.

In late 2015, by benchmarking against other civil engineering projects, independent expert assessments concluded that a much larger budget contingency for the buildings work should have been set aside in 2010. A 'Reserve Fund' created in 2015 for the ITER project as a whole now provides a mechanism to compensate F4E for subsequent change requests, however not for those of the past.

F4E and the ITER Organization, in consultation with F4E's Governing Board, are working closely together to minimise the ongoing cost increases and schedule delays.

Based on the recommendations from the independent assessments referred to above, a specific action plan for the buildings was agreed in January 2016 and by the end of the year F4E had completed 18 out of 20 actions.

F4E puts a large number of organisational, project management related, scope related and contractual measures in place to stabilise this project. These include:

- Postponement or de-scoping (including future optimisation) of non-First Plasma buildings;
- Design-to-cost, resulting in changes asked by F4E from the ITER Organization;
- Dedicated variation and claim management team established by F4E;
- Permanent on-site supervision;
- Very conservative approach in the Change Control Board towards any changes;
- Permanent optimisation of construction methods and processes;
- Maximum acceleration of civil works to contain run-rate related cost.

Figure 1: The ITER construction site showing the Tokamak Complex in the front and the Assembly Building (with the banner) directly behind: Photo: ITER Organization/EJF Riche (October 2016)

Annual Objectives				
Milestone ID/Objectives	**Scope Description**	**Achievement Criteria**	**Forecast Achievement Date**	**Achievement Delivered**
EU41-43.1A.40100	IO approval of Detailed Assembly and Installation Design for SSEN & PPEN	Hold Point Release	31 May 2016	Cancelled. Split into multiple milestones to meet construction schedule needs
EU41-43.115610	Delivery of PBS 43 LC 14	Delivery	17/11/2016	Postponed to November 2017 Re-prioritisation to works on the assembly (13) and cleaning facility (17) buildings and site infrastructure works. No impact on milestones for building RFE milestones nor critical path.
EU62.05.28119	NPC - Notice to Commence work of Hot Basin & Cooling Towers 67 (TB07)	No CAS associated to these milestones	15/12/2015	Achieved

EU62.02.6006610	HP - EU Submission of Construction Design for L3 level - B11, 14, 74 (Concrete Outline)	No CAS associated to these milestones	29/02/2016	Achieved
EU62.05.28719	NPC - Notice to Commence work of HRS Water Treatments + Heat Exchangers 64, 69 (TB07)	No CAS associated to these milestones	19/09/2016	Achieved in March 2017
EU62.02.6006660	HP - EU Submission of Construction Design for L4 level - B11, 14, 74	No CAS associated to these milestones	15/06/2016	Achieved
EU62.05.28419	NPC - Notice to Commence work of CW Pumping Station 68 (TB07)	No CAS associated to these milestones	30/11/2016	Achieved in March 2017
EU62.05.24209	NPC - Notice to Commence construction of Main AC Distribution Buildings (36)	No CAS associated to these milestones	16/06/2016	Achieved
EU62.05.272560	NPC - Notice to Commence construction of Bus-Bar Bridges (between B32 &74)	No CAS associated to these milestones	19/10/2016	Postponed to September 2017 Re-prioritisation to works on Diagnostic Building (74), Buildings 32/33, and site infrastructure works No impact on critical path
EU62.02.6006710	HP - EU Submission of Construction Design for L5 level - B11, 14, 74	No CAS associated to these milestones	16/09/2016	Achieved
EU62.05.65420	NPC - Notice to Commence Assembly Hall cranes Installation	No CAS associated to these milestones	07/12/2015	Achieved
EU62.05.27890	NPC - Confirmation by IO of RFE completion for Site Services Bldg (61)	1.155	23/12/2016	Achieved in May 2017

Table 1: Site and Buildings – Annual Objectives presented in the F4E Work Programme 2016 Second Amendment, June 2016.

1.1.3 Vacuum Vessel

The ITER plasma, where the fusion reactions will take place, will be held under vacuum inside a special double-walled container, the **Vacuum Vessel**. This toroidal (i.e. doughnut-shaped) vessel will be twice the size and eight times the volume as that used in the largest existing fusion device: it is over 19 metres across and 11 metres high. It will weigh in excess of 5,000 tons, similar to the Eiffel Tower.

In 2010 F4E placed a contract with a European consortium (AMW) to fabricate the components of the Vacuum Vessel for which Europe is responsible (seven out of the nine 'sectors' of the vessel). The work progressed more slowly than required and despite significant actions taken by F4E, including a major amendment to the contract in 2015, the production rate remained below the level required into the middle of 2016.

Since the forecasted delivery dates of the first sectors were affecting the critical path of the ITER project, F4E, Euratom and the 19th ITER Council in June 2016 agreed to transfer responsibility for fabricating two of the seven sectors to the ITER Organization. In turn, the ITER Organization passed this responsibility to the Korean Domestic Agency which was already fabricating two sectors for ITER.

In the second half of 2016, F4E commissioned an engineering consultancy to conduct an independent assessment of the project performance. In a second step AMW eventually decided to establish a centralised project and production management team at one location, in Chieti (Italy), with the support of the above-mentioned consultancy firm. In the meantime, as a result of all the efforts made until then, there was a significant improvement in the production rate during the second half of 2016, compared to the first. As this was a necessary but not sufficient step, F4E, in consultation with its Governing Board, has convinced AMW to take on-board as subcontractors further European companies; in Spain, France and Germany.

Annual Objectives				
Milestone ID/Objectives	**Scope Description**	**Achievement Criteria**	**Forecast Achievement Date**	**Achievement Delivered**
Fusion for Energy responsibility				
EU15.1A.3008110	Task order #1 Lot 2 Option #2 for VV resident Inspector #2	Task Order Option signature	07/01/2016	Achieved
EU15.1A.3008170	Task order #2 Lot 1 Option #1 for VV Inspector #1	Task Order Option signature	23/03/2016	Achieved
Fusion for Energy suppliers responsibility				
EU15.1A.1129030	Delivery of Forged Blocks for Sector 4 -	MAD approval for forged blocks	30/06/2016	Achieved

	Batch 2 from R-Kind	from R-Kind for Sector 4		
EU15.1A.3008600	Rails Forgings Sector 5 & Sector 4 Ready for Machining	MAD approval for Rails Forgings Sector 5 & Sector 4	18/10/2016	Postponed to 2017
EU15.1A.103150	F4E Checked Detailed Manufacturing Design of portion of Sector 3	DCC to supplier for sector 3 PS3 detailed manufacturing design	12/09/2016	Postponed to 2017
EU15.1A.106060	Start Fabrication - Sector 4 (Stage 4D)	First fabrication activities on sector 4	03/10/2016	Achieved

Table 2: Vacuum Vessel – Annual Objectives presented in the F4E Work Programme 2016 Second Amendment, June 2016.

1.1.4 Magnets

A system of **30 superconducting magnetic coils** will 'confine' (i.e. hold in place) the extremely hot plasma inside ITER and prevent it from touching the walls. These will be among the largest and most powerful superconducting magnetic coils ever made. Europe is responsible for providing 10 of the 19 'Toroidal Field' (TF) coils for ITER, 20% of the Nb_3Sn superconductor used in the TF coils, five of the six 'Poloidal Field' (PF) coils, 11% of the NbTi superconductor used in the PF coils and nine fibreglass 'pre-compression rings', which keep the coils in place during operation.

1.1.4.1 Conductors

Fabrication and verification of all **superconducting strand** under the responsibility of Europe is complete (97 tons out of the 500 tons required for ITER) and, during 2016, fabrication of the **superconductor** itself was completed; 19 kilometres for the Toroidal Field coils and 7 kilometres for the Poloidal Field coils.

1.1.4.2 Toroidal Field Magnets

Each **Toroidal Field coil**, weighing 310 tons, will comprise a superconducting '**Winding Pack**', mounted in a stainless steel case. To form the Winding Pack, seven smaller modules are stacked together and impregnated with a special resin. In turn, each of these smaller modules consists of a D-shaped stainless steel plate with grooves machined in a spiral path on both sides. The spiral grooves support a 700-metre long length of superconductor, wound into the required shape, heat-treated and electrically insulated before insertion in the grooves.

In 2016, the first ever Winding Pack was completed (see fig. 2), with the involvement of more than 600 people from at least 26 companies across Europe. The Winding Pack is 14 metres long by 9 metres wide, 1 metre-thick and weighs 110 tons. Its fabrication is the culmination of many

complex and highly technical operations. Testing of the Winding Pack at -200°C will begin soon before mounting into a massive stainless steel case to form the first, complete Toroidal Field coil.

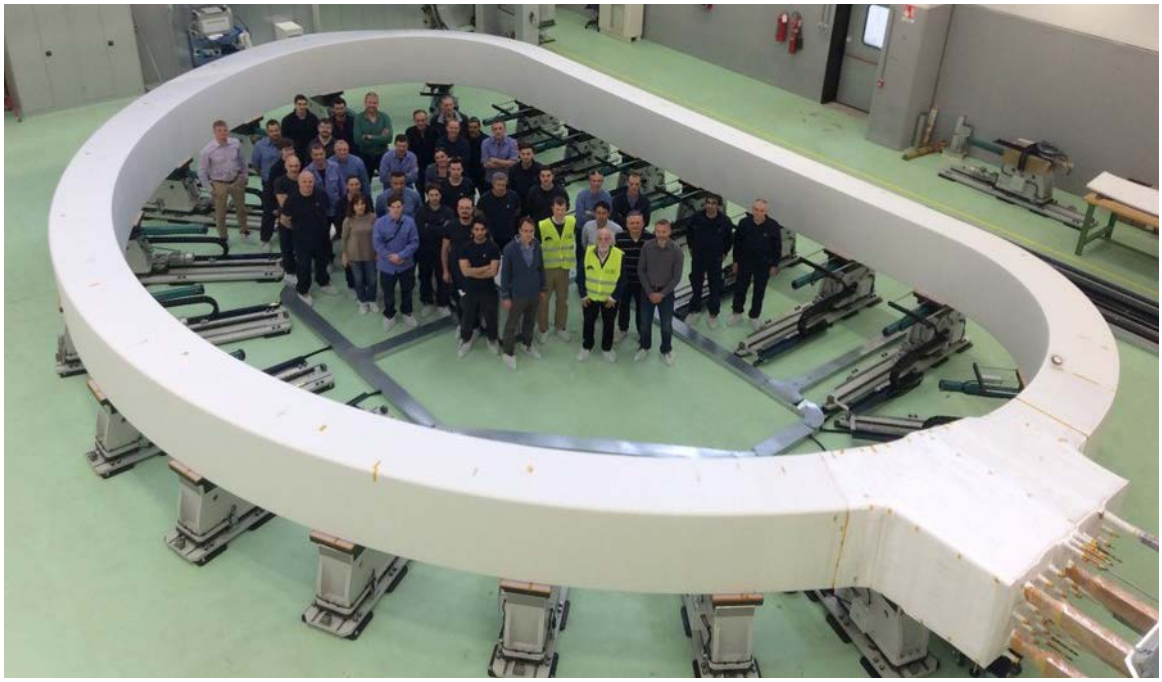


Figure 2: The first-ever Winding Pack for the Toroidal Field coils, completion of which met a major ITER Council milestone (ASG Superconductors, La Spezia, Italy)

Annual Objectives				
Milestone ID/Objectives	**Scope Description**	**Achievement Criteria**	**Forecast Achievement Date**	**Achievement Delivered**
Fusion for Energy suppliers responsibility				
EU11.6A.13980	Delivery of 760m TF Conductor for Double Pancake 5 of TF Coil #1	CAS 1.75000 kIUA	19/04/2016	Achieved
EU11.1A.14800	IO Approval of the Winding Pack Group Insulation 7DPs impregnated and stacked- TF WP11	Cleared by IO	08/04/2016	Achieved
EU11.1A.15567	F4E approval of Winding Pack Group Insulation 7DPs impregnated and stacked- TF WP09	Cleared by F4E	04/11/2016	Achieved in April 2017

Table 3: Magnets (Toroidal Field coils) – Annual Objectives presented in the F4E Work Programme 2016 Second Amendment, June 2016

1.1.4.3 Poloidal Field Magnets

Of the five **Poloidal Field coils** under Europe's responsibility, four are fabricated by European industry led by F4E in the giant Poloidal Field coil factory at the ITER site. One will be fabricated in China under F4E contract, using facilities and staff at the Institute of Plasma Physics, Chinese Academy of Sciences-ASIPP. An engineering integrator supports F4E in fabricating the coils manufactured in Europe.

Manufacture and commissioning of the tooling to wind the coils is complete, both in China and at the ITER site (fig. 3). During 2016 installation in the Poloidal Field coil building of a range of bespoke equipment, heavy cranes, a vacuum chamber and assembly stations was completed.

Fabrication of a mock-up allowed all winding manufacturing stages for the Poloidal Field coils to be tested. This local production line will allow fabrication on site of the largest Poloidal Field coils for ITER, up to 25 metres in diameter, which are too big for transportation to the site. A smaller line in China has achieved comparable progress for fabrication of the smaller PF6 coil.

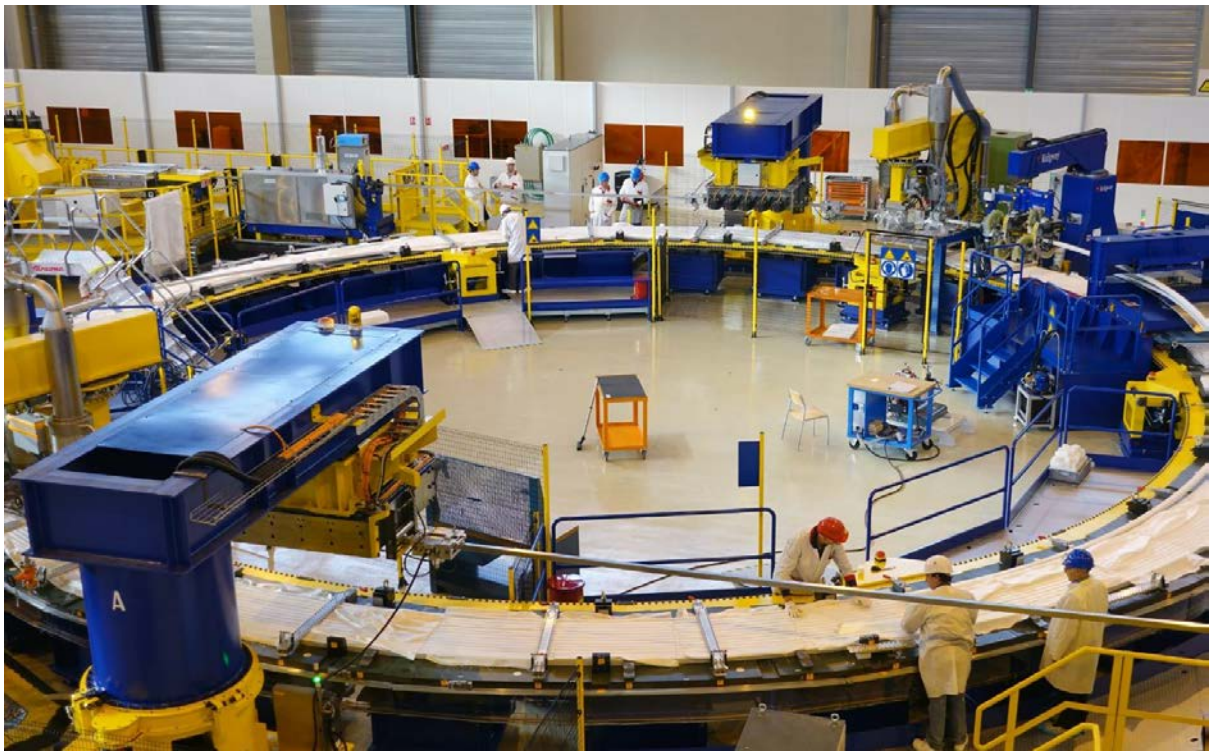


Figure 3: Preparations to wind the largest superconducting Poloidal Field coils underway on part of the production line at the ITER site

Annual Objectives				
Milestone ID/Objectives	**Scope Description**	**Achievement Criteria**	**Forecast Achievement Date**	**Achievement Delivered**
Fusion for Energy responsibility				
EU11.3A.40120	Cold Test Engineering Study and Facility Construction	Contract Signature	30/03/2016	Achieved
Fusion for Energy suppliers responsibility				
EU11.3B.01980	Start Qualification of PF Coils	Hold Point Clearance (HPC) of all Relevant Deliverables related to first qualification component	17/03/2016	Achieved
EU11.6C.0215	Delivery of PF conductor (UL7) for Manufacturing of Double Pancake # 4 of PF Coil#6	CAS 0.93604 kIUA	09/11/2016	Achieved

Table 4: Magnets (Poloidal Field coils) – Annual Objectives presented in the F4E Work Programme 2016 Second Amendment, June 2016

1.1.5 In-Vessel Components

Whilst the ITER magnets will confine most of the hot plasma, some particles and radiation will inevitably escape from this magnetic 'cage'. To protect the Vacuum Vessel and the external systems from this energy flux, the inside surface of the Vacuum Vessel will be covered by 440 special blocks, called Blanket Modules**.**

Each module is made from a Shield block and a **First Wall** panel. Europe will provide 215 First Wall panels. There is also a device at the bottom of the Vacuum Vessel, called the **Divertor**, which will allow the removal of the excess heat and plasma 'ash' keeping the plasma clean enough to continue operation. This particle flux escaping the plasma is hitting components specially designed to handle very high heat flux. Europe is responsible for many key components of the Divertor, in particular the **Inner Vertical Target** and the **Cassette Body**.

During 2016, work continued on manufacturing and testing of prototypes for qualification of potential suppliers within European industry of the Blanket First Wall and Divertor components. Notable achievements include the manufacture of two reduced-scale Blanket First Wall prototypes and the successful high heat flux testing of two qualification 'Semi-Prototypes',

meeting key milestones in the manufacturing process and the ITER First Wall qualification programme.

Regarding the Divertor components, F4E completed the first stage of the procedure for the qualification of potential suppliers for the 'Inner Vertical Target' with the successful manufacture of mock-ups for high heat flux testing. Competition will be reopened early 2017 among the successful candidates for the stage II on the manufacture and testing of full-scale prototypes.

Blanket:

Annual Objectives				
Milestone ID/Objectives	**Scope Description**	**Achievement Criteria**	**Forecast Achievement Date**	**Achievement Delivered**
Fusion for Energy responsibility				
EU.16.01.123275	Storage and recycling of Beryllium coated components.	Contract signed	30/09/2016	Achieved
EU.16.01.22120	Release of contractual option for the contract F4E-OPE-443 Lot-3 (WP13/16/07 for use of electro-plated/foil copper layer.	Letter releasing the option	16/02/2016	Achieved
Fusion for Energy suppliers responsibility				
EU.16.01.20430	WP - Assembly check prior to SS/CuCrZr 980C HIP operation for FSP - Lot 1	SS/CuCrZr assemblies ready for HIPing	23/09/2016	Achieved

Table 5: In-Vessel (Blanket) – Annual Objectives presented in the F4E Work Programme 2016 Second Amendment, June 2016.

Divertor:

Annual Objectives				
Milestone ID/Objectives	**Scope Description**	**Achievement Criteria**	**Forecast Achievement Date**	**Achievement Delivered**
Fusion for Energy responsibility				
EU17.2B.18140	Performance of High Heat Flux (HHF) of full tungsten small scale mock ups to pre-qualify additional suppliers for the procurement of the ITER divertor Inner Vertical Target.	Contract signed	03/10/2016	Achieved
Fusion for Energy suppliers responsibility				
EU17.2B.30810	COMPLETION of the Mock-ups Stage 1 - OMF-567 - Lot 3	Delivery at manufacture facility	30/09/2016	Achieved

Table 6: In-Vessel (Divertor) – Annual Objectives presented in the F4E Work Programme 2016 Second Amendment, June 2016.

1.1.6 Breeding Blanket Modules

Europe will also provide to ITER a special Blanket Module, known as the **Breeding Blanket Module**, also called 'Test Blanket Module' (TBM), which will be the tool to develop a necessary feature of all future fusion reactors – the generation of their own tritium, using ITER as a test bed. Tritium is one of the two fusion fuels, the other being deuterium. Both fuels are isotopes of hydrogen but, unlike deuterium, tritium is not naturally occurring.

The Breeding Blanket Module is not only a technically complex device but must also operate reliably in an extremely harsh environment (heat, neutrons and magnetic fields). F4E is leading this challenging research programme. In fall 2016 EUROfusion and F4E decided to align their Breeding Blanket research and test programmes. This updated joint programme is being built by a joint expert team and is planned to be available end of 2017.

During 2016, a key achievement was the fabrication of 27 tons of EUROFER steel by European industry specialised in very clean steel production (fig. 6a). EUROFER is a special type of steel, which does not become as radioactive as other steels when exposed to neutron irradiation. Manufacturing of mock-ups and qualification prototypes of the Breeding Blanket Module will use this steel.

Fabrication of a full-size mock-up, using a robotic welder, has helped standardise assembly processes for the box structure. An extensive program to test EUROFER under neutron irradiation is now underway. Such tests will support inclusion of engineering design limits for EUROFER in the French nuclear construction code, RCC-MRx.

Annual Objectives				
Milestone ID/Objectives	**Scope Description**	**Achievement Criteria**	**Forecast Achievement Date**	**Achievement Delivered**
Fusion for Energy responsibility				
EU56.01.1225380	Conceptual Design Review Steering Committee decision	Document approved in F4E IDM	03/10/2016	Achieved

Table 7: Breeding Blanket Modules – Annual Objectives presented in the F4E Work Programme 2016 Second Amendment, June 2016.

1.1.7 Remote Handling

Remote Handling (RH) will play an essential role on ITER once the plasma produces significant radiation from the fusion reactions and robotic tools become necessary to conduct inspections and to repair components close to the device. This is especially challenging since some of the items to be manipulated weigh up to 50 tons and all need precision positioning. Europe will provide a significant fraction of the Remote Handling systems on ITER; the **Divertor Remote Handling System**, the **Cask and Plug Remote Handling System**, the **Neutral Beam Remote Handling System** and the **In-Vessel Viewing System**, the latter being a mobile Diagnostic system for metrology of components in the ITER Vacuum Vessel.

Analysis of an existing conceptual design for the Cask and Plug Remote Handling System, its requirements and interfaces, started during 2016 along with preparation of the most urgent design tasks, to ensure that a detailed concept is ready for review by the French Nuclear Safety Regulator (ASN) by mid-2018.

Preliminary design activities also started for the Neutral Beam Remote Handling System, focusing on items that require installation before ITER First Plasma such as the Remote Handling ‘monorail’ crane. Testing of key technologies and components for the Divertor Remote Handling System, such as pipe cutting/welding, Remote Handling-compatible non-destructive testing methods, and water hydraulics components, underpinned significant progress with the preliminary design.

A multi-year programme to industrialise state-of-the-art technologies needed for the ITER Remote Handling systems progressed; with prototyping during 2016 of data acquisition electronics and miniature digital cameras able to survive the radiation environment within several Remote

Handling systems. Development of standardised software for the safety-important control systems for Remote Handling also progressed, along with studies on remote diagnostics and computer-assisted teleoperation.

Remote Handling:

Annual Objectives				
Milestone ID/Objectives	**Scope Description**	**Achievement Criteria**	**Forecast Achievement Date**	**Achievement Delivered**
Fusion for Energy responsibility				
EU23.03.901410	Cask & Plug Remote Handling System Procurement	Contract signed	31/05/2016	Achieved
EU23.05.20130	Preliminary Design first priority items for Neutral Beam Remote Handling System	Contract signed	11/07/2016	Achieved

Table 8: Remote Handling – Annual Objectives presented in the F4E Work Programme 2016 Second Amendment, June 2016

Remote Handling In-Vessel Viewing System:

Annual Objectives				
Milestone ID/Objectives	**Scope Description**	**Achievement Criteria**	**Forecast Achievement Date**	**Achievement Delivered**
Fusion for Energy responsibility				
EU57.01.20130	Initial Scope Evaluation for IVVS Signed	Specific contract signed	21/12/2015	Achieved

Table 9: Remote Handling In-Vessel Viewing System – Annual Objectives presented in the F4E Work Programme 2016 Second Amendment, June 2016.

1.1.8 Cryoplant and Fuel Cycle Systems

The ITER Cryoplant, a complex system and one of the largest of its type in the world, will provide the cryogenic (i.e. very cold) fluids necessary to cool several ITER components, most notably the superconducting magnets. Europe is responsible for the **Liquid Nitrogen Plant and Auxiliary Systems**, representing about one-half of the Cryoplant, along with part of the network to distribute and regulate the cryogenic fluids; the **front-end Cryodistribution lines** and **Cold Valve Boxes**. Europe is also responsible for the all the main **Cryopumps** of ITER, which use cryogenic fluids to keep a high vacuum in, for example, the Vacuum Vessel by condensing-out ('pumping') gases such as oxygen or nitrogen.

One of the fuels for the fusion reaction in ITER will be tritium. As well as being an expensive resource, tritium is radioactive. Careful management and recycling of tritium on ITER is therefore essential. This is the purpose of the Tritium Plant, to be provided by Europe; consisting of a **Water Detritiation System** and a **Hydrogen Isotope Separation System**.

One of the highlights of 2016 has been the delivery and installation in the Tokamak Complex of six large tanks, forming part of the Water Detritiation System; these were the first European in-kind components to be installed on ITER.

Other notable achievements include successful factory acceptance tests for the two nitrogen compressors of the Liquid Nitrogen Plant (fig. 5c) and the delivery to ITER of two massive 'quench' tanks; 35 metres long, five metres wide and five metres high (fig. 5d). The quench tanks, part of the Cryoplant, required a special road convoy for delivery to the ITER site.

Figure 4: Components of the ITER cryogenic cooling systems manufactured by European industries under contract with ITER (a) cold boxes, (b) turbine, (c) compressor and (d) quench tanks

Vacuum Pumping and Leak Detection:

Annual Objectives				
Milestone ID/Objectives	**Scope Description**	**Achievement Criteria**	**Forecast Achievement date**	**Achievement Delivered**
Fusion for Energy responsibility				
EU31.01.00671	Acceptance of Final Design Review Package WRL	Final Design Review Meeting held and final design accepted	26/09/2016	Achieved
EU31.01.12113	Final Approval of Final Design Warm Regeneration Lines	Final Design Review Meeting held & design endorsed by the Steering Committee.	03/11/2016	Achieved

Table 10: Cryoplant (Vacuum Pumping and Leak Detection) – Annual Objectives presented in the F4E Work Programme 2016 Second Amendment, June 2016

Tritium Plant:

Annual Objectives				
Milestone ID/Objectives	**Scope Description**	**Achievement Criteria**	**Forecast Achievement Date**	**Achievement Delivered**
Fusion for Energy suppliers responsibility				
EU32.05.181550	Contract Signature for Procurement of 5m3 and 12m3 (Holding and Feeding) WDS tanks	Contract signature	15/12/2016	Achieved
EU32.05.01760	Delivery of Preliminary Design Package to IO	Delivery to IO	21/09/2016	Achieved

Table 11: Cryoplant (Tritium Plant) – Annual Objectives presented in the F4E Work Programme 2016 Second Amendment, June 2016.

Cryoplant:

Annual Objectives				
Milestone ID/Objectives	**Scope Description**	**Achievement Criteria**	**Forecast Achievement Date**	**Achievement Delivered**
Fusion for Energy suppliers responsibility				
EU34.01.14350	HPC – IO approval for Factory Acceptance Test LIN Tanks	Hold Point Release	28/07/2016	Achieved
EU34.01.21530	HPC – IO approval for Factory Acceptance Test GHe Storage Tanks	CAS 1.56980005 kIUA	16/08/2016	Achieved
EU34.01.16138	HPC – IO approval for Factory Acceptance Test He Dryers	Hold Point Release	10/08/2016	Achieved
EU34.01.13070	HPC – IO approval for Factory Acceptance Test 80 K Loop 2	Hold Point Release	25/08/2016	Achieved
EU34.01.15710	HPC – IO approval for Factory Acceptance Test He Purifier	Hold Point Release	16/09/2016	Achieved
EU34.01.12170	HPC – IO approval for Factory Acceptance Test LN2 Plant Refrigerator 2	Hold Point Release	11/10/2016	Achieved
EU34.01.10800	Delivery 80K Loop 1 by EU-DA to ITER Site	80K Loop assembled, tested and delivered to ITER Site	24/10/2016	Postponed to 2017 Lack of space at ITER IO site for storage of delivered items
EU34.01.14810	HPC - IO approval for Factory Acceptance Test Quench Tanks	Hold Point Release	11/04/2016	Achieved
EU34.01.13850	HPC - IO approval for Factory Acceptance Test LHe Tanks	Hold Point Release	03/11/2016	Achieved

Table 12: Cryoplant – Annual Objectives presented in the F4E Work Programme 2016 Second Amendment, June 2016.

1.1.9 Plasma Heating Systems

To create fusion in ITER, the plasma needs to reach 150 million degrees. By passing a large electrical current through the plasma, which also helps to hold it in a magnetic 'cage', it is possible to reach 20 - 30 million degrees. Since this is not enough on its own, ITER relies on three additional heating systems.

1.1.9.1 Neutral Beam Heating and Current Drive

One of the most reliable ways to heat plasmas in present-day fusion experiments is to fire a beam of fast, uncharged particles into the plasma – called **Neutral Beam Injection**. ITER will have two (or three if needed) Neutral Beam Injectors and Europe is responsible for providing most of their components. Neutral Beam Injectors work by generating an electrically charged form of Deuterium ('ions') in an 'ion source'. A high voltage accelerates a beam of these ions to a high energy. Collisions with Deuterium gas neutralise ions in the beam to create the high-energy neutral beam.

To develop and test the Neutral Beam Injectors a dedicated facility was set up in Padua, Italy – known as the **Neutral Beam Test Facility** (fig. 5a). The facility hosts two test beds:

- **SPIDER** (**S**ource for **P**roduction of **I**ons of **D**euterium **E**xtracted from **R**adio Frequency plasma) where the ion source will be tested up to an acceleration voltage of 100,000 volts; and
- **MITICA** (**M**egavolt **IT**ER **I**njector & **C**oncept **A**dvancement) which will test the injector up to the full acceleration voltage of one megavolt (1 MV) and power of 16.5 megawatts (16.5 MW).

Installation is complete of the SPIDER Vacuum Vessel, Ion Source Handling Tools and High-Voltage Deck, which houses the ion source power supplies. The Vacuum and Gas Injection System, essential for maintaining the high-vacuum, clean environment necessary for SPIDER operations is also installed. The interlock system is manufactured and tested and the control and data acquisition system is accepted. Design and manufacturing of the 35 metre long transmission line, connecting the power supplies to the ion source, is complete and installation is finished (fig. 5b).

As for MITICA, manufacturing of all the main sub-assemblies for the Vacuum Vessel is complete (fig. 5c) and the assembly work advanced. Installation of Cooling Towers and Heat Exchangers on the roof of the facility main building is finished and the mechanical, electrical and control command system is approaching completion. Assembly of a mock-up of the High Voltage Deck is complete (fig. 5d) and the design validated through high-voltage testing (including at 1.2 MV DC for five hours). The High Voltage Bushing Assembly underwent similar electrical testing, as well as stringent mechanical and pressure tests. This assembly will have a key role in connecting power supplies of the MITICA Ion Source to the 1 MV Transmission Line.

Annual Objectives				
Milestone ID/Objectives	**Scope Description**	**Achievement Criteria**	**Forecast Achievement Date**	**Achievement Delivered**
Fusion for Energy responsibility				
EU53.TF.17310	Procurement for SF6 System for MITICA	Contract Signature/ CAS 0.16	06/05/2016	Achieved
EU53.TF.074100	MITICA Beam Source	Specific Contract Signature/	29/07/2016	Achieved
EU53.TF.155900	Procurement of NBTF SPIDER Control 3	Specific Contract Signature	15/11/2016	Achieved in April 2017
EU53.TF.04220	PRIMA Assembly (FWC - Assembly)	Specific Contract Signature/ CAS 0.18	23/092016	Achieved
EU53.CA.00225	NBTF Work Programme 2017	Contract Signature	21/12/2016	Achieved
Milestone ID/Objectives	**Scope Description**	**Achievement Criteria**	**Forecast Achievement Date**	**Achievement Delivered**
Fusion for Energy suppliers responsibility				
EU53.TF.13290	HPC - SPIDER Vessel - Accepted	IO Acceptance/CAS 0.32	15/12/2016	Achieved
EU53.TF.15110	Manufacturing and Testing Completed - SPIDER Interlock	FAT completion	08/07/2016	Achieved
EU53.06.02320	HPC - Final Documentation Set Accepted and Ownership of SPIDER ISEPS Transferred to IO	IO Acceptance/CAS 0.9	16/09/2016	Achieved in February 2017
EU53.TF.02360	HPC - SPIDER Vacuum and Gas Injection Plants - Accepted	IO Acceptance/ CAS 0.24	31/10/2016	Not yet achieved Technical problem during final acceptance tests of commercial cryopumps. These are now under repair.
EU53.TF.22540	HPC - SPIDER CODAS - Accepted	Contract completion/ CAS 0.95	08/08/2016	Achieved (but release of ITER Credit not yet completed)
EU53.TF.20880	HPC - SPIDER TL - Accepted	Contract completion/CAS 0.2	06/07/2016	Achieved (but release of ITER Credit in January 2017)

EU53.06.03280	HPC - First Design Report of MITICA AGPS & GRPS Accepted	IO Acceptance/ CAS 0.85	13/07/2016	Achieved (but release of ITER Credit in February 2017)

Table 13: Plasma Heating Systems (Neutral Beam Heating and Current Drive) – Annual Objectives presented in the F4E Work Programme 2016 Second Amendment, June 2016.

1.1.9.2 Radio and Microwave Heating Systems

Another way to heat up the plasma is to use radio waves to make the ions and electrons in the plasma vibrate, much like the way a microwave oven heats food. ITER is using two systems: **Ion Cyclotron Heating**, which heats the ions, and **Electron Cyclotron Heating**, which heats the electrons. Each system comprises power supplies, radio wave generators, transmission lines to transport the radio waves and antennae inside the Vacuum Vessel to launch them into the plasma. Water-cooled, stainless steel 'port plugs' house both the Electron Cyclotron Heating and Ion Cyclotron Heating antennas and couple them to the Vacuum Vessel.

Europe is responsible for providing two equatorial port plugs (each housing one **Ion Cyclotron Antenna**) and four upper port plugs (each housing one **Electron Cyclotron Upper Launcher**), together with ex-vessel components of both the Electron Cyclotron Upper and Equatorial Launchers and control systems for the Electron Cyclotron plant and Upper Launchers.

Europe is also responsible for providing **eight sets of power supplies** for the Electron Cyclotron Heating system and **six gyrotrons**, with their superconducting magnets and auxiliaries. Gyrotrons are high power radio wave generators in the mm-wave region of the electromagnetic spectrum (fig. 6b). Factory acceptance testing is underway for the first Electron Cyclotron power supply unit and initial testing of a gyrotron manufactured by European industry is meeting its performance targets.

Regarding the Ion Cyclotron Heating antennae, copper coatings on titanium alloy have been tested for suitability in the vacuum transmission lines and tests have been completed on 'Faraday screen' mock-ups, components designed to protect the antennae from the plasma. R&D has started during 2016 for titanium-stainless steel rotary friction weldPlasma Heating Systeming, a key technology for securing the radio-frequency windows that will seal the ITER vacuum whilst allowing transmission of high power radio waves.

For the Electron Cyclotron Heating system, achievements during 2016 include successful prototyping and testing of copper 'cuffs' brazed onto diamond disks, which will form the Electron Cyclotron windows sealing the ITER vacuum. F4E signed a framework contract for the set-up and operation of a high power testing facility for components of the Electron Cyclotron Heating system. Design of the test facility is complete, as is the procurement of components for its control and protection systems. Manufacturing of a gyrotron for the facility is underway. Finally, manufacture and testing is complete of a new superconducting magnet using cryogen-free technology, a key component of European designs for a one MW gyrotron system. By avoiding the use of cryogenic fluids; the cost is reduced and it is simpler to operate than conventional systems.

Figure 5: a) Neutral Beam Test Facility in Padua, Italy, (b) the Transmission Lines for SPIDER, (c) the MITICA Vacuum Vessel and (d) high-voltage testing of MITICA's Deck at Siemens

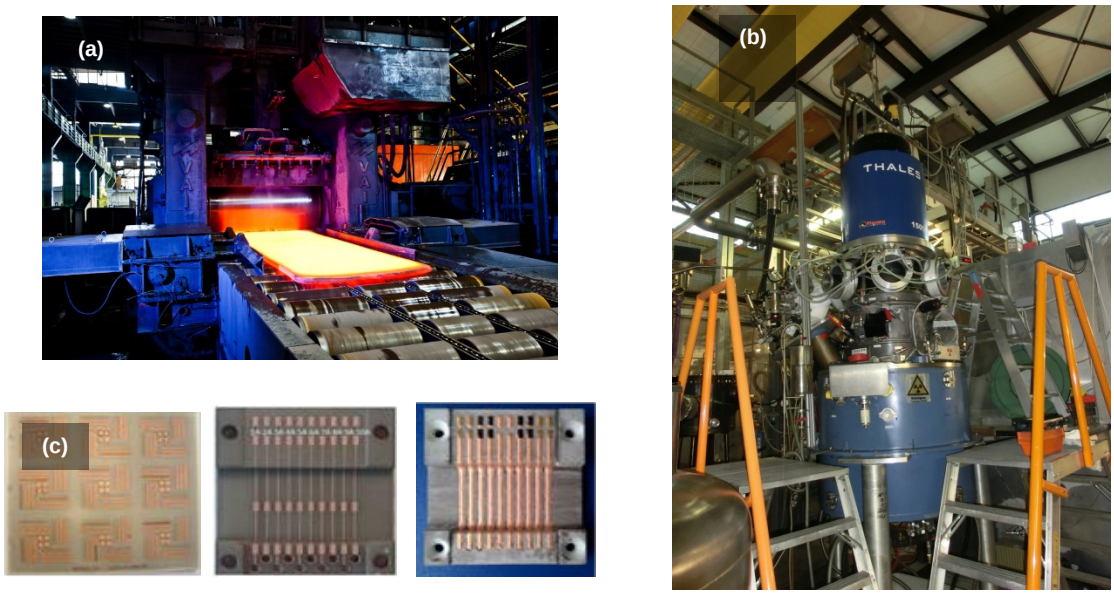


Figure 6: (a) production of special steel for Test Blanket Modules (Saarschmiede/Boehler), (b) the 1 MW gyrotron prototype installed at the Karlsruhe Institute of Technology, (c) selection of pre-production elements from three EU manufacturers for the bolometer

Ion Cyclotron Heating and Current Drive:

Annual Objectives				
Milestone ID/Objectives	**Scope Description**	**Achievement Criteria**	**Forecast Achievement Date**	**Achievement Delivered**
Fusion for Energy responsibility				
EU51.01.141065	Design simplification of the ICH Antenna	Signature of Specific contract	11/07/2016	Achieved in March 2017

Table 14: Plasma Heating Systems (Ion Cyclotron Heating and Current Drive) – Annual Objectives presented in the F4E Work Programme 2016 Second Amendment, June 2016.

Electron Cyclotron Upper Launcher:

Annual Objectives				
Milestone ID/Objectives	**Scope Description**	**Achievement Criteria**	**Forecast Achievement Date**	**Achievement Delivered**
Fusion for Energy suppliers responsibility				
EU52.01.305110	Provision of corrugated waveguide mock-ups for the EC Upper Launcher	Contract signature	06/10/16	Achieved in March 2017
EU52.01.201780	Brazing of diamond disk completed, including acceptance of leak test	Successful results of leak test	09/02/2016	Achieved

Table 15: Plasma Heating Systems (Electron Cyclotron Upper Launcher) – Annual Objectives presented in the F4E Work Programme 2016 Second Amendment, June 2016

Electron Cyclotron Power Sources and Power Supplies

Annual Objectives				
Milestone ID/Objectives	**Scope Description**	**Achievement Criteria**	**Forecast Achievement Date**	**Achievement Delivered**
Fusion for Energy responsibility				
EU52.04.23010	Release of Options for the Contract Procurement of Body PS & MHVPS (Main Contract)	Release of options	7/12/2016	Achieved
EU52.03.117170	Extension of 1MW CW gyrotron prototype testing and ECPS industrial follow-up	Contract Signature	14/12/2016	Achieved
Milestone ID/Objectives	**Scope Description**	**Achievement criteria**	**Forecast achievement date**	**Achievement Delivered**
Fusion for Energy responsibility				
EU52.03.10778	Development of EU 1MW CW gyrotron prototype for ITER	Completion	15/12/2016	Achieved
EU52.03.22165	Packing and Shipping of He-free Magnet II	Shipping	13/12/2016	Achieved in January 2017

Table 16: Plasma Heating Systems (Electron Cyclotron Power Sources and Power Supplies) – Annual Objectives presented in the F4E Work Programme 2016 Second Amendment, June 2016.

Electron Cyclotron Control:

Annual Objectives				
Milestone ID/Objectives	**Scope Description**	**Achievement Criteria**	**Forecast Achievement Date**	**Achievement Delivered**
Fusion for Energy responsibility				
EU52.05.210170	EC Plant Control System (Stage 1)	Contract signed	18/08/2016	Achieved

Table 17: Plasma Heating Systems (Electron Cyclotron Control) – Annual Objectives presented in the F4E Work Programme 2016 Second Amendment, June 2016.

1.1.10 Plasma Diagnostic Systems

Operating ITER successfully will require the availability of comprehensive information on the behaviour of the fusion plasma. This information will allow the safe operation of ITER, optimisation of the plasma configuration for maximum performance and comparisons between that performance and our theoretical understanding. Around fifty different systems ('**Diagnostics**') will measure parameters of the plasma, together with those of the First Wall Blanket Modules and Divertor. Europe is responsible for **twelve Diagnostics and eight ancillary systems**. So far, 28 European research laboratories and 20 European SMEs are involved in the design, development and/or manufacture of these systems.

Many of the European Diagnostics rely on collecting, focussing and transporting visible and infrared light using optical components. During 2016, F4E placed contracts to procure nearly 600 prototype optical samples. Gamma irradiation and 'steam ingress' tests on these samples are complete and analysis is on-going to determine those best able to survive the ITER environment.

At a different wavelength, that of microwaves, the intense electromagnetic forces experienced by metallic components in the Vacuum Vessel has driven the need to develop unique, copper-coated stainless steel waveguides, to transport the microwaves. Evaluation of prototypes for these waveguides was completed using a state-of-the-art, high performance Vector Network Analyser, procured under an F4E grant.

The fusion reactions in the ITER will generate neutrons, which will escape from the magnetic 'cage' confining the plasma. Analysis of the escaping neutrons will provide a host of essential information on the fusion reactions. Europe is responsible for design of two major Diagnostics for measuring neutrons. Prototyping began during 2016 on the performance of diamond detectors, a new technology that converts neutrons to electric current. Due to their ability to withstand high temperatures, these detectors have the potential to reduce substantially the cost of the system compared to alternatives.

In other areas, manufacture is complete of prototypes for Diagnostic components intended for use in high-temperature areas of ITER, exposed to high fluxes of neutrons. These prototypes use metallic tracks deposited on ceramics in three dimensions; a novel combination of technologies developed by several European SMEs. In one case, the prototypes are part of a system to measure total power output from the plasma, and in the second case, the prototypes are of miniaturised pick-up coils, to measure changes in the plasma magnetic fields.

Finally, manufacture is complete of five, 40-metre long Continuous External Rogowski (CER) coils. Once installed in three of the main Toroidal Field Coils on ITER, the Continuous External Rogowski coils will measure, with high reliability, the total electric current flowing in the ITER plasma. This is the most fundamental Diagnostic measurement; required for control of the ITER plasma and with relevance to safety. The Continuous External Rogowski coils will be the first, complete Diagnostic delivered to ITER by any of the Domestic Agencies.

Annual Objectives				
Milestone ID/Objectives	**Scope Description**	**Achievement Criteria**	**Forecast Achievement Date**	**Achievement Delivered**
Fusion for Energy responsibility				
EU55.01.107690	End of Technical Support During Continuous External Rogowski Integration at ITER Site	CAS 0.00277 kIUA	20/12/2016	Postponed to 2017 At ITER IO request, since interfacing items are not ready for integration
EU55.15.202400	Publish Call for tender for manufacturing design and Build to Print drawings and specifications	Call for tender launched	10/06/2016	Achieved
EU55.15.202450	Signature of Grant for Development and Design of Mirror Lifetime Optimisation	Grant signed	10/11/2016	Postponed to 2018 Change in strategy recommended by stakeholder expert review panel. Additional validation of technical approach needed to reduce risk before launch of grant.

Table 18: Plasma Diagnostic Systems – Annual Objectives presented in the F4E Work Programme 2016 Second Amendment, June 2016.

1.2 Contributions to the Broader Approach Projects

1.2.1 Introduction

In addition to acting as ITER Domestic Agency for Europe, F4E is also the Implementing Agency for the EU contribution to three Projects under the **Broader Approach (BA) Agreement** between Euratom and Japan. The Broader Approach Agreement was negotiated in parallel with the ITER agreement to carry out activities complementary to ITER aiming at a faster realisation of fusion as an energy source.

Under the Broader Approach Agreement, Euratom and Japan contribute equally to projects taking place in Japan (€ 338m and ¥ 46bn respectively, values of 5 May 2005). A number of Euratom

Member States (France, Italy, Germany, Spain, Switzerland, and later, Belgium - the **Voluntary Contributors**) pledged support for the Broader Approach projects and committed to provide approx. 90% of the EU contributions in-kind. F4E is the Implementing Agency for the Broader Approach, which coordinates the voluntary contributions and is also in charge of a limited amount of procurement.

1.2.2 Satellite Tokamak Project

The **Satellite Tokamak Project** (or JT-60SA), located in Naka (Japan), consists of the upgrade of an existing tokamak (of comparable size to the EU Joint European Torus (JET) tokamak) into a superconducting device capable of long pulse operation, with the aim of carrying out experiments which should be complementary to those studied in ITER. This upgrade involves the complete dismantling of the old machine, the refurbishing and reutilisation of the buildings, the power supplies systems and the additional heating system.

The first of the 18 **Toroidal Field coils** was successfully cold-tested at full current at the beginning of the year. By the end of 2016 five coils were already tested at the Cold Test Facility (set up by CEA France and SCK CEN Belgium). CEA France, ENEA Italy and F4E delivered three Toroidal Field coils, gravity supports and auxiliaries to Japan (fig. 7). KIT (Germany) successfully manufactured, tested and delivered to Japan ten of the twenty **High Temperature Current Leads**, used to connect the power supplies to the Poloidal Field coil magnets. About half of the **Superconducting Magnets Power Supplies** (CEA France) and the **Switching Network Units** (ENEA Italy) were delivered to Naka and the installation is now well advanced.

The **Cryoplant** (one of the more powerful helium refrigeration plant in fusion research with 9 kW equivalent power at 4.5 K), a CEA/F4E contribution, was successfully commissioned, and the ownership was transferred to the Japanese counterpart (QST). The manufacturing of the **Cryostat** was progressing steadily (CIEMAT Spain). F4E's personnel presence at the Naka site increased, with two professionals seconded there, who, with the support of a specific health and safety monitoring contractor, contributed to the implementation of complex on-site assembly and commissioning operations, as well as successfully integrating EU suppliers in the Japanese safety and management environment.

Figure 7: The status of the assembly of the JT-60SA tokamak with the Vacuum Vessel completed and two Toroidal Field coils already in position

Annual Objectives				
Milestone ID/Objectives	**Scope Description**	**Achievement Criteria**	**Forecast Achievement Date**	**Achievement Delivered**
EU.BA.02.01 Satellite Tokamak (JT-60SA) Common Activities	Common activities required to support JT-60SA activities, not covered under specific WBS sub elements of JT-60SA.	Expected total credit to EU: 1832 BAUA	Dec 2016 1832 BAUA	77% achieved
EU.BA.02.02 - Toroidal Field Magnet	Manufacture and testing of JT-60SA TF coils and structures, and transportation to Japan PoE.	Expected total credit to EU: 39098 BAUA	Dec 2016 1844 BAUA	Achieved
			Dec 2016 34576 +1398 BAUA	64% achieved
			Oct 2016 1280 BAUA	Achieved
EU.BA.02.03 - Assembly	Assembly or support of assembly of various components under European responsibility, at Naka site or in Europe prior to shipment, where not covered under individual subprojects.	Expected total credit to EU: 442 BAUA	April 2016 (442 BAUA)	Achieved
EU.BA.02.04	Provision and installation	Expected	June 2016	Achieved

Power Supply (PS)	of power supplies in Naka	total credit to EU: 11668 BAUA	(2832 BAUA) Dec 2016 (1062 BAUA)	
			June 2016 (3213 BAUA) June 2016 (1606 BAUA) Dec 2016 (1606 BAUA)	25% achieved
			June 2016 (230 BAUA)	Not achieved (delayed by six months)
			August 2016 (1119 BAUA)	Not achieved (delayed by ten months)
EU.BA.02.05 Cryogenic System	Support for installation and testing of cryoplant in Naka.	Expected total credit to EU: 3186 BAUA	Oct 2016 (3186 BAUA)	Achieved

Table 19: Broader Approach (Satellite Tokamak Project –JT60SA) – Annual Objectives presented in the F4E Work Programme 2016 Second Amendment, June 2016.

1.2.3 IFMIF/EVEDA Project

The IFMIF/EVEDA Project is hosted in Rokkasho (Japan), and is concerned with developing a prototype (**Linear IFMIF Prototype Accelerator - LIPAc**) of a facility for testing materials under the conditions of neutron irradiation expected in future fusion reactors. The **International Fusion Materials Irradiation Facility**, known as IFMIF, is an accelerator-based neutron source to produce a large neutron flux in order to qualify materials for future fusion reactors.

In 2016, a series of deliveries to the Rokkasho site have taken place. Most significant was the successful installation of the **Radiofrequency Quadrupole** (fig. 8) and radiofrequency power modules for the Quadrupole next to the injector. The LIPAc injector underwent several commissioning steps towards full performance.

In Europe, the experimental campaign at the Lithium LIFUS6 facility of ENEA Brasimone was completed in November 2016 with long-term erosion/corrosion tests (4000 h) of Reduced Activation Ferritic Martensitic steels in a liquid lithium jet.

Annual Objectives				
Milestone ID/Objectives	**Scope Description**	**Achievement Criteria**	**Forecast Achievement Date**	**Achievement Delivered**
EU.BA.03.01 IFMIF/EVEDA Project Common Activities	Common activities required to support IFMIF/EVEDA activities, not covered under specific WBS sub-elements of IFMIF/EVEDA.	Expected total credit to EU: 600 BAUA	Dec 2016	Achieved
EU.BA.03.02 LIPAc Activities	Part of Delivery of Components of the Linear IFMIF Prototype Accelerator (LIPAc) to Rokkasho, i.e. transportation to Japan PoE.	No credits to F4E, Total of credits allocated to Institutes of Voluntary Contributors for Delivery of RF system, RF Quadrupole: 21600 BAUA	Last Transport: Q4 - 2016	Achieved
EU.BA.03.02 LIPAc Activities	Installation and commissioning of Linear IFMIF Prototype Accelerator (LIPAc)	Credit for contribution to Installation and Commissioning Phase A: 110 BAUA.	September 2016: 110 BAUA).	50% achieved
EU.BA.03.02 LIPAc Activities	Contribution to Procurement Agreement PA AF04 (Crymodule of SRF Linac)	Credits for F4E 880 BAUA Total of credits allocated for Delivery and Assembly of Cryomodule of SRF Linac: 3000 BAUA	Call for tender: Q3/2016 Contract signature: Q1/2017	Not achieved Call for tender issued: Q1/2017 Contract signature expected: Q3/2017
EU.BA.03.01 IFMIF/EVEDA Project Common Activities	Coordination of Work from Designated Institutes of EU Voluntary Contributors to Validation of Lithium Target Facility	No credits to F4E, Total of credits allocated to Institute of Voluntary Contributors for Erosion/corrosion experiments in LIFUS6: 1220 BAUA	September 2016	90% achieved

Table 20: Broader Approach (IFMIF/EVEDA Project) – Annual Objectives presented in the F4E Work Programme 2016 Second Amendment, June 2016.

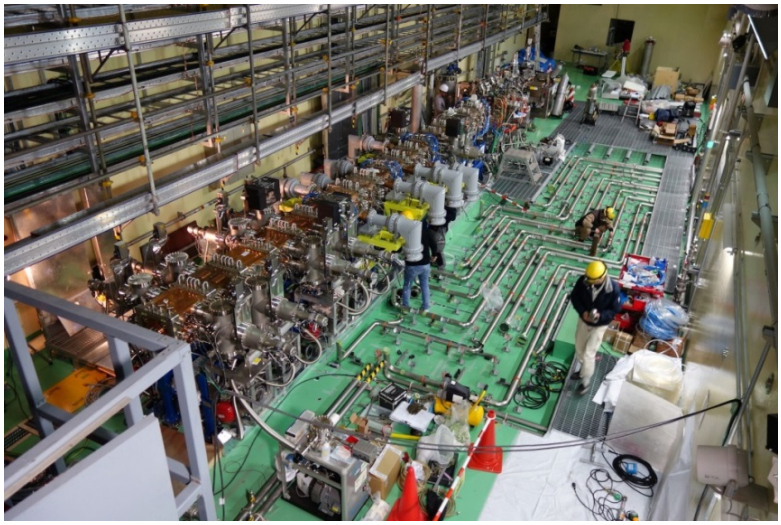


Figure 8: Installation of the Radiofrequency Quadrupole in the LIPAc accelerator vault in Rokkasho (Japan)

1.2.4 IFERC Project

The **International Fusion Energy Research Centre (IFERC)** Project is also hosted in Rokkasho (Japan). Its main sub-project, the Computational Simulation Centre, is providing supercomputer resources to the fusion scientific and technical communities in the EU and Japan.

In 2016 Helios (the supercomputer provided by CEA under a contract with Bull/ATOS) completed its fifth year of operation, with the final cycle of computational projects. Bull/ATOS continued to fulfil its contractual commitments for availability (>98%) and performance of the system. A final upgrade of Helios was carried out in January 2016. It consisted in the installation of a number of next generation processors, to encourage the users of Helios to adapt their codes for future supercomputers. In December 2016 the goal of performing an orderly termination of Helios as well as the recovery of data by the users was achieved. The Computer Simulation Centre has been a very successful Broader Approach project, with 639 scientific papers published to date using Helios. Almost all of the credit (97.82 kBAUA) has been claimed, the remainder for dismantling of Helios in the first months of 2017.

The challenges of reinforcing collaboration with EUROfusion (the European Consortium for the Development of Fusion Energy) and of merging the materials research activities into the Demonstration Reactor (DEMO) Design planning were met. The DEMO Activity Integrated Project Team continued to investigate key issues, which impact the selection of main machine parameters and technical specifications for pre-conceptual DEMO designs.

Figure 9: The Helios Supercomputer

Annual Objectives				
Milestone ID/Objectives	**Scope Description**	**Achievement Criteria**	**Forecast Achievement Date**	**Achievement Delivered**
EU.BA.04.03	Computational Simulation Centre (CSC): Operation, maintenance and upgrades of supercomputer Helios	Expected credit to EU: 6318 BAUA	December 2016 (will complete 97820 BAUA)	Achieved
EU.BA.04.04	DEMO Design and materials R&D activities: Develop design rules, databases for DEMO design	Expected total credit to EU: 1000 BAUA	December 2016	Achieved
EU.BA.04.02	Remote Experimentation Centre: Preparation and establishment of a remote experimentation centre for ITER, to be tested on for example JT-60SA.	Expected total credit to EU: 1560 BAUA	December 2016	Achieved

Table 21: Broader Approach (IFERC Project) – Annual Objectives presented in the F4E Work Programme 2016 Second Amendment, June 2016.

1.3 Technical Support Activities

1.3.1 Technical Support Services

The Technical Support Services team in F4E provides specific technical expertise in engineering and fusion technologies to the F4E Project Teams delivering systems to the ITER Project and, to a more limited extent, also supports the Broader Approach projects. Technical support is provided in the following areas:

- **Design office activities (mechanical and schematics):** maintaining CAD and engineering data management systems: to check the quality of CAD data received from ITER Organisation and F4E suppliers, to manage the exchange of CAD data with ITER Organization and F4E suppliers, to support the technical specification CAD works to be subcontracted, to carry out local mechanical configuration control and, occasionally, to perform in-house mechanical design;
- **Analysis (mechanical, structural dynamics, civil engineering, fluid dynamics, electro magnetism, nuclear analyses):** providing technical support in computational analysis for development of the ITER design, both in-house and by placing and following up service contracts with qualified suppliers. Most of the analysis has been so far in support of the Vacuum Vessel, Magnets and Buildings design, including nuclear analysis to confirm estimates for the heat load on the Magnets and in support of the ITER facility radiological protection status;
- **Design Codes and Standards:** tracking developments in, and the application of, standard codes (e.g. ASME, RCC-MR) to the design of the key ITER mechanical components (e.g.: Vacuum Vessel, Buildings and Magnets);
- **Instrumentation and Control:** managing requirements and requirements formalisation, participation and organisation of design reviews, review of design documents from plant system suppliers and selection process;
- **Metrology:** defining a metrological strategy, preparing technical specifications and following up project activities related to metrology. Support is provided for: the preparation of uncertainties reports, the verification of supplier metrological procedures, participation to the assessment of Non Conformities related to metrology, witnessing geometrical survey campaigns, carrying out independent geometrical surveys and participating relevant project progress meetings;
- **Materials and Fabrication Technologies:** providing technical expertise in materials science, materials technologies and manufacturing processes. Supervising development and qualification of materials, collecting of material data and qualifying of joining technologies.
- Moreover, **specific activities related to the production of nuclear data** are carried out. Validated nuclear data for radiation transport and activation calculations are required to improve predictive capabilities in support of nuclear design activities.

Technical Support Services:

Annual Objectives				
Milestone ID/Objectives	**Scope Description**	**Achievement Criteria**	**Forecast Achievement Date**	**Achievement Delivered**
EU.ES.03.19550	Instrumentation and control integration service	Contract signed	29/09/2016	Achieved
EU.ES.01.21600	Support in the area of integration, operation, maintenance, and other technical areas within short notice	Contract signed	02/11/2016	Achieved

Table 22: Technical Support Services – Annual Objectives presented in the F4E Work Programme 2016 Second Amendment, June 2016.

Material and Fabrication Technologies:

Annual Objectives				
Milestone ID/Objectives	**Scope Description**	**Achievement Criteria**	**Forecast Achievement Date**	**Achievement Delivered**
EU.MF.01.1223120	Provision of Destructive and Non-Destructive Testing of Materials at Room and Elevated Temperature	Contract signed	05/07/2016	Achieved
EU.MF.01.221880	Provision of Engineering Support on Joining and Non Destructive testing techniques for production of ITER Components	Contract signed	29/09/2016	Achieved

Table 23: Technical Support Services (Material and Fabrication Technologies) – Annual Objectives presented in the F4E Work Programme 2016 Second Amendment, June 2016.

1.3.2 Nuclear Safety

Up until the F4E structural reorganisation in October 2016, the F4E Nuclear Safety Group and the Quality Assurance/Quality Control Group were integrated in the Nuclear Safety and Quality Unit reporting to the Head of ITER Department. From October 2016, the Quality Assurance/Quality Control group was transferred to the Project Management Department and the Nuclear Safety Group was transferred to the Technical Support Services inside the ITER Delivery Department, so as to render independent the two Quality Assurance/Quality Control and Nuclear Safety teams.

In order to ensure the correct implementation and management of nuclear safety within F4E, the Nuclear Safety Group provides technical expertise to the Project Teams within the nuclear safety area, and performs some surveillance of their nuclear safety activities. In 2016, the first nuclear safety inspection was performed by F4E in three workshops of a major F4E supplier.

The F4E Nuclear Safety Policy was approved by the Director in 2016 and nuclear safety culture has been strengthened within F4E with the establishment of a new annual nuclear safety workshop and lectures given by French nuclear safety specialists.

Annual Objectives				
Milestone ID/Objectives	**Scope Description**	**Achievement Criteria**	**Forecast Achievement Date**	**Achievement Delivered**
EU.NS.01.22740	Provision of Support for Nuclear Safety	Contract signed	29/09/2016	Achieved in January 2017

Table 24: Nuclear Safety – Annual Objectives presented in the F4E Work Programme 2016 Second Amendment, June 2016.

1.3.3 Plasma Engineering

The Plasma Engineering group provides expert support and analysis to the ITER Project, and directly to F4E Project Teams and their suppliers, in plasma control, plasma scenario development, plasma-wall interactions and plasma operation. Plasma Engineering addresses the analysis and definition of requirements (including definition and verification of loads) coming from interfaces with the ITER plasma and is involved in the study of the impact of design changes on the ITER machine performance and operation.

The Plasma Engineering scope includes also carrying out specific activities requested by ITER Organisation by means of ITER task agreements, supporting F4E managerial/strategic decisions, and interacting with technical and scientific committees advising F4E and the ITER Project.

Annual Objectives				
Milestone ID/Objectives	**Scope Description**	**Achievement Criteria**	**Forecast Achievement Date**	**Achievement Delivered**
EU.PE.501010	Engineering support to PE and Antennas	FWC signed	04/11/2016	Not achieved The contract will not be placed because the scope of this contract will be tendered in a F4E-wide contract.

Table 25: Plasma Engineering – Annual Objectives presented in the F4E Work Programme 2016 Second Amendment, June 2016.

1.3.4 Transportation

This activity reflects the management, on F4E's side, of technical aspects of the joint procurement with ITER Organization for the transportation of ITER components to the site in Cadarache. The scope includes the transportation of all, large ITER components from the point of entry (the port of Marseille at Fos or Marseille's Marignane Airport) to ITER site.

Annual Objectives		
Area	**Scope Description**	**Achievement Delivered**
Transportation	The following general support activities will be carried out during the next 3 years: • Signature of the specific contracts under the ITER Global Logistics Framework Contract for the transportation of ITER Components according to the needs identified by F4E (for EU components) and other Domestic Agencies during the relevant year • Provide all support needed for the security of the transports	Achieved in February 2017

Table 26: Transportation – Annual Objectives presented in the F4E Work Programme 2016 Second Amendment, June 2016.

1.4 Overall ITER Performance

1.4.1 ITER Performance Assessment by Earned Value

While evaluation of milestones provides an indication of performance, it does not take into account that some milestones are more important than others. In order to have a better assessment of the advancement in discharging the EU obligations towards ITER F4E uses an **Earned Value Management** approach using the so-called 'ITER credits' that F4E receives for the implementation of deliveries. The ITER Organization and each Domestic Agency agree such credit as part of each Procurement Arrangement and provides 'proof' that an in-kind contribution is accepted.

A comparison of the achieved ITER credit compared to the plan ('baseline') for 2016 is shown in fig. 10 for all the ITER systems that F4E is contributing to. Delays in the achievement of specific milestones explain the discrepancy between the planned and achieved credit. The achieved ITER credit on the timescale of the whole ITER project is shown in fig. 11. The difference between the 'achieved' and 'released' credit is that the latter only follows after the formal acceptance by ITER of the deliverable and all associated documentation which can be a lengthy process.

1.4.2 ITER Performance Assessment by Milestones

To complement the Earned Value Management monitoring, both ITER Organization and F4E also use the number of **milestones** achieved during the year compared with the amount initially forecasted as a measure of progress.

F4E and the ITER Organization have increased attention on the achievement of a set of agreed milestones that are key to be able to achieve First Plasma on the agreed date. Five of the six planned F4E milestones were achieved on time in 2016. The only missed milestone (met in early 2017) was delayed due to a weld quality issue on a Vacuum Vessel segment.

Using a basket of F4E internal milestones, a Schedule Performance Index (SPI) of 0.7 can be derived for 2016 (1 would indicate that all planned milestones were achieved). This SPI is similar to that reported to Council in previous years and can be attributed to several factors:

- During the first six months of 2016, all new non-First Plasma activities, e.g. tenders were put on hold as part of a package of interim measures. This 'one time' effect delayed many milestones that were foreseen in F4E's work programme;

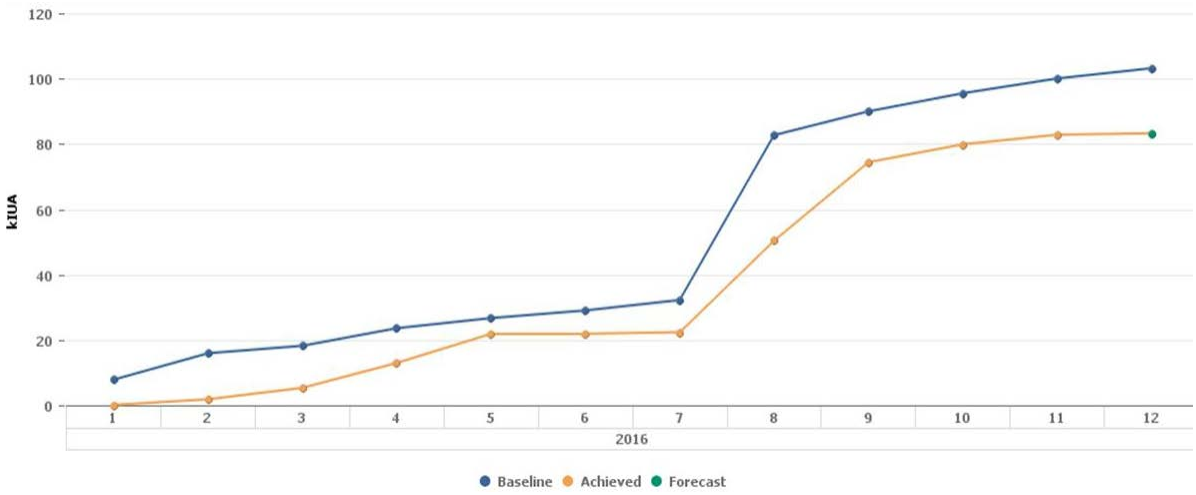


Figure 10: Comparison of the in-year Achieved and Planned Value of ITER Credit during 2016

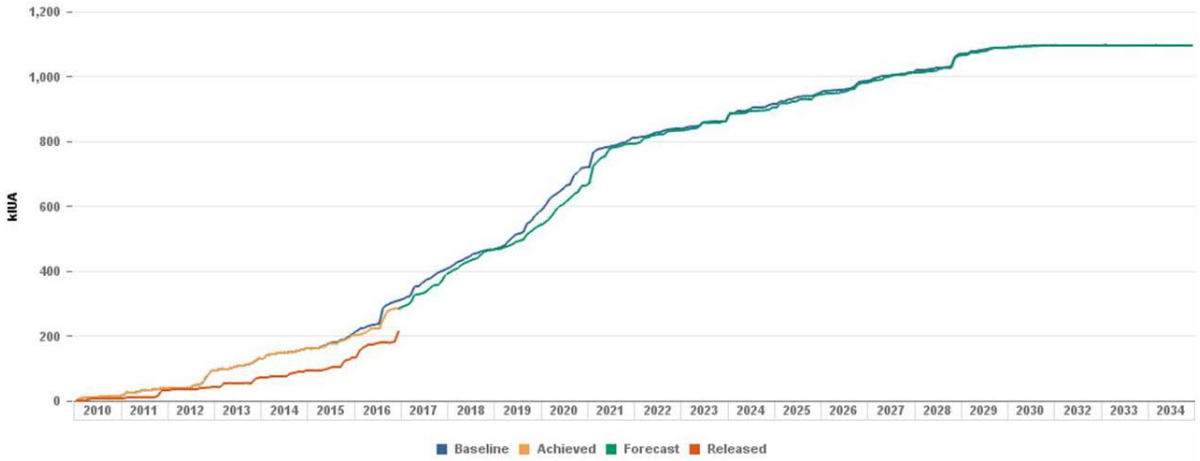


Figure 11: Comparison of the planned/achieved/released ITER Credit over the project lifetime

- Delays in the signature of Procurement Arrangements with the ITER Organization are often caused due to the lack of a complete and consolidated set of input data, in particular mature specifications
- During procurement it often takes longer than expected to sign a contract (extension of tender submission deadlines, more bids than expected, request for clarifications during evaluation, etc.);
- Delay in the completion of a predecessor contract that provides the input data for the following one ('knock-on' effects);
- Delays due to manufacturing issues (e.g. the welding repair that delayed the main 2016 IC milestone for the vacuum vessel;
- Over-optimistic planning by F4E worsened by the need to plan the level of financial commitments two years in advance.

While milestone counting provides simple statistics, during 2016 the **Milestone Trend Analysis** method was introduced at F4E to objectively visualise the evolution of milestones in time and identify trends that indicate possible future slippages as early as possible. An example is shown in fig. 12 for milestones associated with large financial commitments. This method enables F4E to better monitor the evolution of critical milestones, thus allowing F4E to tackle potential issues at an early stage and implement recovery/mitigation actions.

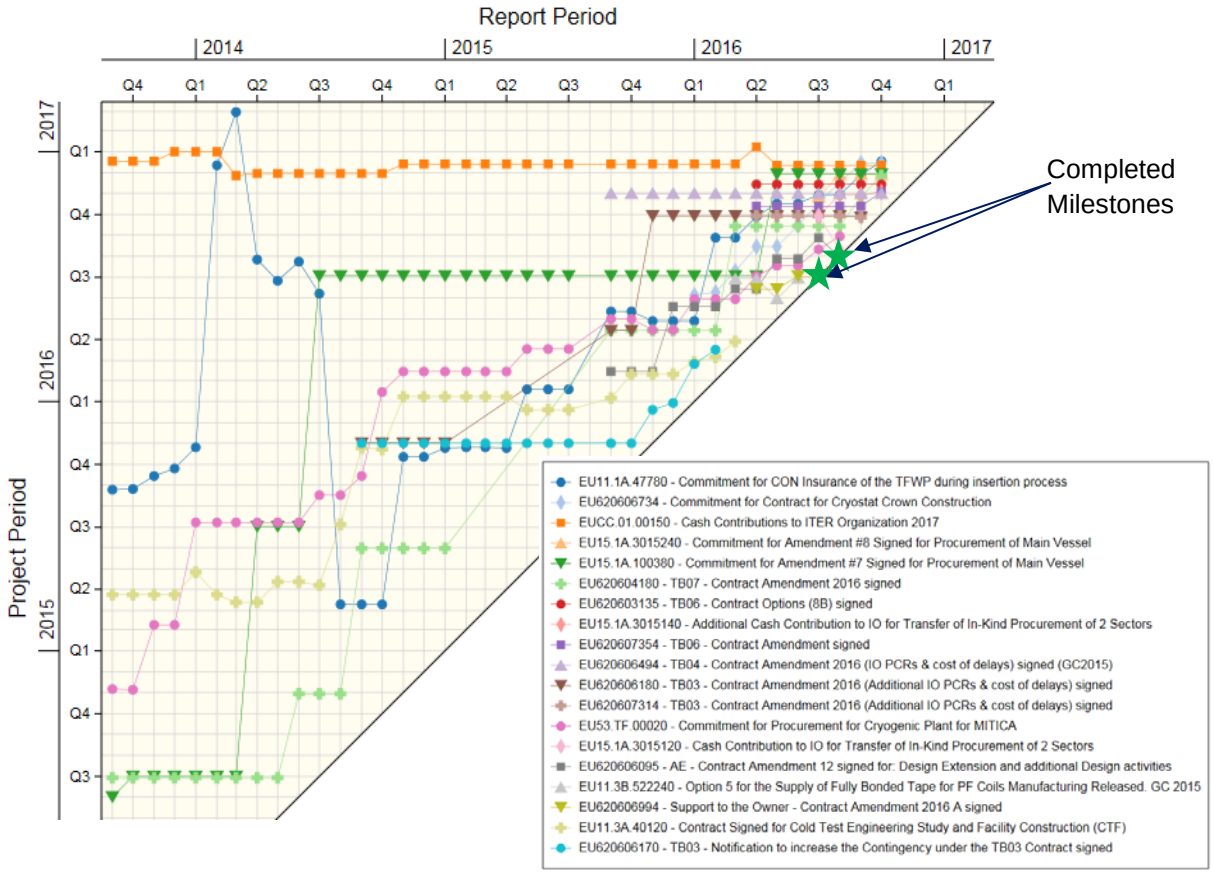
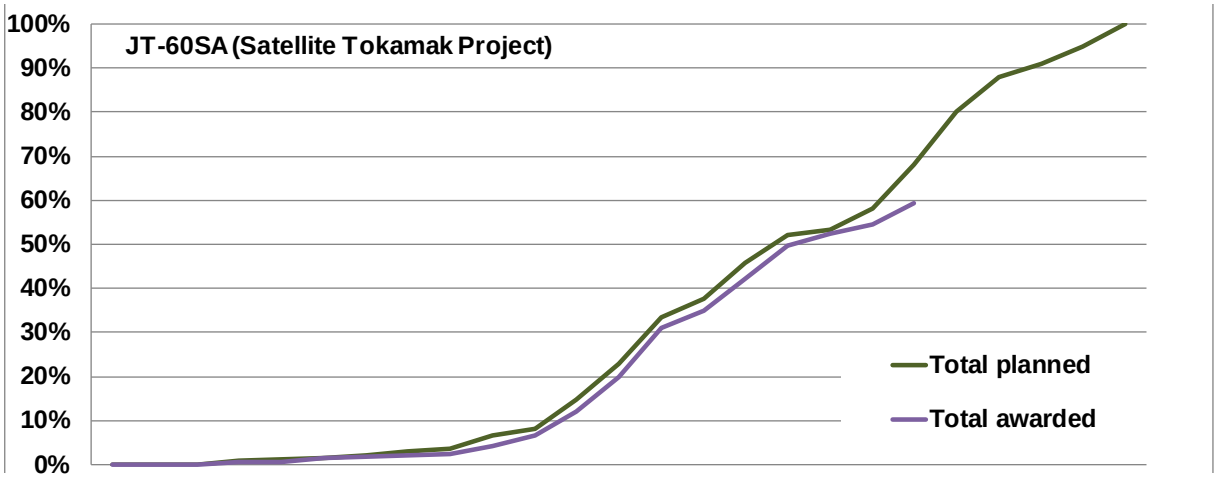
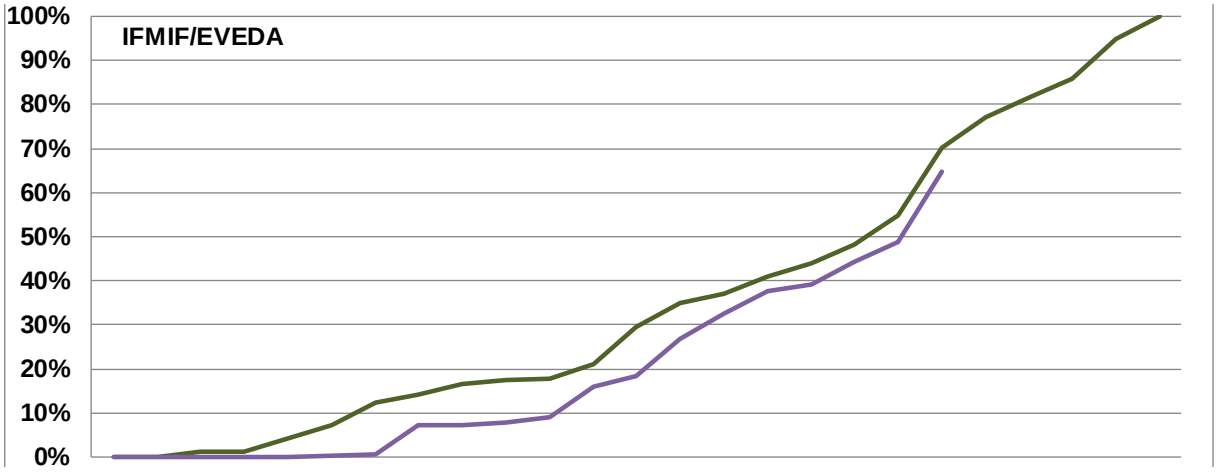


Figure 12: Example Milestone Trend Analysis of F4E's main financial commitments

1.5 Broader Approach Projects Performance

Like ITER, contributions to Broader Approach projects are formalised under Procurement Arrangements between F4E and the Japanese Implementing Agency (QST), which in turn are backed by Agreements of Collaboration between F4E and institutions chosen by the Voluntary Contributors. Direct contributions by F4E through its own budget are for providing support, Quality Assurance, transportation of components to Japan, integration, and, to a limited extent, procurement for EU contributions not covered by the Voluntary Contributors. The accounting of the Parties' contributions is tracked by an **Earned Value Management** approach using credits (Broader Approach Units of Account). The three Projects use as key performance indicator the ratio of credit awarded under the Broader Approach Agreement to credit planned at that date. As shown in fig. 13, the average of all three together is nearly 90%.





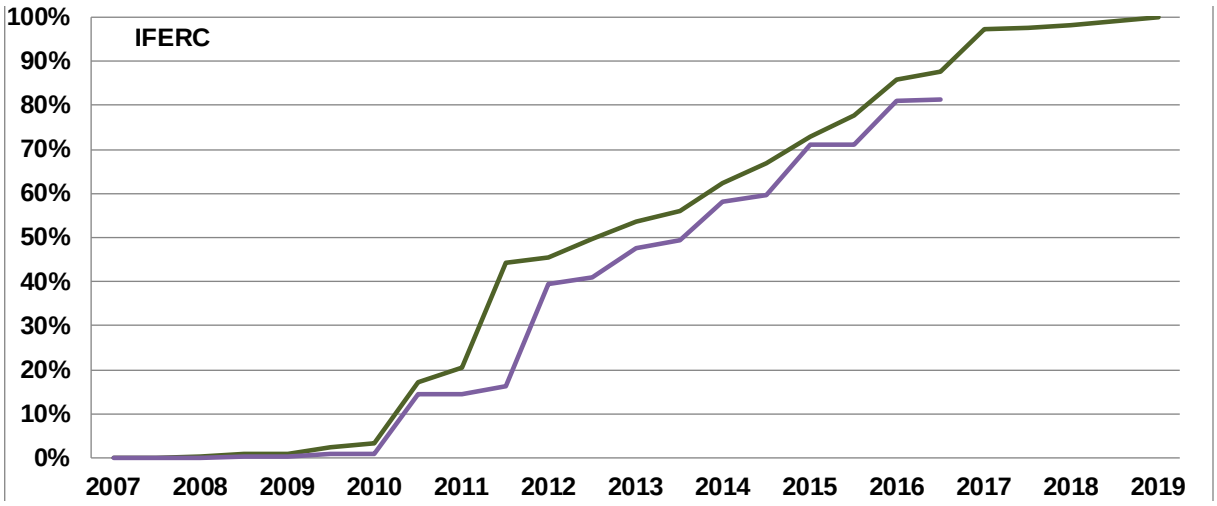
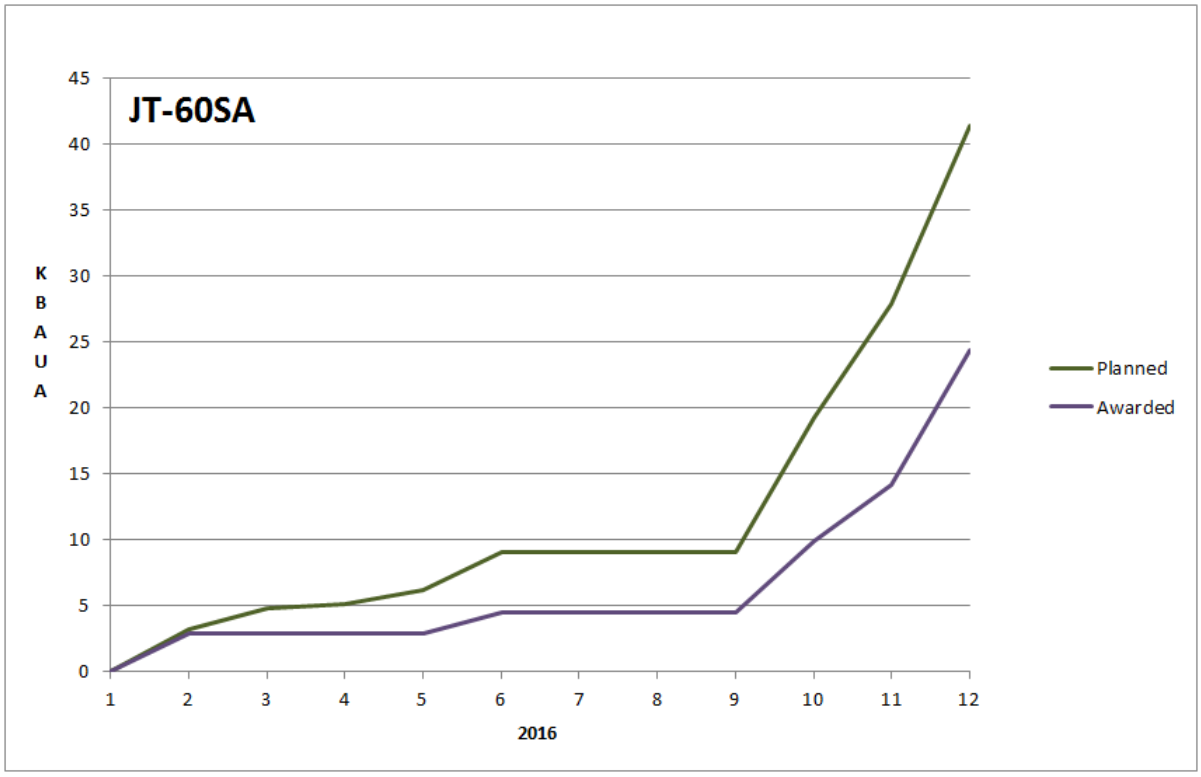


Figure 13: Status of Earned Value (European plus Japanese percentage of total committed credit awarded) for the three Broader Approach projects at the start of the indicated years showing awarded (purple) compared with planned (green)



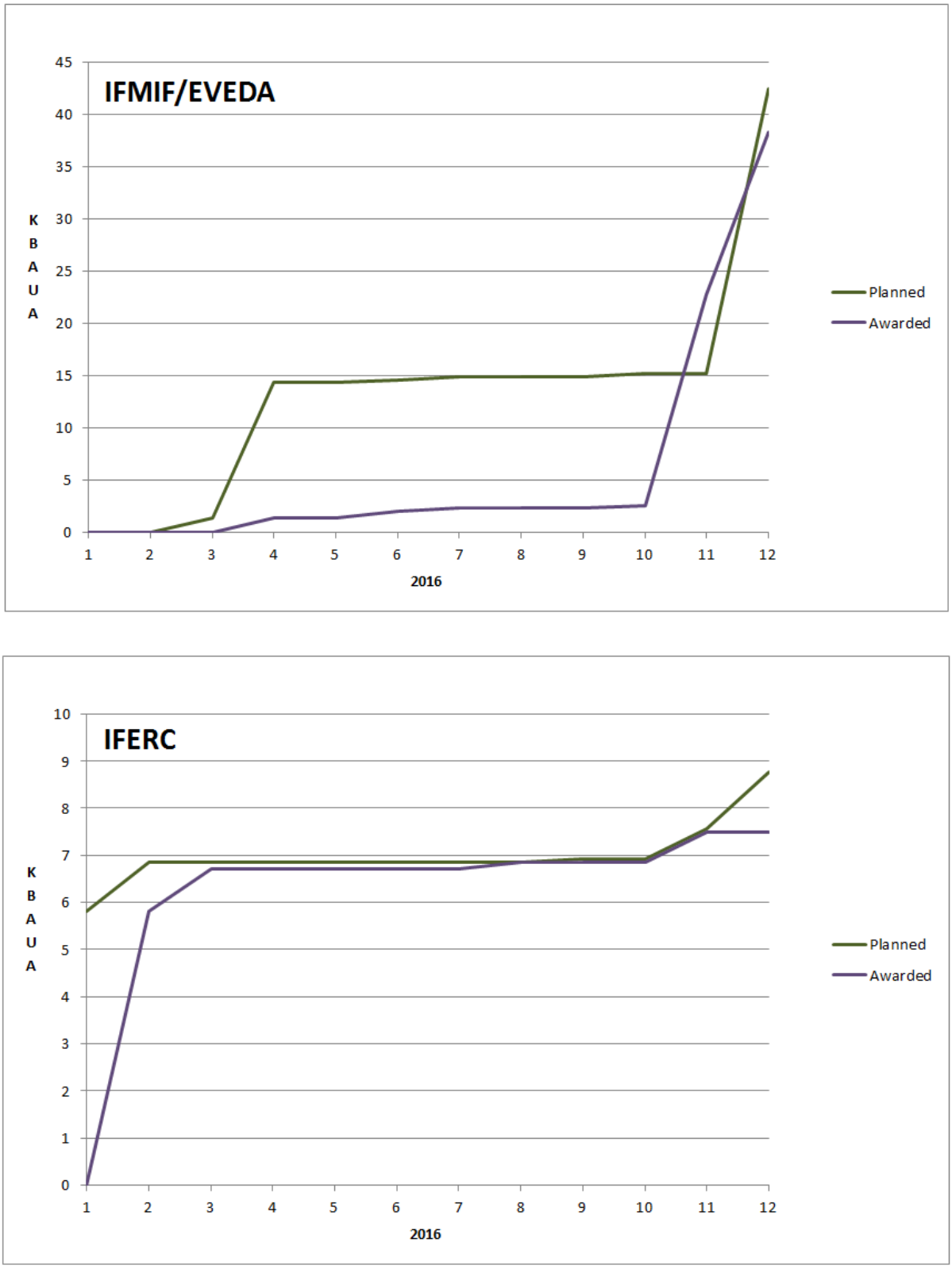


Figure 14: Comparison of the in-year Awarded and Planned Value of Broader Approach Credit during 2016

Part II. (a) Management

2.1 Governing Board

Here follows an overview of the significant risks and control issues signalled to and discussed with F4E's Governing Board and significant items approved or decided by the Governing Board.

Meetings:

F4E`s Governing Board met on two occasions during 2016, preceded by nine Bureau meetings in total, having as main objective the review of key documents and the proposal of recommendations on Governing Board decisions.

The summaries of the meetings of the Governing Board are made public and accessible via F4E`s external website: http://www.fusionforenergy.europa.eu/aboutfusion/meetings16.aspx

Organisation:

The Governing Board approved the amended organisational chart proposed by the F4E Director.

Fifth Annual Assessment of F4E:

The Governing Board agreed to launch a special assessment by an external expert group who analysed the strategy of F4E towards first plasma and beyond and its alignment with the overall ITER schedule as an input. The conclusions were presented at the December meeting and the Governing Board welcomed the overall positive assessment.

ITER Vacuum Vessel:

The Governing Board noted with concern the status of the EU Vacuum Vessel sectors and in benefit of the project supported the decision at the last ITER Council-18 to transfer the responsibility for two sectors, out of nine under European responsibility, from Europe to the ITER Organization.

ITER Buildings:

The Governing Board noted the report on the implementation of the external assessor recommendations on Buildings, in relation with the schedule recovery and cost containment, and commanded F4E the follow-up of the recommendations.

Nuclear Safety:

The Governing Board encouraged F4E to keep giving the utmost priority to the nuclear safety aspects and the proper implementation of the French Nuclear Authority (ASN) requirements and recommended F4E to work together with the ITER Organisation to improve cooperation and efficiency in nuclear safety-related processes;

In this context, the Governing Board also charged F4E's Technical Advisory Panel (TAP), which assists the Governing Board in analysing engineering, scientific and technical matters, to work together with external experts and analyse the way F4E manages nuclear safety aspects.

Operational Matters:

The Governing Board adopted the 2nd and 3rd Amendment to the 2016 Work Programme, the 1st and 2nd Amendment to the 2016 Budget.

Annual Reports and Accounts:

The Governing Board adopted the 2015 Final Annual Accounts and the Analysis and Assessment of the 2015 Annual Report.

Audit matters:

The Governing Board approved the Internal Audit Capability annual Audit Plan 2017 and approved the amended Internal Audit Capability Charter. The Governing Board noted with satisfaction the significant progress in the compliance with part audit´s recommendations and the positive reports of the different auditing bodies during 2016.

Schooling:

The Governing Board adopted the Modification of the Governing Board Decision regarding measures to support access to schooling for children of F4E staff.

2.2 Major Developments

2.2.1 ITER Schedule Performance

2.2.1.1 Background

In June 2013 the ITER Council decided that an **updated ITER long-term schedule** should be developed. The previous schedule dated from 2010 and was considered to be unrealistic since it did not take in due consideration the technical challenges and the real capability of both the ITER Organization and the Domestic Agencies to deliver their in-kind contributions. As a result, the expected delivery dates of some critical items compared to the planned dates in the 2010 schedule had delays of up to 45 months.

In November 2015 the ITER Organization presented a proposal for the updated ITER long-term schedule to the ITER Council. The ITER Council decided to conduct an independent review of the updated schedule and the associated level of resources. The ITER Organization resumed work in order to adjust the schedule to allow a decrease of the required resources taking into account the resources available in F4E and the other ITER Domestic Agencies.

2.2.1.2 Independent Review of the Updated ITER Long-Term Schedule

The **Independent Review of the ITER schedule** and its associated resources provided the following conclusions to the ITER Council in April 2016:

- The schedule is based on a rigorous methodology, systematically applied from the bottom-up and, as a consequence, the schedule is complete, with no significant omission;
- The resource estimate is generally complete, including scope that was previously missing, and provides a credible estimate of cost and human resources. Domestic Agencies activities are not resource-loaded but are tracked using key milestones;
- The schedule results in an earliest possible technically achievable date of December 2025 for the First Plasma milestone. However, it does not have any contingency. Likewise, the resource estimate does not include any explicit contingency. Hence, the schedule and its associated resource estimate cannot be considered to be reliable given that some risks will inevitably materialise;
- The resource estimates for the ITER Organization costs were within a reasonable range for this stage of the project (i.e. not significantly over- or under-estimated).

The reviewers also recommended a '**Staged Approach'** as a means of improving focus and optimising resources. This involved having up to four phases of ITER assembly and operation so as to reduce technical risks (fig. 15). However, the report indicated that the lack of contingency in the proposed schedule may create difficulties in the years to come.

2.2.1.3 F4E's 'Straight Road to First Plasma' Project

In January 2016 the F4E Director launched the project called '**Straight Road to First Plasma**' (SR2FP) with the overall objective to concentrate resources (funding and staff) on the activities critical to the achievement of First Plasma at the end of 2025. To that end non-First Plasma projects were either suspended or slowed down until after 2020 in order to make resources available for the critical First Plasma projects and improve the confidence of remaining within the €2008 6.6bn budget and allowing for a reserve. Due to the complex interdependencies of ITER components this resulted in an extensive re-planning which required several iterations with the ITER Organization and the other Domestic Agencies and which eventually merged into the 'Staged Approach'.

The first planning phase of the SR2FP project was completed by the end of March 2016 as foreseen and three scenarios delivered to Euratom and the ITER Organization. By end of April the preferred scenario was agreed with both and the implementation work at F4E started.

Subsequently the ITER Management Advisory Committee agreed to this SR2FP plan and the ITER Organization integrated it into the schedule in view of its eventual approval at the subsequent ITER Council meetings (section 2.1.1.5).

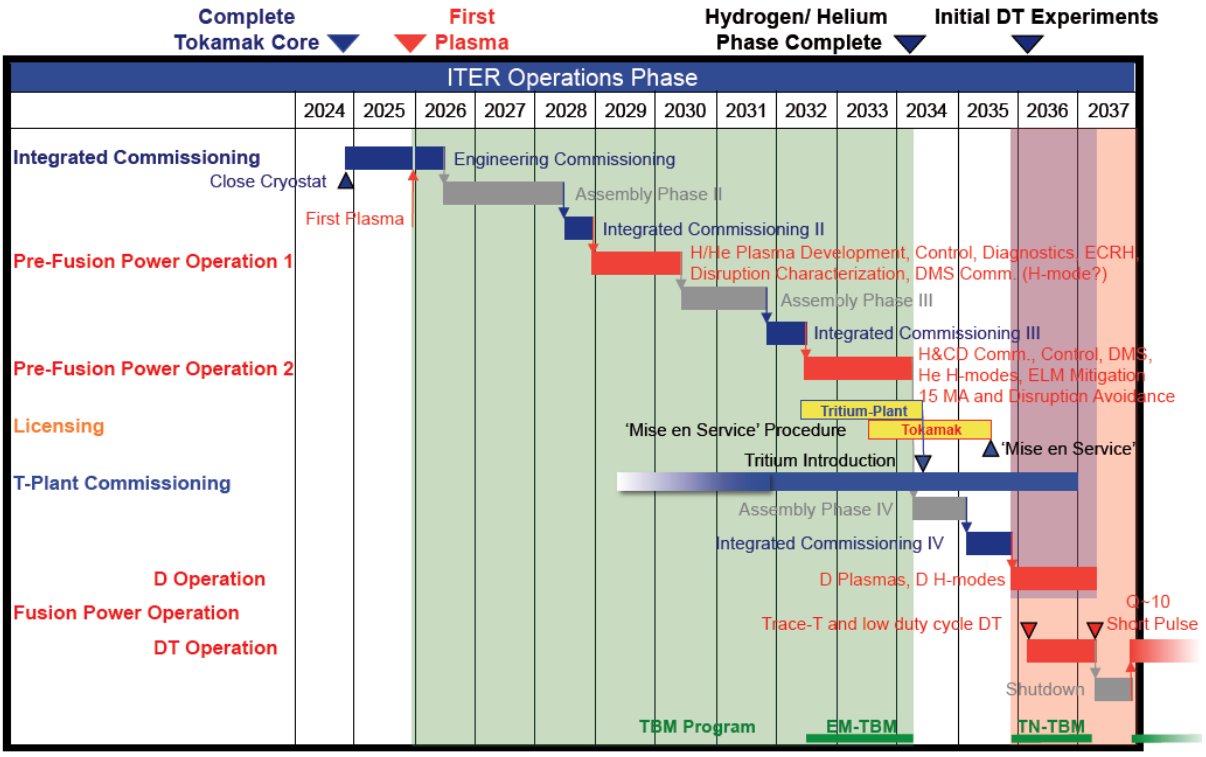


Figure 15: The Staged Approach for the ITER project

2.2.1.4 Independent Review of F4E's Contribution to the ITER Schedule

F4E's Governing Board decided to establish an Expert Group on the **independent review of F4E's contribution to the new ITER schedule** (hereafter the 'Expert Group'). The aim was to assess the capacity of F4E to deliver its contributions on time and in full coherence with the updated ITER long term schedule.

The Expert Group delivered its findings to F4E's Governing Board on 1 December 2016. The main findings and recommendations in relation to the updated ITER long-term schedule were as follows:

- The Expert Group judged that F4E's refocusing on ITER First Plasma has been done consistently, in a rigorous manner, and compatible with the budget ceiling until end-2020 The Straight Road to First Plasma' is compatible with a December 2025 milestone for First Plasma, but it does not presently have any contingency in schedule. The Expert Group found no inconsistencies between the F4E planning for the 'Straight Road to First Plasma' and the schedule presented to the 18th ITER Council;

- As for the schedule reliability, the Expert Group recommended that the ITER Organization together with the Domestic Agencies determine a target date (milestone) for First Plasma that includes a reasonable contingency once a quantitative risk analysis has been performed. F4E should assess whether more projects due for post-First Plasma can be deferred beyond 2020, to potentially reduce the pre-2020 budget utilisation and focus the resource allocation to the First Plasma deliverables;

- The inclusion of a contingency was not implemented in the updated ITER long-term schedule approved by the ITER Council due to political constraints on the latest acceptable First Plasma date. As for the deferrals of post-First Plasma projects beyond 2020, F4E has already shifted some of such activities during the 'Straight Road to First Plasma' exercise. Further deferrals may be required and implemented in the case that problems are encountered to stay within the available budget up to 2020.

2.2.1.5 Approval of the Updated ITER Long-Term Schedule

At the 18th ITER Council in June 2016, the ITER Organization obtained approval *ad referendum* (i.e. subject to domestic processes of obtaining approval) of the schedule, resources and milestones until achievement of the First Plasma in 2025. At the 19th ITER Council in November 2016 the updated **Overall Project Schedule** and **Overall Project Cost** together with the associated estimate of resources covering the full period 2016-2035 were approved *ad referendum* together with a set of milestones for the period 2018-2025. These main milestones were to be used to measure the overall progress of the project.

F4E complemented the ITER Council milestones with additional ones approved by its Governing Board at its meeting in June 2016. Since that time, ITER Organization and F4E regularly report on the status of those milestones via monthly reports, tracks the risks of not achieving them and, where necessary, implements recovery actions to mitigate any forecasted delays.

The F4E top-level schedule for ITER (fig. 16) gives an overview of the most significant and critical ITER and F4E activities. In particular, the EU Vacuum Vessel sectors and nuclear Buildings remain on the critical path (indicated in red). The schedule is underpinned by comprehensive lower-level 'Detailed Work Schedules' of approx. 65,000 activities, encompassing the individual activities to be conducted at cost account level.

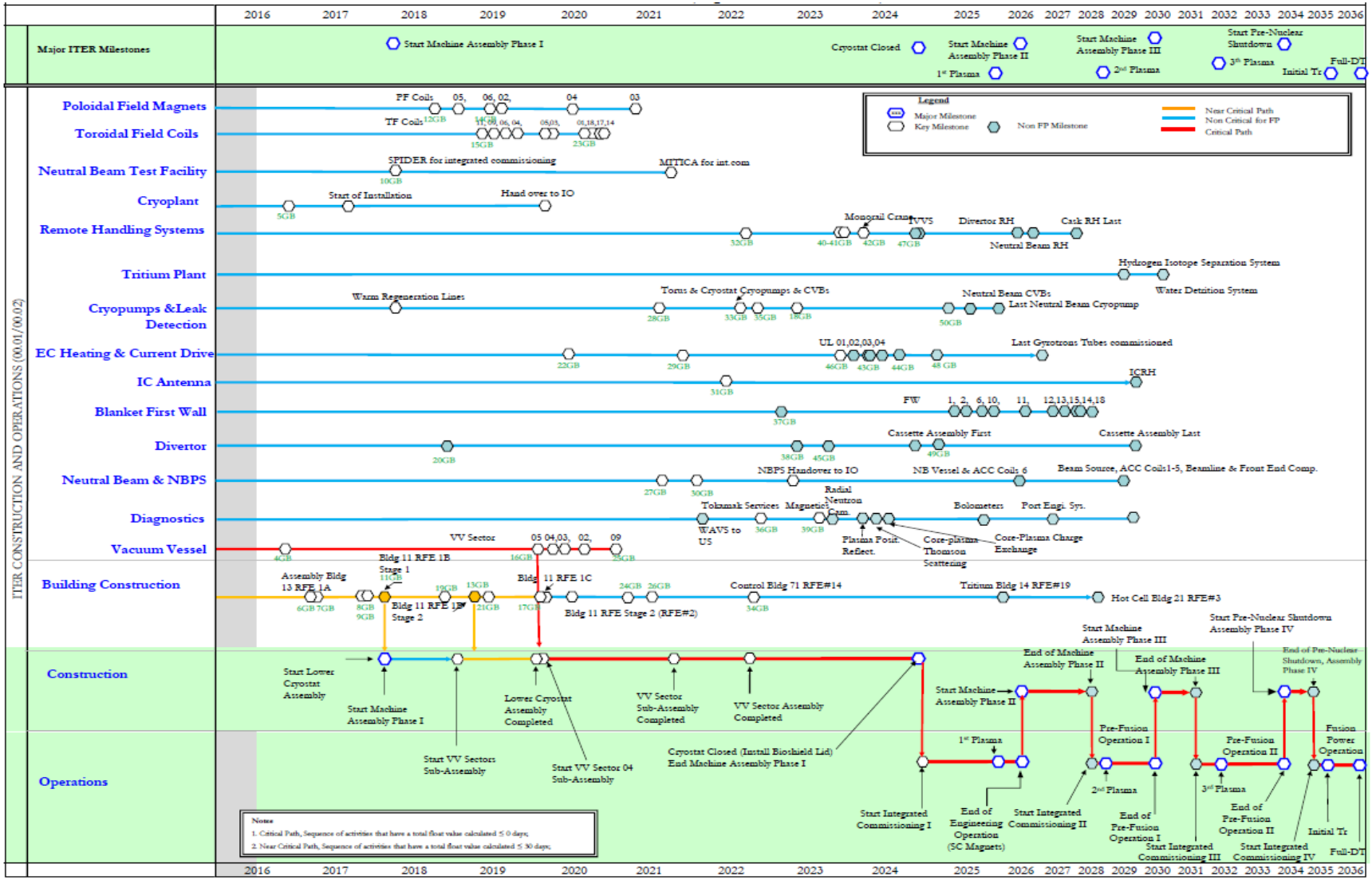


Figure 16: F4E Top Level schedule for ITER up to the Deuterium-Tritium Operation Phase in 2035. The critical path is in red.

2.2.1.6 ITER Schedule Status

F4E is devoting considerable management attention to the maintenance of the schedule. Throughout 2016 F4E managed to ensure the deliveries to First Plasma and achieved five of the six F4E ITER Council milestones planned for 2016, the one not-achieved concerning the Vacuum Vessel manufacturing which was delayed due to a weld quality issue. The milestone was completed two months later.

The schedule, as highlighted by the independent reviews described in sections 2.1.1.2 and 2.1.1.4, results in a First Plasma date of December 2025. This should be considered as the **earliest possible technically achievable date** since it does not have any contingency for work on the critical path (i.e. any delay will delay the First Plasma date).

The lack of contingency is the main issue that F4E and, more generally, the ITER project has to confront. Such a large and complex project, merging very advanced technologies and first-of-a-kind components, entails many risks that can materialise during manufacturing and assembly. Changes can be limited but not avoided altogether. The possibility of further schedule delays and cost increases in the forthcoming years until the machine is fully assembled cannot be excluded.

2.2.2 Status of the F4E Action Plan

During the F4E's Governing Board meeting of 19th March 2015, the F4E Acting Director presented the 2015 **F4E Action Plan**. The F4E's Governing Board endorsed the main principles set out in the Action Plan, in particular, the measures to support the creation of a new integrated organisation as envisioned by the new ITER Director General. The F4E's Governing Board asked the F4E Director to proceed with the implementation of the Action Plan and report regularly on its progress.

The 2015 Action Plan consisted of 19 actions including the creation of integrated project teams between F4E and the ITER Organization, support for the development of a realistic ITER schedule, the implementation of improved cost estimate and risk management methodologies, organisational changes and audit follow-up.

F4E has regularly reported the progress of the implementation of these actions to its Governing Board and as of December 2016, 15 out of the original actions are complete (of which one became obsolete) and four are under implementation. Those that are still under implementation are longer-term activities related to staff redeployment, integration of processes between F4E and the ITER Organization and the implementation of an Enterprise Project Control System.

Responding to new developments and his assessment of the situation following his appointment in January 2016, the current F4E Director has put forward a further 21 actions of which five were already implemented during the course of 2016.

F4E has presented these actions in detail to its Governing Board. They can be broadly categorised as follows:

- **Containment of cost overruns and schedule delays** in two of the most critical running projects, the ITER Buildings and Vacuum Vessel;

- Defining upfront and holding a **set of realistic milestones** that can be used to monitor the overall progress of the project;
- Ensuing that **the capped budget for the EU contribution to ITER until 2020** under the current financial framework **is respected** and that there is a **contingency** to cope with project risks;
- Obtaining a **reduction of the cost estimates for future**, as yet unbuilt, items by optimising their design or manufacturing process;
- **Reinforcing the nuclear safety culture** in the project in response to recent observations by the responsible French authorities.

During its December 2016 meeting, F4E's Governing Board commended the F4E Director on the progress in implementing the actions. Taking into account that many actions from the original 2015 Action Plan have been implemented, the F4E Director is preparing a consolidated strategic plan for the June 2017 F4E's Governing Board meeting.

At the same time, the ITER Director General has continued to implement the 2015 ITER Action Plan and provides regular reports to the ITER Council. Four out of the seven main actions have now been implemented. Those that are on-going include:

- Creation of additional Integrated Project Teams (IPTs) beyond the existing three (Cryogenics, Vacuum Vessel and Buildings, Site Infrastructure & Power Supplies Distribution) in order to focus both ITER Organization and Domestic Agencies staff together on complex procurements;
- Implementation of powerful coordinated tools for establishing a nuclear project culture;
- Optimisation of Human Resources for improved efficiency and cost effectiveness – there have been important changes in personnel management and the development of an action plan on Human Resources management.

2.2.3 Organisational Changes

In June 2016 the F4E Director proposed an **amendment of F4E's organisational structure** to the F4E's Governing Board with the following objectives:

- To achieve a **modern, flat organisation** that is focused on delivery of projects;
- To ensure **enough Senior Management capacity** to handle both the requirements of a public organisation and the typical escalations of a project organisation;
- To **establish efficient processes for procurement and controlling** by having an integrated CFO/Commercial Department.

This entailed splitting the previous single ITER Department into two separate departments: 'ITER Delivery' and 'ITER Programme Head and EU-Domestic Agency Representative'. The Head of the ITER Programme Department, based at Cadarache, is principally responsible for managing the cooperation of F4E with the ITER Organization and ensuring that F4E delivers according to the agreed scope. Moreover, he is responsible for representing F4E at the executive level towards the ITER Organization in the ITER Executive Project Board and other bodies where F4E's interests must be advanced (with the support of the Chief Engineer). The ITER Programme

Department also has line management and budget authority for the Site Buildings and Power Supplies Project including its team, which is based at Cadarache.

The Head of the ITER Delivery Department, who is based in Barcelona, is responsible for the day-to-day management of the nine ITER Project Teams (except the Site and Buildings and Power Supplies Project Team) that represents just under 200 staff members. The main responsibility of the Head of the ITER Delivery Department is to ensure that the resources, in particular human resources, are optimised within and among the ITER Project Teams.

Another modification of the new organisational structure is the creation of the Commercial Department, headed by a Chief Financial Officer. The purpose of this Department is to regroup responsibilities that were previously distributed, and reinforce financial management and control. The Commercial Department performs financial controlling and forecasting (commitments and payments), operational and administrative financial planning, budgeting, accounting and procurement, enabling it to implement process improvements across all of these functions.

The **new organisational structure** (Annex III. Organizational Chart) came into effect on 1 October 2016 and was accompanied by a new set of mission statements, responsibility matrices and delegations.

2.3 Budgetary and Financial Management

The 2016 Financial statements and the Budget Implementation are detailed in the 2016 Final Annual Accounts attached to the present Annual Activity Report (Annex VIII) and in the 2016 Budgetary and Financial Management Report, published separately.

2.3.1 Establishment of the Budget

F4E's 2016 budget was initially adopted by F4E's Governing Board for the amount of € 455.84m in commitment appropriations and € 617.63m in payment appropriations, the decrease of € 80.00m of the Euratom contribution in the last steps of the EU budgetary procedure included.

The budget was successively amended in the June Governing Board meeting and the December Governing Board meeting.

The final budget for 2016 is € 474.34m in commitment appropriations and € 724.51m in payment appropriations.

2.3.2 Contributions to the Budget in Revenue

The repartition of the 2016 revenue ensures a fair balance between contributors, in line with their relative share for the overall period of ITER construction:

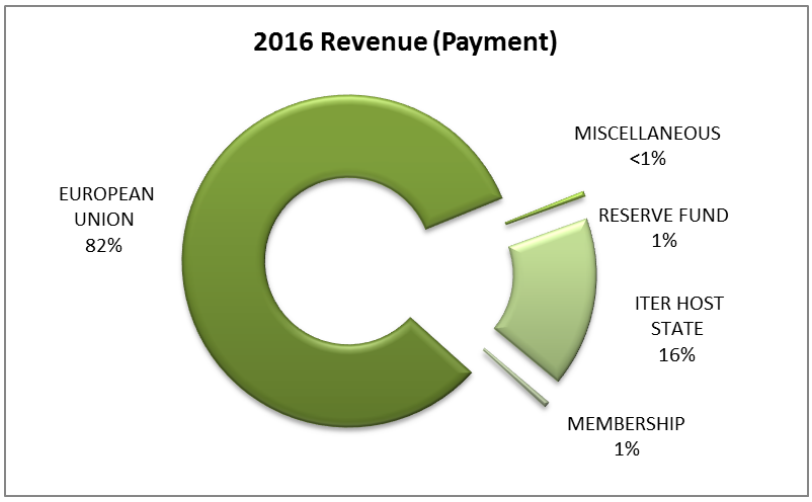


Figure 17: 2016 revenue (Payment)

The final statement of revenue was almost entirely cashed, including outstanding revenue from the previous year. Only small amounts are still due for the membership contributions of Finland and Greece, and an on-going recovery on an operational contract, for a total amount of € 0.15m.

2.3.3 Implementation of the Budget

Commitments	• **99.8% of Implementation in Commitment** • **106.8% compared to the original budget** • **of which 99.7% in individual commitments**
Payments	• **98.1% of implementation in Payment** • **115.1% compared to the original budget**

Figure 18: Commitments and Payments

2.3.3.1 Implementation of the 2016 Administrative Expenditure

There are no specific observations regarding the implementation of the administrative budget. The permanent monitoring of the administrative needs allows reaching a fair balance between actual needs and budget. A global increase of the administrative expenditure was needed, due to the following elements:

- The increase of salaries for 2016 (+1%), after three years of decrease due to the evolution of the coefficient related to the cost of living in Spain, while the vacancy rate was maintained at low level all along the year;
- The transfer of staff from Barcelona to Cadarache, where the cost of living is about 25% higher;
- The increase in the number of manufacturing contracts to be followed up, in order to take into account the recommendations of F4E's Management Assessors, as endorsed by the Governing Board (i.e. F4E staff should be more present at the manufacturing sites).

The evolution of needs was recorded with transfers adopted by the Director according to Article 27 of F4E Financial Regulation – The detail of the transfer is provided in Annex II. The entire administrative budget was committed and 92.5% was paid at the end of the year, the latter representing a better performance than the previous year, in particular for the Title I – Staff expenditure.

2.3.3.2 Implementation of the 2016 Operational Commitments

The statement of operational expenditure, developed in the Annex II, was modified with two amending budgets to reflect the changes in the statement of revenue and to align the operational budget in commitment appropriations with the successive amendments to the 2016 Work Programme in June and December 2016, plus internal transfers. Almost 100% of the budget was implemented in individual direct commitments.

2.3.3.3 Implementation of the 2016 Operational Payments

The statement of operational expenditure, in Annex II, was modified with two amended budgets in order to reflect the changes in the statement of revenue. Transfers within the Title 3 were adopted by the Director according to needs at the year end to allow a better implementation rate.

98.5% of the total operational payments were implemented at the closure, representing € 10.03m of non-execution. The final implementation has been limited by the available treasury, considering that about € 11.0m of VAT has been recovered at the very end of the year, while payments of € 88.01m ready to be executed have been delayed to the 2017 budget.

2.3.4 Impact of the Implementation of the 2016 Budget in Commitment

2.3.4.1 Main Commitments

The main commitments for the 2016 budget are:

- € 177.42m for the In-cash contribution to the ITER Organization;
- € 95.40m for the Transfer of supply of sectors #7 and #8 of the Vacuum Vessel;
- € 67.58m to fund additional scope, quantities and complexity increases for the TB03 contract (Building);
- € 26.76m for staff expenditure from the 2016 Establishment Plan;
- € 119.04m in 574 commitments for smaller contracts and other administrative expenditures.

2.3.4.2 Action Extending for More than One Financial Year

The entire operational budget of F4E is in dissociated appropriations and 263 commitments amounting to € 416.07m cover actions extending for more than one financial year (final date of implementation after 31/12/2017).

2.3.4.3 Actions Carried Forward to 2017

The F4E obligations amount to € 1 863.06m at the closure of the 2016 budget.

It corresponds to the total amount left over on open budgetary commitments and is detailed as follows:

(EUR)

2016 budget Heading	Open Commitments				
	from previous year (1)	from 2016 budget (2)	Total (3)=(1)+(2)	To be de-committed (4)	Net Total (5)=(3)-(4)
TITLE 1 - STAFF EXPENDITURE	**481 458.28**	**836 869.93**	**1 318 328.21**	**481 458.28**	**836 869.93**
TITLE 2 - OTHER OPERATING EXPEND.	**652 923.84**	**2 792 372.20**	**3 445 296.04**	**652 923.84**	**2 792 372.20**
Total TITLE 1 & 2	**1 134 382.12**	**3 629 242.13**	**4 763 624.25**	**1 134 382.12**	**3 629 242.13**
CH 31 - ITER CONSTRUCTION INCLUDING ITER SITE PREPARATION	1 352 361 769.79	211 686 390.39	1 564 048 160.18	50 647 966.70	**1 513 400 193.48**
CH 32 - TECHNOLOGY FOR ITER	11 218 900.01	6 368 283.44	17 587 183.45	374 478.96	**17 212 704.49**
CH 33 - TECHNOLOGY FOR BROADER APPROACH AND DEMO	11 006 933.42	3 598 125.43	14 605 058.85	3 382 707.09	**11 222 351.76**
CH 34 - OTHER EXPENDITURE	1 932 188.08	833 093.20	2 765 281.28	0.00	**2 765 281.28**
CH 35 - ITER CONSTRUCTION - APPROPRIATIONS ACCRUING FROM THE HOST STATE CONTRIBUTION	156 263 593.39	143 012 939.21	299 276 532.60	0.00	**299 276 532.60**
CH 36 - APPROPRIATION ACCRUING FROM THIRD PARTIES TO SPECIFIC ITEM OF EXPENDITURE	1 301 314.76	14 248 373.45	15 549 688.21	0.00	**15 549 688.21**
Total TITLE 3	**1 534 084 699.45**	**379 747 205.12**	**1 913 831 904.57**	**54 405 152.75**	**1 859 426 751.82**
Total	**1 535 219 081.57**	**383 376 447.25**	**1 918 595 528.82**	**55 539 534.87**	**1 863 055 993.95**

Table 27: Open budgetary commitments at the closure of F4E's 2016 budget

The total amount of open commitments is decreased by € 287.7m compared to the situation at the end of 2015.

Notes:

- Administrative expenditure carried forward from 2015 and not paid were cancelled;
- Title 1: There was no left over on the 2016 commitments related to direct staff cost, normally cancelled at the end of the current year. The balance as shown in the table above corresponds to other expenses linked to staff: missions, interim staff, schooling, training, etc. for which the commitments are carried over for one year;
- Title 2: The commitments are carried over and should be consumed at the latest by 31 December of the following year;
- Title 3: The open operational commitments are carried over to the following year with no limitation in time, but to be paid according to the advancement of the contracts.

2.3.5 Type of Procurement Procedure Used

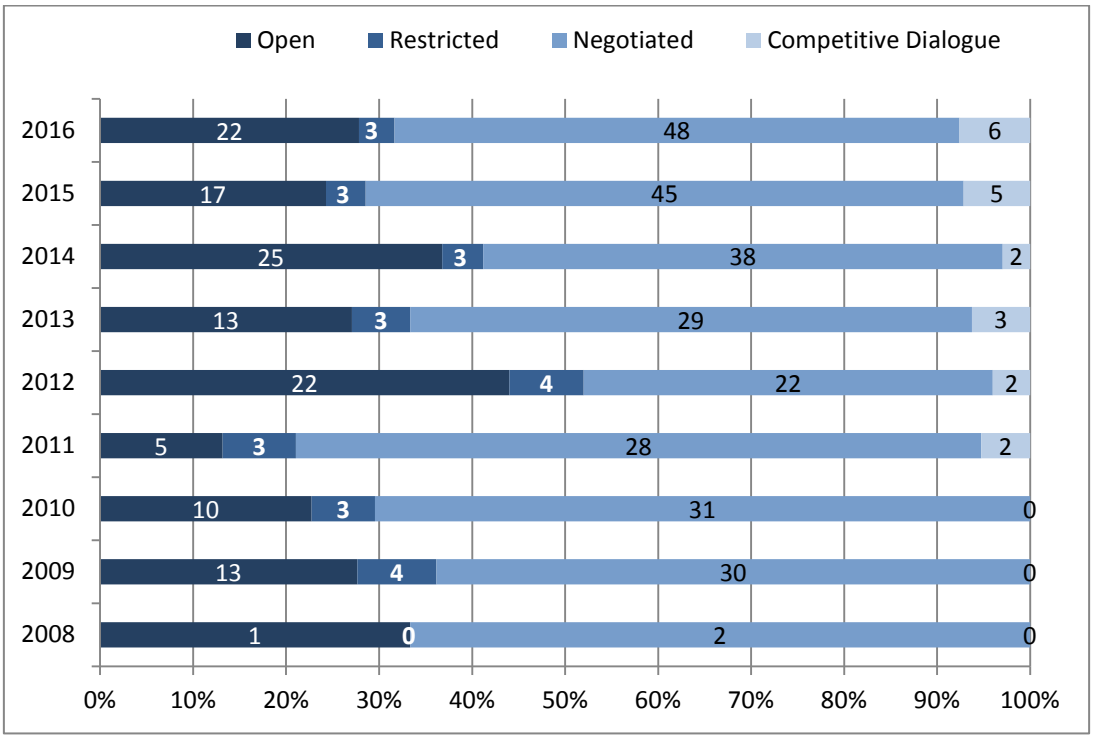


Figure 19: Contracts awarded by procurement procedure (Number)

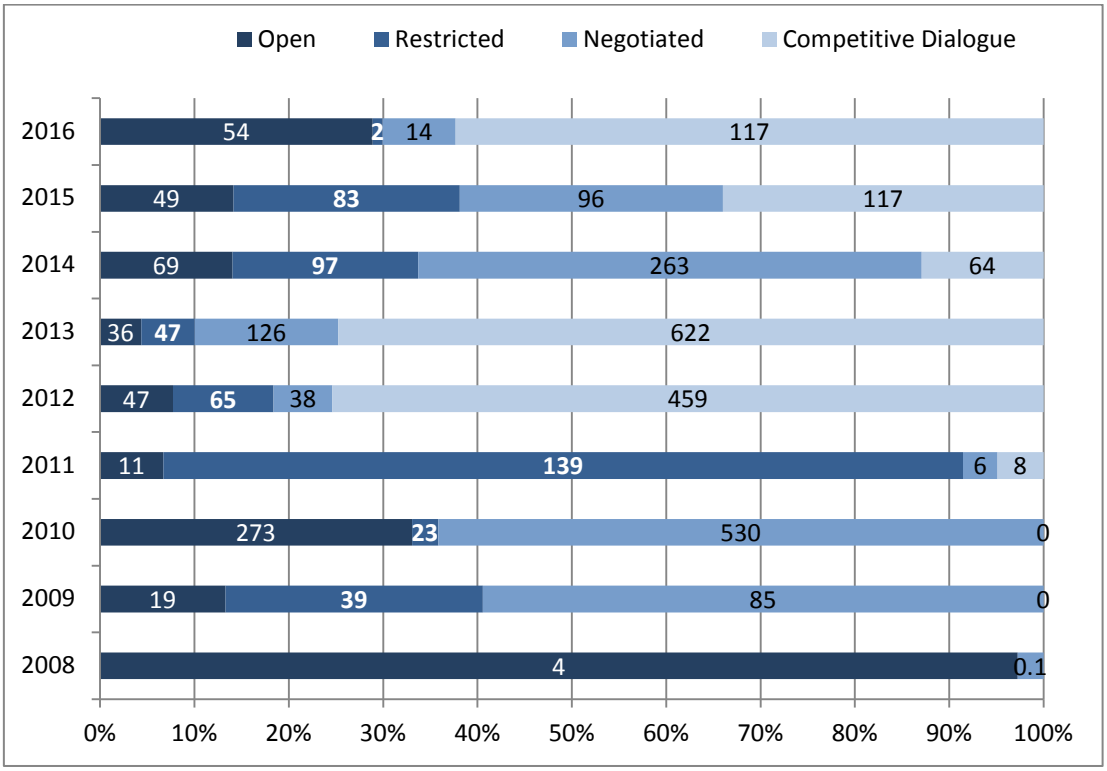


Figure 20: Contracts awarded by procurement procedure (€ million)

2.3.6 Interest Charged by Suppliers Through Late Payments

The total late interest paid by F4E for 2016 amounts to € 16 019.29 on three contracts.

2.4 Human Resources (HR) Management

2.4.1 Major HR Developments

The following changes to the Establishment Plan have taken place in 2016:

- Three Official Assistants (FO AST) have been converted into three Official Administrators (FO AD) in order to provide three staff members with the possibility to be certified;
- Three Official Administrators (FO AD) have been converted into three Temporary Agent Administrators (TA AD), in line with what has been done in the previous years (gradual conversion of vacant Official posts into Temporary Agent posts);
- One unused Seconded National Expert (SNE) post has been replaced with one Contract Agent (CA) post due to the difficulty in finding a suitable candidate.
- One Temporary Agent Administrator (TA AD) has been converted into one Temporary Agent Assistant (TA AST).

These are the main HR developments in 2016:

- **Working conditions:**
    - In 2016, the F4E's Administration and Management Committee approved the decision on working time for all F4E staff (i.e. Officials, Temporary Agents and Contract Agents) and Seconded National Experts. In addition, the Commission Decision (17.12.2015) on the implementation of teleworking applies to F4E as of 1 October 2016.
- **Schooling:**
    - Four Service Level Agreements have been signed with Spanish schools in 2016. Moreover, four Service Level Agreements have been signed with French schools for the children of the staff members in Cadarache.

- **Training/career development:**
    - The management of the Training budget has been decentralised for technical training courses. Some events have taken place in the area of Project Management.
- **Reorganisation:**
    - F4E's Human Resources Unit was reorganised in 2016. The reorganisation from the traditional and functional model to a new model aims to shift the focus of F4E's HR management from personnel administration to a more strategic and staff centric role, balancing the needs of the organisation with those of individual staff.
- **Health matters:**
    - The specific contracts with the providers of medical services and complementary health insurance have been renewed.
- **Flexitime data:**
    - The number of authorised days of leave under the flexitime scheme can be found in Annex IV. d. Recuperation Approved taken in 2016. The table shows the number of days recuperated by the staff members per type of contract, category and grade.

2.4.2 The Results of the Screening/Benchmarking Exercise

This exercise is included in the European Commission Guidelines as part of the reporting on Resources Management. According to the methodology used by the European Commission, F4E staff is classified in different categories depending on the area of work at F4E. The rates per category represent the number of staff assigned to each activity out of the total number of staff (the results of the Screening/Benchmarking exercise can be found in Annex IV).

- 19% of the posts in F4E are assigned in the heading Administration Support and Coordination, around 71% belong to the Operational group and 10% are Neutral. The majority of the Operational posts are found in the category Programme Management and Implementation (PGM M/IMP) and represents 61% of the total posts;

- The increase of posts in 2016 under the two headings, Logistics and Programme Management Coordinators, is due to by the addition of interim staff and trainees to the organisation. The Operational Coordinators group has also grown due to the reorganisation which involved the reallocation of some staff members from certain units to Head of Department cells. Finally, there has been a slight increase of Information and Communication Technology (ICT) staff due to the variation of external service providers/consultants in comparison to 2015.

2.5 Assessment by Management

The F4E Governing Board adopted F4E's 'Overall Control and Monitoring Strategy' in 2012 which aims at providing reasonable assurance to the F4E Director and external stakeholders on the state of internal control in F4E. It also sets out the framework to ensure that operational and financial transactions are implemented to the highest standards expected for such a project as ITER and to allow a close monitoring of the overall internal control system in place. This strategy is structured in three main areas: the Integrated Management System, the Control Environment and the Organisational Improvement Plan.

F4E's Integrated Management System combines the two control environments within which F4E operates, the ITER-wide Quality System which is intended to ensure the performance of ITER and the compliance with the nuclear safety requirements; and the European Commission Internal Control Standards which are inspired by the internationally recognised COSO framework.

The control objectives of this system are:

- Sound financial management of operations (effectiveness, efficiency and economy);
- Safeguarding of assets and information;
- Reliability of reporting;
- Compliance with applicable law and regulations, in particular:
    - Quality aspects and nuclear and safety requirements;
    - Legality and regularity of budget implementation;
    - Prevention, detection, correction and follow-up of fraud and irregularities.

F4E's control environment is composed of independent assurance functions (Internal Audit Capability, Internal Audit Service, European Court of Auditors and External Assessments) and internal control and assurance functions (Ex-post controls on grants and procurement contracts, Corporate Internal Supervision Function, Authorising Officers by Delegation and Sub-Delegation, Quality Management System and Fraud Prevention and Data Protection).

The main results of the control procedures carried out by the F4E internal control and assurance functions are described below. The results of the independent assurance functions are described in sections 2.7 'Assessment of Audit Results during the Reporting Year', 2.8 'Follow-up of Recommendations and Action Plans for Audits', and Part II (b) 'External Evaluations'.

2.5.1 Assurance Strategy on Grants and Procurement Contracts

F4E's 'Assurance Strategy on Grants and Procurement Contracts' was endorsed in 2014 by the Audit Committee. In the case of F4E grants, which are similar to the FP7 grants of the European Commission, the costs are reimbursed on the basis of declarations of costs incurred by the beneficiaries and therefore have to be subject to ex-post audits in order to ascertain their legality

and regularity. These ex-post audits are outsourced via a framework contract concluded between the European Commission and three external audit firms.

F4E grants account for a minimum portion of the F4E operational budget; they represent only 0.1% of the total awarded values for contracts signed in 2016. In order to efficiently use the resources available, the selection of beneficiaries to be audited focuses on the top beneficiaries who have not been previously audited by the Research Directorate-General and Executive Agencies of the European Commission or for which such audits resulted in significant findings.

In 2016, two beneficiaries from Germany and Greece were selected to be audited. In one case the audit was only launched in December 2016 as it will be carried out in conjunction with a European Executive Agency. In the other case, F4E has planned a financial verification of the costs claimed at the beneficiary premises, to be performed in the second half of this year.

For procurement contracts, which are based on agreed-upon prices, the same principles applied for ex-post controls on grants cannot be applied. F4E procurement contracts are, instead, subject to controls on a much broader basis than the ex-post controls and verifications applied to grants. These controls are performed via audits or reviews (assurance engagements) carried out by the F4E's Internal Audit Capability and cover the financial, compliance, quality and performance aspects of contracts. For further details on the activities of the F4E's Internal Audit Capability, please refer to section 2.7.2.

2.5.2 Corporate Internal Supervision Functions

The key corporate functions supervising the legality and regularity of F4E's transactions as well as the sound financial management are:

- Procurement and Contracts Committee, which provides the F4E Director with recommendations on the award of contracts above € 10m and grants above € 4m, and on strategies in relation to procurement and grant activities;
- The Internal Review Panel complements the Procurement and Contracts Committee by reviewing the correctness of the procedural aspects followed for contracts and framework contracts with a value equal to or above € 1m and less than € 10m and grants or framework partnership agreements with a maximum F4E contribution equal to or above € 400k and less than € 4m. In 2016, the Internal Review Panel met 13 times and reviewed 16 procedures. It found that compliance of the submitted procurement files with F4E's procedural requirements had further improved. In addition, the Internal Review Panel issued general recommendations to F4E Senior Management on how to address recurring issues;
- Financial Supervision, which examines the financial transactions from a compliance and efficiency perspective and responds to the need for further control mechanisms after the decentralisation of the financial circuits. As regards its activities, a third campaign was launched in 2016 analysing the time to pay for a sample of pre-financing, intermediate and final payments. It has been noted that for the pre-financing payments the trends related to 'time to signature' and 'time to pay' are stable compared to the previous year, whilst for the intermediate and final payment activities a minor negative trend has been noticed but on average is still below the contractual time frame.

2.5.3 Assurance from the Authorising Officers by Delegation and Sub-Delegation

In addition to these assurance functions, each staff member who has received a (Sub-) Delegation for the implementation of F4E's 2016 budget was requested to provide their personal "Declaration of Assurance" for the budgetary area for which they were responsible.

In 2016 the decentralisation followed the organisational structure, with a clear segregation between administrative (financial) and operational (project) management, empowering staff members within their areas of responsibility. In total, 43 declarations were received for 2016; none of these contained a reservation nor raised any issue of significance at the level of F4E that merits the inclusion of a reservation in the F4E Director's Declaration of Assurance.

These declarations together with the reports from the different assurance functions form the basis for the "Declaration of Assurance" (see Part V).

For the sake of transparency towards our stakeholders, two significant risks which were disclosed by the respective authorising officers are included as an observation in the F4E Director's Declaration of Assurance. These risks, which are described in more detail below, do not question in any case the legality and regularity of the underlying transactions in relation to the 2016 annual accounts.

Several projects are currently exposed to high risks which are managed through the F4E risk register. The cost impacts of these risks have been integrated into the Estimate at Completion. The major cost risks stem from the buildings, in particular due to the impact on the contracts of the changes requested by the ITER Organization since several years.

The commitment of the new ITER Organization Director General (since 2015) to limit to the minimum possible the number of new changes, together with mitigation actions which have been and are being agreed between the ITER Organization and F4E, will help reduce the current cost creep.

In the revised ITER Schedule, approved by the ITER Council in 2016, two major activities of F4E are on the critical path to the first plasma: The construction of the Nuclear Buildings (the Tokamak Complex) and the manufacturing and deliveries of the Vacuum Vessel sectors. Concerning the latter, a major mitigation action has been decided by the ITER Council and implemented in 2016, consisting in transferring the manufacturing of two of the initial nine European Vacuum Vessel sectors to the ITER Organization Central Team. In line with the ITER Agreement, F4E committed to pay to the ITER Organization Central Team the full manufacturing cost (by Hyundai Heavy Industries (HHI), the Korean manufacturer).

2.5.4 Quality Management System

In 2016, F4E continued the implementation and development of the Quality Management System through four main activity areas:

Process Development and Reviewing

According to the ISO-9000 series and its quality management principles – a desired result is achieved more efficiently when activities and related resources are managed and documented as a process. The process approach is also a requirement of the IAEA Safety Requirements No. GS-R-3, which together with ISO-9001 are the standards followed by F4E to comply with the ITER project quality, safety and management requirements. The F4E quality system is a stakeholder-oriented system, taking into account equally:

- The requirement definitions;
- The stakeholder feedback;
- F4E compliance with the requirements.

Following this logic F4E moved further towards a 'process approach' by broadening its 'process map' to organise all of its processes showing the links between all activities to carry out across the organisation. As part of the Integrated Management System, an F4E Manual aims to closely mirror the evolution of the organisation and encourage a harmonised approach in the development and application of working procedures to achieve organisational objectives on all levels (corporate, departmental and individual staff objectives).

During the first half of 2016 (following the revision of the F4E Financial Regulation and Implementing Rules) the process-mapping effort was dedicated to the update of the financial and procurement related processes impacted by the procurement and grant titles which entered into force on 1st June 2016.

At the same time, F4E continued the contract management improvement exercise with the further development of the online database and electronic tool for the management of the contract modifications, released in September 2016.

In 2016, the statistics of the process development were:

Processes Status	Total	Approved				In Development		
		Process	Procedure / Policy	Updating	Software tool-based	Review	Mapped	Preparation
31 Dec 2016	198	133	22	4	2	8	1	11

Table 28: Statistics on the process development status

Quality Assurance in Support of the Operational Projects

Quality Assurance is defined as part of quality management focused on providing assurance that quality requirements will be fulfilled.

One of the major Quality Assurance activities is the support to the operational projects to ensure the correct implementation of the quality programme. This activity can be divided into:

- Support and review of the Procurement Arrangements and ITER task agreements to ensure conformance with the F4E Quality Assurance Programme, the ITER Organization-Domestic Agency coordination meetings in quality and safety and issue of the implementation templates;
- Full support to the technical departments on quality issues of contracts and grants, verification of the Call for tender documentation (including full review of the management specifications) for compliance with the F4E Quality Assurance Programme and issue of the follow-up documentation templates;
- Training on Quality Assurance and nuclear safety to suppliers providing 'protection important class' items and/or services;
- Verification of the suppliers' quality plans and all the contract implementation quality documentation;
- Full support regarding Quality Assurance to the kick-off and progress meetings, as well as the control point quality-related visits.

Another major support Quality Assurance activity is the coordination, registry and reporting of **Nonconformities and Deviations**:

- A Nonconformity is a non-fulfilment of a requirement. A Deviation is a planned alternative to a specified requirement. These requirements come from procedures, the item and service specifications or from the stakeholder.
- F4E has defined a process for handling all aspects of the detected nonconformities in line with ITER Organization requirements. All F4E personnel are responsible for the identification and reporting of any detected nonconformity.

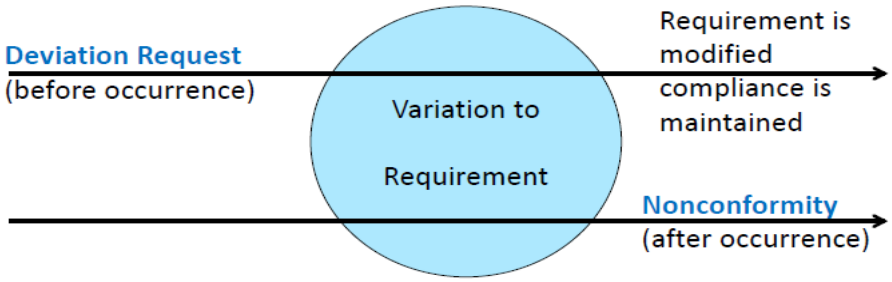


Figure 21: Schematic representation of the Deviation and Nonconformity

- Any deviation (or modification) to a specified requirement identified by F4E or the supplier shall be handled by the dedicated deviation procedure and the F4E configuration

management process. A detailed process exists at F4E for the management of deviations.

- Nonconformities and deviations are addressed at F4E in a graded approach, where the most significant (higher impact on cost and/or performance) require a more strict control and review.
- In 2016 the main types of nonconformities (includes from Quality Audits) and deviations are represented in the tables below:

Nonconformities (F4E classification)	Cases	%
Major (impact on customer critical requirements)	231	*35%*
Minor (impact on customer non-critical requirements)	236	*35%*
Relevant (impact on F4E contract, but not on customer requirements)	196	*29%*
Technical Exception (no impact on F4E contract or customer requirements)	3	*(~) 0%*
Total	666	-

Table 29: Statistics on nonconformities by type

- Corrective actions are triggered by the occurrence of nonconformity to eliminate the cause and prevent repetition.

Deviations (F4E classification)	Cases	%
Level A (no impact on F4E contract or customer requirements)	35	6%
Level B (impact on F4E contract, but not on customer requirements)	261	48%
Level C (impact on customer requirements)	137	25%
Cancelled or still to be defined (in the process of assessment)	116	21%
Total	549	-

Table 30: Statistics on deviations by impact

Deviations (by type)	Cases	%
F4E DR (deviation request by F4E, internally or to ITER IO)	36	7%
Supplier DR (deviation request by the supplier to F4E)	217	40%
ITER IO DR (deviation request by ITER IO towards F4E)	26	5%
Deviation Notice/Order (deviation by F4E towards supplier)	270	49%
Total	549	-

Table 31: Statistics on deviations by type

Quality Management System Audits (Internal and External)

A Quality Management System Audit aims at providing F4E and its stakeholders the reasonable assurance that the system is adequately implemented according to the standards. F4E is developing and implementing an annual audit plan to assess that the quality requirements are properly fulfilled by the Project Team and the Suppliers. A quality audits process frames the methodology to be followed for each key step of those audits (planning, preparation, implementation, follow-up of actions and recording).

The objective of the External Quality Management System Audits is to ensure that F4E Suppliers comply with the Quality Plan and it is effectively implemented. The internal Quality Audit also aims at ensuring that operational teams comply with the F4E Quality system requirements and ensure it is effectively implemented.

Each audit result is presented in an audit report, which includes the identification of any strong areas describing the strengths of the Supplier Quality Plan, improvement areas and nonconformities. When improvements or nonconformities are identified, the report is followed by an action plan from the auditee to address the findings. At the end of the year the 'Annual Quality Management System Plan' for 2017 was developed and approved for implementation.

The Supplier Action Plan once approved by F4E is followed-up to ensure its correct implementation and closure guaranteeing the correct issue of Nonconformity Reports, the approval of the disposition of the remedial actions, the review of the remedial outputs, the corrective actions proposed and the closure of the nonconformities.

In 2016, out of the 28 Quality Management System audits planned:

Quality Management System Audits	Cases	%
External - Operational Contracts	25	*88%*
External - Grant or Partnership Agreements	1	*4%*
Internal on quality implementation	1	*4%*
Cancelled (due to contractual progress) and replaced	1	*4%*
Total	28	-

Table 32: Statistics on quality management system audits by type

The global results of the quality audits are detailed in the table below:

Audit Result	Cases	%
With an Acceptable Result	23	*82%*
With an non-Acceptable Result	5	*18%*

Table 33: Statistics on the results of quality management system audits

These audits resulted in 195 findings, classified as follows:

Audit Finding	Cases	%
Strong Areas	20	*10%*
Improvement Areas	143	*73%*
Nonconformities	32	*17%*
Total	195	--

Table 34: Statistics on the findings of quality management system audits

As foreseen in the related process, all the nonconformities found triggered a Nonconformity Report issued by the auditee with the action to address the weaknesses.

Continual Improvement of the Quality Management System in 2016

The Management Standard 19 'Continual Improvement' requires F4E to continually improve the effectiveness of the Integrated Management System and where necessary takes corrective and preventive measures to address weaknesses. In line with this requirement, F4E performed the following improvements in 2016:

- Introduction of a new improvement methodology called Lean Six Sigma in order to align improvement approaches across the organisation preparing the ground for effective results. The introduction of this methodology was executed through three main actions:
    - Process owners and their Management team were trained on the basic principles of this methodology. Furthermore, some staff members followed the certification training to become experts to then facilitate improvement projects in line with the methodology.
    - Improvement projects applying the methodology were launched to deliver efficiency gains and more effective processes in key activity areas of the organisation such as project control, recruitment, operational procurement and contract management.
    - A steering committee was put in place to adopt, follow up and monitor all improvement projects to ensure optimal outcomes are obtained.
- The F4E Sign-Off Authority Policy was reinforced with the definition of an overall Responsibility Matrix (following the RASCI[7] model) that defines the main principles across the organisation. All principles remain implemented through the processes and are disseminated via the F4E Manual.
- All F4E working procedures were aligned with the revised F4E Financial Regulation signed in 2016;
- Active participation in the F4E improvement working groups, assurance and improvement networks;
- Operational Quality Guidance 2016 training sessions to operational officers;

[7] Responsible, Accountable, Support, Consulted and Informed.

- Active participation in the development of the safety culture in F4E;
- Further development of the F4E process map, including the subsidiary macro-processes.

Corrective Actions Taken and Conclusion:

- All raised accepted nonconformities have to be presented with the correspondent remedial action to the specific situation and the corrective action related to the cause on the nonconformity;
- All deviations are assessed for impact on performance, cost and schedule before the decision to accept them, or not, is taken. For level C deviations, an assessment by the customer is required before a decision is taken.
- All the Quality Management System Audit improvement areas and nonconformities found were addressed in an action plan proposed by the entity being audited (Suppliers in the case of external audits, F4E for internal). These action plans are subjected to the acceptance by F4E (or the Auditor if external) and must propose, especially for nonconformities, the corrective actions.
- The auditee Action Plan once approved by F4E is followed-up to ensure its correct implementation and closure. This ensures the correct issue of Nonconformity Reports, the approval of the disposition of the remedial actions, the review of the remedial outputs, the corrective actions proposed and the closure of the nonconformities.
- All the reported quality situations had a technical nature (documentation, performance and/or planning) and were adequately processed (including amendments, remedial and corrective actions) at the contract or Procurement Arrangement level.

2.5.5 Fraud Prevention and Data Protection

During 2016, the Anti-Fraud and Ethics Officer together with the respective units further implemented F4E's Anti-Fraud Strategy, which was checked by the European Court of Auditors as part of its regular visits. A noteworthy action which furthered this implementation was the "Ethics & Integrity" Session, also involving audit- and control functions with the participation of Investigation and Disciplinary Office. This interactive training was addressed to all staff and in particular to managers, in order to raise awareness and thus prevent the occurrence of fraud and irregularities. It touched on many areas (e.g. ethical behaviour, conflicts of interest, gifts, corporate spirit, reputational and financial damage, reporting wrongdoing, etc.) and aimed at fostering integrity and transparency during daily work.

Further to the adoption of the F4E "Whistleblowing Rules" in 2015, an implementation process was drafted, establishing a concise and detailed process map on how serious irregularities and wrongdoings can be reported and are being followed-up within F4E.

Regarding data protection, F4E continued to implement the requirements of Regulation (EC) 45/2001, with a view to guarantee the lawfulness of the processing of personal data, its security and confidentiality, as well as to provide data subjects (i.e. F4E staff, Committee members as well

as external experts) with the possibility to exercise their rights regarding the treatment of their personal data. For 2016 the following is to be highlighted:

- For the first time, the European Data Protection Supervisor, Assistant Supervisor and team, visited F4E to get a picture of the implementation and practice of data protection within F4E. The European Data Protection Supervisor noted significant improvement. Particular emphasis was placed on IT security – data protection and the importance of a risk management of information security in all Agencies. The European Data Protection Supervisor highlighted that in future, a stronger focus lies on accountability, i.e. that the organisation itself (all levels and management) are responsible for demonstrating compliance with the rules.
- Constant progress was made in raising awareness and evaluating the personal data compliance within F4E, through collaboration between the Data Protection coordinators, the Data Protection Officer and Head of Administration, as well as with the involvement of the European Data Protection Supervisor. Advising on data processing and privacy notices related e.g. to flexitime, teleworking and industrial portal.
- The Data Protection Officers of all EU institutions and bodies met in order to exchange experiences on streamlining processes and to discuss the preparation of the upcoming EU data protection reform.

2.6 Budget Implementation Tasks Entrusted to Other Services and Entities

There are no F4E activities delegated to other European Institutions or Bodies.

2.7 Assessment of Audit Results During the Reporting Year

2.7.1 Internal Audit Service (IAS)

The Internal Audit Service of the European Commission concluded two follow-up reports and an assurance engagement in 2016:

a) A second follow-up on the 'TB03 Competitive Dialogue audit';

b) A first follow-up on the 'Contract management Limited Review'; and

c) A 'Limited Review of the Implementation of Procurement Arrangements in F4E'.

a) Regarding the second follow-up of TB03 Competitive Dialogue, the final report was issued in mid-June 2016 based on fieldwork conducted in April 2016. The conclusion was that the Internal Audit Service was not able to assess the effectiveness of the recent actions implemented (e.g. new guidelines not yet applied at that moment, no new contracts awarded under the new rules, etc.) and left two recommendations open. During the second half of the year, F4E used the new guidelines/process developed in response to the audit, and submitted those recommendations for the review of the Internal Audit Service which concluded that all recommendations submitted were adequately and effectively implemented and considered the audit closed;

b) The Internal Audit Service also performed a follow up of the Contracts Management Limited Review (original audit report was issued in 2014). The final report was issued at the end of August 2016, and concluded that four (three Very Important and one Important) recommendations were adequately implemented, one Critical recommendation was downgraded to Very Important, one Very Important was downgraded to Important, and one Important recommendation remained open. The main residual risks were related to the management of amendments (for which F4E developed a new IT tool, named Deviations Amendments and Contracts Changes, and also a new contract management platform, "contract tracker", at the time of the fieldwork not tested by the Internal Audit Service), the management of the reporting (linked to the alerts related to up-coming needs for amendments), and finally, risks regarding the management of subcontractors (for which the Internal Audit Service could not assess the F4E's new policy, recently approved). During the last quarter of 2016, F4E finalised the implementation of the three remaining actions, and by the end of 2016 they were submitted to the Internal Audit Service for review. On that basis, the Internal Audit Service conducted a desk review and assessed that all the remaining recommendations were adequately and effectively implemented by F4E and concluded that this audit is closed;

c) The third assignment of the Internal Audit Service corresponded to the Limited Review of the Implementation of Procurement Arrangements in F4E. This engagement is in fact a continuation of the Internal Audit Service audit on Preparation of Procurement Arrangements from 2012 but now focussing on the implementation phase. The final report, issued at the end of September 2016, concluded with six recommendations, five of

which (ranked as Very Important) were accepted by F4E Management and the remaining one was rejected. The report recognised the progress made by F4E in several areas (such as Cost Estimates at Completion). The recommendations issued concern the monitoring of changes and their related costs (in particular when emanating from the ITER Organization), and also the performance management. The action plan proposed to the Internal Audit Service was accepted at the beginning of December 2016. It should be noted that some of the actions will not be implemented before the end of 2017, due to their complexity and the fact they require the involvement of the ITER Organization.

2.7.2 Internal Audit Capability (IAC)

In 2016 the Internal Audit Capability issued 31 new recommendations for F4E management. 28 of these recommendations (90%) were accepted or partially accepted and three (10%) were rejected. In 2016 the Internal Audit Capability followed up implementation of 29 previous recommendations, out of which 23 (79%) were fully or partially implemented and six (21%) represented rejected recommendations with low or medium residual risks.

The following are summaries of the Internal Audit Capability's audit and assurance engagements finalised in 2016:

Review of ABAC Access Rights issued on 4/3/2016:

The overall conclusion of the 2016 ABAC Access Rights Review performed by the Internal Audit Capability was that the access rights are generally in line with the delegations entrusted to the staff of F4E;

Audit of Contracts in the Area of ITER Neutral Beam and Electron Cyclotron Power Supplies and Sources issued on 8/6/2016:

Overall the Internal Audit Capability concluded that the audited activity complied, in all material respects, with the applicable rules and processes of F4E, although several weaknesses related with cost and schedule performance as well as with the efficiency and effectiveness of governance, risk management and internal controls were identified;

Audit of Contracts in the Area of Cryoplant and Fuel Cycle issued on 8/6/2016:

Overall the Internal Audit Capability concluded that the audited activity complied, in all material respects, with the applicable rules and processes of F4E. The actual cost and schedule performance of the assessed contracts was good, although delays with respect to achievement of future milestones of ongoing contracts are probable and risks of cost increases remain present;

Follow-up Review of Procurement in the area of ITER Buildings issued on 27/10/2016:

As a result of the follow-up review, the Internal Audit Capability concluded that out of the 29 original recommendations F4E fully or partially implemented 23 recommendations (79%, which corresponds to all accepted ones) and these are considered as closed. In four of these cases the follow-up review showed the need for further improvement and as a result six new recommendations were proposed. In the case of the six (21%) rejected recommendations, these were re-assessed and it was concluded that the residual risk of not implementing them is low (five cases) or medium (one case) and no further action from the management is deemed necessary;

The Internal Audit Capability Self-Assessment Report prepared for the purpose of External Quality Assessment by an independent validator issued by the Internal Audit Capability on 26/9/2016:

Following the validation of the Internal Audit Capability's self-assessment, the independent external validators expressed the opinion that F4E's Internal Audit Capability's activity generally conforms with the Standards and Code of Ethics of the Institute of Internal Auditors. The validators issued three recommendations for F4E Management and nine recommendations for the Internal Audit Capability.

2.7.3 European Court of Auditors (ECA)

In November 2016 the European Court of Auditors adopted the final report on the 2015 annual accounts of F4E[8], where it expressed an unqualified opinion, meaning that in the European Court of Auditors' opinion:

- The Joint Undertaking's annual accounts present fairly, in all material respects, its financial position as at 31st December 2015 and the results of its operations and its cash flows for the year then ended;
- The transactions underlying the annual accounts of the Joint Undertaking for the year ended 31st December 2015 are, in all material respects, legal and regular.

In addition, the European Court of Auditors has included an 'Emphasis of Matter' sub-section within the 'Statement of Assurance' in order to raise awareness on the problems faced by F4E and ITER Organization in relation to the cost and schedule of the overall ITER project. As a consequence, the Budgetary Authority invited the F4E Director to the hearings both at the Council of the European Union and at the European Parliament in order to explain the measures taken to address these risks and concerns.

Finally, there are a number of observations that did not affect the assurance, but which in some cases should be addressed by F4E. By the end of 2016 the status of these observations is as follows:

[8] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52016TA1216(05)&from=EN

Area	In Progress	Implemented	No Action	Total
Presentation of the Accounts	1			**1**
Implementation of the 2015 budget			1	**1**
Key controls of the Joint Undertaking's Supervisory and Control Systems	1			**1**
Operational procurement and grants	1		1	**2**
Overall control and monitoring of operational procurement contracts and grants			3	**3**
Anti-fraud Strategy			1	**1**
Legal Framework	1	1	1	**3**
Annual Activity Report		1		**1**
Intellectual property rights and industrial policy	1	1	1	**3**
Host State agreement		1	1	**2**
Rules implementing the Staff Regulations		1		**1**
TOTAL	**5**	**5**	**9**	**19**

Table 35: European Court of Auditors observations by status of implementation

For the observations in progress, the current status is the following:

- **Presentation of the accounts:** The revision of the ITER credit distribution throughout the life of the Procurement Arrangements is being addressed in conjunction with the ITER Organization. After a preliminary agreement with the ITER Organization on the criteria for the update of the milestones and following the introduction of a different procedure by ITER Organization to accept credit re-distribution over the credit milestones, F4E started the update after the agreement with the ITER Organization counterpart for each area. In order to decrease the administrative burden associated with the release of the credit, the ITER Organization has recently requested further simplifications which are now being agreed;
- Key controls of the Joint Undertaking's Supervisory and Control Systems: **Central and uniform system for the integration of all the operational, financial and budgeting data:** F4E is currently developing an IT system for the management of budgets, commitments forecast, payments forecast, and Estimate at Completion, which will be integrated with Primavera and ABAC. An overall data model will be used as the basis to integrate the various IT applications, ensuring central and uniform reporting available through the reporting portal (Business Objects).
- Operational procurement and grants – **Negotiated procedures**: Negotiated procedures with low value (i.e. below the Directive's publication threshold) represent 30-40% of F4E's yearly number of contracts but only correspond to around 1% of the budget. Using negotiated procedures for these (within the limits imposed by F4E's Financial Regulations) responds to a concern of sound financial management, as this allows F4E to engage internal resources more effectively in high value procurement. We therefore consider that no action is needed to further reduce low value negotiated procedures.

- For what concerns higher value contracts, regrettably the characteristics of the fusion technology market are such that in many cases very limited competition is present. Since 2012 F4E increased its dissemination efforts but participation remained low. In F4E's opinion, the main root cause is not lack of visibility but rather the sporadic nature of F4E purchases. As a consequence, during 2016 F4E started to look for ways to address the issue, in collaboration with other contracting authorities managing similar projects in Europe and facing the same lack of competition. This is attempted by fostering a single market for large scientific projects, which is more stable and larger and therefore more capable of attracting companies' interest. The first public event will be hosted in Denmark in 2018;
- Legal Framework – F4E **Financial Regulation and Implementing Rules:** The implementing provisions for certain aspects of four existing F4E derogations from common EU Financial Rules were sent for consultation with the relevant services of the European Commission, which provided their comments. F4E aims to agree with the European Commission services a common text before it is submitted to the European Commission for prior opinion and to F4E's Governing Board for adoption;
- **Intellectual Property Rights and Industrial Policy:** F4E has completed the Industrial Policy action plan and has implemented 28 out of the 32 actions. Of the remaining four actions: one became obsolete, one was superseded by project developments and two were cancelled after unsuccessful negotiation with stakeholders. With regards to the impact assessment of the Industrial Policy, F4E intends to use the results of the assessment of F4E's activities (and the ITER project as a whole) that will be performed by the European Commission during 2017.

2.8 Follow-up of Recommendations and Action Plan for Audit

The status of the implementation of the internal audit action plans as of January 2017 is as follows:

Overview per Audit:

				ACTION PLAN					
Audit File	**Audit Name**	**Audit Source**	**Recommendations**	**Actions**	**In Progress**	**Implemented**	**Cancelled**	**Obsolete**	**Implemented % (*)**
2011/IAF/7	**Procurement in the area of ITER Buildings**	IAF	35	40	6	32	1	1	84%
2011/IAF/8	**Selection and Recruitment**	IAF	18	38	0	34	3	1	100%
2013/IAF/13	**Contracts monitoring in the area of buildings**	IAF	13	24	0	23	1	0	100%
2013/IAS/2	**TB03 Competitive Dialogue Review**	IAS	8	23	0	23	0	0	100%
2014/IAS/3	**Limited Review of Contracts Management- Entity-wide Controls in F4E**	IAS	7	19	0	16	1	2	100%
2016/IAF/16	**Neutral Beam and Electron Cyclotron PSS Contracts Audit**	IAF	15	22	16	6	0	0	27%
2016/IAF/17	**Cryoplant and Fuel Cycle Contracts Audit**	IAF	7	8	3	5	0	0	63%
2016/IAS/5	**Implementation of Procurement Arrangements**	IAS	6	15	14	1	0	0	7%
			109	189	**39**	**140**	**6**	**4**	**78%**
					21%	**74%**	**3%**	**2%**	

Table 36: Statistics on audit actions by audit and status of implementation

(*) Implemented % is equal to the number of actions implemented per total number of actions that can be executed (Cancelled and Obsolete actions are not taken into account)

Significant progress was achieved during 2016 in implementing audit actions as a a result of the strong focus placed by F4E management in this area of concern. F4E reported a 100% implementation rate of audit actions to the June 2016 Audit Committee. During the second half of 2016, there were six new reports issued (three audit and three follow-up reports), and as a consequence, there were 39 actions in progress added by the end 2016. This led to a lower implementation rate which dropped to 78%.

There are four action plans which F4E's Management considers as implemented. In two cases (the audits on TB03 and Contract Management), the Internal Audit Service performed follow-ups in 2016 and concluded at the of beginning 2017 that all the recommendations had been adequately and effectively implemented. In the case of the audit on Selection and Recruitment, the Internal Audit Capability is currently performing a first follow-up, whereas the one for the audit on contracts monitoring in the area of ITER buildings has not yet started.

Of the remaining four action plans which are still in the process of being implemented, one corresponds to the follow-up on the procurement in the area of ITER buildings (which resulted in six new recommendations accepted by F4E and thus the implementation rate drop from 100% to 84%). Three other reports were finalised in the second half of the year and therefore have a low implementation rate:

- **Neutral Beam and Electron Cyclotron Power Supplies and Sources Contracts:** The Internal Audit Capability issued 15 recommendations, five Very Important and ten Important. Only 13 recommendations were accepted by F4E Management, as the following two Important recommendations were rejected:
    - Analyse the costs and benefits of implementing a system to enable production of automated reports on the drivers of cost and schedule overruns. The rationale for rejecting this recommendation was that it was not feasible to implement, as the provision of reports on the drivers behind these changes would need the ad-hoc intervention of the Project Teams who have the expertise on these changes and the automatisation would not be possible;
    - Analyse the possibility of simplifying the operational processes, in particular the ones involving the ITER Organization to reduce the number of actors/steps, starting from procurement procedures, and acceptance of deliverables, nonconformities and deviations. The rationale for rejecting this recommendation was the identified risk had already been mitigated, as F4E processes have been frequently reviewed during the past few years always taking into account the simplification, clarification and streamlining of the flows.
- **Cryoplant and Fuel Cycle Contracts:** The Internal Audit Capability issued seven recommendations, two Very Important, two Important and three Desirable. All the recommendations were accepted except one Desirable: *"Compare the rates and assess the possibility to use framework contracts managed by the Technical Support Services (TSS) Unit for the tasks covered by the contractual options based on hourly rates."* This recommendation was rejected as it was not feasible to implement. The hourly rates used in Technical Support Services Framework Contracts are the results of a competition whose scope is restricted to these services while the hourly rate proposed in design and manufacture contracts are the results of a very different competition constrained by the broad technical scope of the contract.
- **Implementation of Procurement Arrangements:** The Internal Audit Service concluded with six recommendations, five of which (ranked as Very Important) were accepted by F4E Management and the remaining one (ranked as Important) was rejected. The latter concerned the improvement of the Management of ITER Credits:
    - F4E should clarify, if necessary in liaison with the ITER Organization regarding the supporting documents, the procedure for managing and monitoring ITER credits, by allocating clear roles and responsibilities to monitor Credit Allocation Scheme milestones, report on delays and ensure the timely receipt of credit notes;

- Reasons for large delays should be addressed at appropriate levels of F4E management; Project Teams should be alerted to reduce the delays and remedial action should be followed up.
- F4E Management rejected the recommendation as it considers that the identified risks are adequately mitigated with the processes already in place.

Overview per Criticality of Actions

	In Progress	Implemented	Cancelled	Obsolete	Totals	Implemented % (1)
Critical	0	5	0	0	**5**	**100%**
Very Important	24	79	4	2	**109**	**77%**
Important	14	47	2	2	**65**	**77%**
Desirable	1	9	0	0	**10**	**90%**
Totals	**39**	**140**	**6**	**4**	**189**	**78%**
	21%	**74%**	**3%**	**2%**		

Table 37: Statistics on audit actions implementation by criticality

(*) Implemented % is equal to the number of actions implemented per total number of actions that can be executed (Cancelled and Obsolete actions are not taken into account)

It has to be noted that all actions related to the critical recommendation issued in 2015 by the Internal Audit Service on contract management were implemented effectively. This has been confirmed by the Internal Audit Service in their follow-up engagement made in January 2017 which considered this audit closed. In 2016, no critical recommendation was issued on the three new audit reports.

The IT tool RAPID has become key in the reporting and monitoring of the status of the implementation of audit action plans, and all the audit recommendations can be directly accessed by the action owners, who directly input progress made in the tool. It also provides a reporting functionality via the Integrated Reporting System.

2.9 Follow-up of Observations from the Discharge Authority

In April 2016, the European Parliament decided to postpone its discharge decision on F4E as regards the 2014 budget implementation, allowing the time for more information to become available on the revised schedule and cost estimate of the ITER project.

At its meeting of 16 of June 2016, and following a two-year effort by the ITER Organization and the seven Domestic Agencies to establish a new baseline schedule, the ITER Council adopted *ad referendum* the updated Integrated Schedule for the ITER Project, which identifies the date of for the achievement of First Plasma as December 2025.

In July 2016, in accordance with Article 110 of the F4E Financial Regulation, the F4E Director reported to the European Parliament on the measures taken in the light of the observations expressed in the decision to postpone the discharge. Consequently, on 27 October 2016, the European Parliament granted the discharge for the financial year 2014. With this decision, the European Parliament has recognised the most recent significant efforts and improvements which have been made by the ITER Project. The continued support of the European Parliament is crucial for Europe's ongoing efforts to bring the ITER Project 'back on track'.

The final decision of the European Parliament contained a total of eight observations, one of those requesting F4E to provide a progress report on improvement actions that have been implemented to address the key challenges to put the ITER Project back on track by the new management. This report was sent to the Discharge Authority in January 2017.

Part II. (b) External Evaluations

Following the request made by the Council in 2010, F4E is subject to an annual review by an independent group of experts appointed by F4E's Governing Board. In 2016, Professor Albrecht Wagner, who previously led the 2016 ITER Organization assessment, was invited by the Governing Board to also lead the F4E Review. The Review Group performed the assessment in autumn 2016 and the results were presented to the Governing Board in December 2016.

By addressing the Terms of Reference approved by the Governing Board, the Review Group concluded the following regarding F4E's management of Euratom's contribution to the ITER Project:

- The refocusing on the achievement First Plasma has been done consistently, in a rigorous manner, and is compatible with the budget ceiling up to the end 2020. It provides a credible approach to achieving first plasma in December 2025, the earliest possible technically achievable date. The planning is robust for the majority of the projects in F4E. However, the Review Group noted that schedule risks related to projects on the critical path remain and F4E does not presently have any contingency in schedule;
- Civil construction shows no major technical risks, but it is currently one of the two major components defining the critical path to the achievement of first plasma. The mitigation measures so far adopted have already shown visible benefits, but a further effort needs to be made to implement them fully, through an even better ITER Organization Central Team and F4E coordination;
- There have been, and continue to be, significant delays in the Vacuum Vessel project. The associated schedule risk is very high, but has to some degree been mitigated by the decision to transfer two of the initial seven sectors from Europe to Korea. But since then addition delays have accumulated at the European manufacturing consortium. F4E must continue to assure highest management attention to this project and take adequate risk mitigation measures to assure a timely manufacturing. The Review Group endorses the mitigation measures being taken by F4E in order to meet the need dates of the Vacuum Vessel project as much as possible;
- The coordination between ITER Organization Central Team and F4E has improved, indeed the integrated project teams and the Executive Project Board has been a significant advance. However, there remains room for further improvement. Specifically, the Review Group encourages further integration of the projects, including tools, processes, governance, objectives, and roles and enhancement of the collaborative culture to capture synergies, minimise mini silos and encourage internal, cross department and cross project communication;
- The Review Group notes that F4E measures the performance of each project via a series of Key Performance Indicators covering financial and schedule performance and risks. These are reviewed on a regular basis at the monthly Project Steering Meeting. The Review Group concurs with F4E that the current set of Key Performance Indicators provides an accurate overview of the financial and schedule performance of each project;
- In the view of the Review Group, the F4E financial resources required up to the end of 2020 will remain within the € 6.6bn limit, including the proposed management reserve. There are however certain risks that should be closely monitored. F4E's schedule and resource estimates and the Estimate at Completion and fund allocation have still to be aligned with the ITER Organization Central Team long-term schedule once it has been approved by the ITER Council. If this creates budget pressures F4E should assess whether there are projects that are due for post-First Plasma that can be deferred beyond 2020;

- The Review Group, after having assessed the detailed cost estimates and projections, believes that the preliminary aggregated F4E cost estimate of until First Plasma is reasonable, with an uncertainty of about 10%, due to possible overall project delays. In order to report more accurately on the required financial resources, it could be appropriate to use higher level Estimate at Completion estimates with assumed risk factors that will be quicker to update;
- The Review Group suggest that F4E puts in place a robust system to ensure adequate long- term HR planning in line with F4E's mission;
- In view of the fact that most ITER components are "first-of-a-kind", some of which have to satisfy nuclear safety standards, and can efficiently only be procured in negotiated processes, the Review Group strongly recommends that open procurement procedures should only be applied for standard, off-the shelf purchases;
- The Review Group recommends that also indicators of safety and quality related to deviations and nonconformities should be used to monitor the performance of the project. They are important KPIs to identify opportunities for improvement of the performance;
- The Review Group supports the F4E management in its request to implement a more stringent change control and configuration management in close collaboration with ITER Organization Central Team. The Review Group recommends that F4E tightens its efforts to assure that the technical requirements based on the safety requirements will be correctly understood and strictly followed by contractors. The Review Group encourages the F4E Management to improve continuously safety culture. One recommendable measure could be to arrange a self-assessment of safety culture within the F4E organisation;
- The Review Group concludes that the contract monitoring is done systematically and uses appropriate tools and procedures;
- The Review Group is of the opinion that the claims management is done efficiently and follows clear procedures. The Review Group recommends to F4E's Director to keep claims management under close supervision and control;
- In the view of the Review Group the ITER Organization Central Team Reserve Fund and the proposed F4E Management Reserve cover different risk areas and complement each other. The maturity level of the projects in course and the recent detailed bottom-up cost at completion update made by F4E, give confidence that costs will stay within the present estimates;
- The Review Group sees in the creation of the Risk Management a major strengthening of the organisation and encourages the F4E management to help establish a proper "risk culture";
- The Review Group is of the opinion that the new organisation structure matches the need to strengthen the financial planning, control and management that will be of critical importance for F4E in the period up to the achievement of First Plasma and the intermediate budget limitation to the end of 2020. Similarly, the successful delivery of the F4E projects will require closer and more effective working practices with the ITER Organization. For this reason, the creation of the new Commercial Department and the ITER Programme Department alongside the ITER Delivery, Project Management and Administration departments will enable F4E to deliver on its obligations to ITER and F4E stakeholders. The Review Group recommends F4E to ensure that this new organisation will ensure the success of the integrated project teams, Buildings, Infrastructures and Power Supplies (BIPS), Cryogenics and Vacuum Vessel.

Part III. Assessment of the Effectiveness of the Internal Control Systems

3.1 Risk and Opportunity Management

F4E risk and opportunity management is the process that covers the identification, management and monitoring of the risk of F4E both negative or positive impact. It currently consists of two different levels: corporate and project level.

As far as the corporate risks are concerned, it covers the transversal risks and risks with high impact from the different projects. Most of the risk are treated at project level, but monitored at corporate level.

Project risks are identified for each project and actions are assigned and carried out in order to mitigate them, with more detail than in the corporate risk register, monitored through the Project Steering Meeting.

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

- Consistent within each register;
- Homogenised among all registers;
- Effective action plans.

Typical main project risks are the following ones (not in order of priority):

- Lack of clear definition of requirements;
- Large number of deviations and non-conformities causing delays and over-costs;
- Uncertainties in the manufacturing process;
- Delay in the reception of items from other ITER Domestic Agencies, to be then included into the European components;
- Lack of competition in the industry causing increase of costs;
- Lack of adequate budget to carry out the activities;
- Decrease in the human resources available in the teams;
- Delays due to lack of agreement with contractors on the consequence of changes received from the ITER Organization through F4E;

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 materialise.

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), and with interaction with the ITER Organization to feed the ITER project risk register and find synergies with other Domestic Agencies' for similar risks and transversal risks.

3.2 Compliance and Effectiveness of Management Standards

The Integrated Management System Standards, now named F4E Management Standards, provide the framework for the F4E Integrated Management System by integrating the ISO-9001 quality requirements, the European Commission Internal Control Standards and the ITER project quality and safety requirements.

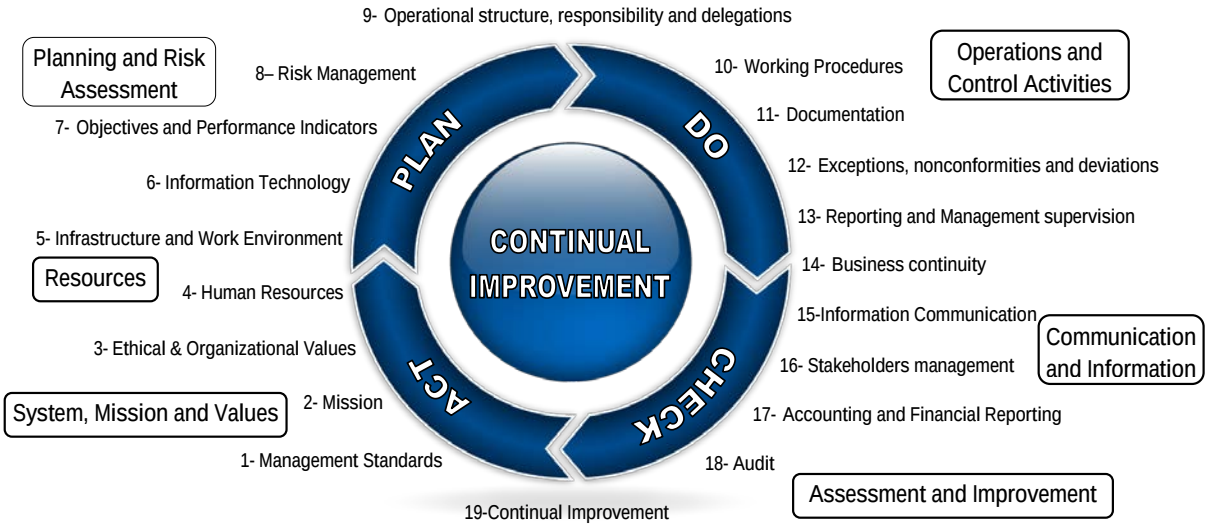


Figure 22: F4E Management Standards

In June 2016 the Governing Board adopted a revision of the former Integrated Management System Standards (hereafter referred to as the F4E Management Standards), which had as its main objective the incorporation of the changes to the European Commission's Internal Control Standards performed in 2015 and the latest update of the ISO-9001. At the same time, and in order to make the F4E Management Standards more effective and efficient, its requirements were simplified and widely disseminated within the organisation.

In the last annual report, F4E concluded that the Integrated Management System Standards were, in accordance with the information and data assessed at the time, effectively implemented in F4E, with improvements necessary for some standards. The different actions undertaken during 2016 in order to strengthen the system were the following:

- **MS 10 'Working Procedures'** (previously Integrated Management System Standards 14 'Processes and Procedures'): The processes in the contract management area have been substantially reinforced with the introduction of the Deviations Amendments and Contract Changes tool (in response to a recommendation from the Internal Audit Service). In addition, F4E updated all the processes impacted by the entry into force of the revised F4E Financial Regulation. At the same time F4E aligned all the processes to the new responsibility matrix put in place since October 2016 with the new organisational structure;

- **MS 13 'Reporting and Management Supervision'** (previously Integrated Management System Standards 19 'Management Information and Reporting' and Integrated Management System Standards 20 'Management Supervision'): These two intrinsically related standards were impacted by the European Court of Auditors' observations on the 'Emphasis of Matter', in relation to the respect of the multi-annual budget cap, the unreliable schedule and the lack of a system at contract level to regularly monitor cost deviations. Actions have been taken in 2016 at the highest governance levels of the ITER project to address the concerns of the European Court of Auditors, in particular with the revision of the project schedule that was adopted ad referendum by the ITER Council of June 2016;
- **MS 18 'Business Continuity'** (previously IMSS 14 'Business Continuity'): The organisation is still working on establishing a Business Continuity Plan. The first steps towards the completion of this plan (the conclusion of a Business Impact Assessment) had been already achieved in 2015. Unfortunately during 2016 no further progress was achieved in this regard due to resource constraints and other critical priorities. This action has been prioritised for 2017, and F4E is taking all the steps to have a first iteration of the Business Continuity Plan ready by the end of the year.

At the beginning of 2017, F4E launched a self-assessment on the effectiveness of the Management Standards via an internal questionnaire addressed to a sample of F4E staff. The purpose of the exercise was two-fold, firstly to get feedback on how well the Management Standards are known, understood and effectively implemented in the organisation and secondly as an awareness raising and communication exercise. The results of this exercise have been categorised into strengths and improvements to be made.

- **Strengths:**
    - It was evident that the Management Standards related to the areas that had been prioritised and which were the subject of improvement actions during the course of 2016 were clearly better known and implemented by F4E staff such as MS 10 Working Procedures and MS 13 Reporting and Management Supervision.
    - In addition, the different initiatives launched by the new F4E Director had a positive influence on the knowledge and implementation of certain Management Standards by the F4E staff, in particular 2 Mission; 3 Ethical and Organisational Values; 7 Objectives and Performance Indicators; 9 Operational structure, responsibility and delegations; and, 15 Information and Communication.
- **Improvements to be made:**
    - Concerning certain of the Management Standards the exercise confirmed areas of improvement already identified by other internal controls and results of audits. The responses for the following Management Standards suggested the need for improvement:
    - MS 6 'Information Technology' and MS 11 'Documentation': F4E will strengthen these areas during 2017 as a consequence of the audit carried out by the Internal Audit Service on Document Management and Information Security at the end of 2016;
    - MS 14 'Business Continuity': F4E is taking all the steps to have a first iteration of the Business Continuity Plan ready by the end of the year.

To conclude, this assessment has shown the benefits of the improvement actions carried out in 2016 and will be used to support the overall analysis for proposing the areas of improvement for

2017. F4E is now taking a more structured approach towards improvement which is further explained in the section 3.2.1 'Improvement Steering Committee'. In any case, further enhancing the effectiveness of the F4E control system in place, by inter alia taking into account any control weaknesses reported, is an ongoing effort in line with the principle of continual improvement of the F4E Integrated Management System.

3.2.1 Organisational Improvement

In F4E's 2015 Annual Report, four areas of improvement were identified as a priority for the organisation in 2016:

- Cost control policies, tools and procedures (MS 10 Working procedures);
- Contract management policies, tools and procedures (MS 10 Working procedures);
- Project planning and budget aligned with the realistic schedule, allowing the monitoring of the degree of advancement of works (MS 13 Reporting and Management Supervision);
- Integrated processes (including reserve fund and Integrated Project Teams with special focus on compliance aspects), (MS 10 Working procedures).

Significant progress has been achieved in these areas, as recognised in the European Court of Auditors in their final report on the 2015 annual accounts of F4E[9]. In the section 'Comments on key controls in the Joint Undertaking's supervisory and control systems' the Court states that: *"Significant progress has been achieved in many areas, and the exercise carried out by F4E in 2015 to calculate the EAC for the construction phase of the project was a major achievement".*

In addition, the European Parliament, in its resolution granting the discharge on the 2015 annual accounts to F4E[10], *"…welcomes the efforts taken by the Joint Undertaking to provide more global and realistic cost estimates"* and *"…points out that the Joint Undertaking's new director was appointed in January 2016 and has already introduced many necessary key changes; notes that the director put forward 21 new actions in addition to the 2015 action plan; notes the high level of ambition of the new actions, which go beyond budgetary and timeframe improvements by aiming for broad and comprehensive progress across a range of areas affecting ITER project performance, including management and communications, professionalization of processes, and training and professional development for personnel".*

An Improvement Steering Committee was set up in December 2016, chaired by the Director and composed of all Heads of Department with the support of the Process and Organisational Improvement Unit. It aims at aligning the visions on the improvement approach in F4E.

[9] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52016TA1216(05)&from=EN

[10] http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//NONSGML+TA+P8-TA-2017-0193+0+DOC+PDF+V0//EN

This forum deals with improvements and efficiency of the F4E Integrated Management System, assesses, aligns, prioritises, and steers improvement actions ensuring that the appropriate resources are allocated along the way to successfully achieve what is intended.

It will also be responsible to monitor the efficiency of the F4E Integrated Management System as a whole to reach higher process maturity levels. By centralising the follow-up of all improvement plans and actions, it ensures optimisation of resources across the organisation and overall alignment of Department approaches in conducting improvement actions and its dependencies

Moreover, F4E has selected “Lean Six Sigma” as the methodology to guide the organisation in the way it conducts improvement. The "Lean Six Sigma" is a methodology that analyses Key Performance Indicators to measure the performance of an activity at a given point in time before taking any action and to measure the progress made with improvement actions along the way.

The following improvement projects that had been launched in 2016 will be monitored by the Improvement Steering Committee in 2017:

In addition, for the areas of improvement 2017 the Improvement Steering Committee has launched the following projects:

- Integrating F4E change control;
- Lead time on operational procurement;
- Improve recruitment and selection;
- Estimate at Completion and budget;
- Financial and operational role and responsibilities in the approval flow.
- Tool to manage the Deviation and Amendment and Contract Changes;
- Financial Planning tool;
- Safety Requirements propagation and transmission.

Part IV. Management Assurance

4.1 Review of the Elements supporting the Assurance

The main elements supporting the assurance of the F4E Director are the following:

- Observations of the European Court of Auditors;
- Reporting of the Internal Audit Service and the Internal Audit Capability;
- Results of the F4E corporate internal supervision functions;
- Results of the ex-post controls on grants;
- Corporate risk assessment;
- Annual external assessment of F4E;
- Declarations of the Authorising Officers by Delegation and Sub-Delegation.

The detailed outcome of these different assurance functions has been described in detail in sections Part II and III of this report.

4.2 Reservations

No reservation is entered for 2016.

4.3 Overall Conclusions on Assurance

In conclusion, F4E Management has reasonable assurance that, overall, suitable controls are in place and function as intended; risks are being appropriately monitored and mitigated and continual improvements are being implemented. The F4E Director, in his capacity as Authorising Officer, has signed the Declaration of Assurance without reservation.

Part V. Declaration of Assurance

I, undersigned, Johannes Schwemmer, Director of the European Joint Undertaking for ITER and the Development of Fusion Energy (F4E) in my capacity as Authorising Officer:

- State that I have reasonable assurance that:
    - the information contained in this report presents a true and fair view;
    - the resources assigned to the activities described in this report have been used for their intended purpose and in accordance with the principles of sound financial management;
    - the control procedures put in place give the necessary guarantees concerning the legality and regularity of the underlying transactions related to the 2016 annual accounts.

  This reasonable assurance is based on my own judgment and on the information at my disposal, such as the observations of the European Court of Auditors, the Internal Audit Service and the Internal Audit Capability, the declarations of the Authorising Officers by Delegation and Sub-Delegation, the results of the F4E corporate supervision functions, the ex-post controls on grants and the annual external assessment of F4E.
- Without qualifying this reasonable assurance, I confirm that the system of internal control has been significantly enhanced during 2016 in order to appropriately mitigate the risks observed by the European Court of Auditors in the “Emphasis of Matter” section of their 2015 Annual Report:
    - The amount of the Joint Undertaking contribution to the construction phase of the ITER project is exposed to significant risks of increase, mainly resulting from changes in the scope of the project deliverables and due to the current schedule which is considered unrealistic;
    - In relation to these risks, the June 2016 ITER Council endorsed an updated integrated schedule for the ITER Project which identifies the date of achievement of the strategic milestone of the construction phase of the project (“First Plasma”) as December 2025. The Joint Undertaking has achieved significant progress in its key controls and supervisory and control systems, and the exercise carried out by F4E in 2015 to calculate the Estimate At Completion (EAC) for the construction phase of the project was a major achievement;
    - Neither of these elements called into question the legality and regularity of the underlying transactions of the 2015 annual accounts.
- Confirm that those risks do not question the legality and regularity of the underlying transactions in relation to the 2016 annual accounts.
- Confirm that those risks under the control of F4E are being addressed through the following actions:
    - Support to the ITER International Organization in developing a realistic and sound revised schedule that takes into account the available resources and the cost dimension which are closely related;
    - Strengthening of the F4E system to centrally monitor the cost estimates and deviations, existing since October 2015;

  - Conclusion of the ”Straight Road to First Plasma Project” to focus resources on those projects required for the ITER First Plasma, ensuring the respect of the capped budget of EUR 6.6 billion (2008 values) for the period 2007-2020.
  - Implementation of mitigation actions to address the most significant risks in the areas of Vacuum Vessel and Buildings.

- Confirm that I am unaware of any additional information which has not been reported here and which could harm the interests of F4E and the European institutions in general.

Johannes Schwemmer
Director of Fusion for Energy
17 May 2017

Annexes

Annex I. Core Business Statistics

To obtain an indication of progress, both the ITER Organization and F4E use the number of milestones achieved during the year compared with the amount initially forecasted (baseline of the year). The F4E milestones cover the following types:

- Signature of Procurement Arrangements;
- Calls for Tender Published;
- Commitments higher than € 2m;
- Work Programme Objectives;
- Contract/Grant Signature higher than € 2m;
- Project Internal Milestones;
- ITER Council/F4E's Governing Board Milestones.

The chart below shows the comparison between the planned and achieved number of milestones. Both the total of distinct milestones and the numbers for each category are shown (some milestones can belong to more than one category).

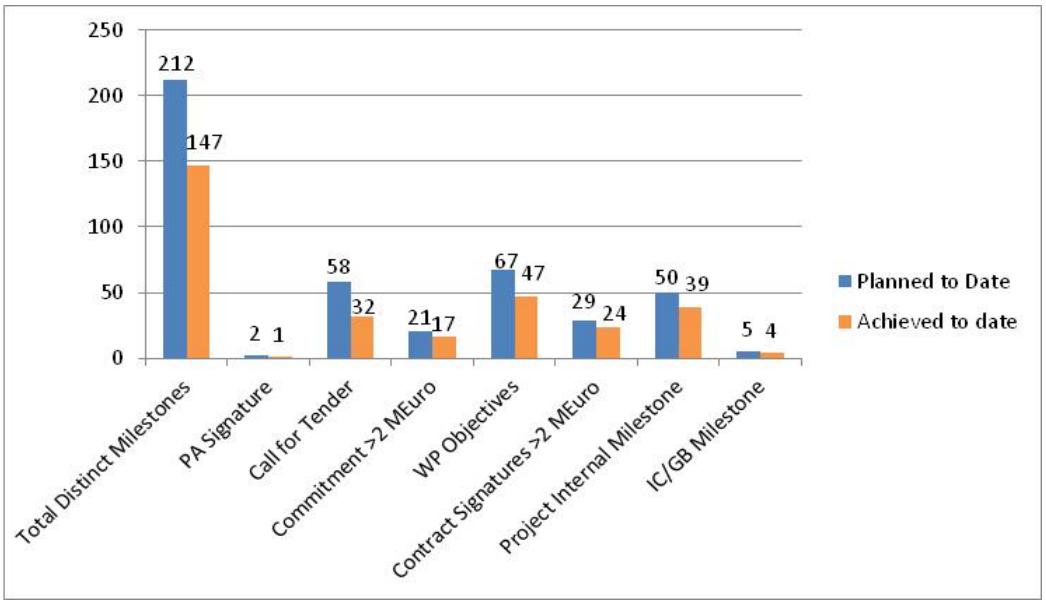


Figure 23: Achievement of 2016 Milestones until end-December 2016

Annex II. Statistics on Financial Management

Annex II. a. Statistics on Financial Management Budget – Budget Execution

Implementation of the Statement of Administrative Expenditure (EUR)

Heading of the 2016 Budget	Commitment Appropriation			Payment Appropriation		
	Final budget for implementation (1)	Final implementation (2)	% implementation (3)= (2)/(1)	Final budget for implementation (4)	Final implementation (5)	% implementation (6)= (5)/(4)
CH 11 - STAFF EXPENDITURE IN THE ESTABLISHMENT PLAN	26 763 755.71	26 763 755.71	100.0%	26 763 755.71	26 763 755.71	100.0%
CH 12 - EXTERNAL STAFF EXPENDITURE (CA, IS AND SNE)	9 026 777.57	9 026 777.57	100.0%	9 026 777.57	8 911 235.89	98.7%
CH 13 - MISSIONS AND DUTY TRAVEL	2 245 153.35	2 245 153.35	100.0%	2 245 153.35	2 243 379.09	99.9%
CH 14 - MISCELLANEOUS EXPENDITURE ON STAFF RECRUITMENT AND TRANFER	1 167 537.28	1 167 537.28	100.0%	1 167 537.28	1 051 612.38	90.1%
CH 15 - REPRESENTATION	10 000.00	10 000.00	100.0%	10 000.00	5 922.39	59.2%
CH 16 - TRAINING	705 764.12	705 764.12	100.0%	705 764.12	418 022.69	59.2%
CH 17 - OTHER STAFF MANAGEMENT EXPENDITURE	1 972 500.00	1 972 500.00	100.0%	1 972 500.00	1 673 667.52	84.9%
CH 18 - TRAINEESHIPS	110 000.00	110 000.00	100.0%	110 000.00	97 022.43	88.2%
TITLE 1 Staff expenditure	42 001 488.03	42 001 488.03	100.0%	42 001 488.03	41 164 618.10	98.0%
CH 21 - BUILDINGS AND ASSOCIATED COSTS	1 375 000.00	1 375 000.00	100.0%	1 375 000.00	841 669.09	61.2%
CH 22 - INFORMATION AND COMMUNICATION TECHNOLOGIES	2 825 000.00	2 817 566.00	99.7%	2 825 000.00	1 693 819.84	60.0%
CH 23 - MOVABLE PROPERTY AND ASSOCIATED COSTS	198 000.00	198 000.00	100.0%	198 000.00	89 442.41	45.2%
CH 24 - EVENTS AND COMMUNICATION	271 799.88	271 799.88	100.0%	271 799.88	183 469.47	67.5%
CH 25 - OUTSOURCING AND OTHER CURRENT EXPENDITURE	1 282 965.32	1 282 965.32	100.0%	1 282 965.32	689 253.84	53.7%
CH 26 - POSTAGE AND TELECOMMUNICATIONS	390 000.00	390 000.00	100.0%	390 000.00	132 861.54	34.1%
CH 27 - EXPENDITURE ON FORMAL AND OTHER MEETINGS	276 000.00	276 000.00	100.0%	276 000.00	188 442.81	68.3%
TITLE 2 -	6 618 765.20	6 611 331.20	99.9%	6 618 765.20	3 818 959.00	57.7%
Total TITLE 1 & 2 Commitment	48 620 253.23	48 612 819.23	100.0%	48 620 253.23	44 983 577.10	92.5%

Implementation of the Statement of Operational Expenditure and Total (EUR)

Heading of the 2016 Budget	Commitment Appropriation			Payment Appropriation		
	Final budget for implementation (1)	Final implementation (2)	% implementation (3)= (2)/(1)	Final budget for implementation (4)	Final implementation (5)	% implementation (6)= (5)/(4)
CH 31 - ITER CONSTRUCTION INCLUDING ITER SITE PREPARATION	265 604 228.48	265 593 480.95	100.0%	535 046 617.74	530 022 035.93	99.1%
CH 32 - TECHNOLOGY FOR ITER	6 754 310.85	6 754 310.85	100.0%	8 575 606.14	8 575 606.14	100.0%
CH 33 - TECHNOLOGY FOR BROADER APPROACH AND DEMO	6 367 221.45	6 367 221.45	100.0%	5 861 571.98	5 861 571.98	100.0%
CH 34 - OTHER EXPENDITURE	2 032 468.55	2 031 474.06	100.0%	2 305 199.27	2 299 628.78	99.8%
CH 35 - ITER CONSTRUCTION - APPROPRIATIONS ACCRUING FROM THE HOST STATE CONTRIBUTION	143 439 650.19	143 439 650.19	100.0%	120 003 611.29	119 127 078.69	99.3%
CH 36 - APPROPRIATION ACCRUING FROM THIRD PARTIES TO SPECIFIC ITEM OF EXPENDITURE	14 983 791.90	14 248 373.45	95.1%	4 120 733.99	0.00	0.0%
TITLE 3	439 181 671.42	438 434 510.95	99.8%	675 913 340.41	665 885 921.52	98.5%
Total implementation	487 801 924.65	487 047 330.18	99.8%	724 533 593.64	710 869 498.62	98.1%

Annex II. b. Statistics on Financial Management Budget – Evolution of the Budget

Title Chapter	Heading	Initial Budget 2016		Transfer 2016/01		Amendment N°1		Transfer 2016/02		Transfer 2016/03		Amendment N°2		Second Amended Budget	
		Commitments	Payments	Commitments	Payments	Commitments	Payments	Commitments	Payments	Commitments	Payments	Commitments	Payments	Commitments	Payments
1	**STAFF EXPENDITURE**														
1 1	STAFF EXPENDITURE IN THE ESTABLISHMENT PLAN	26 800 000.00	26 800 000.00					- 280 000.00	- 280 000.00	- 520 000.00	- 520 000.00			26 000 000.00	26 000 000.00
1 2	EXTERNAL STAFF EXPENDITURE (CONTRACT AGENTS, INTERIM STAFF AND NATIONAL EXPERTS)	8 400 000.00	8 400 000.00							445 000.00	445 000.00			8 845 000.00	8 845 000.00
1 3	MISSIONS AND DUTY TRAVEL	2 100 000.00	2 100 000.00							- 100 000.00	- 100 000.00			2 000 000.00	2 000 000.00
1 4	MISCELLANEOUS EXPENDITURE ON STAFF RECRUITMENT AND TRANSFER	760 000.00	760 000.00					150 000.00	150 000.00	188 000.00	188 000.00			1 098 000.00	1 098 000.00
1 5	REPRESENTATION	10 000.00	10 000.00											10 000.00	10 000.00
1 6	TRAINING	817 000.00	817 000.00											817 000.00	817 000.00
1 7	OTHER STAFF MANAGEMENT EXPENDITURE	1 860 000.00	1 860 000.00							165 000.00	165 000.00			2 025 000.00	2 025 000.00
1 8	TRAINEESHIPS	60 000.00	60 000.00							50 000.00	50 000.00			110 000.00	110 000.00
	Title 1 - Total	**40 807 000.00**	**40 807 000.00**	**0.00**	**0.00**	**0.00**	**0.00**	**- 130 000.00**	**- 130 000.00**	**228 000.00**	**228 000.00**	**0.00**	**0.00**	**40 905 000.00**	**40 905 000.00**
2	**BUILDINGS, EQUIPMENT AND MISCELLANEOUS OPERATING EXPENDITURE**														
2 1	BUILDINGS AND ASSOCIATED COSTS	1 245 000.00	1 245 000.00					130 000.00	130 000.00					1 375 000.00	1 375 000.00
2 2	INFORMATION AND COMMUNICATION TECHNOLOGIES	2 816 000.00	2 816 000.00							49 000.00	49 000.00			2 865 000.00	2 865 000.00
2 3	MOVABLE PROPERTY AND ASSOCIATED COSTS	213 000.00	213 000.00							- 15 000.00	- 15 000.00			198 000.00	198 000.00
2 4	EVENTS and COMMUNICATION	425 000.00	425 000.00							- 190 000.00	- 190 000.00			235 000.00	235 000.00
2 5	OUTSOURCING AND OTHER CURRENT EXPENDITURE	1 272 000.00	1 272 000.00											1 272 000.00	1 272 000.00
2 6	POSTAGE AND TELECOMMUNICATIONS	355 000.00	355 000.00							19 000.00	19 000.00			374 000.00	374 000.00
2 7	EXPENDITURE ON FORMAL AND OTHER MEETINGS	367 000.00	367 000.00							- 91 000.00	- 91 000.00			276 000.00	276 000.00
	Title 2 - Total	**6 693 000.00**	**6 693 000.00**	**0.00**	**0.00**	**0.00**	**0.00**	**130 000.00**	**130 000.00**	**- 228 000.00**	**- 228 000.00**	**0.00**	**0.00**	**6 595 000.00**	**6 595 000.00**
	Titles 1 & 2 : Administrative expenditure - Subtotal	**47 500 000.00**	**47 500 000.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**47 500 000.00**	**47 500 000.00**

Title Chapter	Heading	Initial Budget 2016		Transfer 2016/01		Amendment N°1		Transfer 2016/02		Transfer 2016/03		Amendment N°2		Second amended budget	
		Commitments	Payments	Commitments	Payments	Commitments	Payments	Commitments	Payments	Commitments	Payments	Commitments	Payments	Commitments	Payments
3	**OPERATIONAL EXPENDITURE**														
3 1	ITER CONSTRUCTION INCLUDING THE ITER SITE PREPARATION	255 632 138.01	499 925 891.88	- 275 000.00		- 140 000.00	- 107 000 000.00					2 412 180.83	129 323 497.38	257 629 318.84	522 249 389.26
3 2	TECHNOLOGY FOR ITER	11 500 000.00	17 000 000.00			- 1 600 000.00						- 753 495.38		9 146 504.62	17 000 000.00
3 3	TECHNOLOGY FOR BROADER APPROACH AND DEMO	6 708 000.00	9 200 000.00	275 000.00		1 740 000.00						1 420 000.00		10 143 000.00	9 200 000.00
3 4	OTHER EXPENDITURE	4 500 000.00	4 000 000.00									- 200.00		4 499 800.00	4 000 000.00
3 5	ITER CONSTRUCTION - APPROPRIATION ACCRUING FROM THE ITER HOST STATE CONTRIBUTION	130 000 000.00	120 000 000.00											130 000 000.00	120 000 000.00
3 6	APPROPRIATION ACCRUING FROM THIRD PARTIES TO SPECIFIC ITEM OF EXPENDITURE	p.m.	p.m.											p.m	p.m.
	Title 3: Operational expenditure - Total	**408 340 138.01**	**650 125 891.88**	**0.00**	**0.00**	**0.00**	**-107 000 000.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3 078 485.45**	**129 323 497.38**	**411 418 623.46**	**672 449 389.26**
	TOTAL BUDGET	**455 840 138.01**	**697 625 891.88**	**0.00**	**0.00**	**0.00**	**-107 000 000.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3 078 485.45**	**129 323 497.38**	**458 918 623.46**	**719 949 389.26**

Title Chapter	Heading	Second amended budget		Transfer 2016/04		Transfer 2016/05		Transfer 2016/06		Transfer 2016/07		Transfer 2016/08		Transfer 2016/09		Final Budget		Additional revenue and carry over		Final statement of Expenditure	
		Commitments	Payments	Commitments	Payments	Commitments	Payments	Commitments	Payments	Commitments	Payments	Commitments	Payments	Commitments	Payments	Commitments	Payments	Commitments	Payments	Commitments	Payments
1	**STAFF EXPENDITURE**																				
1 1	STAFF EXPENDITURE IN THE ESTABLISHMENT PLAN	26,000,000.00	26,000,000.00			763,755.71	763,755.71									26,763,755.71	26,763,755.71			26,763,755.71	26,763,755.71
1 2	EXTERNAL STAFF EXPENDITURE (CONTRACT AGENTS, INTERIM STAFF AND NATIONAL EXPERTS)	8,845,000.00	8,845,000.00			181,777.57	181,777.57									9,026,777.57	9,026,777.57			9,026,777.57	9,026,777.57
1 3	MISSIONS AND DUTY TRAVEL	2,000,000.00	2,000,000.00			100,000.00	100,000.00	145,000.00	145,000.00							2,245,000.00	2,245,000.00	153.35	153.35	2,245,153.35	2,245,153.35
1 4	MISCELLANEOUS EXPENDITURE ON STAFF RECRUITMENT AND TRANSFER	1,098,000.00	1,098,000.00			69,237.28	69,237.28									1,167,237.28	1,167,237.28	300.00	300.00	1,167,537.28	1,167,537.28
1 5	REPRESENTATION	10,000.00	10,000.00													10,000.00	10,000.00			10,000.00	10,000.00
1 6	TRAINING	817,000.00	817,000.00			- 111,235.88	- 111,235.88									705,764.12	705,764.12			705,764.12	705,764.12
1 7	OTHER STAFF MANAGEMENT EXPENDITURE	2,025,000.00	2,025,000.00			- 52,500.00	- 52,500.00									1,972,500.00	1,972,500.00			1,972,500.00	1,972,500.00
1 8	TRAINEESHIPS	110,000.00	110,000.00													110,000.00	110,000.00			110,000.00	110,000.00
	Title 1 - Total	**40,905,000.00**	**40,905,000.00**	**0.00**	**0.00**	**951,034.68**	**951,034.68**	**145,000.00**	**145,000.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**42,001,034.68**	**42,001,034.68**	**453.35**	**453.35**	**42,001,488.03**	**42,001,488.03**
2	**BUILDINGS, EQUIPMENT AND MISCELLANEOUS OPERATING EXPENDITURE**																				
2 1	BUILDINGS AND ASSOCIATED COSTS	1,375,000.00	1,375,000.00													1,375,000.00	1,375,000.00			1,375,000.00	1,375,000.00
2 2	INFORMATION AND COMMUNICATION TECHNOLOGIES	2,865,000.00	2,865,000.00			- 40,000.00	- 40,000.00									2,825,000.00	2,825,000.00			2,825,000.00	2,825,000.00
2 3	MOVABLE PROPERTY AND ASSOCIATED COSTS	198,000.00	198,000.00													198,000.00	198,000.00			198,000.00	198,000.00
2 4	EVENTS and COMMUNICATION	235,000.00	235,000.00			12,000.00	12,000.00									247,000.00	247,000.00	24,799.88	24,799.88	271,799.88	271,799.88
2 5	OUTSOURCING AND OTHER CURRENT EXPENDITURE	1,272,000.00	1,272,000.00			10,965.32	10,965.32									1,282,965.32	1,282,965.32			1,282,965.32	1,282,965.32
2 6	POSTAGE AND TELECOMMUNICATIONS	374,000.00	374,000.00			16,000.00	16,000.00									390,000.00	390,000.00			390,000.00	390,000.00
2 7	EXPENDITURE ON FORMAL AND OTHER MEETINGS	276,000.00	276,000.00													276,000.00	276,000.00			276,000.00	276,000.00
	Title 2 - Total	**6,595,000.00**	**6,595,000.00**	**0.00**	**0.00**	**- 1,034.68**	**- 1,034.68**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**6,593,965.32**	**6,593,965.32**	**24,799.88**	**24,799.88**	**6,618,765.20**	**6,618,765.20**
	Titles 1 & 2 : Administrative expenditure - Subtotal	**47,500,000.00**	**47,500,000.00**	**0.00**	**0.00**	**950,000.00**	**950,000.00**	**145,000.00**	**145,000.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**48,595,000.00**	**48,595,000.00**	**25,253.23**	**25,253.23**	**48,620,253.23**	**48,620,253.23**

Title Chapter	Heading	Second amended budget		Transfer 2016/04		Transfer 2016/05		Transfer 2016/06		Transfer 2016/07		Transfer 2016/08		Transfer 2016/09		Final Budget		Additional revenue		Final statement of Expenditure	
		Commitments	Payments	Commitments	Payments	Commitments	Payments	Commitments	Payments	Commitments	Payments	Commitments	Payments	Commitments	Payments	Commitments	Payments	Commitments	Payments	Commitments	Payments
3	**OPERATIONAL EXPENDITURE**																				
3 1	ITER CONSTRUCTION INCLUDING THE ITER SITE PREPARATION	257,629,318.84	522,249,389.26		8,051,554.21						3,729,847.81		585,910.46	7,544,993.64		265,174,312.48	534,616,701.74	429,916.00	429,916.00	265,604,228.48	535,046,617.74
3 2	TECHNOLOGY FOR ITER	9,146,504.62	17,000,000.00		-8,051,554.21						- 436,837.65		60,502.62	- 2,395,689.15		6,750,815.47	8,572,110.76	3,495.38	3,495.38	6,754,310.85	8,575,606.14
3 3	TECHNOLOGY FOR BROADER APPROACH AND DEMO	10,143,000.00	9,200,000.00								-2,818,428.02		- 520,000.00	- 3,775,778.55		6,367,221.45	5,861,571.98			6,367,221.45	5,861,571.98
3 4	OTHER EXPENDITURE	4,499,800.00	4,000,000.00			- 950,000.00	- 950,000.00	- 145,000.00	- 145,000.00		- 474,582.14		- 126,413.08	- 1,373,525.94		2,031,274.06	2,304,004.78	1,194.49	1,194.49	2,032,468.55	2,305,199.27
3 5	ITER CONSTRUCTION - APPROPRIATION ACCRUING FROM THE ITER HOST STATE CONTRIBUTION	130,000,000.00	120,000,000.00													130,000,000.00	120,000,000.00	13,439,650.19	3,611.29	143,439,650.19	120,003,611.29
3 6	APPROPRIATION ACCRUING FROM THIRD PARTIES TO SPECIFIC ITEM OF EXPENDITURE	p.m.	p.m.													p.m	p.m.	14,983,791.90	4,120,733.99	14,983,791.90	4,120,733.99
	Title 3: Operational expenditure - Total	**411,418,623.46**	**672,449,389.26**	**0.00**	**0.00**	**- 950,000.00**	**-950,000.00**	**- 145,000.00**	**-145,000.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**410,323,623.46**	**671,354,389.26**	**28,858,047.96**	**4,558,951.15**	**439,181,671.42**	**675,913,340.41**
	TOTAL BUDGET	**458,918,623.46**	**719,949,389.26**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**458,918,623.46**	**719,949,389.26**	**28,883,301.19**	**4,584,204.38**	**487,801,924.65**	**724,533,593.64**

Annex II. c. Statistics on Financial Management Budget – Procurement Data

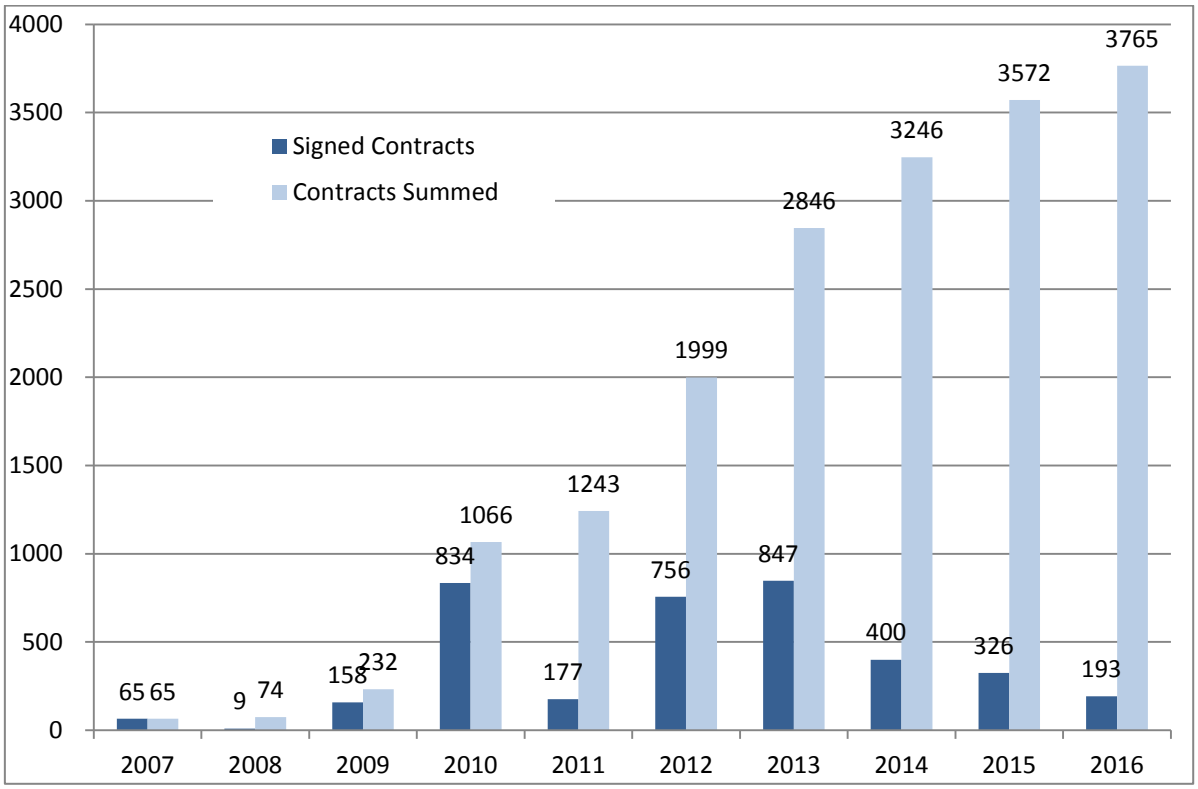


Figure 24: Annual and cumulative value of contracts and grants signed by F4E

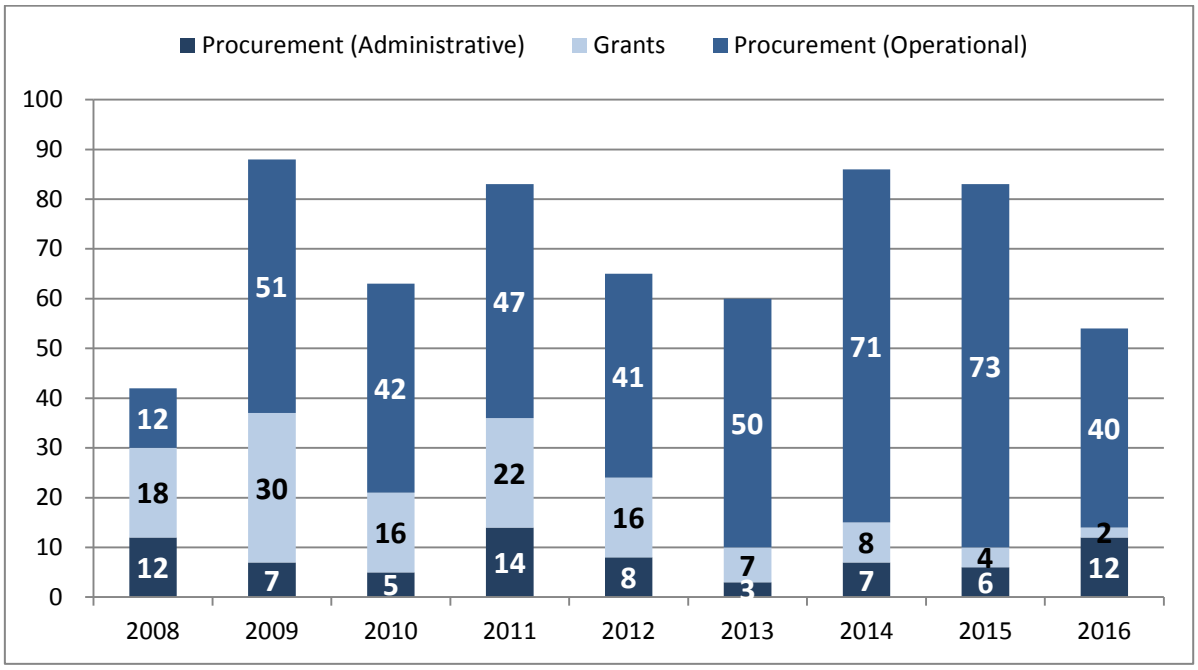


Figure 25: Procurement and grant procedures launched

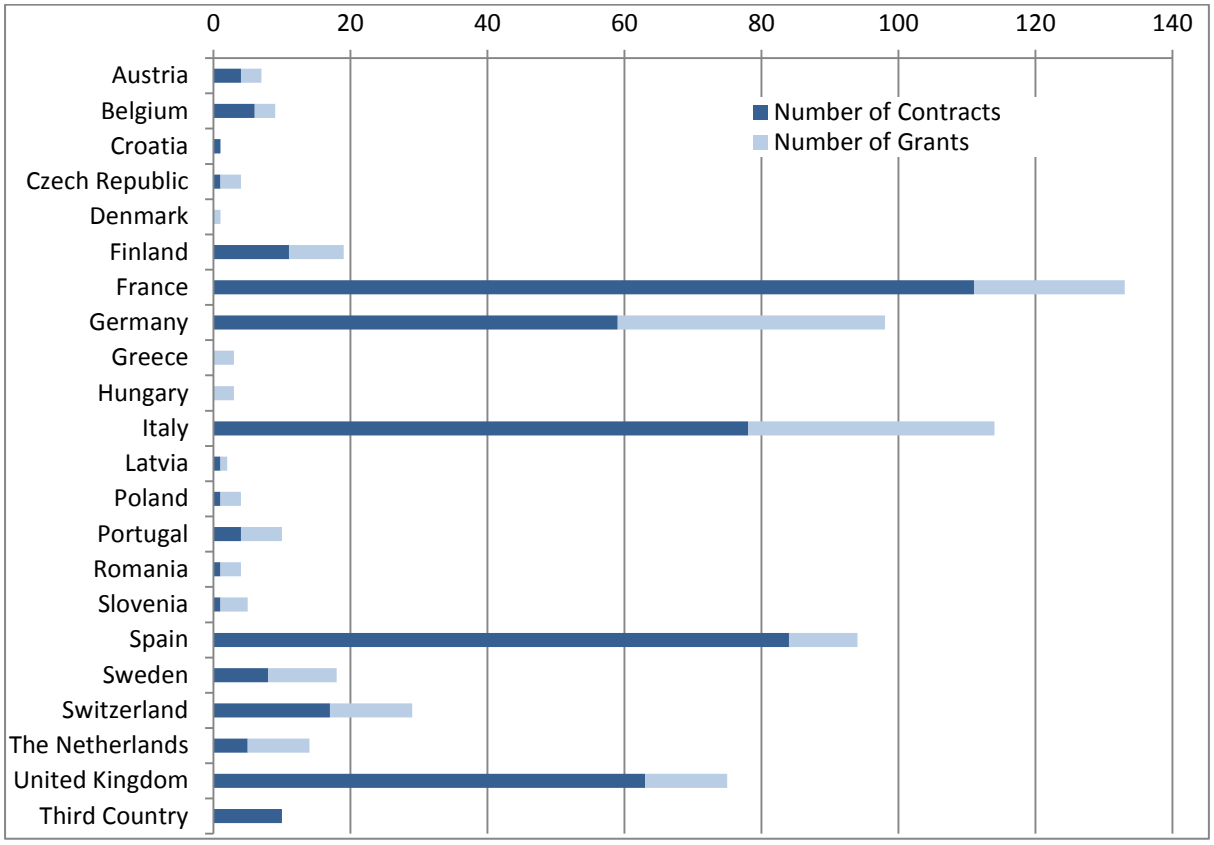


Figure 26: Geographical distribution of awarded contracts and grants (Number in the period 2008-2016)

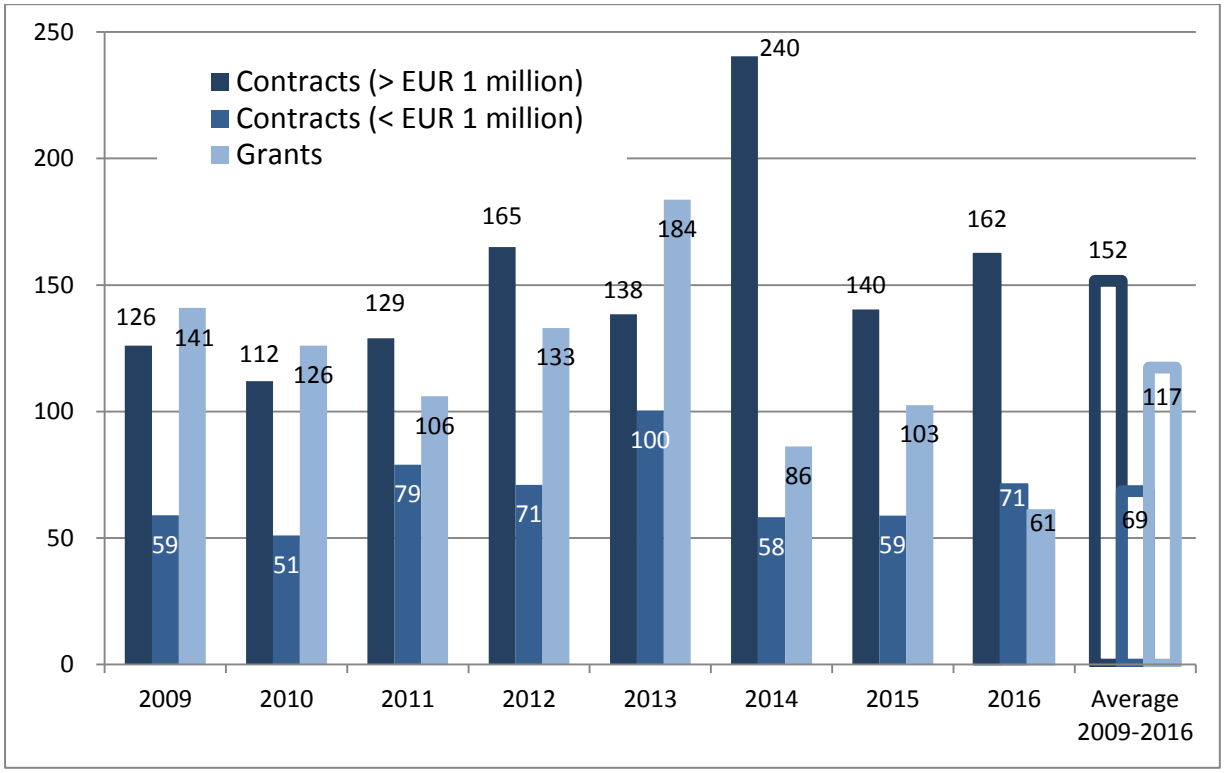


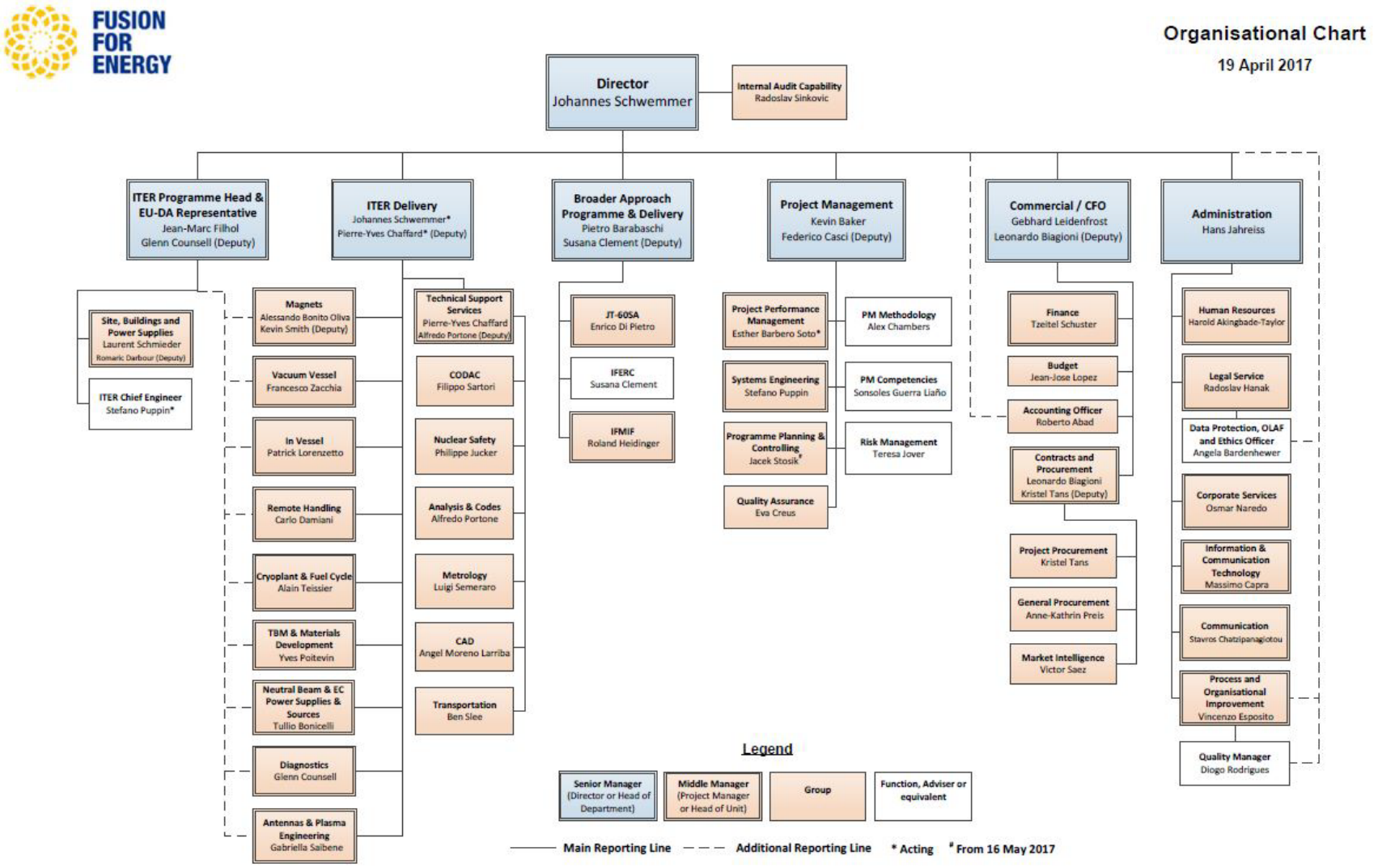
Figure 27: Average time to award contracts and grants (days from submission to deadline to award)

Annex II. d. Status (as of 31 December 2016) concerning the implementation of the F4E Work Programme 2016

		Grant		Procurement		Cash Contribution		TOTAL	
		Amount (€)	Variation (%)	Amount (€)	Variation (%)	Amount (€)	Variation (%)	Amount (€)	Variation (%)
B3-1 & B3-5 ITER Construction	Original WP	33 800 000	-	149 342 138	-	202 490 000	-	**385 632 138**	-
	Last amended WP	11 500 000	-66%	110 497 856	-26%	279 235 000	38%	**401 232 856**	**4%**
	Execution	4 937 801	-57%	129 324 730	17%	274 774 655	-2%	**409 037 186**	**2%**
B3-2 Technologies for ITER	Original WP	4 200 000	-	5 500 000	-	1 800 000	-	**11 500 000**	-
	Last amended WP	1 000 000	-76%	3 500 000	-36%	4 650 000	158%	**9 150 000**	**-20%**
	Execution	818 486	-18%	2 190 619	-37%	3 745 206	-19%	**6 754 311**	**-26%**
B3-3 Broader Approach	Original WP	0	-	5 000 000	-	1 708 000	-	**6 708 000**	-
	Last amended WP	0	-	7 720 000	54%	2 423 000	42%	**10 143 000**	**51%**
	Execution	0	-	4 754 242	-38%	1 608 219	-34%	**6 362 461**	**-37%**
B3-4 Other Expenditure	Original WP	0	-	4 500 000	-	0	-	**4 500 000**	-
	Last amended WP	0	-	4 500 000	0%	0	-	**4 500 000**	**0%**
	Execution	0	-	2 031 474	-55%	0	-	**2 031 474**	**-55%**
B3-6 Reserve Fund	Original WP	0	-	P.M.	-	0	-	**P.M.**	-
	Last amended WP	0	-	50 453 772	-	0	-	**50 453 772**	-
	Execution	0	-	14 248 373	-72%	0	-	**14 248 373**	**-72%**
TOTAL	Original WP	**38 000 000**	-	**164 342 138**	-	**205 998 000**	-	408 340 138	-
	Last amended WP	**12 500 000**	**-67%**	**176 671 628**	**8%**	**286 308 000**	**39%**	**475 479 628**	**16%**
	Execution	**5 756 287**	**-54%**	**152 549 438**	**-14%**	**280 128 080**	**-2%**	**438 433 806**	**-8%**

Variations: Last amended WP compared to Original WP and Execution to Last amended WP

Annex III. Organisational Chart



Annex IV. Establishment Plan and Additional Information on Human Resources Management

Annex IV. a. Establishment Plan

	Authorised Posts (EP 2016)		Filled as of 31/12/2016	
	FO	TA	FO	TA
AD 16	0	0		
AD 15	0	1		
AD 14	1	0		1
AD 13	14	5	8	3
AD 12	16	8	9	1
AD 11	5	19	6	15
AD 10	3	27	2	22
AD 9	1	20	1	30
AD 8	0	34	8	43
AD 7	0	47	2	32
AD 6	0	40		36
AD 5	0	0	1	
Subtotal	**40**	**201**	**37**	**183**
Total AD	**241**		**220**	
AST 11	3	0		
AST 10	3	0	1	
AST 9	3	0	1	
AST 8	1	0	2	
AST 7	3	0	2	
AST 6	1	3	3	1
AST 5	1	13	0	9
AST 4	0	11	3	7
AST 3	0	0	1	10
AST 2	0	0	2	
AST 1	0	0		
Subtotal	**15**	**27**	**15**	**27**
Total AST	**42**		**42**	
Total FO/TA	**283**		**262**	

Annex IV. b. Entry Level for Each Type of Post: Indicative Table

Key functions	***Type of contract (official, TA or CA)***	***Function group, grade of recruitment (or bottom of the brackets if published in***	***Indication whether the function is dedicated to administrative support or operations***
Head of Department (level 2, taking the Director as level 1)	FO/TA	AD13	Administrative/Operations
Head of Unit/Project Team Manager (level 3)	FO/TA	From AD9	Administrative/Operations
Group Leader (level 4)	FO/TA	From AD6	Operations/Neutral
Senior Officer	FO/TA	From AD9	Administrative/Operations/
Officer	FO/TA	From AD5 to AD8	Administrative/Operations/
Assistant	FO/TA	From AST1	Administrative/Operations/
Head of Administration	TA	AD13	Administrative
Head of Human Resources	TA	AD11	Administrative
Head of Finance	FO	AD10	Neutral
Head of ICT	TA	AD10	Administrative
Secretary/Clerk	CA	II	Administrative/Operations/
Mail Clerk	Interim	II	Administrative
Data Protection Officer	FO	AD12	Administrative
Accounting Officer	FO	AD7	Neutral
Internal Auditor	FO	AD7	Administrative
Administrative Support to the Director	CA	III	Operations

Annex IV. c. Benchmarking Exercise

Screening type	Screening category	Description	Year 2015 (%)	Year 2016 (%)
Administrative Support and Coordination (overhead)	**Administrative support**		**14.74%**	**16.73%**
	DOC	Document management	0.42%	0.39%
	HR	Human resource management	4.84%	4.28%
	IA	Internal auditing and control (procedural aspects)	0.42%	0.97%
	ICT	Information and communication technologies	6.11%	7.78%
	LOG	Logistics, facilities management and security	2.53%	2.92%
	RES DIR/HoA	Head of Administration	0.42%	0.39%
	Coordination		**2.11%**	**2.33%**
	LEGAL	Legal (administrative matters, including DP)	0.42%	0.78%
	COMM	External communication & information	1.47%	1.36%
	GEN COORD	General coordination activities	0.21%	0.19%
Operational			**73.68%**	**71.01%**
	TOP COORD	Top operational coordination (Director/HoD)	3.58%	5.45%
	PGM M/IMP	Programme management and implementation	64.42%	61.28%
	EVAL	Evaluation and impact assessment	1.47%	1.17%
	GEN OPER	General operational activities	4.21%	3.11%
Neutral			**9.47%**	**9.92%**
	FIN	Finance, accounting, contract management and administrative procurement	5.68%	6.42%
	CONT	Quality management and internal audit and control (with focus on financial aspects)	3.79%	3.50%

Annex IV. d. Recuperation Approved taken in 2016

Type	Category	Grade	Sum of Leave days Recuperation
TA	AD	6	15
		7	19
		8	23.5
		9	19.5
		10	10.5
		11	1.5
	AST	3	2.5
		4	6
		5	3.5
FO	AD	7	1
		8	2.5
		9	0.5
		10	0.5
		11	2.5
		12	6
	AST	4	2
		7	0.5
		10	2
CA	II	6	2.5
		7	0.5
	III	9	5.5
		10	7.5
		11	3
	IV	13	6.5
		14	8.5
		15	14.5
		16	1.5
		17	2.5
		Grand Total	**171**

Annex V. Human and Financial Resources by Activity

Actions	Final 2016 Budget (EUR)		Staff
	Commitments	Payments	
ADMINISTRATIVE EXPENDITURE	48 595 000.00	48 595 000.00	75
ITER CONSTRUCTION INCLUDING THE ITER SITE PREPARATION	397 205 586.54	656 920 706.52	296
TECHNOLOGY FOR ITER	6 750 815.47	8 572 110.76	17
TECHNOLOGY FOR BROADER APPROACH AND DEMO	6 367 221.45	5 861 571.98	33
TOTAL	**458 918 623.46**	**719 949 389.26**	**421**

Annex VIII. Final Annual Accounts

FUSION FOR ENERGY

FINAL ANNUAL ACCOUNTS

Financial statements

&

Budget implementation

THE EUROPEAN JOINT UNDERTAKING FOR ITER AND THE DEVELOPMENT OF FUSION ENERGY

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www.fusionforenergy.europa.eu

These annual accounts have been drawn up by the Accounting Officer of Fusion for Energy (F4E).

The opinion of the Governing Board on the final accounts will be given on 3rd-4th July 2017.

The final accounts, together with the opinion of the Governing Board, will be sent to the Commission's Accounting Officer, the European Court of Auditors, the European Parliament and the Council.

The final accounts are published on F4E's website:

http://www.fusionforenergy.europa.eu/aboutfusion/keydocs.aspx

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1. CERTIFICATION LETTER FROM F4E ACCOUNTING OFFICER

The annual accounts of Fusion for Energy (F4E) for the year 2016 have been prepared in accordance with the Financial Regulation applicable to the general budget of the European Union1 and the accounting rules adopted by the Commission's Accounting Officer, as are to be applied by all the institutions, agencies and joint undertakings, and in accordance with Title IX of the Financial Regulation of F4E2.

I acknowledge my responsibility for the preparation and presentation of the annual accounts of F4E in accordance with article 50 of the Financial Regulation of F4E.

I have obtained from the Authorising Officer, who certified its reliability, all the information necessary for the production of the accounts that show the assets and liabilities of F4E and the budgetary implementation.

I hereby certify that based on this information, and on such checks as I deemed necessary to sign off the accounts, I have a reasonable assurance that the accounts present fairly, in all material aspects, the financial position, the results of the operations and the cash-flow of F4E.

(signed)

Mr Roberto Abad Villanueva

Accounting Officer

Done in Barcelona, 25 May 2017

[1] Financial Regulation (EC, Euratom) n° 966/2012 of the European Parliament and of the Council of 25 October 2012, last amended on 28/10/2015 (EU, Euratom) n° 2015/1929..

[2] F4E Financial Regulation (adopted by F4E Governing Board on 22/10/2007 – F4E(07)-GB03-11, last amended on 02/12/2015 – F4E(15)-GB34-12.9) and its implementing rules (adopted by F4E Governing Board on 22/10/2007 – F4E(07)-GB03-12, last amended on 02/12/2015 – F4E(15)-GB34-12.9.

2. INTRODUCTION

The 2016 financial statements of F4E and its reports on budget implementation for 2016 have been prepared in conformity with:

- The Council Decision establishing F4E,
- The Financial Regulation applicable to the general budget of the EU,
- The F4E Financial Regulation and its implementing rules
- The « Inventory directive » (EC n° 643/2005),
- The European Commission's consolidation manual for the 2016 closure.

The accounts have also been drawn up in accordance with the accounting rules adopted by the Accounting Officer of the European Commission (EC).

Article 152 of the general Financial Regulation states that the Accounting Officer of the EC adopts the accounting rules and the harmonised chart of accounts to be applied by all institutions and EU bodies. They are accrual based accounting policies derived from International Public Sector Accounting Standard (IPSAS) or by default, International Financial Reporting Standards (IFRS).

F4E has implemented the ABAC system (Accrual Based Accounting) owned by the EC and used by many EU bodies. The accounting and budgetary information is integrated in one system which has SAP as a back-end for the accounting part. The workflow system in ABAC allows the Authorising Officer to ensure that the "four eyes" principle has been observed for each transaction.

The representation letter related to the accounts 2016 has been transmitted to the President of the European Court of Auditors (ECA) in a separate note. It includes no reservation from F4E Accounting Officer.

In line with Article 208.4 of the Financial Regulation applicable to the general budget of the EU, Moore Stephens LLP has been appointed as independent external auditor in order to verify that the 2016 annual accounts properly present the income, expenditure and financial position of F4E.

ECA shall prepare a specific Annual Report in line with the requirement of Article 287 (1) TFEU. When preparing this report, ECA shall consider the audit work performed by the independent external auditor and the action taken in response to the auditor's findings.

The European Parliament is the discharge authority within the EU. This means that, following the audit and finalisation of the annual accounts, it falls under the responsibility of the Council to recommend and then to the European Parliament to give a discharge to F4E.

Section I. 2016 Financial Statements

3. Balance sheet

3.1. Assets

Consolidation account	ASSETS		Note n°	31.12.2016 (1)	31.12.2015 (2)	Variation (3)=(1)-(2)
	A. NON-CURRENT ASSETS					
210000	**Intangible assets**		**7.2.1.**	**519 600.00**	**455 044.00**	**64 556.00**
	Tangible fixed assets			**38 272 748.00**	**37 687 955.00**	**584 793.00**
220000		Land and buildings		34 535 281.00	34 166 793.00	368 488.00
230000		Plant and equipment		2 644 425.00	2 464 813.00	179 612.00
240000		Furniture and vehicles	**7.2.1.**	261 931.00	240 511.00	21 420.00
241000		Computer hardware		740 045.00	715 886.00	24 159.00
242000		Other fixtures and fittings		91 066.00	99 952.00	-8 886.00
244000		Tangible assets under construction		0.00	0.00	0.00
	TOTAL NON-CURRENT ASSETS			**38 792 348.00**	**38 142 999.00**	**649 349.00**
	B. CURRENT ASSETS					
310000	**Inventories**		**7.2.2.**	**90 034 730.40**	**61 279 520.17**	**28 755 210.23**
	Current pre-financing			**173 276 982.27**	**200 605 312.14**	**-27 328 329.87**
406141		Current pre-financing (gross amount)	**7.2.3.**	252 543 223.63	251 727 394.31	815 829.32
406142		Current pre-financing (cut off)		-79 266 241.36	-51 122 082.17	-28 144 159.19
	Current receivables			**188 092 671.05**	**126 438 924.69**	**61 653 746.36**
401200		Current receivables - Member States		133 921.95	4 540 900.99	-4 406 979.04
410000		Sundry receivables	**7.2.4.**	127 480.07	359 953.89	-232 473.82
490002		Deferrals/Accruals with consolidated EU entities		187 831 235.91	121 521 513.00	66 309 722.91
490013		Accrued income		33.12	16 556.81	-16 523.69
500000	**Cash and cash equivalents**		**7.2.5.**	**14 602 708.53**	**3 207 779.96**	**11 394 928.57**
	TOTAL CURRENT ASSETS			**466 007 092.25**	**391 531 536.96**	**74 475 555.29**
	TOTAL			**504 799 440.25**	**429 674 535.96**	**75 124 904.29**

3.2. Liabilities

Consolidation account	LIABILITIES		Note n°	31.12.2016 (1)	31.12.2015 (2)	Variation (3)=(1)-(2)
	A. NET ASSETS/LIABILITIES			**162 085 225.44**	**159 427 462.69**	**2 657 762.75**
100000		Reserves	**7.2.6.**	0.00	0.00	0.00
140000		Accumulated surplus/deficit		159 427 462.69	292 925 142.89	-133 497 680.20
141000		Economic result of the year - Profit (+)/Loss (-)		2 657 762.75	-133 497 680.20	136 155 442.95
	B. NON-CURRENT LIABILITIES			**84 140 981.97**	**85 486 404.44**	**-1 345 422.47**
163000		Non-current provisions	**7.2.7.**	84 140 981.97	85 486 404.44	-1 345 422.47
170000		Other non current financial liabilities		0.00	0.00	0.00
	TOTAL A+B			**246 226 207.41**	**244 913 867.13**	**1 312 340.28**
	C. CURRENT LIABILITIES					
483000	**Current provisions**			**0.00**	**0.00**	**0.00**
440000	**Accounts payable**			**184 720 690.21**	**102 741 759.34**	**81 978 930.87**
441000		Current payables vendors		1 282 219.81	8 549 478.43	-7 267 258.62
443000		Sundry payables	**7.2.8.**	102 317.97	35 317.79	67 000.18
440019		Pre-financing received from consolidated EU entities		6 231 580.51	1 938 267.74	4 293 312.77
441009		Current payables with consolidated EU entities		177 104 571.92	92 218 695.38	84 885 876.54
491000	**Accrued charges and deffered income**			**73 852 542.63**	**82 018 909.49**	**-8 166 366.86**
491010		Accrued charges	**7.2.9.**	72 261 726.41	80 902 678.04	-8 640 951.63
491090		Deferrals/accruals with consolidated EU entities		1 590 816.22	1 116 231.45	474 584.77
	TOTAL C. CURRENT LIABILITIES			**258 573 232.84**	**184 760 668.83**	**73 812 564.01**
	TOTAL			**504 799 440.25**	**429 674 535.96**	**75 124 904.29**

4. Statement of financial performance

Consolidation account			Note n°	2016 (1)	2015 (2)	Variation (3)=(1)-(2)
	A. NON-EXCHANGE REVENUES		**7.3.1**	**714 672 514.80**	**489 907 304.08**	**224 765 210.72**
745919		Revenue from Euratom		589 447 133.30	408 415 000.08	181 032 133.22
745911		Other non exchange revenue (Member States)		125 225 381.50	81 492 304.00	43 733 077.50
	B. EXCHANGE REVENUES			**14 683 624.25**	**207 861.12**	**14 475 763.13**
744100		Reserve Fund		14 533 791.90	0.00	14 533 791.90
74*/75*		Other revenues		149 832.35	207 861.12	-58 028.77
TOTAL REVENUE				**729 356 139.05**	**490 115 165.20**	**239 240 973.85**
	A. OPERATIONAL EXPENSES		**7.3.2.**	**674 902 216.01**	**566 673 174.19**	**108 229 041.82**
600140		Expenses with third parties		507 500 486.05	485 021 784.10	22 478 701.95
600149		Expenses with consolidated EU entities		167 401 729.96	81 651 390.09	85 750 339.87
	B. OTHER EXPENSES		**7.3.3.**	**51 796 160.29**	**56 939 671.21**	**-5 143 510.92**
620100		Staff costs		38 287 489.98	34 467 862.25	3 819 627.73
630199		Property, plant and equipment related expenses		4 338 166.00	12 471 532.25	-8 133 366.25
64*/65*		Other expenses		9 170 504.31	10 000 276.71	-829 772.40
TOTAL EXPENSES				**726 698 376.30**	**623 612 845.40**	**103 085 530.90**
SURPLUS (+) / DEFICIT (-) OF THE YEAR				**2 657 762.75**	**-133 497 680.20**	**136 155 442.95**

5. Cash flow statement (indirect method)

		2016	2015
Cash Flows from ordinary activities			
Surplus/(deficit) from ordinary activities		**2 657 762.75**	**-133 497 680.20**
Operating activities	Amortization (intangible fixed assets) +	289 070.98	294 428.01
Adjustments	Depreciation (tangible fixed assets) +	2 532 778.91	12 166 506.32
	Increase/(decrease) in Provisions for risks and liabilities	-1 345 422.47	-184 112.79
	Increase/(decrease) in Value reduction for doubtful debts	0.00	0.00
	(Increase)/decrease in Stock	-28 755 210.23	-15 425 816.43
	(Increase)/decrease in Long term Pre-financing	0.00	0.00
	(Increase)/decrease in Short term Pre-financing	27 328 329.87	31 329 439.87
	(Increase)/decrease in Long term Receivables	0.00	0.00
	(Increase)/decrease in Short term Receivables	-61 653 746.36	-27 438 663.24
	(Increase)/decrease in Receivables related to consolidated EU entities	0.00	0.00
	Increase/(decrease) in Other Long term liabilities	0.00	0.00
	Increase/(decrease) in Accounts payable	-15 366 625.30	62 446 999.23
	Increase/(decrease) in Liabilities related to consolidated EU entities	89 179 189.31	32 736 363.20
Net cash Flow from operating activities		**14 866 127.46**	**-37 572 536.03**
Cash Flows from investing activities			
	Increase of tangible and intangible fixed assets (-)	-3 471 198.89	-981 353.33
	Proceeds from tangible and intangible fixed assets (+)	0.00	0.00
Net cash flow from investing activities		**-3 471 198.89**	**-981 353.33**
Net increase/(decrease) in cash and cash equivalents		11 394 928.57	-38 553 889.36
Cash and cash equivalents at the beginning of the period		3 207 779.96	41 761 669.32
Cash and cash equivalents at the end of the period		**14 602 708.53**	**3 207 779.96**

6. Statement of Changes in Net assets

Net assets	Accumulated Surplus (+) / Deficit (-)	Economic result of the year	Net assets (total)
Balance as of 31 December 2015	292 925 142.89	-133 497 680.20	159 427 462.69
Balance as of 1 January 2016	**292 925 142.89**	**-133 497 680.20**	**159 427 462.69**
Fair value movements	0.00	0.00	0.00
Allocation of the Economic Result of Previous Year	-133 497 680.20	133 497 680.20	0.00
Economic result of the year	0.00	2 657 762.75	2 657 762.75
Balance as of 31 December 2016	**159 427 462.69**	**2 657 762.75**	**162 085 225.44**
Account	140000	141000	

7. Notes to the Financial statements

7.1. Accounting principles

Financial statements provide information about the financial position, performance and cash flow of an entity that is useful to a wide range of users. For a public sector entity such as F4E, the objectives are more specifically to provide information useful for decision-making, and to demonstrate the accountability of the entity for the resources entrusted to it.

The accounts of the Joint Undertaking comprise the general accounts and budget accounts. These are kept in euro on the basis of the calendar year. The budget accounts give a detailed picture of the implementation of the budget. They are based on the modified cash accounting principle. The general accounts allow for the preparation of the financial statements which consist in a statement of financial performance, showing all income and expenditure for the financial year, and a balance sheet designed to establish the financial position of F4E at 31 December.

Article 95 of F4E Financial Regulation sets out the accounting principles to be applied in drawing up the financial statements.

Use of estimates: In accordance with IPSAS and generally accepted accounting principles, the financial statements include amounts based on estimates and assumptions by management based on the most reliable information available.

Significant estimates include, but are not limited to, amounts for provisions, accounts receivables, accrued income and charges, contingent assets and liabilities, and the degree of impairment of intangible assets and property, plant and equipment. Actual results could differ from those estimates. Changes in estimates are reflected in the period in which they become known.

7.2. Notes to the balance sheet

7.2.1. Fixed assets

An asset shall be recognised only if it is probable that the expected future economic benefits or service potential that are attributable to that asset will flow to F4E and the cost or fair value of the asset can be measured reliably. Service potential would refer to assets that are used to achieve an objective but which do not directly generate net cash inflows. In the context of F4E this comprises all assets that are used by F4E to fulfil its objectives.

F4E books as fixed assets only items with a purchase price above EUR 420. Items with a lower value, such as monitors, digital cameras, etc., are treated as expenses of the year but are however registered in the physical inventory. All assets are stated at cost less accumulated depreciation and impairment losses.

Regarding the EU contribution to IO (consisting mainly in buildings, magnets, vessels and other engineering components), the PA between F4E and IO define the F4E deliverables to IO as well

as the credit allocation scheme for each deliverable under the ITER unit of account. On the basis of theses PAs, F4E launches procurements and concludes contracts with the industry. The industry delivers usually directly to IO, which performs the acceptance and recognises the credits to F4E.

As there is no specific EC accounting rule covering those operations, F4E refers to IPSAS rule n° 11 “Construction contracts” taking into account that F4E has no control over the use of the items and no inflow of service potential (F4E receives credits in ITER unit of accounts for the deliverables).

Therefore, the items constructed and delivered to IO are recognised as expense in the accounts and not as assets under construction.

F4E has introduced the module ABAC Assets in 2008. ABAC Assets has been developed to meet the requirements of the EC “Inventory Directive” (EC n° 643/2005) and its content is replicated in SAP Assets Accounting module.

All fixed assets are depreciated monthly, with zero residual value, over a variable useful lifetime:

Asset type	Annual depreciation rate
Intangible fixed assets	**25%**
Tangible fixed assets	
Buildings	**4%**
Plant and equipment	**12,5%, 25%**
Furniture and vehicles	
Office furniture	**10%**
Transport, electrical office, printing and mailing equipment	**25%**
Kitchen, Printshop and postroom equipment	**12.5%**
Computer hardware	**25%**
Other fixtures and fittings	
Audiovisual and Telecommunications equipment	**25%**
Computer, scientific and general books, documentation	**25%, 33%**
Health, safety, protective, security and medical equipment,	**12.5%**
Other	**10%**
Tangible fixed assets under construction	**0%**

Intangible fixed assets:

An intangible asset is an identifiable non-monetary asset without physical substance.

Regarding the internally developed intangible assets (e.g. software), the requirements of the accounting rule n°6 from 1/1/2010 onwards are:

- costs directly linked to an internally developed intangible asset, providing they meet the necessary criteria, must be capitalised as asset under construction. Once the project goes live, the resulting asset will be amortised over its useful life,

- the amount of research expenses incurred on IT projects and development costs not capitalised (e.g. for small projects below threshold, see note 7.3.3. below) must be disclosed in the financial statements.

As of 31/12/2016, all projects identified were below the threshold of EUR 500 000.00 used by F4E for the capitalisation of internally generated intangible assets.

Tangible fixed assets:

A tangible asset is an identifiable non-monetary asset with physical substance.

The main tangible assets are:

Assets – PF Coils Building: **EUR 34 535 281.00**

The ITER project involves major civil engineering work, to enable the construction and operation of a new tokamak device of unprecedented size.

The first phase of the construction was the design and construction of a PF coils building (the "PF Coils Fabrication Building") on the site of the European part of the ITER Facilities in Cadarache, France.

The primary purpose of the PF Coil Fabrication Building is to provide a suitable environment for the production of the PF Coils.

In accordance with the PA 6.2.P2.EU.01, F4E is owner of this building (the delivery took place in February 2012) and will be in charge of the production of the PF Coils (the large dimensions of the PF Coils make it necessary to build a large factory for the manufacture of five of them at the Cadarache site).

The ownership of this building will be transferred to IO after acceptance by the latter of the last PF Coil. This transfer will be accounted for at the residual value of the building.

Assets – Portal Machine: **EUR 1 519 723.00**

A portal machine allows the machining of large components with high precision.

The transfer of ownership of the portal machine from the contractor to F4E has taken place upon delivery and acceptance of the tested radial plate in accordance with the Contract (March 2012).

The machine is used to manufacture 70 radial plates.

Assets: summary table

The total depreciation in 2016 amounts to **EUR 3 350 286.81**, resulting in a net book value of

EUR 38 792 348.00 as of 31.12.2016.

The variation of the fixed assets in 2016 is described in the following table:

ASSETS

2016		Intangible fixed assets			Tangible fixed assets							Fixed assets
		Intangible fixed assets internally generated	Computer Software	Total Intangible fixed assets	Buildings	Plant and Equipment	Computer hardware	Furniture and vehicles	Other Fixtures and Fittings	Tangible Fixed Assets under Construction	Total Tangible fixed assets	Total fixed assets
Gross carrying amounts 01.01.2016	+	**0.00**	**1 964 522.26**	**1 964 522.26**	**40 513 982.44**	**4 378 236.00**	**44 373 090.75**	**789 123.64**	**820 304.24**	**0.00**	**90 874 737.07**	**92 839 259.33**
Additions	+		353 626.98	**353 626.98**		910 890.96	501 519.54	104 493.81	27 998.43		**1 544 902.74**	**1 898 529.72**
Disposals	-			**0.00**			-477 493.80	-46 613.07	-4 330.05		**-528 436.92**	**-528 436.92**
Transfer between headings	+/-			**0.00**							**0.00**	**0.00**
Other changes : post capitalized assets	+/-			**0.00**	2 101 106.09						**2 101 106.09**	**2 101 106.09**
Gross carrying amounts 31.12.2016		**0.00**	**2 318 149.24**	**2 318 149.24**	**42 615 088.53**	**5 289 126.96**	**44 397 116.49**	**847 004.38**	**843 972.62**	**0.00**	**93 992 308.98**	**96 310 458.22**
Accumulated amortization and impairment 01.01.2016	-	**0.00**	**-1 509 478.26**	**-1 509 478.26**	**-6 347 189.44**	**-1 913 423.00**	**-43 657 204.75**	**-548 612.64**	**-720 352.24**	**0.00**	**-53 186 782.07**	**-54 696 260.33**
Depreciation	-		-289 070.98	**-289 070.98**	-1 704 603.00	-731 278.96	-477 360.54	-83 073.81	-36 884.43		**-3 033 200.74**	**-3 322 271.72**
Write-back of depreciation	+			**0.00**							**0.00**	**0.00**
Disposals	+			**0.00**			477 493.80	46 613.07	4 330.05		**528 436.92**	**528 436.92**
Impairment	-			**0.00**							**0.00**	**0.00**
Write-back of impairment	+			**0.00**							**0.00**	**0.00**
Transfer between headings	+/-			**0.00**							**0.00**	**0.00**
Other changes : depreciation on post capitalized assets	+/-			**0.00**	-28 015.09						**-28 015.09**	**-28 015.09**
Accumulated amortization and impairment 31.12.2016		**0.00**	**-1 798 549.24**	**-1 798 549.24**	**-8 079 807.53**	**-2 644 701.96**	**-43 657 071.49**	**-585 073.38**	**-752 906.62**	**0.00**	**-55 719 560.98**	**-57 518 110.22**
Net carrying amounts 31.12.2016		**0.00**	**519 600.00**	**519 600.00**	**34 535 281.00**	**2 644 425.00**	**740 045.00**	**261 931.00**	**91 066.00**	**0.00**	**38 272 748.00**	**38 792 348.00**
Accounts				210000	221000	230000	241000	240000	242000	244000	200000	

7.2.2. Inventories

The main part of the inventories is composed of items related to the magnet system that will be used for the assembly of components to be delivered by F4E to IO.

The ITER Tokamak requires a superconducting magnet system, which consists of four main sub-systems: the 18 Toroidal Field coils, the Central Solenoid, the 6 PF coils and the Correction Coils.

The stocks owned by F4E are as follows:

Contract reference	*Quantity as of 01/01/2016*	*Value as of 01/01/2016*	**Quantity as of 31/12/2016 (1)**	**Unit price (2)**	**Value as of 31/12/2016 (3)=(1)x(2)**
F4E-OPE-355. Radial Plates for the ITER Toroidal Field Coils	*38.00 pcs*	*41 054 555.90*	41.00 pcs	1 068 567.36	43 811 261.76
F4E-OPE-053 Toroidal Fields Winding Packs - Double Pancakes	*- pcs*	*0.00*	21.00 pcs	1 773 469.00	37 242 849.00
F4E-2008-OPE-005-01 (MS-MG) Supply of chromium plated NB3SN strand	*11.81 t*	*7 996 893.03*	4.71 t	677 358.38	3 190 357.97
F4E-2008-OPE-005-02 (MS-MG) Supply of chromium plated NB3SN strand	*13.19 t*	*8 685 858.50*	3.95 t	658 568.39	2 601 345.14
F4E-2008-OPE-01-01 (MS-MG) Supply of chromium plated copper strand	*11.83 t*	*677 709.35*	2.52 t	57 287.35	144 364.12
F4E-2010-OPE-091 140 Kg of Herakles (Snecma) SEPCARB NB41	*137.52 kg*	*1 045 152.00*	137.52 kg	7 600.00	1 045 152.00
F4E-OPE-138 Lot 2 - Divertor Inner Vertical Target monoblocks: 2465 W monoblocks and 440 CFC monoblocks	*2 605.00 pcs*	*1 113 878.00*	2 605.00 pcs	427.59	1 113 871.95
F4E-OPE-138 Lot 2 - Divertor Inner Vertical Target : other material	*- pc*	*665 565.00*	- pcs	-	665 565.00
F4E-OMF-444-02 - Fabrication of ITER Divertor cassette body prototype	*- kg*	*0.00*	7 098.00 kg	20.48	145 367.04
	- t	*0.00*	6.20 t	8 550.00	53 010.00
F4E-OPE-635 - Tungsten monoblocks	*100.00 pc*	*11 300.00*	100.00 pcs	113.00	11 300.00
EUROFER-97 plates (16/32/35 mm)	*0.31 t*	*10 153.69*	0.31 t	33 182.00	10 286.42
F4E-OPE-594 - Fabrication of CuCrZr Plates for the ITER FW FSP	*2.00 pc*	*18 454.70*	- pcs	9 227.35	0.00
Total		***61 279 520.17***			***90 034 730.40***

7.2.3. Current pre-financing

Pre-financing is a payment intended to provide the beneficiary with a cash advance, i.e. a float. It may be split into a number of payments over a period defined in the specific pre-financing agreement. The float or advance is repaid or used for the purpose for which it was provided during the period defined in the agreement. If the beneficiary does not incur eligible expenditures, he has the obligation to return the pre-financing advance to F4E.

The amount of the pre-financing is reduced (wholly or partially) by the acceptance of eligible costs and amounts returned.

At year-end, outstanding pre-financing amounts are valued at the original amount(s) paid less: amounts returned, eligible amounts cleared, estimated eligible amounts not yet cleared at year-end, and value reductions.

Account	Pre-financing without interest for F4E <1 yr	31.12.2016	31.12.2015
405290	Pre-financing (PF) given to third parties (TP)	252 543 223.63	251 727 394.31
405297	Accrued charges on PF TP	-79 266 241.36	-51 122 082.17
405200	**Total**	**173 276 982.27**	**200 605 312.14**

These pre-financings are related mainly to the following operational procurement contracts:

Contract Reference	Contractor	Amount	End of works
OPE-301_TB04_Buildings	AXIMA	59 410 910.85	2019
OPE-414_Cold test of 10 winding packs and insertion process of TF Coils	SIMIC	33 994 224.17	2019
OPE-068-01_Supply VV Sectors	ANSALDO NUCLEARE	30 574 434.49	2020
OPE-053_ Toroidal field coils winding packs	IBERDROLA	9 497 931.58	2018
OPE-570_PF Coils manufacturing and cold test	CNIM	6 461 786.92	2020
Poloidal field coils cooperation agreement between ASIPP (CHINA) & F4E	EVERFIT CO	5 301 827.61	2019
OPE-376_Test LN2 Plant & auxiliary systems	AIR LIQUIDE	3 940 940.62	2019
OPE-636_TB16_ Site infrastructure works	SPIE BATIGNOLLES	3 666 739.22	2022
OPE-654_Supply of impregnation systems and additional toolings	ELYTT ENERGY	3 662 600.42	2020
OPE-285_TB02_Tokamak cargo lift and crane	NKM NOELL SPECIAL CRANES	2 924 815.19	2020
OPE-286_TB03_Buildings	VINCI CONSTRUCTION	2 608 559.15	2020
OPE-443-03_Supply of 1 full scale prototype of NHF 1st wall panel	IBERDROLA	1 089 203.73	2017
OPE-083_Supply of high voltage decks/bushings	SIEMENS	1 070 480.34	2021

7.2.4. Current receivables

All receivables are carried out at the original amount less write-down for impairment when there is objective evidence that F4E will not be able to collect all amounts due according to the original payment terms.

Current receivables: **EUR 133 921.95** referring mainly to the membership contributions from Finland and Greece.

Sundry receivables: EUR 127 480.07 composed mainly of advances to staff (missions and salaries) and amounts due by other EC/public bodies.

Deferrals and accruals: EUR 187 831 269.03 referring mainly to:

- EUR 177 418 178.00: deferred charges corresponding to the 2017 cash contribution to IO
- EUR 10 413 057.91: accrued revenue from the Reserve Fund (Cf. note 7.4.3.6)

7.2.5. Cash and cash equivalents

Account	Description	31.12.2016	31.12.2015
505000	*Unrestricted cash:*		
505300	Current accounts (bank accounts)	10 753.45	19 668.03
505600	Transfers (Cash in transit)	0.00	0.00
505500	Imprest accounts/Cash in hand	25 000.00	25 000.00
505700	Short-term deposits ("Euratom account")	14 566 827.85	3 162 895.86
505700	Short-term deposits ("ITER Host State account")	127.23	216.07
500000	**Total**	**14 602 708.53**	**3 207 779.96**

The cash position at the end of 2016 is composed of two current accounts, two short-term deposits (for the Euratom and ITER-Host state contribution) and two imprest accounts (petty cash).

The bank interests generated in 2016 amount to EUR 7 922.92.

7.2.6. Net assets

F4E net assets are increased by the positive financial performance of the year (EUR 2 657 762.75) totalling **EUR 162 085 225.44** as of 31 December 2016.

The resources of F4E consist of contributions from Euratom and from the ITER host State, annual membership, voluntary contributions from the Members other than Euratom and additional resources.

It is to be noted that according to F4E Financial Regulation, if the balance of the outturn account is positive, it shall be repaid to the EC up to the amount of the Euratom contribution paid during the financial year (Cf. point 8.6. Budget outturn account).

7.2.7. Non-current provisions

Provisions are recognised when F4E has a legal or constructive obligation towards third parties as a result of past events, for which it is more likely than not that an outflow of resources will be required to settle the obligation, and when the amount can be reliably estimated. Provisions are not recognised for future operating losses. The amount of the provision is the best estimate of the expenditures expected to be required to settle the present obligation at the reporting date.

Regarding the arrangements signed between F4E, the JAEA and IO, the transfer of procurement responsibilities from Europe to Japan is implemented through annual cash contributions (Cf. point below 7.4.3.3. ITER Annexe to PAs).

In addition to the original agreements, in January 2014, Euratom and the Japanese Ministry of Science and Technology reached an agreement for settling the transfer of procurement responsibilities, following the request by Japan for an additional financial contribution.

The parties agreed to conclude a specific agreement (no later than 31 December 2021) with detailed provisions aiming at establishing the modalities under which F4E will transfer the additional cash contribution to JAEA equivalent to EUR 75.00 million (2014 value).

Therefore, in compliance with the accounting rules, an amount of **EUR 84 140 981.97** has been booked as non-current provision taking into account an annual inflation rate of 2 % and a discount rate of 0.47 % (ECB - 5 years zero coupon rate).

7.2.8. Accounts payable

Current and sundry payables are **EUR 1 384 537.78** and are composed of suppliers' invoices received but not paid at year end and reimbursements to staff.

Pre-financing received from consolidated EU entities totalled **EUR 6 231 580.51**

- EUR 5 881 420.51 corresponding to the balance of the budget outturn account 2016, to be reimbursed to the EC in 2017 (Cf. point 8.6. Budget outturn account).
- EUR 350 160.00 corresponding to a long term pre-financing received from IO.

Current payables with consolidated EU entities totalling **EUR 177 104 571.92** include mainly the balance on the invoice for the 2017 cash contribution to be paid to IO.

7.2.9. Accrued charges and deferred income

In accordance with EC Accounting Rule n° 10, accruals are made to recognize the amounts to be paid for goods or services that have been received or supplied but have not been paid, invoiced or formally agreed with the supplier, including amounts due to employees. The accruals are based on project analysis performed by the Authorizing Officer and cross-checked with the amounts actually invoiced at the time of finalization of the accounts.

The amount of **EUR 73 852 542.63** which represents mainly invoices to be received in 2017 for services rendered in 2016, includes:

- EUR 70 725 217.64 for services rendered in 2016 on operational activities and not invoiced at 31/12/2016.
- EUR 2 139 059.67 for services rendered in 2016 on administrative expenditures and not invoiced at 31/12/2016.
- EUR 988 265.32 for F4E staff's untaken leave as at the end of December 2016. In conformity with EC Accounting Rule n° 12, an entity shall recognize the cost of holidays carried over to the following years during the year the services were rendered by the staff members.

7.2.10. Post balance sheet events

No significant post balance sheet event occurred between 31st December 2016 and the final closing of the accounting year.

7.3. Notes to the statement of financial performance

7.3.1. Revenue

The operating revenues, **EUR 729 356 139.05** (EUR 490 115 165.20 in 2015), include mainly the 2016:

- Euratom contribution: EUR 589 447 133.30
- ITER Host state contribution: EUR 120 000 000.00
- Membership contributions: EUR 4 600 000.00
- Revenue from the ITER Reserve Fund: EUR 14 533 791.90

7.3.2. Operational expenses – **EUR 674 902 216.01** (EUR 566 673 174.19 in 2015)

The types of expenses that F4E reports include exchange expenses (where F4E receives goods or services in return) and non-exchange expenses (where F4E transfers value to another entity without receiving anything in exchange).

In line with IPSAS rule n° 11, the construction contracts for which no inflow of service potential will arise to F4E are accounted as expense (operational items that are being built by F4E and directly handed over to IO after acceptance by the latter).

The operational expenses include mainly the following items:

Contract Reference	Contractor	2016 Expenses	% cumulative expenses as of 31/12/2016
OPE-286_TB03_Building	VINCI CONSTRUCTION	130 588 005.79	45.35%
2016 Cash contribution for ITER IO	ITER IO	121 372 665.00	100.00%
Cash contributions to Japan	QST	73 834 175.98	93.24%
OPE-301_TB04_Buildings	AXIMA	43 204 445.49	21.43%
Credit value transfer VV sectors (PA 1.5.P1A.EU.01_Amendment 1)	ITER IO	42 929 048.00	100.00%
OPE-058_Civil engineering	ENGAGE	27 997 116.55	78.32%
OPE-355_Radial plates	SIMIC	24 873 507.06	79.82%
OPE-376_Test LN2 Plant & auxiliary systems	AIR LIQUIDE	18 205 714.44	80.04%
OPE-053_Toroidal field coils winding packs	IBERDROLA	14 876 429.95	62.60%
OPE-068-01_Supply VV Sectors	ANSALDO NUCLEARE	13 748 307.89	29.14%
OPE-414_Cold test of 10 Winding packs and insertion process of 10 TF coils	SIMIC	9 559 055.38	20.69%
OPE-018_Magnet conductors	ICAS	7 389 127.59	90.36%
OPE-429_TB07_Design and constructions	FERROVIAL AGROMAN	7 212 713.38	100.00%
OPE-285_TB02_Tokamak cargo lift and crane	NKM NOELL SPECIAL CRAN	6 232 110.20	43.16%
OPE-654_Supply of impregnation systems and additional toolings	ELYTT ENERGY	6 197 964.18	55.06%
OPE-428_TB06_EPD_Buildings	FERROVIAL AGROMAN	5 565 398.32	21.78%
OPE-090_Civil engineering & construction consultancy	ALTRAN TECHNOLOGIES	5 254 792.63	64.81%
OPE-378_TB05_Buildings	FERROVIAL AGROMAN	5 216 195.96	32.63%
OPE-568_PF Coil site	DALKIA France	5 126 322.21	52.36%
OPE-636_TB16_Site infrastructure works	SPIE BATIGNOLLES	4 870 995.22	7.09%
NBTF AGREEMENT_F4E-RFX-PMS_A-WP2015	CONSORZIO RFX	4 632 400.00	100.00%
OPE-351-01_Cooling plant for the Mitica and Spider experiment	DELTA TI IMPIANTI	4 370 759.79	73.14%
OPE-083_High voltage decks and bushings	SIEMENS	3 156 100.00	68.44%
OFC-433-01_Set-up Equatorial and upper port	IDOM	3 143 339.30	81.82%
OPE-429_TB07_Design and constructions	FERROVIAL AGROMAN	2 872 302.44	52.69%
OPE-463_PF Winding equipment for ITER CSM Coils	CONSORZIO SEA ALP	2 711 780.00	81.95%
OPE-520 - Supply Mitica Vacuum Vessel	MAN TURBO SRL DE PRETT	2 417 500.00	58.48%
OPE-570 PF Coils manufacturing and cold test	CNIM	2 007 362.35	6.25%
OPE-081-01_Items for Spider experiment	THALES	2 000 000.00	46.02%
OPE-278-01_Supply of the acceleration grids power supply conversion system	NIDEC ASI	1 793 802.33	8.78%
OPE-344_Engineering integration services for the supply of the PF Coils	ASG SUPERCONDUCTORS	1 761 922.42	51.58%
OPE-025-01_Health and safety protection/Legal inspection services	CETEN APAVE	1 727 051.15	65.86%
OFC-686-02-01_OIS Fasteners for JT-60SA	TDI	1 599 253.00	100.00%
Site Cooperation agreement, power and water	ITER IO	1 509 477.11	59.90%
GRT-553_Design and validation of the European Gyrotron	EPFL	1 447 000.00	60.43%
OMF-340-1-01-03_Preliminary design of the DHRHS-Phase 2	ASSYSTEM UK	1 356 671.81	26.07%
OPE-304-01-18_Vacuum Vessel transportation plan	DAHER	1 341 405.00	100.00%
OPE-443-01_Supply of 1 full scale prototype of normal heat flux 1st wall panel	ATMOSTAT	1 324 450.40	67.06%
OFC-280-01 Prima Plant System Codas and Spider safety equipment	CONSORZIO RFX	1 180 745.34	100.00%
OPE-293_Arragement ITER_operation Sultan test facility	EPFL	1 165 734.56	90.91%
MoU Test Blanket System connection pipes	ITER IO	1 066 668.00	100.00%
Host agreement 2016	ITER IO	1 032 000.00	100.00%
OFC-531-01_Diagnostics for the Spider experiment	CONSORZIO RFX	1 030 313.34	47.31%
Poloidal field coils cooperation agreement between ASIPP (CHINA) & F4E	EVERFIT CO	1 006 111.53	20.20%

The expenses related to experts with contracts amount to EUR 845 281.86 (EUR 950 713.64 in 2015).

7.3.3. Other expenses – **EUR 51 796 160.29** (EUR 56 939 671.21 in 2015)

- Staff expenses: EUR 38 287 489.98 (EUR 34 467 862.25 in 2015)

  This includes the total gross salaries (including allowances, social contributions, taxes and pension contributions), employer's contribution for social security, allowances for seconded national experts and other staff related costs.

- Property, plant and equipment related expenses: EUR 4 338 166.00 (EUR 12 471 532.25 in 2015) refers to the yearly depreciation of fixed assets.

- Other administrative expenses: the amount of EUR 9 170 504.31 includes mainly the following items:

	2016	2015	Variation
IT costs – operational/support	2 782 772.28	2 261 230.77	521 541.51
IT costs - development	342 250.72	560 354.95	-218 104.23
Missions	2 259 365.75	2 557 369.68	-298 003.93
Maintenance & security for the building	987 879.19	1 183 889.58	-196 010.39
Communications & publications	767 567.11	582 025.75	185 541.36
Training	680 698.17	655 056.37	25 641.80
Interim staff	478 684.16	568 825.37	-90 141.21
Office supplies & maintenance	332 130.29	329 608.90	2 521.39
Experts and related expenditure	309 027.89	377 462.90	-68 435.01
Legal expenses	113 266.23	61 911.90	51 354.33
Recruitment	77 493.54	90 773.05	-13 279.51
Total	***9 131 135.33***	***9 228 509.22***	***-97 373.89***

7.4. Off balance sheet items and notes

7.4.1. Contingent liabilities - Litigation in front of the General Court of the EU (GC):

On 3 December 2015, an applicant to an operational tender lodged with the GC an application (Court Case T-668/15) requesting:

- annulment of the decision taken by F4E to reject the bid of the applicant,
- payment of the costs according to the rules of the procedures of the GC.

After having received the rejoinder, the Court communicated to F4E on 4 October 2016 the composition of the chamber that will deal with this case. F4E is waiting for the date of the oral hearing to be set by the Court.

If the tenderer would be successful in this pleading it is to be expected that he will lodge a separate claim for damages.

This case is not recognised as liability in the accounts (and therefore no provisions foreseen) as it is more likely that no present obligation exists at the reporting date.

7.4.2. Contingent assets

A contingent asset is a possible asset that arises from past events and the existence of which will be confirmed only by the occurrence or non-occurrence of one or more uncertain future events not wholly within the control of F4E. A contingent asset is disclosed when an inflow of economic benefits or service potential is probable.

Contingent assets are assessed at each balance sheet date to ensure that developments are appropriately reflected in the financial statements. If it has become virtually certain that an inflow of economic benefits or service potential will arise and the asset's value can be measured reliably, the asset and the related revenue are recognised in the financial statements of the period in which the change occurs.

Guarantees are possible assets (or obligations) that arise from past events and whose existence will be confirmed by the occurrence or non-occurrence of the object of the guarantee. Guarantees can thus qualify as contingent assets (or liabilities). A guarantee is settled when the object of the guarantee no longer exists. It is crystallised when the conditions are fulfilled for calling a payment from the guarantor.

Account	Description	31.12.2016	31.12.2015
901120	Guarantees for pre-financing (nominal-on going)	179 716 361.22	199 692 872.87
901180	Performance guarantees	191 025 887.03	158 867 776.54
901100	**TOTAL - Guarantees received**	**370 742 248.25**	**358 560 649.41**

Guarantees received in respect of pre-financing:

These are guarantees that F4E in certain cases requests from beneficiaries when paying out advance payments (pre-financing). There are two values to disclose for this type of guarantee, the "nominal" and the "on-going" values. For the "nominal" value, the generating event is linked to the existence of the guarantee. For the "on-going" value, the guarantee's generating event is the pre-financing payment and/or subsequent clearings.

Performance guarantees are sometimes requested to ensure that beneficiaries of F4E funding meet the obligations of their contracts with F4E.

7.4.3. Other significant disclosures

7.4.3.1. Commitment for future funding

A commitment for future funding represents a legal or constructive commitment, usually contractual, that F4E has entered into and which may require a future outflow of resources.

Account	Commitments for future fundings	31.12.2016	31.12.2015
902500	Commitments against appropriations not yet consumed*	**1 606 170 252.76**	**1 916 435 706.89**
903200	Operating lease	**0.00**	**0.00**
903300	Contractual commitment/obligations to deliver (open PAs/ITA's)**	**3 496 852 206.93**	**3 944 476 093.65**
903100	Other	**0.00**	**0.00**

* the majority of the leftovers on budgetary commitments are derived from PAs and therefore included under ** here below

** see below points 7.4.3.2, 7.4.3.3, 7.4.3.4 and 7.4.3.5. for details.

To ensure a fair cost sharing of ITER by "value", around 90% of the project is built by in-kind contributions. In-kind contributions have been classified into about 85 procurement "packages" which were divided among the seven parties to the ITER Agreement.

ITER is being constructed at Cadarache in the South of France. Europe supports 45.46% of the construction cost and 34% of the cost of operation, deactivation and decommissioning of the facility as well as preparing the site.

Most of the components that make up the ITER facility are to be manufactured by each of the ITER Parties and contributed in-kind to ITER through Domestic Agencies. F4E will provide components to ITER on behalf of the EU.

The contractual commitments for which budgetary commitments have not yet been placed refers to the PAs which establish a detailed common understanding of each Party on the in-kind contribution to be provided to IO for each domain of activities in accordance with the procurement allocation and values (in ITER Unit of Accounts - IUA) as defined in the ITER Agreement.

Regarding the update of the conversion rate between IUA and EUR, the ITER Council (IC-1, November 2007), decided that the annual average change in the Harmonised Indices of Consumer Prices (HICP) for the euro area as published by EUROSTAT should be used. The 2016 exchange rate euro/IUA amounts to 1 690.12.

In addition to the in-kind procurements F4E has also an obligation to finance the transportation of the non-EU components from the entry site in France (i.e. either Fos-sur-Mer or the Marignane airport) to Cadarache. This commitment is part of the ITER site agreement and not compensated by any ITER credit.

As far as the Test Blanket System is concerned, in 2014 F4E has signed two TBM Arrangements for the delivery of two systems to the ITER site. This programme is fully funded by the EU and is not compensated by any ITER credit.

7.4.3.2. ITER PA (with IO)

(kIUA)

PA-EU in Kind Systems*	Current Value	Signed value (1)	Earned Credit (2)	Balance (3)=(1)-(2)
Buildings and Power Supplis	514.67	516.15	107.58	408.57
Magnet	185.82	185.82	70.12	115.70
Vaccum vessel	96.58	92.06	2.20	89.86
Neutral beam Heating and Current Drive	84.98	57.18	9.30	47.88
Blanket system	40.33	0.00	0.00	0.00
Remote Handling Equipment	39.73	39.73	0.00	39.73
Divertor	32.88	30.50	0.94	29.56
Electron Cyclotron Heating & Current Drive	32.27	13.03	2.33	10.70
Diagnostics	31.70	2.28	0.01	2.27
Cryoplant & Distribution	26.37	26.37	20.72	5.65
Tritium Plant	16.72	3.25	2.55	0.70
Ion Cyclotron Heating & Current Drive	14.73	0.00	0.00	0.00
Vacuum Pumping & Fuelling	13.45	3.86	0.02	3.84
Waste Management	10.06	0.00	0.00	0.00
Radiological Protection	4.20	0.60	0.00	0.60
Total in Kind	***1 144.48***	***970.83***	***215.76***	***755.07***

*Each system may group one or more PAs

The amount of 1 144.48 kIUA (EU Current Share) in the above table corresponds to the EU share of the ITER Project, provided by in-kind contributions according to the ITER Agreement and Common Understanding on Procurement Allocation plus any Amendment and PA Value Refinement agreed by ITER Council afterwards. Since the IUA value is only a “virtual” currency to share contributions among the seven parties to the ITER Agreement – according to respective percentages of contribution to the programme - the actual cost of the ITER project differs from the allocated credits. In order to consider that the PA obligations have been fulfilled by each party, the original PA value has to be fully earned, independently of the actual cost incurred for executing the scope of work of each PA. For each PA key milestone an ITER credit is associated.

The progress in the execution of the work and in discharging the EU from its obligation toward the ITER Agreement is recognized by means of credit earned by F4E depending on the achievement of project milestones laid down in each PA (see PA credited column in the table above).

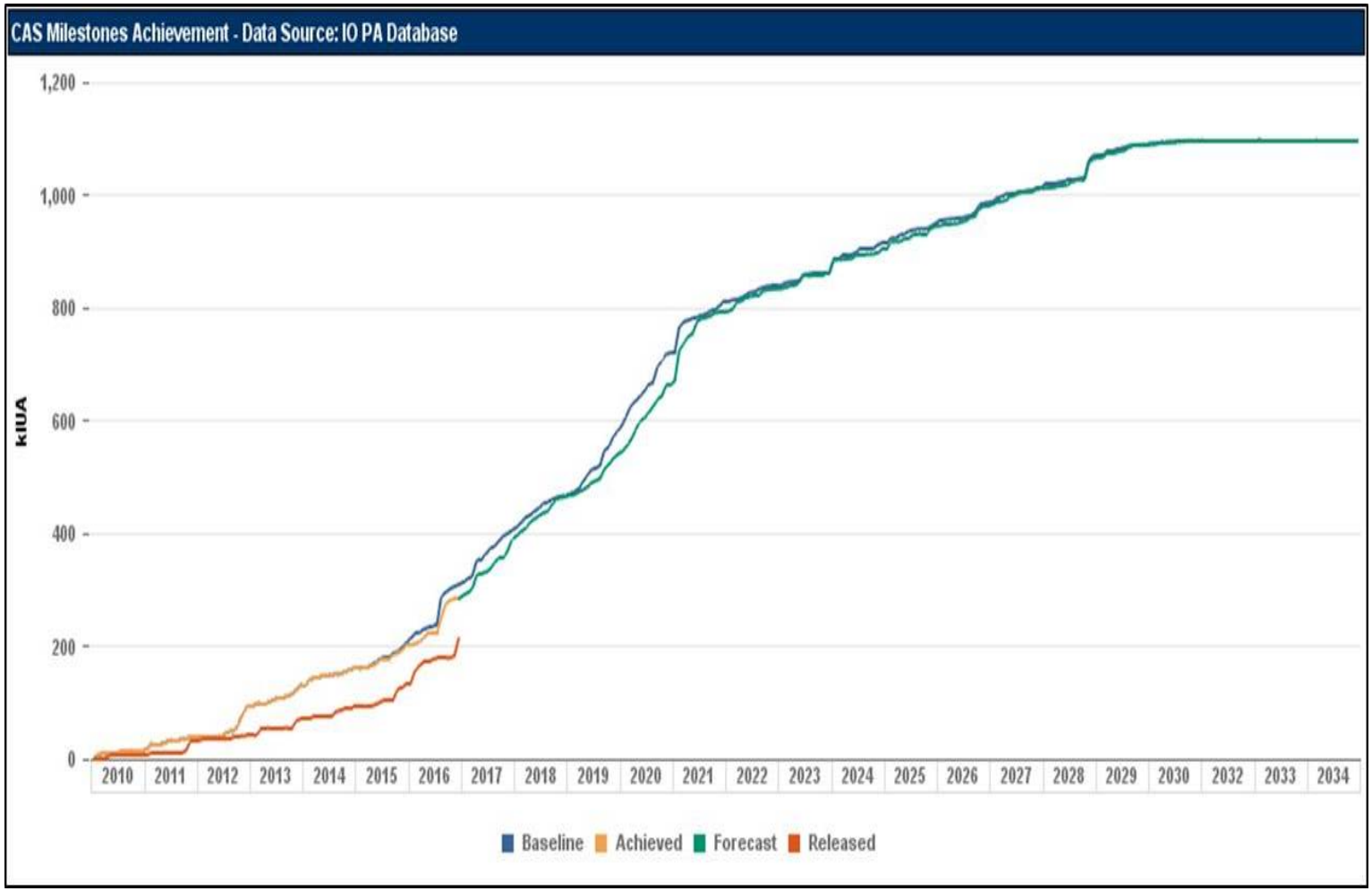
The complete execution of each scope of work for a PA would imply an earned credit matching the PA signed current value, hence with a balance that is zero with all EU PA signed, scope of work completed and credited.

The amount of 970.83 kIUA (PA Signed) in the table corresponds to the value of the EU PA already signed between IO and EU Domestic Agency. Value refers also to the current figure - signed original value in the agreement might be different- including the so-called PA Value Refinements (approved by the ITER Council), in order to take into account changes to the initial scope of work.

As far as the achieved ITER credit is concerned (215.76 kIUA earned/credited as of 31/12/2016 – representing 22.2 % of the PAs signed), F4E is currently implementing an agreement with IO on a modified credit distribution along the life of the PAs in a way that reflects more accurately the progress achieved by each Domestic Agency. Once the change request process is finalised, it is expected an increase in the value of the achieved credit more in line with the real progress in the procurement of the in-kind contribution. The graph on the following page shows the actual values of the achieved and earned credit vs the forecast value.

As for the PAs signed with IO, F4E only enters into a legal obligation which results in a budgetary commitment by signing contracts or grant agreements with third parties in accordance with its financing decision.

More details on the actual advancement of the works achieved at the end of the year are available in the F4E Annual report 2016.



CAS milestone achievement for signed PAs. The actuals and forecast are those in the latest integrated Detailed Working Schedule (end December 2016). Milestones are achieved when marked as completed in the schedule and credit is earned when the credit note for the milestone is released by IO.

7.4.3.3. ITER Annexe to PAs (JAEA)

Transfers of Procurement to Japan	Value of Cash Contribution (1) (kIUA)	Cumulative Payments (2) (kIUA)	Indicative balance (3)=(1)-(2) x 1 690.12 x 1 000 (EUR)
Magnet	168.60	154.89	23 171 545.20
Tritium Plant	15.10 (not signed)	0.00	0.00
Neutral Beam H&CD	44.99 (20.30 not yet signed)	23.97	1 216 886.40
Total to Japan	***228.69***	***178.86***	***24 388 431.60***

Regarding the arrangements signed between F4E, JAEA and IO, the transfer of procurement responsibilities from Europe to Japan is implemented through annual cash contributions. The cash contributions are based on an adequate evidence of the payments performed by QST (i.e. the Japanese Domestic Agency) to its suppliers and on a progress report on their work.

As from 2012, the corresponding budgetary commitments cover the full amount of the PAs signed.

7.4.3.4. ITER Task Agreement

Number ITAs open as of 31/12/2016	Amount	Currency	2016 Exchange rate to Euro	Amount (EUR)
3	5 249.00	IUA	1 690.12	8 871 439.88
16	20 070 001.44	EUR		20 070 001.44
3	Voluntary	n/a		
22				***28 941 441.32***

A total of 3 ITAs were signed during 2016 for a total value of EUR 1 539 868.00.

F4E supports the IO in the preparation of the technical specifications to be included into the PAs for the components under the EU in-kind contribution through these Task Agreements (ITAs).

As for the PA signed with IO, F4E only enters into a legal obligation which results in a budgetary commitment by signing contracts or grant agreements with third parties in accordance with its financing decision.

7.4.3.5. Broader Approach Agreement

(kBAUA)

BA Projects	EU Share	PA signed	PA credit awarded	Of which F4E Contribution	PA signed (1)	PA credit awarded (2)	Balance (3)=(1)-(2)
JT-60SA	236.41	236.41	104.58	42.87	42.87	9.43	33.44
IFMIF/EVEDA	147.34	147.34	103.82	19.54	19.54	15.08	4.46
IFERC	116.25	115.54	105.33	3.67	2.96	1.49	1.47
BA_Total	***500.00***	***499.29***	***313.73***	***66.08***	***65.37***	***26.00***	***39.37***

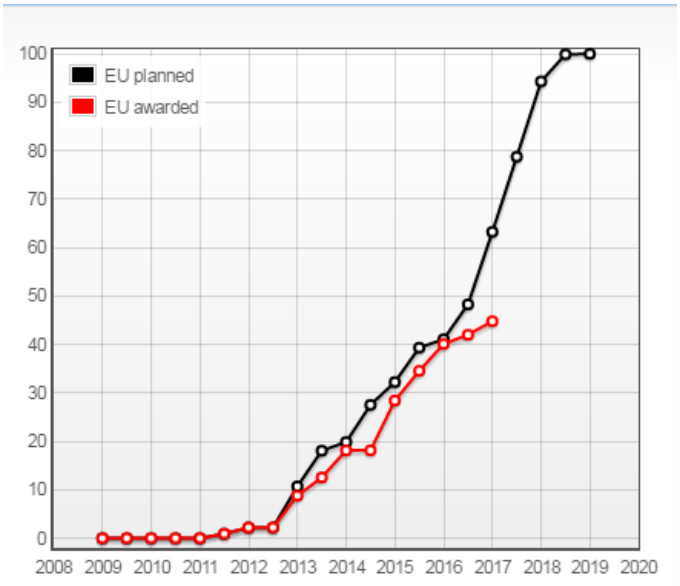
The Broader Approach Agreement between Euratom and the Government of Japan envisages two Implementing Agencies, F4E and JAEA, who are responsible for providing the Parties individual contributions. F4E's contribution is mostly provided by Voluntary Contributors agreed at the time of the ITER site decision. Their contribution is formalised by Agreements of Collaboration which match the obligations entered into by F4E with JAEA in each PA. The Agreements of Collaboration signed between the respective Voluntary Contributors and F4E result in contracts being placed and managed by a Voluntary Contributors Designated Institution. Some items are procured directly by F4E.

Each BA project is executed by its own Integrated Project Team, consisting of JAEA and F4E staff, as well as staff from the Voluntary Contributors Designated Institution. This is coordinated by a Project Team of experts proposed by each Implementing Agency.

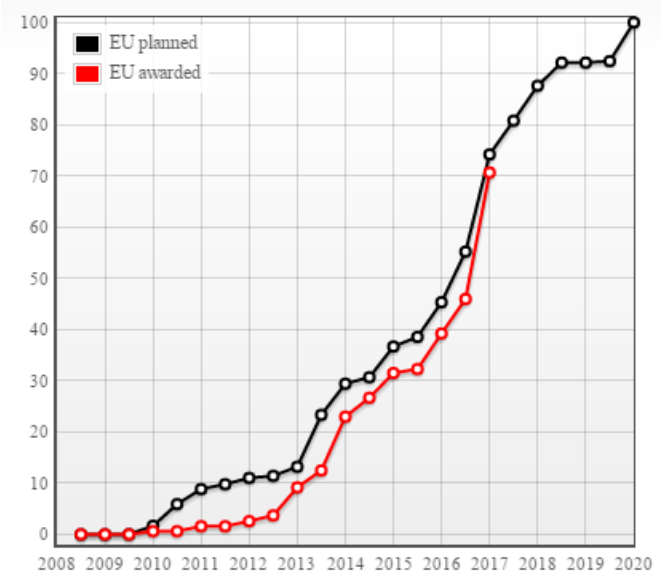
The contribution of each Party to the BA Activities is evaluated by a system of credits similar to the approach followed in the ITER project. The complete scope of work covered by the BA Agreement is assessed with a value of 1 000 000.00 BA Units of Account (BAUA), 500 000.00 of which are provided by Euratom. In the joint declaration establishing the BA Activities the overall scope of the Euratom contribution was evaluated at EUR 339 million in 2005, which means that 1 BAUA = EUR 678 in values of that time.

Further details of the BA activities may be found on the BA web site (www.ba-fusion.org).

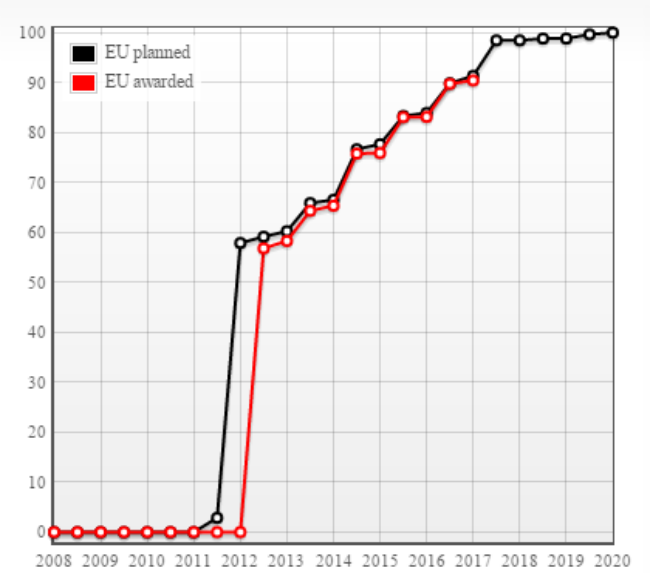
The graphs below show the % of total EU credits by semester up to the end of 2016 by project.



JT-60SA



IFMIF



IFERC

7.4.3.6. Reserve fund

The terms of reference of the ITER Reserve Fund were approved in 2015 in order to compensate the Domestic Agencies for cost increases incurred due to changes which are driven by the IO and have cost impacts. The Executive Project Board (EPB) has approved the eligibility to finance from the Reserve Fund 13 Project Change Requests (PCRs) amounting to EUR 60 167 274.93. The approval of 9 other PCRs for a total amount of EUR 975 000 is still pending, while IO has given the authorisation to start the corresponding work (in order not to delay the project).

F4E recognises the revenue in the year of approval of the legal commitment/contract amendment by the IO DG (EUR 14 533 791.90 for 2016).

7.4.3.7. Services in-kind

Under the Host agreement with Spain, the office building used by F4E is free of charge. For the year 2016, this service in-kind amounts to EUR 2 110 411.69.

7.5. Financial instruments

Financial instruments comprise cash, current receivables and recoverables, current payables, amounts due to and from consolidated entities. Financial instruments give rise to liquidity, credit, interest rate and foreign currency risks. Information about which and how they are managed is set out below. Pre-financings, accrued income, accruals and deferred income are not included.

The carrying amounts of financial instruments are as follows:

Financial assets	2016	2015
Current receivables	133 921.95	4 540 900.99
Other receivables	127 480.07	359 953.89
Cash and deposits	14 602 708.53	3 207 779.96
TOTAL	**14 864 110.55**	**8 108 634.84**

Financial liabilities	2016	2015
Current payables	1 282 219.81	8 549 478.43
Other payables	102 317.97	35 317.79
Accounts payable with EU entities	177 104 571.92	92 218 695.38
TOTAL	**178 489 109.70**	**100 803 491.60**

7.5.1. Liquidity Risk

Liquidity risk is the risk that arises from selling an asset; for example, the risk that a given security or asset cannot be traded quickly enough in the market to prevent a loss or meet an obligation. Liquidity risk arises from the ongoing financial obligations, including the settlement of payables.

Details of contractual maturities for assets and liabilities form an important source of information for the management of liquidity risk.

Bank accounts opened in the name of F4E may not be overdrawn. Treasury and payment operations are highly automated and rely on modern information systems. Specific procedures are applied to guarantee system security and to ensure segregation of duties in line with the Financial Regulation, the internal control standards, and audit principles. EU budget principles ensure that overall cash resources for a given year are always sufficient for the execution of all payments.

F4E's liabilities have remaining contractual maturities as summarised below:

31 December 2016	< 1 year	1 - 5 years	> 5 years	Total
Payables with third parties	1 384 537.78	0.00	0.00	**1 384 537.78**
Payables with consolidated entities	177 104 571.92	0.00	0.00	**177 104 571.92**
Total liabilities	**178 489 109.70**	**0.00**	**0.00**	**178 489 109.70**

7.5.2. Credit Risk

Credit risk is the risk of loss due to a debtor's/borrower's non-payment of a loan or other line of credit (either the principal or interest or both) or other failure to meet a contractual obligation. The default events include a delay in repayments, restructuring of borrower repayments and bankruptcy.

Treasury resources are kept with commercial banks. F4E recovers contributions from EURATOM and the ITER Host State in average 3 times per year to ensure appropriate cash management and to maintain a minimum cash balance on its bank account. This is with a view to limit its risk exposure. Requests to the EC are accompanied by cash forecasts. The overall treasury balances fluctuated between approximately EUR 0.5 million and EUR 200 million taking into account payment time limits for the recovery of contributions and the total of payments executed in 2016.

In addition, specific guidelines are applied for the selection of commercial banks in order to further minimise counterparty risk to which F4E is exposed.

All commercial banks are selected by call for tenders. The minimum short term credit rating required for admission to the tendering procedures is Moody's P-1 or equivalent (S&P A-1 or Fitch F1). A lower level may be accepted in specific and duly justified circumstances.

Name of the bank	Credit quality/rating	Balance at 31/12/2016
ING Belgium	Upper medium grade	14 565 053.47
BNP Paribas Fortis		1 901.61
BBVA		10 753.45

The credit ratings of the commercial banks where F4E has accounts are reviewed at least on a monthly basis or higher frequency if and when needed.

The table below shows the maximum exposure to credit risk by F4E.

Credit quality/rating	Amount of receivables with Member States
Prime and high grade	86 421.95
Upper medium grade	0.00
Lower medium grade	0.00
Non-investment grade	47 500.00

7.5.3. Market Risk

Market Risk can be split into interest rate risk and currency risk.

F4E is mainly concerned by the interest rate risk. Interest rate risk arises from cash. It is recognised that interest rates fluctuate and F4E accepts the risk and does not consider it to be material. F4E's treasury does not borrow any money; as a consequence it is not exposed to interest rate risk. It does, however, earn interest on balances it holds on its banks accounts.

Overnight balances held on commercial bank accounts earn interest on a daily basis. This is based on variable market rates to which a contractual margin (positive or negative) is applied. For most of the accounts, the interest calculation is linked to the EONIA (Euro over night index average) or EURIBOR (Euro InterBank Offer Rate) and is adjusted to reflect any fluctuation of this rate (interests negotiated with the commercial banks may not be negatives). As a result no risk exists that F4E earns interest at rates lower than market rates or negatives.

7.6. Related party disclosure

The related parties of F4E are the key management personnel. Transactions between F4E and the key management personnel take place as part of the normal operations and as this is the case, no specific disclosure requirements are necessary for these transactions in accordance with the EU Accounting rules.

Highest grade description	Grade	Number of persons of this grade
Director	AD14	1

The transactions of F4E with key management personnel during financial year 2016 consist only of the payment of their remuneration, allowances and other entitlements in accordance with the Staff Regulations of the European Communities.

Section II. 2016 Budget Implementation

8. Budgetary implementation

8.1. Main Facts on the implementation of the 2016 budget of F4E

Revenue	• **100.0% of the revenue was collected.**
Commitments	• **99.8% of Implementation in Commitment** • **106.8%** compared to the original budget • of which **99.7%** in individual commitments
Payments	• **98.1% of implementation in Payment** • **115.1%** compared to the original allocated budget

8.2. The principles for the budgetary implementation

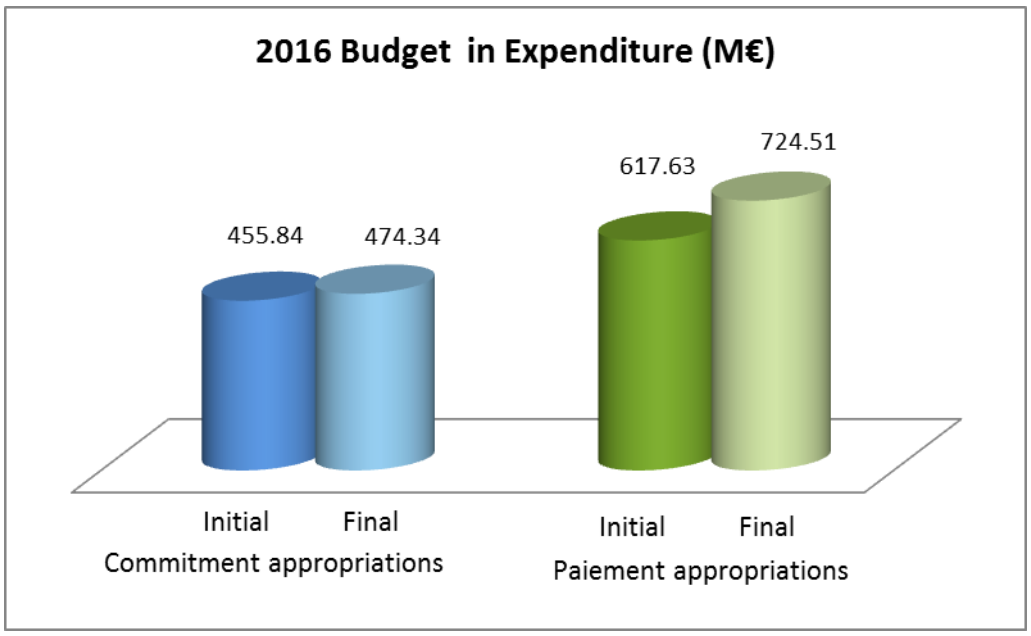
The budget is the instrument which, for each financial year, forecasts and implements the revenue and expenditure considered necessary for F4E.

The budget is established and implemented in compliance with the principles of unity, budgetary accuracy, annuality, equilibrium, unit of account, universality, specification, sound financial management and transparency.

- **unity and budget accuracy**: all F4E's expenditure and revenue must be incorporated in a single budget document, must be booked on a budget line and expenditure must not exceed authorised appropriation;
- **annuality:** the appropriation entered are authorised for a single year and must therefore be used during that year;

- **equilibrium:** the revenue and expenditure shown in the budget must be in balance (estimated revenue must equal payment appropriation);
- **unit of account:** the budget is drawn up and implemented in euro (EUR) and the accounts are presented in euro;
- **universality:** this principle comprises two rules: – the rule of non-assignment, meaning that budget revenue must not be earmarked for specific items of expenditure (total revenue must cover total expenditure); – the gross budget rule, meaning that revenue and expenditure are entered in full in the budget without any adjustment against each other;
- **specification:** each appropriation is assigned to a specific purpose and a specific objective;
- **sound financial management:** budget appropriation are used in accordance with the principle of sound financial management, namely in accordance with the principles of economy, efficiency and effectiveness;
- **transparency:** the budget is established and implemented and the accounts presented in compliance with the principle of transparency - the budget and amending budgets are published in the website of F4E.

8.3. Evolution of the Budget



F4E 2016 budget[3] is initially adopted by F4E's Governing Board for the amount of EUR 455.84 million in commitment appropriations and EUR 697.63 million in payment appropriations, even though the Euratom contribution in payment is decreased by EUR 80.00 million in the last steps of the EU budgetary procedure.

The actual original budget in payment appropriations to be considered is therefore EUR 617.63 million.

The budget is successively amended in the June Governing Board meeting[4] and the December Governing Board meeting[5].

The final available budget is EUR 474.34 million in commitment appropriations and EUR 724.51 million in payment appropriations.

8.4. Statement of Revenue

8.4.1. Evolution of the Statement of Revenue

Evolution of the Statement of Revenue in Commitment Appropriations

Commitment Appropriations (EUR)

Heading of the 2016 Budget	Initial budget 02 December 2015 (1)	Amending budget 30 June 2016 (2)	Amending budget 02 December 2016 (3)	Final Budget (4)=(1)+(2)+(3)	Additional revenue (5)	Final Revenue (6)=(4)+(5)
I - 1 10 PARTICIPATION FROM THE EUROPEAN UNION TO OPERATIONAL EXPENDITURE	275 475 092.00		3 057 650.00	278 532 742.00		278 532 742.00
I - 1 11 RECOVERY FROM PREVIOUS YEARS OPERATIONAL EXPENDITURE						0.00
I - 1 20 PARTICIPATION FROM THE EUROPEAN UNION TO ADMINISTRATIVE EXPENDITURE	44 737 000.00			44 737 000.00		44 737 000.00
I - 1 21 RECOVERY FROM PREVIOUS YEARS ADMINISTRATIVE EXPENDITURE	1 028 046.01			1 028 046.01		1 028 046.01
I - 2 10 ANNUAL MEMBERSHIP CONTRIBUTIONS	4 600 000.00			4 600 000.00		4 600 000.00
I - 3 10 ASSIGNED REVENUE ACCRUING FROM THE CONTRIBUTION OF ITER HOST STATE	130 000 000.00			130 000 000.00		130 000 000.00
I - 4 10 MISCELLANEOUS REVENUE	p.m.		20 835.45	20 835.45	423 283.87	444 119.32
I - 5 10 OTHER ASSIGNED REVENUE TO SPECIFIC ITEM OF EXPENDITURE	p.m.			p.m.	3 611.16	3 611.16
I - 5 20 OTHER ASSIGNED REVENUE FROM THE IO RESERVE FUND	p.m.			p.m.	14 983 791.90	14 983 791.90
Total Revenue	455 840 138.01	0.00	3 078 485.45	458 918 623.46	15 410 686.93	474 329 310.39

[3] Decision of the F4E Governing Board F4E(15)-GB34-12.5 adopted on 02/12/2015

[4] Decision of the F4E Governing Board F4E(16)-GB35-13.2 adopted on 30/06/2016

[5] Decision of the F4E Governing Board F4E(16)-GB36-09.3 adopted on 02/12/2016

The changes to the statement of revenue in commitment appropriations are:

- + EUR 3.06 million of additional Euratom Contribution introduced with the second amendment to the budget in December, corresponding to the re-allocation to F4E from unused appropriations at the end of the year on other EU budget lines.
- + EUR 0.02 million of bank interests collected since January 2016 on the "current" F4E's bank account.
- + EUR 0.42 million of re-imbursement (repayment), automatically assigned to the corresponding heading of expenditure according to Article 23.3 of the F4E Financial Regulation. It corresponds to various recoveries of payments made in excess, mainly on operational contracts. Those recoveries generally happen following the implementation of audit recommendations or are due to changes in scope of contracts.
- + EUR 14.98 million of assigned revenue for the ITER Reserve Fund.

  According to the Terms of reference of the ITER Reserve fund[6] and to the ITER Reserve Fund Management Plan[7], the requests for changes introduced by IO shall be financed from the ITER

Reserve Fund, subject to:

- The authorisation for financing from the Reserve Fund given by the IO DG (implemented with the decisions of the EPB).
- The approval of the related contractual amendment by the IO DG too.

The following revenue in commitment appropriations are opened according to the procedure above for the Reserve fund:

[6] Approved by ITER Council on 17 July 2015

[7] IDM RRMAH5

Estimate of Revenue: Approval of the PCR by EPB			Revenue : Approval of the Legal commitment by IO DG			
Reference	Title	Approval EPB	F4E Original contract	Visa IO-DG on the contract amendment in IDM		
				Date	Reference	Amount (EUR)
PCR-642	PBS 26 Interfaces with TB07 Buildings (64, 67, 68A, 68B, 69 and surrounding area)	RoD EPB16-032 28 Oct 2016	TB07	05/04/2016	28RDAE	481 544.41
				08/12/2016	28RDAE V1	1 635 450.46
				29/07/2016	269EBF V1.2	2 489 300.54
				08/12/2016	3LNJ8K V2.2	2 606 417.97
PCR-662	Revise TCWS Design and Shielding to Mitigate Gamma Radiation and Fast Neutron Dose Rates	RoD EPB16-020 26 Jan 2016	A/E	13/01/2015	*No formal approval process*	1 500 000.00
			TB04	12/10/2015	3A7EYB	530 000.00
PCR-670	Amendments to RFE 01 document	Not yet approved	A/E	02/04/2015	*No formal approval process*	300 000.00
			TB04	12/10/2015	3A7EYB	150 000.00
PCR-697	Stress Test Assessments Implementation for PBSs 62 and 65 in the Tokamak Complex building	RoD EPB15-015 29 Oct 2015	TB04	18/12/2015	3A7EYB	4 000 000.00
PCR-698	Tokamak Complex Building construction cost associated to the PCR-662 including sky-shine	RoD EPB15-015 29 Oct 2015	TB03	13/10/2015	2R9KM8	233 292.03
				13/10/2015	3NQJMH	231 127.20
				13/10/2015	*No formal approval process*	94 000.00
PCR-734	Changes to MITICA vessel	RoD EPB16-032 28 Oct 2016	OPE-520	24/07/2016	Amendment 1 265WLN	71 467.00
PCR-750	Welding test coupons & Forming test coupons	RoD EPB16-034 30 Nov 2016	OPE-068	20/12/2016	2755C7 DN-844	661 192.29
			Total			**14 983 791.90**

It should be noted that PCR-670 is not yet approved by EPB. Not implemented in expenditure, the corresponding appropriations amounting to EUR 0.45 million are cancelled in 2017.

- + EUR 0.43 million of re-imbursement (refund), automatically assigned to the corresponding heading of expenditure according to Article 19 of the F4E Financial Regulation. It corresponds to various recoveries of payments made in excess, mainly on operational contracts. Those recoveries, listed below, happen following audits or are due to changes of scope of the contracts.

Evolution of the Statement of Revenue in Payment Appropriations

Payment appropriations (EUR)

Heading of the 2016 Budget		Initial budget 02 December 2015 (1)	Amending budget 30 June 2016 (2)	Amending budget 02 December 2016 (3)	Final Budget (4)=(1)+(2)+(3)	Additional revenue (5)	Final Revenue (6)=(4)+(5)
I - 1 10	PARTICIPATION FROM THE EUROPEAN UNION TO OPERATIONAL EXPENDITURE	500 000 000.00	-107 000 000.00	129 302 661.93	522 302 661.93		522 302 661.93
I - 1 11	RECOVERY FROM PREVIOUS YEARS OPERATIONAL EXPENDITURE	27 260 845.87			27 260 845.87		27 260 845.87
I - 1 20	PARTICIPATION FROM THE EUROPEAN UNION TO ADMINISTRATIVE EXPENDITURE	44 737 000.00			44 737 000.00		44 737 000.00
I - 1 21	RECOVERY FROM PREVIOUS YEARS ADMINISTRATIVE EXPENDITURE	1 028 046.01			1 028 046.01		1 028 046.01
I - 2 10	ANNUAL MEMBERSHIP CONTRIBUTIONS	4 600 000.00			4 600 000.00		4 600 000.00
I - 3 10	ASSIGNED REVENUE ACCRUING FROM THE CONTRIBUTION OF ITER HOST STATE	120 000 000.00			120 000 000.00		120 000 000.00
I - 4 10	MISCELLANEOUS REVENUE	p.m.		20 835.45	20 835.45	423 283.87	444 119.32
I - 5 10	OTHER ASSIGNED REVENUE TO SPECIFIC ITEM OF EXPENDITURE	p.m.			p.m.	3 611.16	3 611.16
I - 5 20	OTHER ASSIGNED REVENUE FROM THE IO RESERVE FUND	p.m.			p.m.	4 120 733.99	4 120 733.99
Total Revenue		697 625 891.88	-107 000 000.00	129 323 497.38	719 949 389.26	4 547 629.02	724 497 018.28

The changes to the statement of revenue in payment appropriations are:

- + EUR 22.30 million of the Euratom contribution, firstly decreased by EUR 80.00 million by the EU Budgetary Authority in the last steps of the adoption of the 2016 EU General Budget, and by EUR 27.00 million by internal transfer initiated by the Commission.
- It was later reinforced by EUR 129.30 million through the Global Transfer considering the F4E obligations in terms of payments.
- Note: The last minute decrease of EUR 80.00 million introduced by the European Council came too late to the knowledge of F4E to be included in its proposal for the initial budget. In this meaning the actual initial Budget to be considered should be EUR 617.63 million.
- + EUR 4.12 million called to IO according to the payment forecasts related to the ITER Reserve Fund.
- The origin and amounts of the miscellaneous and additional revenue are identical in commitment and payment appropriations.

8.4.2.

8.4.3. Implementation of the Statement of Revenue

Implementation of the Statement of Revenue in Commitment Appropriation

A full implementation of the revenue is achieved. This is by virtue of the fact that the commitment appropriations are not revenue as such but authorisation of expenditure based on the EU budget

for the Euratom contribution, the amount adopted in the annual F4E budget for the ITER Host State contribution, and the amounts of membership and miscellaneous contributions.

Implementation of the Statement of Revenue in Payment Appropriation

Payment appropriations (EUR)

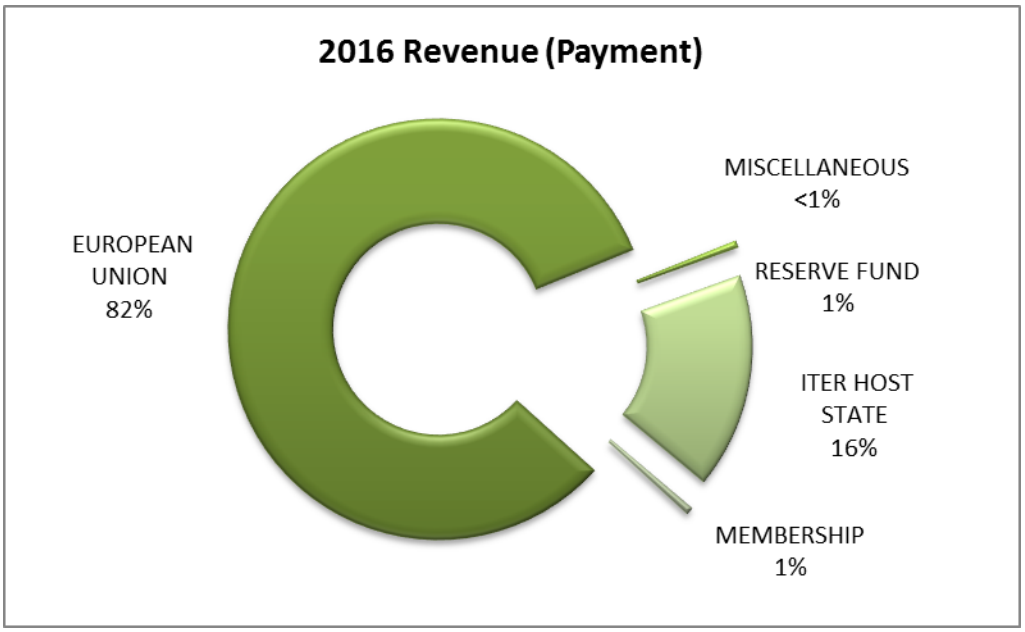
Heading of the 2016 Budget		Final Revenue from B2016 (1)	Outstanding revenue from previous years (3)	Final actual revenue (Debit note cashed) (4)	Outstanding Revenue at the year end (5) = (2)+(3)-(4)
I - 1 10	PARTICIPATION FROM THE EUROPEAN UNION TO OPERATIONAL EXPENDITURE	522 302 661.93	-	522 302 661.93	-
I - 1 11	RECOVERY FROM PREVIOUS YEARS OPERATIONAL EXPENDITURE	27 260 845.87	-	27 260 845.87	-
I - 1 20	PARTICIPATION FROM THE EUROPEAN UNION TO ADMINISTRATIVE EXPENDITURE	44 737 000.00	-	44 737 000.00	-
I - 1 21	RECOVERY FROM PREVIOUS YEARS ADMINISTRATIVE EXPENDITURE	1 028 046.01	-	1 028 046.01	-
I - 2 10	ANNUAL MEMBERSHIP CONTRIBUTIONS	4 600 000.00	9 792.66	4 485 292.66	124 500.00
I - 3 10	ASSIGNED REVENUE ACCRUING FROM THE CONTRIBUTION OF ITER HOST STATE	120 000 000.00	-	120 000 000.00	-
I - 4 10	MISCELLANEOUS REVENUE	444 119.32	36 153.35	455 894.67	24 378.00
I - 5 10	OTHER ASSIGNED REVENUE TO SPECIFIC ITEM OF EXPENDITURE	3 611.16	-	3 611.16	-
I - 5 20	OTHER ASSIGNED REVENUE FROM THE IO RESERVE FUND	4 120 733.99	-	4 120 733.99	-
Total Revenue		724 497 018.28	45 946.01	724 394 086.29	148 878.00

The final statement of revenue is almost entirely cashed with the following two exceptions:

- EUR 124 500 corresponding to the non-payment of the membership contribution from Finland and Greece.
- EUR 24 378 from a recovery on an operational contract.

It should be noted that all outstanding revenue from 2015 are cashed in 2016.

The breakdown of revenue by contributor in 2016 in payment appropriations is as follows:



Some of the revenue is budgeted for the full amount and made available in expenditure while the late cashing of interests received was not introduced in an amending budget. Some appropriations were also carried over from 2015 to 2016. The table below shows the reconciliation between cashed revenue and final budget available in payment expenditure:

EUR

Total cashed revenue	**724 394 086.29**
Late interest on 2015 Membership Contribution, cashed but not budgeted	-9 792.66
Uncashed 2016 Membership contribution (budgeted)	124 500.00
Total budgeted revenue	**724 508 793.63**
Carry over of payment appropriations from 2015 to 2016	24 800.01
Total Expenditure in payment appropriations	**724 533 593.64**

8.4.4. Non Budgeted Revenue

The late payment interests received have not been budgeted with the miscellaneous revenue for the 2016 budget. Such case are usually due to incompatibility between the cashing date of the revenue and the deadline for the preparation of the last amendment to the budget.

8.5. Statement of Expenditure

8.5.1. Evolution of the Statement of Expenditure

In line with the F4E budgetary procedure, the statement of expenditure adopted with the initial 2016 budget was established with the 2014 edition of the Resource Estimates Plan and adjusted to the final contributions from Euratom and France.

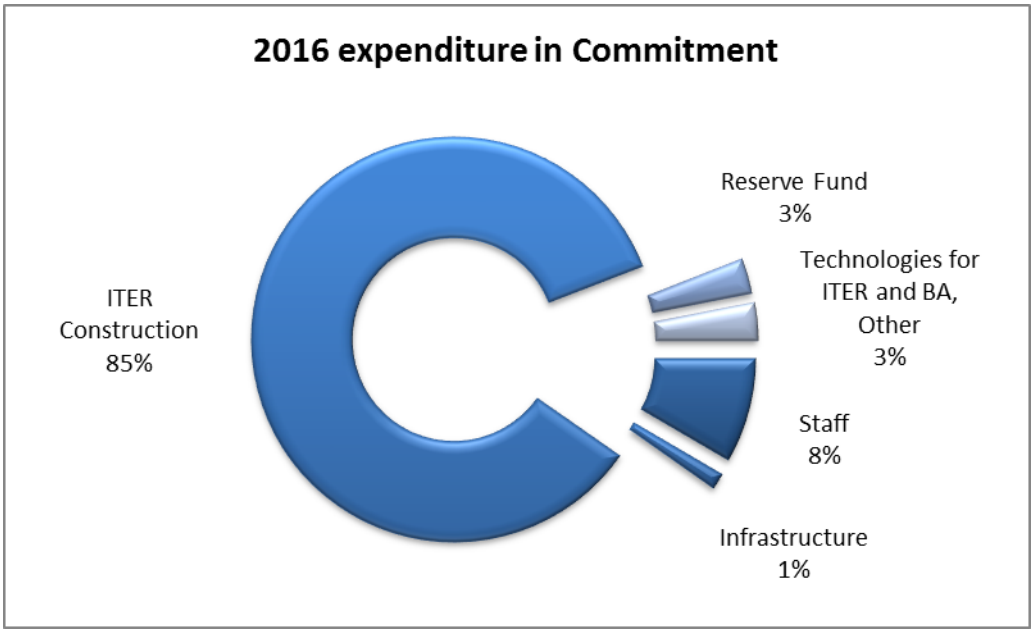
The details of the initial statement of expenditure are also adjusted according to the 2016 Work Programme (WP) in commitment appropriations and to the last available forecasts of execution in payment appropriations.

The statement of expenditure is further adjusted in the course of its implementation in accordance with the successive changes in the statement of revenue and with the amendments to the WP.

These adjustments are implemented with the two amended budgets and through the transfers approved by the Director within the limits foreseen in Article 27 of the Financial Regulation. The Governing Board is duly informed about the transfers.

The appropriations accruing from assigned revenue at the end of 2016 are automatically carried over to 2016.

The final breakdown of the statement of expenditure in commitment appropriations is as follows:



Evolution of the Administrative Expenditure

Commitment and Payment appropriation (Non Dissociated Appropriation) **(EUR)**

Heading of the 2016 Budget	Initial budget 02 December 2015 (1)	Transfers adopted by F4E Director (2)	Additional revenue (3)	Final budget (4)= Σ(1 to 3)	Carried over from 2015 (5)	Final budget for implementation (6)=(4)+(5)
CH 11 STAFF EXPENDITURE IN THE ESTABLISHMENT PLAN	**26 800 000.00**	-36 244.29		**26 763 755.71**		26 763 755.71
CH 12 EXTERNAL STAFF EXPENDITURE (CA, IS AND SNE)	**8 400 000.00**	626 777.57		**9 026 777.57**		9 026 777.57
CH 13 MISSIONS AND DUTY TRAVEL	**2 100 000.00**	145 000.00	153.35	**2 245 153.35**		2 245 153.35
CH 14 MISCELLANEOUS EXPENDITURE ON STAFF RECRUITMENT AND TRANFER	**760 000.00**	407 237.28	300.00	**1 167 537.28**		1 167 537.28
CH 15 REPRESENTATION	**10 000.00**	0.00		**10 000.00**		10 000.00
CH 16 TRAINING	**817 000.00**	-111 235.88		**705 764.12**		705 764.12
CH 17 OTHER STAFF MANAGEMENT EXPENDITURE	**1 860 000.00**	112 500.00		**1 972 500.00**		1 972 500.00
CH 18 TRAINEESHIPS	**60 000.00**	50 000.00		**110 000.00**		110 000.00
TITLE 1 - Commitment and Payment	**40 807 000.00**	**1 194 034.68**	**453.35**	**42 001 488.03**	**0.00**	**42 001 488.03**
CH 21 BUILDINGS AND ASSOCIATED COSTS	**1 245 000.00**	130 000.00		**1 375 000.00**		1 375 000.00
CH 22 INFORMATION AND COMMUNICATION TECHNOLOGIES	**2 816 000.00**	9 000.00		**2 825 000.00**		2 825 000.00
CH 23 MOVABLE PROPERTY AND ASSOCIATED COSTS	**213 000.00**	-15 000.00		**198 000.00**		198 000.00
CH 24 EVENTS AND COMMUNICATION	**425 000.00**	-178 000.00		**247 000.00**	24 799.88	271 799.88
CH 25 OUTSOURCING AND OTHER CURRENT EXPENDITURE	**1 272 000.00**	10 965.32		**1 282 965.32**		1 282 965.32
CH 26 POSTAGE AND TELECOMMUNICATIONS	**355 000.00**	35 000.00		**390 000.00**		390 000.00
CH 27 EXPENDITURE ON FORMAL AND OTHER MEETINGS	**367 000.00**	-91 000.00		**276 000.00**		276 000.00
TITLE 2 - Commitment and Payment	**6 693 000.00**	**-99 034.68**	**0.00**	**6 593 965.32**	**24 799.88**	**6 618 765.20**
Total TITLE 1 & 2 - Commitment & Payment	**47 500 000.00**	**1 095 000.00**	**453.35**	**48 595 453.35**	**24 799.88**	**48 620 253.23**

The administrative expenditure are non-dissociated appropriations (commitment and payment appropriations are in unison), therefore any transfers or budget amendments are authorised or adopted in both commitment and payment appropriations.

The two amendments to the 2016 budget have no impact on administrative expenditure, whilst the transfers approved by the Director increase the global budget and modify the detailed allocation of the administrative expenditure.

The need for increasing the administrative budget is due to the following elements:

- The increase of salaries for 2016 (+1%), after 3 years of decrease due to the evolution of the coefficient related to the cost of living in Spain, while the vacancy rate is maintained at low level all along the year.
- The transfer of staff from Barcelona to Cadarache, where the cost of living is about 25% higher.

- Regarding Missions, the increasing number of manufacturing contracts to be followed-up on site (also recommended by F4E's Management Assessors, as endorsed by the Governing Board).

The major changes (> +/-10%) to the statement of administrative expenditure are detailed below:

- Chapter 14 – Miscellaneous expenditure on staff recruitment and transfer (+54%): In addition to the recruitment cost normally charged on this budget, the increase is due to the transfer of staff to Cadarache for daily and installation allowances.
- Chapter 16 - Training (- 14%): The decrease is due to a closer monitoring of training actions following the adoption of a revised training policy, in particular with a strict budget allocation by unit and team.
- Chapter 18 - Trainee-ships (+ 83%): the budget increase is due to a more ambitious traineeship policy endorsed in April 2015. It is now addressed to trainees having completed their studies and for a longer period than the previous studentship scheme. The purpose is to promote training in the fusion field and in the ITER project as well as to allow university graduates to provide contributions to the work carried out by F4E.
- Chapter 21 – Buildings and associated cost (+ 10%): The increase is due to additional expenditure made mandatory in the security domain (guard and fire alarm).
- Chapter 24 - Event and Communication (- 42%): The decrease is explained by the postponement or cancellation of some events, and to the postponement of the redesign of the F4E external home page.
- Chapter 27 – Expenditure on formal and other meetings (- 25%): The decrease is due to the slightly lower number of meetings. The adoption of rules limiting the catering for meetings has also allowed some economy on this chapter.

Evolution of the Operational Expenditure

The statement of operational expenditure, developed in the table on the next page, is modified with the two amended budgets to reflect the changes in the statement of revenue and to align the operational budget in commitment appropriations with the successive amendments to the 2016 WP in June and December 2016.

In commitment appropriations:

To be noted, the figures for the budget chapters B035 and B036 refer to the available appropriations for the 2016 budget only, whereas the details of the 2016 implementation by funds source provided in annexe 8.7.3 refers to the appropriations of the year plus the amounts left over on the commitments carried over from the previous years, respectively EUR 418.40 million for B035 and EUR 16.29 for B036. This is due to the specific management of assigned revenue in the accounting system.

The main changes (more than +/-10% of the original budget) are justified as follows:

- Chapter 32 – Technology for ITER (- 41%): The decrease is mainly due to the reorganisation in F4E of all activities to focus the resources on First Plasma. Concerning the TBM activities, the budget up to 2020 has been reduced by 75% and three staff members left the team in 2016 forcing a move of some commitments to later years and reducing the scope of others. In addition, in the period from January to April 2016, interim measures were adopted to limit the commitments until a new schedule of activities was agreed in line with the new First Plasma approach. Among the activities affected: OMF-331-04-01-03, FPA-611-01-01 and FPA-380-01-02 were rescheduled after 2020, while the scope of OMF-331-05-01-04 and OMF-331-04-01-02 was sensibly reduced.
- Chapter 34 – Other Expenditure (- 55%): The amount initially foreseen in the 2016 WP represents a ceiling according to the needs of the services. Each proposal for contract is scrutinised and the budget is adjusted at the end of the year with the actual implementation.

In payment appropriations:

The amendments to the 2016 budget align the statement of expenditure with the statement of revenue, by adjusting the payment appropriations of the chapter 31 for the changes in Euratom or Miscellaneous contributions.

The adjustments between budgetary chapters according to actual needs are implemented through transfers authorised by the Director at the end of the year, to reach the highest possible rate of budget implementation.

Evolution of the Statement of Operational expenditure and Total (EUR)

Heading of the 2016 Budget	Initial budget 02 December 2015 (1)	Amending budget 30 June 2016 (2)	Amending budget 02 December 2016 (3)	Transfers adopted by F4E Director (4)	Additional revenue (5)	Final budget (6)= Σ(1 to 5)	Carried over from 2015 (7)	Final budget for implementation (8)=(6)+(7)
CH 31 ITER CONSTRUCTION - INCLUDING SITE PREPARATION	**255 632 138.01**	-140 000.00	2 412 180.83	7 269 993.64	429 916.00	**265 604 228.48**		**265 604 228.48**
CH 32 TECHNOLOGY FOR ITER	**11 500 000.00**	-1 600 000.00	-753 495.38	-2 395 689.15	3 495.38	**6 754 310.85**		**6 754 310.85**
CH 33 TECHNOLOGY FOR BROADER APPROACH AND DEMO	**6 708 000.00**	1 740 000.00	1 420 000.00	-3 500 778.55		**6 367 221.45**		**6 367 221.45**
CH 34 OTHER EXPENDITURE	**4 500 000.00**		-200.00	-2 468 525.94	1 194.49	**2 032 468.55**		**2 032 468.55**
CH 35 ITER CONSTRUCTION - APPROPRIATIONS ACCRUING FROM THE HOST STATE CONTRIBUTION	**130 000 000.00**				3 611.16	**130 003 611.16**	13 436 039.03	**143 439 650.19**
CH 36 APPROPRIATION ACCRUING FROM THIRD PARTIES TO SPECIFIC ITEM OF EXPENDITURE	**pm**				14 983 791.90	**14 983 791.90**		**14 983 791.90**
TITLE 3 - Commitment	**408 340 138.01**	**0.00**	**3 078 485.45**	**-1 095 000.00**	**15 422 008.93**	**425 745 632.39**	**13 436 039.03**	**439 181 671.42**
CH 31 ITER CONSTRUCTION - INCLUDING SITE PREPARATION	**499 925 891.88**	-107 000 000.00	129 323 497.38	12 367 312.48	429 916.00	**535 046 617.74**		**535 046 617.74**
CH 32 TECHNOLOGY FOR ITER	**17 000 000.00**			-8 427 889.24	3 495.38	**8 575 606.14**		**8 575 606.14**
CH 33 TECHNOLOGY FOR BROADER APPROACH AND DEMO	**9 200 000.00**			-3 338 428.02		**5 861 571.98**		**5 861 571.98**
CH 34 OTHER EXPENDITURE	**4 000 000.00**			-1 695 995.22	1 194.49	**2 305 199.27**		**2 305 199.27**
CH 35 ITER CONSTRUCTION - APPROPRIATIONS ACCRUING FROM THE HOST STATE CONTRIBUTION	**120 000 000.00**				3 611.16	**120 003 611.16**	0.13	**120 003 611.29**
CH 36 APPROPRIATION ACCRUING FROM THIRD PARTIES TO SPECIFIC ITEM OF EXPENDITURE	**pm**				4 120 733.99	**4 120 733.99**		**4 120 733.99**
TITLE 3 - Payment	**650 125 891.88**	**-107 000 000.00**	**129 323 497.38**	**-1 095 000.00**	**4 558 951.02**	**675 913 340.28**	**0.13**	**675 913 340.41**
Total TITLE 1 & 2 - Commitment & Payment	**47 500 000.00**			**1 095 000.00**	**453.35**	**48 595 453.35**	**24 799.88**	**48 620 253.23**
Total BUDGET in Commitment Appropriation	**455 840 138.01**	**0.00**	**3 078 485.45**	**0.00**	**15 422 462.28**	**474 341 085.74**	**13 460 838.91**	**487 801 924.65**
Total BUDGET in Payment Appropriation	**697 625 891.88**	**-107 000 000.00**	**129 323 497.38**	**0.00**	**4 559 404.37**	**724 508 793.63**	**24 800.01**	**724 533 593.64**

8.5.2. Implementation of the Statement of Expenditure

The statement of expenditure in commitment and payment appropriation is shown in the table on the following pages.

Implementation of the Budget in Commitment Appropriations

A full implementation of the 2016 budget shall be considered.

There are no specific observations regarding the implementation of the administrative budget for which the permanent monitoring allows reaching a fair balance between actual needs and budget.

Regarding the operational expenditure 99.8% of the final budget is implemented, of which 99.7% through direct individual commitment.

The non-implementation of EUR 0.74 million on the chapter B036 – Reserve Fund is due to PCR 670, the corresponding amendment is not ready to be signed considering the PCR is finally not formally approved by EPB.

Implementation of the Statement of Administrative Expenditure (EUR)

Heading of the 2016 Budget	Commitment Appropriation			Payment Appropriation		
	Final budget for implementation (1)	Final implementation (2)	% implementation (3)= (2)/(1)	Final budget for implementation (4)	Final implementation (5)	% implementation (6)= (5)/(4)
CH 11 - STAFF EXPENDITURE IN THE ESTABLISHMENT PLAN	26 763 755.71	26 763 755.71	100.0%	26 763 755.71	26 763 755.71	100.0%
CH 12 - EXTERNAL STAFF EXPENDITURE (CA, IS AND SNE)	9 026 777.57	9 026 777.57	100.0%	9 026 777.57	8 911 235.89	98.7%
CH 13 - MISSIONS AND DUTY TRAVEL	2 245 153.35	2 245 153.35	100.0%	2 245 153.35	2 243 379.09	99.9%
CH 14 - MISCELLANEOUS EXPENDITURE ON STAFF RECRUITMENT AND TRANFER	1 167 537.28	1 167 537.28	100.0%	1 167 537.28	1 051 612.38	90.1%
CH 15 - REPRESENTATION	10 000.00	10 000.00	100.0%	10 000.00	5 922.39	59.2%
CH 16 -TRAINING	705 764.12	705 764.12	100.0%	705 764.12	418 022.69	59.2%
CH 17 - OTHER STAFF MANAGEMENT EXPENDITURE	1 972 500.00	1 972 500.00	100.0%	1 972 500.00	1 673 667.52	84.9%
CH 18 - TRAINEESHIPS	110 000.00	110 000.00	100.0%	110 000.00	97 022.43	88.2%
TITLE 1 Staff expenditure	42 001 488.03	42 001 488.03	100.0%	42 001 488.03	41 164 618.10	98.0%
CH 21 - BUILDINGS AND ASSOCIATED COSTS	1 375 000.00	1 375 000.00	100.0%	1 375 000.00	841 669.09	61.2%
CH 22 - INFORMATION AND COMMUNICATION TECHNOLOGIES	2 825 000.00	2 817 566.00	99.7%	2 825 000.00	1 693 819.84	60.0%
CH 23 - MOVABLE PROPERTY AND ASSOCIATED COSTS	198 000.00	198 000.00	100.0%	198 000.00	89 442.41	45.2%
CH 24 - EVENTS AND COMMUNICATION	271 799.88	271 799.88	100.0%	271 799.88	183 469.47	67.5%
CH 25 - OUTSOURCING AND OTHER CURRENT EXPENDITURE	1 282 965.32	1 282 965.32	100.0%	1 282 965.32	689 253.84	53.7%
CH 26 - POSTAGE AND TELECOMMUNICATIONS	390 000.00	390 000.00	100.0%	390 000.00	132 861.54	34.1%
CH 27 - EXPENDITURE ON FORMAL AND OTHER MEETINGS	276 000.00	276 000.00	100.0%	276 000.00	188 442.81	68.3%
TITLE 2 -	6 618 765.20	6 611 331.20	99.9%	6 618 765.20	3 818 959.00	57.7%
Total TITLE 1 & 2 Commitment	48 620 253.23	48 612 819.23	100.0%	48 620 253.23	44 983 577.10	92.5%

Implementation of the Statement of Operational Expenditure and Total (EUR)

Heading of the 2016 Budget	Commitment Appropriation			Payment Appropriation		
	Final budget for implementation (1)	Final implementation (2)	% implementation (3)= (2)/(1)	Final budget for implementation (4)	Final implementation (5)	% implementation (6)= (5)/(4)
CH 31 - ITER CONSTRUCTION INCLUDING ITER SITE PREPARATION	265 604 228.48	265 593 480.95	100.0%	535 046 617.74	530 022 035.93	99.1%
CH 32 - TECHNOLOGY FOR ITER	6 754 310.85	6 754 310.85	100.0%	8 575 606.14	8 575 606.14	100.0%
CH 33 - TECHNOLOGY FOR BROADER APPROACH AND DEMO	6 367 221.45	6 367 221.45	100.0%	5 861 571.98	5 861 571.98	100.0%
CH 34 - OTHER EXPENDITURE	2 032 468.55	2 031 474.06	100.0%	2 305 199.27	2 299 628.78	99.8%
CH 35 - ITER CONSTRUCTION - APPROPRIATIONS ACCRUING FROM THE HOST STATE CONTRIBUTION	143 439 650.19	143 439 650.19	100.0%	120 003 611.29	119 127 078.69	99.3%
CH 36 - APPROPRIATION ACCRUING FROM THIRD PARTIES TO SPECIFIC ITEM OF EXPENDITURE	14 983 791.90	14 248 373.45	95.1%	4 120 733.99	0.00	0.0%
TITLE 3	439 181 671.42	438 434 510.95	99.8%	675 913 340.41	665 885 921.52	98.5%
Total implementation	487 801 924.65	487 047 330.18	99.8%	724 533 593.64	710 869 498.62	98.1%

Implementation of the Budget in Payment Appropriations

The implementation rate of the 2016 final available budget is 98.1% in payment appropriations:

- 92.5% of implementation of the administrative expenditure, representing a better performance than the previous year, in particular for the Title I – Staff expenditure.
- 98.5% of the total operational expenditure, representing EUR 10.03 million of non-execution. The execution has been limited by the available treasury, considering that about EUR 11.0 million of VAT has been recovered at the very end of the year, while payments of EUR 88.01 million ready to be executed have been delayed to the 2017 budget.
- Regarding the Reserve Fund, regularisations of payment originally done on the budget to be moved to the B036 chapter have been delayed to 2017.

8.5.3. Additional information on the final implementation of the 2015 Budget

Final implementation of the administrative expenditure 2015

The payment appropriations linked to open administrative commitments at the end of 2015, corresponding to legal obligations not yet paid, were automatically carried over to 2016 according to the rules for non-dissociated appropriations for an amount of EUR 5.91 million.

80% of the appropriations, EUR 4.70 million, are paid in 2016. The balance, EUR 1.20 million, is cancelled and enters in the budgetary outturn as shown in the table at the chapter 8.5.6 below.

Final implementation of the Global Commitments 2015

Final implementation of the 2015 Global Commitments (EUR)	Appropriation available on 01/01/16	Implementation	%
individual Commitments placed on 31/12/2016	223 055 114.45	175 084 576.67	78.5%

The total amount available for implementation of individual commitments from the 2015 Global commitments is EUR 223.06 million. EUR 175.08 million of individual contracts are signed at the end of 2016, representing 78.5% of the total. The balance still available at the end of 2016 is cancelled.

The non-implementation of the Global commitments 2015 is mainly due to the change of strategy for the procurement of the Vacuum Vessel. Originally foreseen as procurement in the final 2015 Work Programme, F4E was not allowed to charge the transfer of the sectors 7 and 8 back to IO on the 2015 Global Commitment, despite of the same purpose.

8.5.4. Open commitments at 31 December 2016

The F4E obligations amount to EUR 1 863.06 million at the closure of the 2016 budget.

It corresponds to the total amount left over on open budgetary commitments and is detailed as follows:

(EUR)

2016 budget Heading	Open Commitments				
	from previous year (1)	from 2016 budget (2)	Total (3)=(1)+(2)	To be de-committed (4)	Net Total (5)=(3)-(4)
TITLE 1 - STAFF EXPENDITURE	**481 458.28**	**836 869.93**	**1 318 328.21**	**481 458.28**	**836 869.93**
TITLE 2 - OTHER OPERATING EXPEND.	**652 923.84**	**2 792 372.20**	**3 445 296.04**	**652 923.84**	**2 792 372.20**
Total TITLE 1 & 2	**1 134 382.12**	**3 629 242.13**	**4 763 624.25**	**1 134 382.12**	**3 629 242.13**
CH 31 - ITER CONSTRUCTION INCLUDING ITER SITE PREPARATION	1 352 361 769.79	211 686 390.39	1 564 048 160.18	50 647 966.70	**1 513 400 193.48**
CH 32 - TECHNOLOGY FOR ITER	11 218 900.01	6 368 283.44	17 587 183.45	374 478.96	**17 212 704.49**
CH 33 - TECHNOLOGY FOR BROADER APPROACH AND DEMO	11 006 933.42	3 598 125.43	14 605 058.85	3 382 707.09	**11 222 351.76**
CH 34 - OTHER EXPENDITURE	1 932 188.08	833 093.20	2 765 281.28	0.00	**2 765 281.28**
CH 35 - ITER CONSTRUCTION - APPROPRIATIONS ACCRUING FROM THE HOST STATE CONTRIBUTION	156 263 593.39	143 012 939.21	299 276 532.60	0.00	**299 276 532.60**
CH 36 - APPROPRIATION ACCRUING FROM THIRD PARTIES TO SPECIFIC ITEM OF EXPENDITURE	1 301 314.76	14 248 373.45	15 549 688.21	0.00	**15 549 688.21**
Total TITLE 3	**1 534 084 699.45**	**379 747 205.12**	**1 913 831 904.57**	**54 405 152.75**	**1 859 426 751.82**
Total	**1 535 219 081.57**	**383 376 447.25**	**1 918 595 528.82**	**55 539 534.87**	**1 863 055 993.95**

The total amount of open commitments is decreased by EUR 287.7 million compared to the situation at the end of 2015.

Note :

- Title 1: There are no left over on the 2016 commitments related to direct staff cost, normally cancelled at the end of the current year.
- The balance as shown in the table above corresponds to other expenses linked to staff: missions, interim, schooling, training, etc.… for which the commitments are carried over for one year.
- Title 2: The commitments are carried over and should be consumed at the latest by 31 December of the following year.
- Title 3: The open operational commitments are carried over to the following year with no limitation in time, but to be paid according to the advancement of the contracts.

The 2016 global commitments, amounting to EUR 1.40 million are carried over for one year, to be implemented in individual commitments/contracts by the 31 of December 2017.

8.5.5. Status for non-budgeted commitment appropriation

According to the annuality principle of the F4E Financial Regulation, the unused commitment appropriations at the end of each year and the de-commitments made on the budget of the previous years are cancelled, except for assigned revenue. The regulation also foresees the possibility to make the cancelled appropriations available again in future budget.

The corresponding amounts are provided in the table below:

Commitment appropriation for operational expenditure (EUR)		B031-B034 Budgets	B035/B036 Assigned revenue
Amount de-committed as of 31/12/2016 (since 2008)	+	543 600 235.08	134 898 000.04
Amount budgeted again or carried over (since 2008)	-	9 759 760.00	134 898 000.04
Amount to be de-committed	+	47 970 537.78	0.00
Amount available for future budgets	=	581 811 012.86	-
Amount carried over to 2017	=	-	0.00

The amounts to be de-committed correspond to the outdated balance on the 2015 global commitments.

From 2008 to 2016, the total of de-commitments amounts to EUR 581.8 million, mainly due to partial implementation of global commitments in individual contracts.

From this amount:

- EUR 9.8 and EUR 96.0 million have been reintroduced in the 2011 and 2017 budget, respectively,
- EUR 134.9 million have been automatically carried over to the following budget, in accordance with the financial rules for assigned revenue.

It results in a cumulative amount of unassigned commitment appropriations of EUR 581.8 million, to be entered in future F4E Budget.

8.5.6. Cancelled Payment appropriations

Cancelled Payment appropriations from the 2016 budget

(EUR)

2016 budget Heading	Unused Appropriations (1)	Appropriations carried over to 2017 (2)	Cancelled appropriation (3)=(1)-(2)
TITLE 1	**836 869.93**	**836 869.93**	**0.00**
TITLE 2	**2 799 806.20**	**2 792 372.20**	**7 434.00**
Total TITLE 1 & 2 Payment	**3 636 676.13**	**3 629 242.13**	**7 434.00**
CH 31 - ITER CONSTRUCTION INCLUDING ITER SITE PREPARATION	5 024 581.81	216 129.28	4 808 452.53
CH 32 - TECHNOLOGY FOR ITER	0.00	0.00	0.00
CH 33 - TECHNOLOGY FOR BROADER APPROACH AND DEMO	0.00	0.00	0.00
CH 34 - OTHER EXPENDITURE	5 570.49	994.49	4 576.00
CH 35 - ITER CONSTRUCTION - APPROPRIATIONS ACCRUING FROM THE HOST STATE CONTRIBUTION	876 532.60	876 532.60	0.00
CH 36 - APPROPRIATION ACCRUING FROM THIRD PARTIES TO SPECIFIC ITEM OF EXPENDITURE	4 120 733.99	4 120 733.99	0.00
TITLE 3 - Payment	**10 027 418.89**	**5 214 390.36**	**4 813 028.53**
Total BUDGET in Payment	**13 664 095.02**	**8 843 632.49**	**4 820 462.53**

The almost full implementation of the 2016 budget and the automatic carry over make the level of cancelled appropriations very low for 2016, representing less than 1% of the budget.

The Payment appropriations not used by the 31/12/2016 are cancelled except the amount automatically carried over for Non Dissociated Appropriations (Title 1 and Title 2) and assigned revenue (B035 and B036), according to the respective rules in F4E Financial Regulation.

Cancelled Payment appropriations carried over from the 2015 budget

(EUR)

Administrative appropriation carried over from B 2015 to B 2016	Appropriation available (EUR) (1)	Implementation (EUR) (2)	Cancelled appropriation (3)=(1)-(2)
TITLE 1	2 718 448.73	2 223 571.09	**494 877.64**
TITLE 2	3 188 797.99	2 481 013.26	**707 784.73**
Total TITLE 1 & 2 Payment	5 907 246.72	4 704 584.35	**1 202 662.37**

The cancelled appropriations correspond to the amounts not paid in 2016 on open administrative commitments carried over from 2015.

8.6. Budget Outturn account 2016

The outturn for the financial year is calculated according to the total revenue actually cashed minus the total payment incurred during the year, minus the appropriation carried over to the following year.

Budget Outturn Account (EUR)		2016	2015
REVENUE			
Euratom contribution	+	595 328 553.81	409 488 267.82
ITER Host state and Membership contributions	+	124 485 292.66	81 410 707.34
Other revenue	+	4 580 239.82	2 308 501.83
TOTAL REVENUE (a)		**724 394 086.29**	**493 207 476.99**
EXPENDITURE			
Title I:Staff			
Payments	-	41 164 618.10	36 149 086.30
Appropriations carried over	-	836 869.93	2 718 448.73
Title II: Infrastructure Expenditure			
Payments	-	3 818 959.00	3 177 080.23
Appropriations carried over	-	2 792 372.20	3 213 597.87
Title III: Operational Expenditure			
Payments	-	665 885 921.52	480 781 793.20
Appropriations carried over	-	5 214 390.36	0.13
Total Payments (b)		*710 869 498.62*	*520 107 959.73*
Total Appropriations carried over (c)		*8 843 632.49*	*5 932 046.73*
TOTAL EXPENDITURE (d)=(b)+(c)		**719 713 131.11**	**526 040 006.46**
OUTTURN FOR THE FINANCIAL YEAR (a-d)		**4 680 955.18**	**-32 832 529.47**
Cancellation of unused payment appropriations carried over from previous year	+	1 202 662.37	925 783.04
Adjustment for carry-over from the previous year of appropriations available at 31.12 arising from assigned revenue	+	24 879.81	33 000 000.00
Exchange differences for the year (gain +/loss -)	+/-	-27 076.85	-19 985.83
BALANCE OF THE OUTTURN ACCOUNT FOR THE FINANCIAL YEAR		**5 881 420.51**	**1 073 267.74**
Of which Administrative expenditure		**1 183 019.52**	**1 052 559.60**
Of which Operational expenditure		**4 698 321.19**	**20 708.14**

For the 2016 financial year, the balance of the budget outturn amounts to EUR 5.88 million.

8.7. Annexes

8.7.1. Budget implementation – Multi-annual payment schedule for the operational budget

Year	Commitments	Paid <=2007	Paid 2008	Paid 2009	Paid 2010	Paid 2011	Paid 2012	Paid 2013	Paid 2014	Paid 2015	Paid 2016	*Outstanding amount*
<= 2007	115 445 438.21	44 786 869.53	17 483 367.00	22 159 849.68	6 661 575.00	5 814 938.04	10 677 563.35	5 536 846.81	2 062 547.93	261 880.87	-	-
2008	162 505 480.01	-	66 535 002.37	25 675 909.44	12 397 585.34	22 041 158.79	16 926 171.12	10 755 158.98	8 026 734.12	-	-	147 759.85
2009	295 863 671.49	-	-	63 201 452.03	40 413 138.03	72 962 663.48	34 136 990.20	23 997 122.64	26 549 875.43	13 259 338.45	8 008 925.36	13 334 165.87
2010	392 345 805.90	-	-	-	102 542 780.43	60 943 579.59	58 266 404.13	52 784 759.28	34 717 587.59	39 227 964.72	9 607 653.62	34 255 076.54
2011	371 494 352.29	-	-	-	-	57 876 015.77	118 112 199.21	48 623 561.70	29 962 742.34	26 739 952.54	35 305 192.97	54 874 687.76
2012	1 130 489 284.93	-	-	-	-	-	83 739 910.79	144 231 319.33	128 364 796.05	164 239 683.64	189 718 067.75	420 195 507.37
2013	901 370 246.29	-	-	-	-	-	-	67 053 699.98	181 415 330.39	96 759 662.07	124 738 904.24	431 402 649.61
2014	583 825 400.00	-	-	-	-	-	-	-	52 626 681.58	93 676 757.92	116 670 110.66	320 851 849.84
2015	374 384 163.94	-	-	-	-	-	-	-	-	46 616 552.99	123 149 761.09	204 617 849.86
2016	438 434 510.95	-	-	-	-	-	-	-	-	-	58 687 305.83	379 747 205.12
Total	**4 766 158 354.01**	**44 786 869.53**	**84 018 369.37**	**111 037 211.15**	**162 015 078.80**	**219 638 355.67**	**321 859 238.80**	**352 982 468.72**	**463 726 295.43**	**480 781 793.20**	**665 885 921.52**	**1 859 426 751.82**

Notes:

- The actions accounted to F4E projects and implemented by the EC and the CEA before F4E financial autonomy in 2008 are included.
- The global commitments from 2016 to be individually committed in 2017 are included in full in the 2016 commitments.
- 849 commitment positions are open on the 31/12/16.

8.7.2. Reconciliation between budgetary and accrual based accounts

	sign +/-	Amount (EUR)
Economic result (+ for surplus and - for deficit)	**+/-**	**2 657 762.75**
Ajustment for accrual items (items not in the budgetary result but included in the economic result)		
Adjustments for Accrual Cut-off (reversal 31.12.N-1)	**+/-**	-11 602 921.85
Adjustments for Accrual Cut-off (cut- off 31.12.N)	**+/-**	-34 712 485.04
Unpaid invoices at year end but booked in charges (class 6)	**+**	21 965 754.79
Depreciation of intangible and tangible assets	**+**	3 350 286.81
Provisions (impact of the year)	**+/-**	-1 345 422.47
Recovery Orders issued in 2016 in class 7 and not yet cashed	**-**	-124 500.00
Prefinancing given in previous year and cleared in the year	**+**	31 103 008.02
Prefinancing received in previous year and cleared in the year	**-**	-514 840.00
Payments made from carry over of payment appropriations	**+**	4 704 584.35
Other : Change in inventories (production material)	**+/-**	-28 205 474.20
Ajustment for budgetary items (item included in the budgetary result but not in the economic result)		
Asset acquisitions (less unpaid amounts)	**-**	-1 797 163.34
New pre-financing paid in the year 2016 and remaining open as at 31.12.2016	**-**	-31 784 702.32
New pre-financing received in the year 2016 and remaining open as at. 31.12.2016	**+**	5 881 420.51
Budgetary recovery orders issued before 2016 and cashed in the year	**+**	45 946.01
Budgetary recovery orders issued in 2016 on balance sheet accounts (not 7 or 6 accounts) and cashed	**+**	109 557.02
Payment appropriations carried over to 2017	**-**	-8 843 632.49
Cancellation of unused carried over payment approppriations from previous year	**+**	1 202 662.37
Adjustment for carry-over from the previous year of appropriations available at 31.12 arising from assigned revenue	**+**	24 879.81
Other : Invoices paid in 2016 but booked in charges in previous years	**+/-**	53 766 921.82
total		5 881 642.55
Budgetary result (+ for surplus)	**+/-**	**5 881 420.51**
Including amount of exchange rate differences		-27 076.85
Delta not explained		222.04

8.7.3. 2016 Budget implementation – Details by fund source

Fund Source: C1 - Credits of the year (EUR)

Budget Line Position	Budget Line Description	Commit.Approp. Amount (1)	Commitment Amount Accepted (2)	% Committed (2)/(1)	Paym.Approp. Amount (4)	Payment Amount Accepted (5)	% Paid (5)/(4)
A01100	STAFF EXPENDITURE IN THE ESTABLISHMENT PLAN	26 763 755.71	26 763 755.71	100.00%	26 763 755.71	26 763 755.71	100.00%
A01200	EXTERNAL STAFF EXPENDITURE (CA, SNE, INTERIM STAFF)	9 026 777.57	9 026 777.57	100.00%	9 026 777.57	8 911 235.89	98.72%
A01300	MISSIONS AND DUTY TRAVEL	2 245 000.00	2 245 000.00	100.00%	2 245 000.00	2 243 225.74	99.92%
A01400	MISCELLANEOUS EXPENDITURE ON STAFF RECRUITMENT	1 167 237.28	1 167 237.28	100.00%	1 167 237.28	1 051 388.38	90.07%
A01500	REPRESENTATION	10 000.00	10 000.00	100.00%	10 000.00	5 922.39	59.22%
A01600	TRAINING	705 764.12	705 764.12	100.00%	705 764.12	418 022.69	59.23%
A01700	OTHER STAFF MANAGEMENT EXPENDITURE	1 972 500.00	1 972 500.00	100.00%	1 972 500.00	1 673 667.52	84.85%
A01800	TRAINEESHIPS	110 000.00	110 000.00	100.00%	110 000.00	97 022.43	88.20%
Total Title 1		**42 001 034.68**	**42 001 034.68**	**100.00%**	**42 001 034.68**	**41 164 240.75**	**98.01%**

Budget Line Position	Budget Line Description	Commit.Approp. Amount (1)	Commitment Amount Accepted (2)	% Committed (2)/(1)	Paym.Approp. Amount (4)	Payment Amount Accepted (5)	% Paid (5)/(4)
A02100	BUILDINGS AND ASSOCIATED COSTS	1 375 000.00	1 375 000.00	100.00%	1 375 000.00	841 669.09	61.21%
A02200	INFORMATION AND COMMUNICATION TECHNOLOGIES	2 825 000.00	2 817 566.00	99.74%	2 825 000.00	1 693 819.84	59.96%
A02300	MOVABLE PROPERTY AND ASSOCIATED COSTS	198 000.00	198 000.00	100.00%	198 000.00	89 442.41	45.17%
A02400	EVENTS and COMMUNICATION	247 000.00	247 000.00	100.00%	247 000.00	158 669.59	64.24%
A02500	OUTSOURCING AND OTHER CURRENT EXPENDITURE	1 282 965.32	1 282 965.32	100.00%	1 282 965.32	689 253.84	53.72%
A02600	POSTAGE AND TELECOMMUNICATIONS	390 000.00	390 000.00	100.00%	390 000.00	132 861.54	34.07%
A02700	EXPENDITURE ON FORMAL AND OTHER MEETINGS	276 000.00	276 000.00	100.00%	276 000.00	188 442.81	68.28%
Total Title 2		**6 593 965.32**	**6 586 531.32**	**99.89%**	**6 593 965.32**	**3 794 159.12**	**57.54%**

Fund Source: C1 - Credits of the year (EUR)

(cont'd)

Budget Line Position	Budget Line Description	Commit.Approp. Amount (1)	Commitment Amount Accepted (2)	% Committed (2)/(1)	Paym.Approp. Amount (4)	Payment Amount Accepted (5)	% Paid (5)/(4)
B03100	ITER CONSTRUCTION - INCL. SITE PREPARATION	265 174 312.48	265 174 312.48	100.00%	534 616 701.74	529 808 249.21	99.10%
B03200	TECHNOLOGY FOR ITER	6 750 815.47	6 750 815.47	100.00%	8 572 110.76	8 572 110.76	100.00%
B03300	TECHNOLOGY FOR BROADER APPROACH AND DEMO	6 367 221.45	6 367 221.45	100.00%	5 861 571.98	5 861 571.98	100.00%
B03400	OTHER EXPENDITURE	2 031 274.06	2 031 274.06	100.00%	2 304 004.78	2 299 428.78	99.80%
Total Title 3		**280 323 623.46**	**280 323 623.46**	**100.00%**	**551 354 389.26**	**546 541 360.73**	**99.13%**
Total C1		**328 918 623.46**	**328 911 189.46**	**100.00%**	**599 949 389.26**	**591 499 760.60**	**98.59%**

Fund Source: C4 - Internal assigned revenues (EUR)

Budget Line Position	Budget Line Description	Commit.Approp. Amount (1)	Commitment Amount Accepted (2)	% Committed (2)/(1)	Paym.Approp. Amount (4)	Payment Amount Accepted (5)	% Paid (5)/(4)
A01300	MISSIONS AND DUTY TRAVEL	153.35	153.35	100.00%	153.35	153.35	100.00%
A01400	MISCELLANEOUS EXPENDITURE ON STAFF RECRUITMENT	300.00	300.00	100.00%	300.00	224.00	74.67%
Total Title 1		**453.35**	**453.35**	**100.00%**	**453.35**	**377.35**	**83.24%**

Fund Source: C4 - Internal assigned revenues (EUR)

(cont'd)

Budget Line Position	Budget Line Description	Commit.Approp. Amount (1)	Commitment Amount Accepted (2)	% Committed (2)/(1)	Paym.Approp. Amount (4)	Payment Amount Accepted (5)	% Paid (5)/(4)
B03100	ITER CONSTRUCTION - INCL. SITE PREPARATION	429 916.00	419 168.47	97.50%	429 916.00	213 786.72	49.73%
B03200	TECHNOLOGY FOR ITER	3 495.38	3 495.38	100.00%	3 495.38	3 495.38	100.00%
B03400	OTHER EXPENDITURE	1 194.49	200.00	16.74%	1 194.49	200.00	16.74%
Total Title 3		**434 605.87**	**422 863.85**	**97.30%**	**434 605.87**	**217 482.10**	**50.04%**
Total C4		**435 059.22**	**423 317.20**	**97.30%**	**435 059.22**	**217 859.45**	**50.08%**

Fund Source: C5 - Carried-over internal assigned revenues (EUR)

Budget Line Position	Budget Line Description	Commit.Approp. Amount (1)	Commitment Amount Accepted (2)	% Committed (2)/(1)	Paym.Approp. Amount (4)	Payment Amount Accepted (5)	% Paid (5)/(4)
A02400	EVENTS and COMMUNICATION	24 799.88	24 799.88	100.00%	24 799.88	24 799.88	100.00%
Total Title 2		**24 799.88**	**24 799.88**	**100.00%**	**24 799.88**	**24 799.88**	**100.00%**
Total C5		**24 799.88**	**24 799.88**	**100.00%**	**24 799.88**	**24 799.88**	**100.00%**

Fund Source: C8 - Carried over credits from previous years (EUR)

Budget Line Position	Budget Line Description	Commit.Approp. Amount (1)	Commitment Amount Accepted (2)	% Committed (2)/(1)	Paym.Approp. Amount (4)	Payment Amount Accepted (5)	% Paid (5)/(4)
A01200	EXTERNAL STAFF EXPENDITURE (CA, SNE, INTERIM STAFF)	113 965.88	113 965.88	100.00%	113 965.88	57 378.97	50.35%
A01300	MISSIONS AND DUTY TRAVEL	850 889.32	850 889.32	100.00%	850 889.32	688 332.08	80.90%
A01400	MISCELLANEOUS EXPENDITURE ON STAFF RECRUITMENT	196 102.41	196 102.41	100.00%	196 102.41	80 478.34	41.04%
A01500	REPRESENTATION	2 209.97	2 209.97	100.00%	2 209.97	70.23	3.18%
A01600	TRAINING	324 265.14	320 883.94	98.96%	324 265.14	271 076.11	83.60%
A01700	OTHER STAFF MANAGEMENT EXPENDITURE	1 225 036.20	1 214 998.04	99.18%	1 225 036.20	1 125 147.96	91.85%
A01800	TRAINEESHIPS	5 979.81	5 979.81	100.00%	5 979.81	1 087.40	18.18%
Total Title 1		**2 718 448.73**	**2 705 029.37**	**99.51%**	**2 718 448.73**	**2 223 571.09**	**81.80%**

Budget Line Position	Budget Line Description	Commit.Approp. Amount (1)	Commitment Amount Accepted (2)	% Committed (2)/(1)	Paym.Approp. Amount (4)	Payment Amount Accepted (5)	% Paid (5)/(4)
A02100	BUILDINGS AND ASSOCIATED COSTS	825 907.31	809 087.81	97.96%	825 907.31	644 880.31	78.08%
A02200	INFORMATION AND COMMUNICATION TECHNOLOGIES	1 162 862.80	1 159 830.80	99.74%	1 162 862.80	1 078 429.88	92.74%
A02300	MOVABLE PROPERTY AND ASSOCIATED COSTS	120 961.77	120 961.77	100.00%	120 961.77	33 472.71	27.67%
A02400	EVENTS and COMMUNICATION	122 819.23	122 819.23	100.00%	122 819.23	70 898.79	57.73%
A02500	OUTSOURCING AND OTHER CURRENT EXPENDITURE	479 910.52	454 444.64	94.69%	479 910.52	326 128.60	67.96%
A02600	POSTAGE AND TELECOMMUNICATIONS	248 756.43	242 964.47	97.67%	248 756.43	216 015.02	86.84%
A02700	EXPENDITURE ON FORMAL AND OTHER MEETINGS	227 579.93	223 828.38	98.35%	227 579.93	111 187.95	48.86%
Total Title 2		**3 188 797.99**	**3 133 937.10**	**98.28%**	**3 188 797.99**	**2 481 013.26**	**77.80%**

Fund Source: C8 - Carried over credits from previous years (EUR)

(cont'd)

Budget Line Position	Budget Line Description	Commit.Approp. Amount (1)	Commitment Amount Accepted (2)	% Committed (2)/(1)	Paym.Approp. Amount (4)	Payment Amount Accepted (5)	% Paid (5)/(4)
B03100	ITER CONSTRUCTION - INCL. SITE PREPARATION	2 101 562 166.54	1 828 476 715.16	87.01%	Payment appropriations under C1 Fund source		
B03200	TECHNOLOGY FOR ITER	19 620 139.06	19 408 478.74	98.92%			
B03300	TECHNOLOGY FOR BROADER APPROACH AND DEMO	18 617 852.16	14 099 409.38	75.73%			
B03400	OTHER EXPENDITURE	3 257 977.33	3 033 436.00	93.11%			
Total Title 3		**2 143 058 135.09**	**1 865 018 039.28**	**87.03%**			
Total C8		**2 148 965 381.81**	**1 870 857 005.75**	**87.06%**	**5 907 246.72**	**4 704 584.35**	**79.64%**

Fund Source: C9 - Carried over credits from previous years (EUR)

Budget Line Position	Budget Line Description	Commit.Approp. Amount (1)	Commitment Amount Accepted (2)	% Committed (2)/(1)	Paym.Approp. Amount (4)	Payment Amount Accepted (5)	% Paid (5)/(4)
A01100	STAFF EXPENDITURE IN THE ESTABLISHMENT PLAN	10 839.05		-			-
A01200	EXTERNAL STAFF EXPENDITURE (CA, SNE, INTERIM STAFF)	21 064.33		-			-
A01300	MISSIONS AND DUTY TRAVEL						
A01400	MISCELLANEOUS EXPENDITURE ON STAFF RECRUITMENT	31 474.27		-			-
A01500	REPRESENTATION						
A01600	TRAINING	40 702.63		-			-
A01700	OTHER STAFF MANAGEMENT EXPENDITURE	28 738.85					
A01800	TRAINEESHIPS	3 781.73		-			-
Total Title 1		**136 600.86**	**-**	**-**	**-**	**-**	**-**

Fund Source: C9 - Carried over credits from previous years (EUR)

(cont'd)

Budget Line Position	Budget Line Description	Commit.Approp. Amount (1)	Commitment Amount Accepted (2)	% Committed (2)/(1)	Paym.Approp. Amount (4)	Payment Amount Accepted (5)	% Paid (5)/(4)
A02100	BUILDINGS AND ASSOCIATED COSTS	21 321.37		-			-
A02200	INFORMATION AND COMMUNICATION TECHNOLOGIES	3 873.63		-			-
A02300	MOVABLE PROPERTY AND ASSOCIATED COSTS			-			-
A02400	EVENTS and COMMUNICATION	58 327.00		-			-
A02500	OUTSOURCING AND OTHER CURRENT EXPENDITURE	101 427.91		-			-
A02600	POSTAGE AND TELECOMMUNICATIONS	4 652.30		-			-
A02700	EXPENDITURE ON FORMAL AND OTHER MEETINGS	49 113.77		-			-
Total Title 2		**238 715.98**	**-**	**-**	**-**	**-**	**-**
Total C9		**375 316.84**	**-**	**-**	**-**	**-**	**-**

Fund Source: R0 - Assigned revenues (EUR)

Budget Line Position	Budget Line Description	Commit.Approp. Amount (1)	Commitment Amount Accepted (2)	% Committed (2)/(1)	Paym.Approp. Amount (4)	Payment Amount Accepted (5)	% Paid (5)/(4)
B03500	ITER CONSTRUCTION - APPROPRIATION ACCRUING FROM THE ITER HOST STATE CONTRIBUTION	418 403 611.29	418 403 611.29	100.00%	120 003 611.29	119 127 078.69	99.27%
B03600	APPROPROPRIATION ACCRUING FROM THIRD PARTIES TO SPECIFIC ITEM OF EXPENDITURE	16 285 106.66	15 549 688.21	95.48%	4 120 733.99		
Total Title 3		**434 688 717.95**	**433 953 299.50**	**99.83%**	**124 124 345.28**	**119 127 078.69**	**95.97%**
Total R0		**434 688 717.95**	**433 953 299.50**	**99.83%**	**124 124 345.28**	**119 127 078.69**	**95.97%**

8.7.4. 2016 Establishment plan

Function group and grade	2016 Budget			
	Authorised under the EU Budget		Filled as 31/12/2016	
	Permanent posts	Temporary Posts	Permanent posts	Temporary Posts
AD 16				
AD 15		1		
AD 14	1			1
AD 13	14	5	8	3
AD 12	16	8	9	1
AD 11	5	19	6	15
AD 10	3	27	2	22
AD 9	1	20	1	30
AD 8		34	8	43
AD 7		47	2	32
AD 6		40		36
AD 5			1	
AD total	**40**	**201**	**37**	**183**
AST 11	3			
AST 10	3		1	
AST 9	3		1	
AST 8	1		2	
AST 7	3		2	
AST 6	1	3	3	1
AST 5	1	13		9
AST 4		11	3	7
AST 3			1	10
AST 2			2	
AST 1				
AST total	**15**	**27**	**15**	**27**
AST/SC total	**0**	**0**	**0**	**0**
TOTAL	**55**	**228**	**52**	**210**
GRAND TOTAL	**283**		**262**	

9. Glossary and Abbreviations

ABAC	Accrual Based Accounting
Accounts payable	Organisation's current payables due within one year. Accounts payable are current liabilities..
Accounts receivable	Organisation's current receivables due within one year. Accounts receivable are current assets.
Accrual accounting	Accounting methodology that recognises income when it is earned and expenses when they occur, rather than when they are actually received or paid, as opposed to cash accounting.
Actual = Actual amounts	Budget outturn = Budget execution = Budget implementation
Assets	Assets are items owned by an individual or an organisation, which have commercial or exchange value. Assets may consist of specific property or claims against others.
Cash accounting	Accounting methodology based on cash flows, i.e. transactions are recognised when cash is received or paid, as opposed to accrual accounting.
Current asset	The group of assets considered to be liquid in that they can be turned into cash within one year.
Current liability	Liabilities to be paid within one year of the balance sheet date
EC	European Commission
EU	European Union
External assigned revenues	Funds received from sources other than the European Commission for specific purpose
Financial statements	Written reports which quantitatively describe the financial health of an organisation. They comprise the Statement of Financial Performance, the Balance Sheet, the Cash Flow Statement, the Statement of Changes in Net Assets (capital) and the explanatory notes.
Imprest account	Bank accounts and/or cash at hand used for the payment of low value expenses
Internal assigned revenues	Funds received for specific assigned operations and activities from amounts recovered
IO	ITER Organisation
Liability	A financial obligation, debt, claim, payable or potential loss
PA	Procurement Arrangement: the PA between F4E and IO define the F4E deliverables to IO as well as the credit allocation scheme for each deliverable under the ITER unit of account
RAL	Commitments resulting in payment appropriations remaining to be paid