FUSION FOR ENERGY

2019

Annual Activity Report

Part I

This report fulfils the requirement of Article 48 of F4E's Financial Regulation on the provision of a Consolidated Annual Activity Report (Part I)

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Design by Martial Boulguy

2019

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FOREWORD

Imagine if we could create a small Sun on Earth to make a virtually inexhaustible and clean energy source - this sounds like science fiction but it is the ultimate mission of Fusion for Energy ("F4E").

We are the main contributor to ITER – an international project to build and operate the largest research machine to create solar fusion. We also have three fusion projects with Japan.

I am very proud to be the Director of F4E and will use this report to tell you about some exciting developments in 2019.

ITER has been 'the project that takes one year longer every year' but I am sure if you look through the following pages you will see that it is really going full speed ahead.

2019 has been the year where everyone could see and feel the very big components we build for ITER taking shape!

Working with ITER Organization and our international partners (China, India, Japan, Korea, Russia and US) we are 70% on the way to switch on ITER in 2025 in its first configuration.

A key achievement of European industry was the successful insertion and welding of the first of the ten European superconducting Toroidal Field coil magnets, please see the impressive pictures on page 26.

As this report shows, we also made important progress in many other areas of ITER works including the assembly of one of the largest cryoplants in the world. If you see the pictures (page 45), I hope you agree with me that we are delivering, no doubt.

We are also close to completing the assembly of a smaller fusion experiment in Japan called JT60-SA so that European scientists bridge the gap until ITER starts operating, see page 58

I appreciate that this is a tremendous investment of public money and thank you to entrust it to us.

F4E partners with more than 500 European companies and 70 research organisations through 1 000 contracts for a value of €4.2bn. This investment has produced benefits of around €4.8 billion, 34 000 job years to Europe's economy as well as high-tech expertise and spin-offs.

I invite you to look through this publication and discover many more of our achievements during 2019 and if you are curious, I encourage you to visit our website and to follow us on social media.

Johannes P. Schwemmer
Director

What is Fusion for Energy (F4E)?

F4E is the European organisation managing Europe's contribution to ITER— the biggest scientific experiment on the path to fusion energy. This partnership of seven parties (China, Europe, Japan, India, the Republic of Korea, the Russian Federation and the USA), represents half of the world's population and 80% of the global GDP. Europe is responsible for nearly half of the project, while the other six parties contribute equally to the rest.

Our mission is to bring fusion, the energy of the Sun and the stars, to Earth. To do so, we are working closely with industry and research organisations to provide the infrastructure and the components for ITER. In parallel, F4E is involved in three major fusion R&D projects, stemming from the Broader Approach Agreement signed between Europe and Japan. Ultimately, F4E will contribute towards the development of a demonstration fusion reactor (DEMO) and related facilities including the International Fusion Materials Irradiation Facility.

F4E is a Joint Undertaking created under the Euratom Treaty by a decision of the Council of the European Union. F4E was established on 19 April 2007 for a period of 35 years. Its headquarters are in Barcelona (Spain) and has offices in Cadarache (France) and Garching (Germany) with over 450 staff and a budget of € 6.6bn until 2020 (in 2008 values). F4E is governed by the 27 Member States of the European Union, Euratom and Switzerland

To carry out its tasks, many involving the development of cutting-edge technologies, F4E is investing most of its resources through contracts with European industry, SMEs and research laboratories.

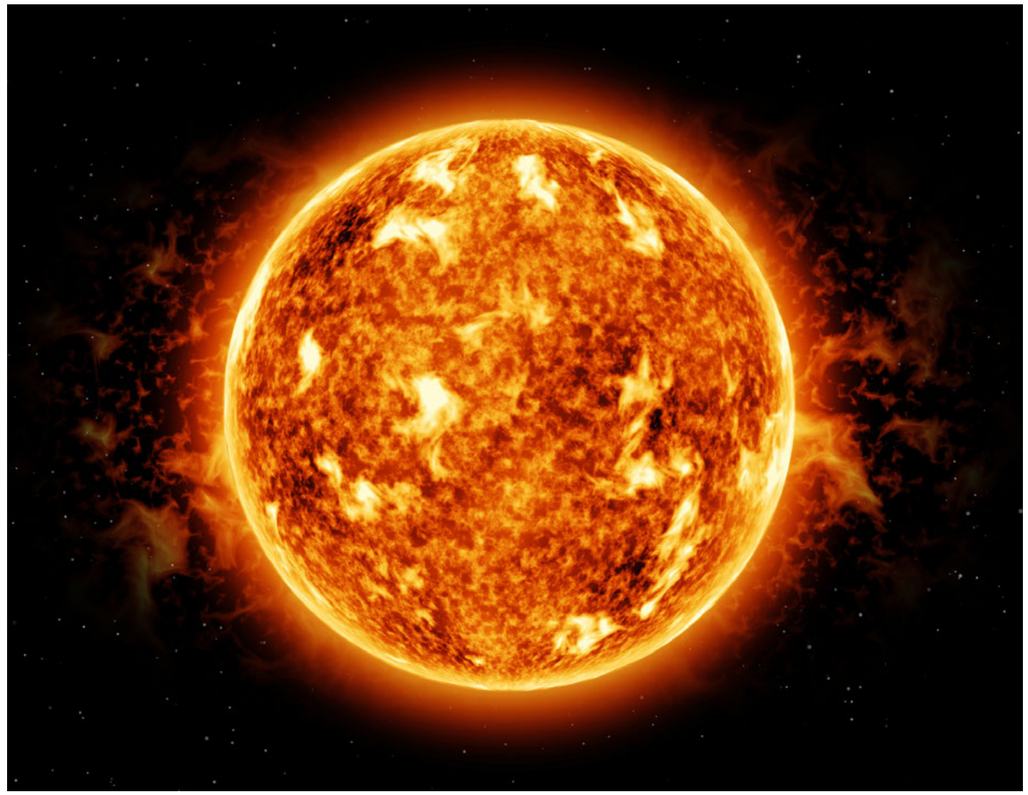
What is fusion?

Fusion is the energy that powers the stars. Our Sun is a gigantic fusion device, the biggest in our solar system. The energy making life on Earth possible. In the core of the Sun, hydrogen atoms move at incredible speed. Light atoms of hydrogen fuse into one heavier atom of helium. The reaction releases lots of energy in the form of light and heat.

To replicate the fusion reaction, we need two kinds of hydrogen: deuterium and tritium. But because they are both positively charged they tend to repel one another. On the Sun, due to the strong gravity, hydrogen atoms fuse at. On Earth, however, because of the weaker gravitational forces, they need to be heated at temperatures as high as 150 million °C in order to collide. Deuterieum can be found in sea water. We have enough supplies to last millions of years. Tritium can be generated from lithium, extracted from the crust of the earth.

For decades scientists have been trying to figure out how to produce this energy through various experiments. Although the principle is simple, they face several challenges. At, hydrogen atoms separate into a sea of ions and electrons forming an 'electrically-charged gas' known as plasma. One of the most successful types of fusion experiment is the Tokamak - a doughnut-shaped device that uses a powerful magnetic field to contain the plasma.

Europe has been at the forefront of fusion and the JET project has released large quantities of fusion energy. The next step is to develop a much larger machine that can produce more energy than required to heat up the plasma. This is the aim of ITER.



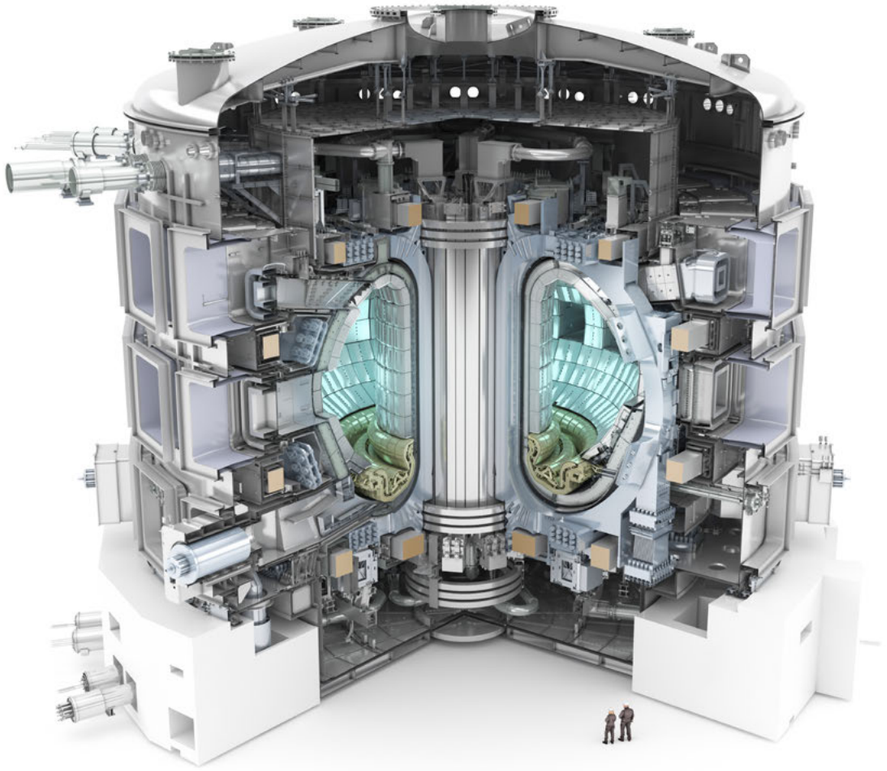
What is ITER?

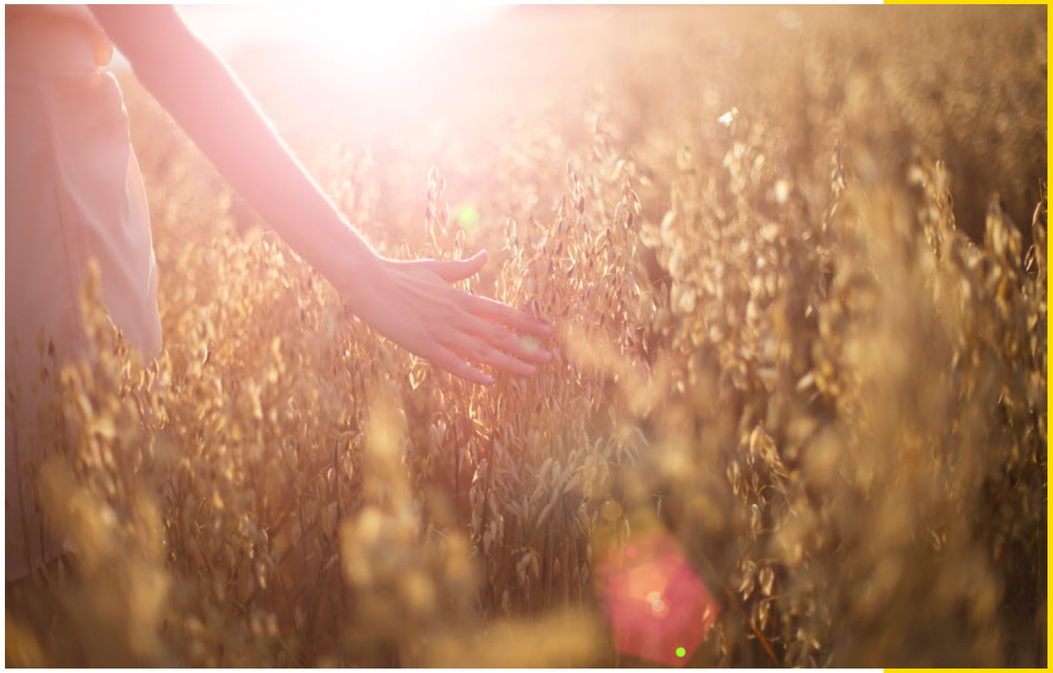
ITER, which in Latin means “the way”, will be the world’s biggest experiment on the path to fusion energy. It will be the first fusion device to generate more energy than that it consumes, relying on an impressive range of technologies which are essential to deliver fusion power in future. Europe is the host of the project which is currently under construction in Cadarache, south of France

ITER is a global scientific partnership of unprecedented scale bringing together half of the world’s population: China, Europe, Japan, India, the Republic of Korea, the Russian Federation and the United States. ITER will be the largest Tokamak device to test magnetic confinement to produce fusion energy. It will count millions of components, operated by cutting-edge systems, so as to measure its performance, and draw lessons for a future commercial fusion power plant.

Once the fusion fuel is in machine, powerful heating systems will raise the temperature to 150 million °C in order to generate a super-hot plasma, which will be housed inside a doughnut-shaped chamber. To avoid any contact between the hot gas and the walls of the chamber, gigantic magnets will be cooled down to -269 °C to become superconductive so as to create a massive magnetic cage around it.

Europe as the Host Party and France, as Host State, have special responsibilities for the success of the ITER. Europe bears 46 % of the construction cost including all the buildings. It will provide 34 % of the cost of operation, deactivation and decommissioning of ITER.





Why fusion?

Energy consumption is expected to increase dramatically over the next 50 years as the world’s population grows and developing countries become more industrialised. At the same time we have recognised the threat of climate change due to global warming produced by greenhouse gas emissions. The EU aims to be climate-neutral by 2050 – an economy with net-zero greenhouse gas emissions. This objective is at the heart of the European Green Deal and in line with the EU’s commitment to global climate action under the Paris Agreement. Fusion could be a future low carbon energy option and help to deliver a sustainable, secure and safe energy mix complementing renewables. The key advantages of fusion are:

- Very low global impact on the environment – no production of CO2 greenhouse gas emissions or long-lasting radioactive waste
- Fusion fuel is abundant everywhere on the planet reducing the risk of any geopolitical tension; they can be extracted from sea water and the crust of the earth
- Fusion machines are inherently safe posing very low risk to populations in the vicinity. Any malfunction causes the plasma to cool down immediately and fusion stops

Fusion contributes towards the EU’s policy objectives. In 2018 the Council recognised “the fundamental importance of the ITER project in the European fusion roadmap […] in view of achieving the commercial deployment of fusion power in a cost efficient way”. In its 2019 report to the European Parliament and the Council, the Commission stated “ITER remains an important part of EU energy and innovation policies and, its potential role in the decarbonisation of the energy landscape post-2050 is very significant. […]the ITER project places the EU at the forefront of fusion research, and various European initiatives cite ITER as an example of the EU investing in future energy solutions.”

Investment in fusion is not only opening up the path to a new form of clean and sustainable energy but is also offering European industry and research organisations unparalleled opportunities to becoming more competitive by acquiring new skills and knowledge; providing skilled employment opportunities, entering into new business markets, and creating spin-offs. Studies have shown that F4E’s spending on ITER has already produced 34 000 job years and almost €4.8bn in added value to the EU economy. Last but not least, research in fusion is advancing our scientific understanding of plasma which is estimated to make up 99.99% of the universe.

2019 KEY FIGURES

Project Progress

ITER Project Progress

67%

Progress towards ITER First Plasma in 2025

53%

Progress towards ITER construction

F4E's Contributions to ITER

43%

European in-kind Contributions to ITER delivered

35%

Share of in-kind contributions among ITER members

46%

Share of in-cash contributions to ITER among members

Broader Approach Project Progress

99%

European contributions to Satellite Tokamak delivered

98%

European contributions to IFMIF/EVEDA delivered

100%

European contributions to IFERC delivered

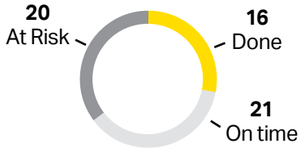
Project Performance

94%

Internal Milestones Achieved in 2019

95%

Estimated project cost compared to total budget



Status of Main ITER Council & GB Milestones

Contracts with Industry and Laboratories

€229m

Contracts signed in 2019

€4.2bn

Total value of contracts signed from 2007-2019

€4.8bn

Estimated Benefit to EU Economy

>600

Companies and Research Organisations

>1500

Subcontractors

34,000

Job-Years Created

Budget and Finance

€6.6bn

Budget 2007-2020 (2008 values)

€730m

2019 Commitments Budget of which implemented

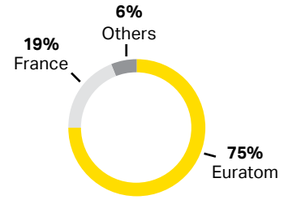
99.8%

€761m

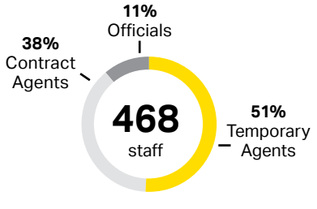
2019 Payments Budget of which implemented

97.1%

Contributions to F4E's 2019 Budget



People



36% female - 64% male

Vacancy Rate **4.8 %**

Turnover Rate **3.2%**

Absenteeism Rate **1.8 %**

Some of the F4E achievements during 2019

January

Europe's suppliers start working on the first series of ITER Divertor Cassettes. Progress made in designing a leak detection system for ITER. The 40-degree crown mockup on the construction site celebrated for serving a learning purpose.

March

ITER Pre-Compression Rings manufacturing started. Spin-off unveiled in the field of accelerators developed by Seven Solutions through involvement in IFMIF-EVEDA. Commercial partnerships explored during 1100 B2B meetings at ITER Business Forum-2019.

May

JT-60SA central solenoid installed. Massive steel roof pillars of Tokamak building delivered on-site. Sixth Poloidal Field coil entered final production phase. F4E and European Fusion Laboratories test Test Blanket Modules technology and equipment.

February

Chairman of European Parliament Budget Committee visited ITER site. Winding concluded for Europe's second Poloidal Field coil. Tokamak building crown and bioshield completed.

April

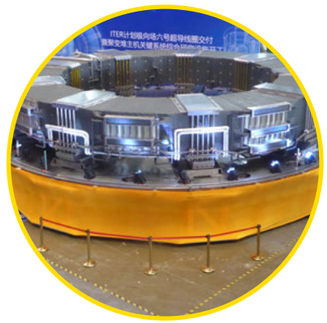
F4E handed over to ITER Organization Magnet Power Conversion buildings. Designs for Diagnostics feedthroughs approved. Blanket Cooling Manifold prototype structures approved.

June

MITICA beam source vessel installed. SPIDER delivered its first hydrogen beam. First Pre-Compression Ring completed by CNIM. Fusion and ITER project discussed at EU Sustainable Energy Week.

July

Qualification procedure for the Blanket Shield Module successfully concluded. MITICA High Voltage Deck and High Voltage Bushing Assembly tests performed successfully.



September

Testing started for the combined operation of JT-60SA power supplies. F4E and ASIPP completed manufacturing process of the sixth Poloidal Field coil. ITER presented at European Research and Innovation Days.

November

Final concrete poured at Tokamak building. Lower segment of ITER Vacuum Vessel sector 5 completed and ready to go through radiographic tests.

August

Vacuum vessel manufacturing progressed with all electron beam welding completed for sector 5 assemblies. F4E in collaboration with Air Liquide successfully completed the installation of the MITICA cryoplant.

October

Insertion of Toroidal Field coils in cases and welding operations accelerated. Europe delivered its first Electron Cyclotron Power Supply unit to ITER.

December

Notable progress in Poloidal Field coils manufacturing. Europe signed last major contract for the ITER Neutral Beam Test Facility. F4E Director presented ITER progress at European Parliament's Budgetary Control Committee.

SOME OF THE ITER ACHIEVEMENTS DURING 2019

ITER Organization

- On Coil Power Supply, the first unit of Filter Reactors and Thyristor Controlled Reactors (TCRs) was successfully installed.

China

- Alternative Current / Direct Current production close to an end conducted were delivered to Europe in September.
- On the Correction Coils (CC):
  - Series production of the Bottom Correction Coil (BCC) is ongoing: two are finished and one have been tested.
  - Series production started for the Side Correction coil after successful qualification.
- The first two In-Cryostat Feeders were delivered in early August, and the following two are under assembly.
- 4 Cold Terminal Boxes have been integrated. The following two are underway.
- 4 Cryostat Feedthroughs have been integrated and tested.
- On the Shield Blanket, 91 series production forgoing have been complete and 63 are on-going.

Korea

- On the Vacuum Vessel sectors 6, 7, 8 and 1, the manufacturing is ongoing in order to ensure First Plasma.
- Regarding the Vacuum Vessel ports, the first Lower Port Stub Extension (LPSE) were delivered.
- On the AC/DC Converters, Factory Acceptance Tests were completed on the first batch of converters in July 2019.
- On the thermal shield, silver coating was completed on sector 6 of the Vacuum Vessel and shipped.

India

- The Cryostat is over 60% complete. The Cryostat base section was handed over to IO in June 2019. Upper Cylinder Tier-1 & Tier-2 sectors have been delivered.
- The Cooling Water System manufacturing and shipment is reaching completion: 93% for the piping and 90% for the equipment.
- On the In-Wall Shielding, 66% of the blocks have been manufactured and shipped.
- 80% of cryolines and cryodistribution have been manufactured, and about 20% of it have been installed on-site.
- Ion-Cyclotron RF Power Sources (ICRF) were successfully tested in IN-DA Test Facility at 1.5 MW power level.

Japan

- For the Toroidal Field (TF) coil 1, the case closure welding as well as the gap filling impregnation was completed
- For TF 2, the case closure welding is completed and gap-filling impregnation has started.
- The casing of TF 4 was delivered to the EU
- Factory Acceptance Test were completed on the second Gyrotron.

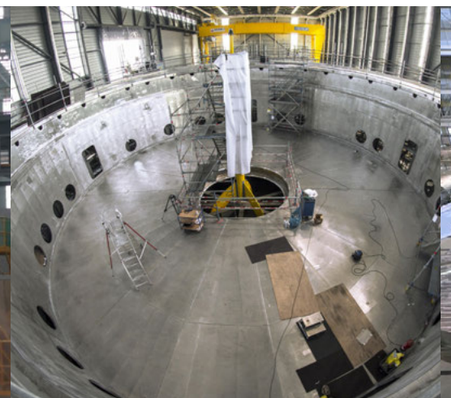
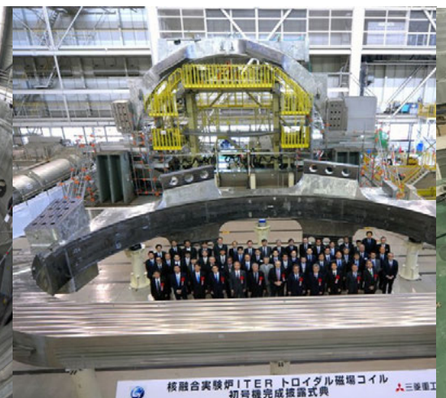
Russia

- On PF 1, the eighth and final double pancake has been successfully impregnated.
- On the Vacuum Vessel upper ports, the central upper port No. 16 was manufactured.
- On the Blanket First Wall panels, a plan for inspection of the First Wall full-scale prototype panel has been developed
- On the Dome Divertor, the manufacturing of a full-scale prototype is in progress.
- On the Plasma Facing Component Test, the operational capability of the new hypervapotron design has been verified.

United States

- Central Solenoid Module 1 testing is underway. Two rounds of Paschen and hipot testing were successfully completed.
- The fabrication of the Central Solenoid Lower Key Block is completed.




01

Building ITER

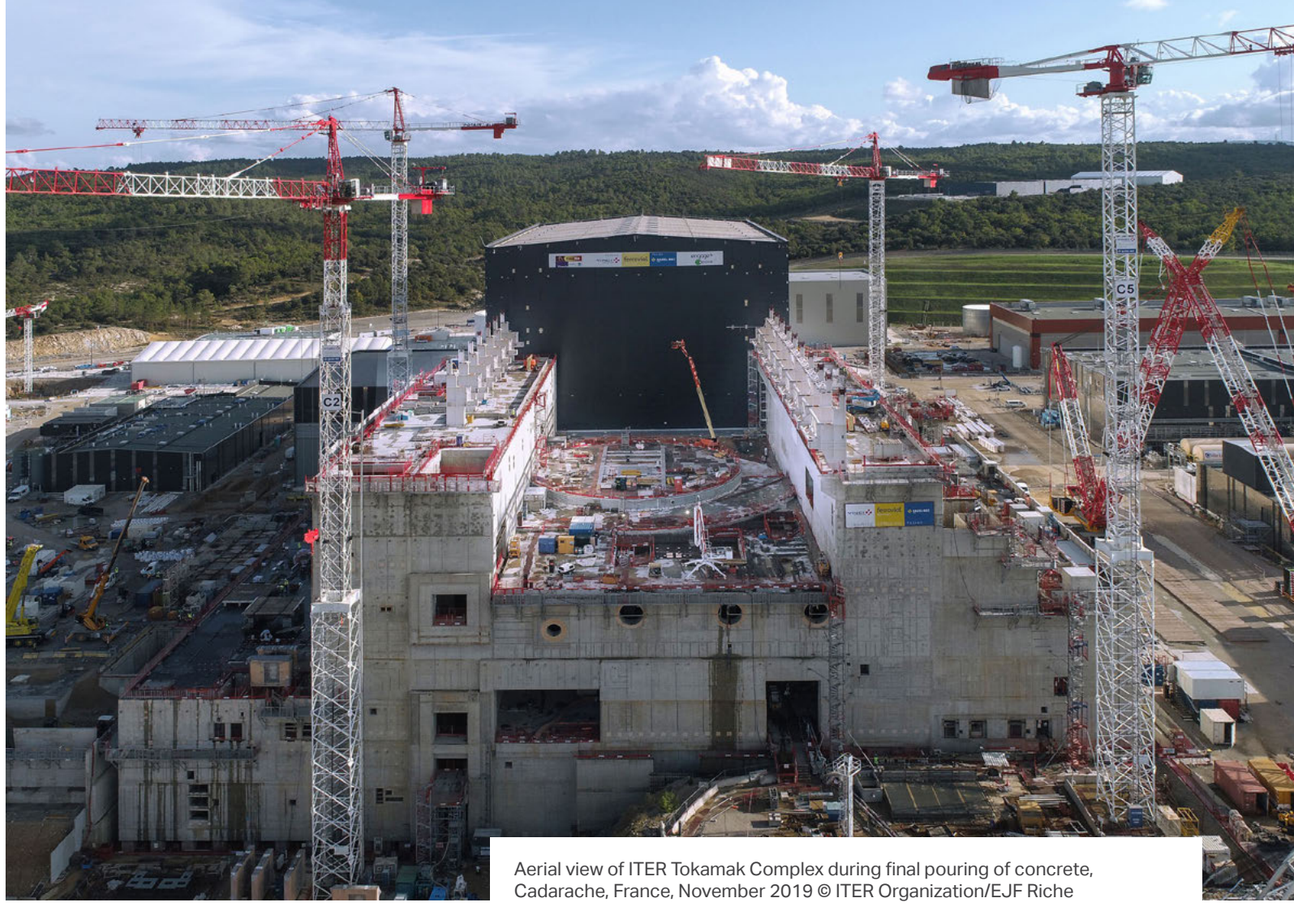
The ITER platform measures 42 hectares and is located in Cadarache, south of France. It is one of the largest man-made levelled surfaces in the world.
Europe is responsible for the construction of 39 buildings, as well as of the infrastructure and power supplies on-site required to operate the world's biggest fusion machine.
More than 2 000 people working for European companies are involved in ITER's civil engineering works. Architects, engineers, technicians, planners, inspectors are some of the professionals contributing to the project. They are building the facilities where the components arriving from all over the world will be delivered, assembled and installed.
Day by day the workforces on the ground are transforming the platform into the "home" of one of the most impressive technology projects.

THE ITER SITE

Europe has mobilised its workforces on the ground to transform the Tokamak building, the house of the ITER device, so that the first pieces of equipment get installed according to schedule. The pouring of the last concrete was an important milestone towards the completion of the civil engineering works which started five years ago. The first massive steel pillars, placed on the top floor of the building, offered a sense of how impressive its rooftop will be like. There were also important activities unfolding on the lower floors of the building. For instance, F4E handed over to ITER Organization the ground and first floors to move forward with the next wave of works; the bioshield was completed and further progress was made with the installation of the port cell doors. The Magnet Power Conversion buildings and that of Electrical Power Supplies were also delivered. Works in the galleries advanced rapidly forming a maze below the ground in order to install the piping and cabling of the project. Here are some of this year's main achievements on the ITER construction site.

Construction in progress

Contracts signed	74%
Construction completed	55%
Tokamak	77%
Assembly bldg.	95%
Radio Frequency bldg.	46%
Site Service bldg.	84%
Cryoplant bldg.	84%
Power Supply	66%
Magnet Power Conv. Bldg.	100%
Cooling Towers Bldg.	100%



Aerial view of ITER Tokamak Complex during final pouring of concrete, Cadarache, France, November 2019 © ITER Organization/EJF Riche

Final pouring of concrete at the Tokamak building

The VFR consortium (VINCI, Ferrovial, Razel-Bec) poured the final concrete at the Tokamak building marking an important moment on-site. The first excavation works began in 2010 - a turning point in the history of the project. Four years later the first pouring of concrete took place. The tight schedule, the precision required, the complex design of the machine and need to comply with the high standards set by the French Nuclear Safety Authority, were some of the challenges we had to face. Approximately ten types of concrete were developed for the construction of different parts of the edifice.

Almost like a fortress, the Tokamak Complex comprises the Tritium, Tokamak and Diagnostics buildings. It is 120 m long, 80 m high and 80 m wide. In order to build its foundation slab, 150 000 m^3 of concrete had to poured, and only for the Tokamak building 19 000 t of steel reinforcement bars had to be used.

"Europe is the party responsible for building ITER's infrastructure. Our close collaboration with VINCI, its partners, and more than 700 workers, has enabled us to finalise successfully this phase in compliance with the safety, security and quality requirements."

Laurent Schmieder
F4E Programme Manager for Site, Buildings and Power Supplies

"VINCI undertook to write a new chapter in one of the most ambitious and promising research experiments ever undertaken. We warmly thank them for having been a highly capable, reliable partner sharing our objectives, standards and determination. The success of ITER will be theirs."

Bernard Bigot
Director-General of ITER Organization

"VINCI Construction and its partners Razel-Bec and Ferrovial are extremely proud of carrying out the ITER civil engineering works. This is an extraordinary human undertaking, posing a huge technical challenge, and we were constantly called on to innovate and expand our expertise. With ITER, we are humbly helping to implement one of the greatest and most ambitious energy projects of our time, designed to make electricity available without CO_2 emissions."

Jérôme Stubler
Chairman of VINCI Construction

TOKAMAK COMPLEX

Diagnostics, Tokamak and Tritium buildings

Dimensions: 120 x 80 m, 60 m high, 17 m deep

Weight: 360 000 t (the equivalent of the Empire State building)

A massive rooftop for the Tokamak building

An impressive 2 000 t rooftop structure of the Tokamak building started to get erected. It will cover the crane coming from the Assembly Hall to the Tokamak Building, which will transport the exceptionally heavy components directly into the central pit. F4E installed all the steel structure columns and beams needed to support the roof.

Tokamak building rooftop fully installed, December 2019

Power to the magnets

In order to power the giant ITER superconducting magnets and thus confine the plasma, a strong electrical current is needed. This will be managed by electrical converters, switches, as well as fast discharge units delivered by China, Korea and Russia, all housed inside two 150 m long Magnet Power Conversion buildings. F4E provides these buildings which measure 4 900 m^2.

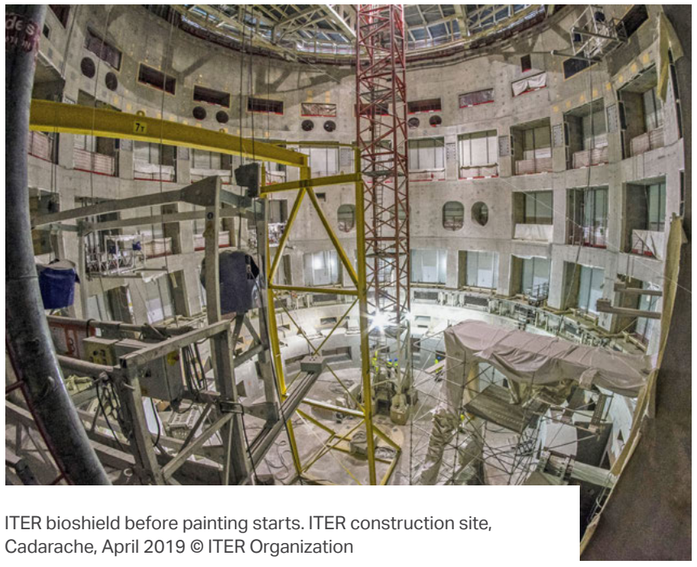
In March, the Magnet Power Conversion buildings were officially handed over by F4E to the ITER Organization signalling another major delivery from Europe to the ITER project. This was the culmination of nearly two years of design and three of construction counting on the support of 150 people at peak time. It will be now up to ITER Organization and China to supervise the installation of the equipment.

View of the equipment installed in the Power Supplies building. The works have been financed by F4E and carried out by Ferrovial, ITER construction site, Cadarache, France, October 2019 © F4E

Bioshield and port cell doors to protect ITER

The bioshield, a massive cylinder made of concrete around the ITER device will act as a safety barrier between the ITER device and the rest of building, keeping the radiation inside the machine. Another measure of shielding is offered by the port cell doors weighing more than 50 t each. F4E in collaboration with its contractors installed 28 out of a total of 40 heavy doors.

To ensure the best clean-up in the case of an incident, the floors, walls and ceiling of the Tokamak building must have a smooth surface. The first and second basement floors of the Tokamak Complex were painted. ITER Organization moved ahead with the installation of the first components in the Diagnostics and Tokamak buildings.



ITER bioshield before painting starts. ITER construction site, Cadarache, April 2019 © ITER Organization

Johannes Schwemmer, Director of F4E; Joaquín G. Vidal, Ferrovial; Bernard Bigot, Director of ITER Organization; cutting the ribbon at the handover ceremony held on the ITER construction site, Cadarache, France.

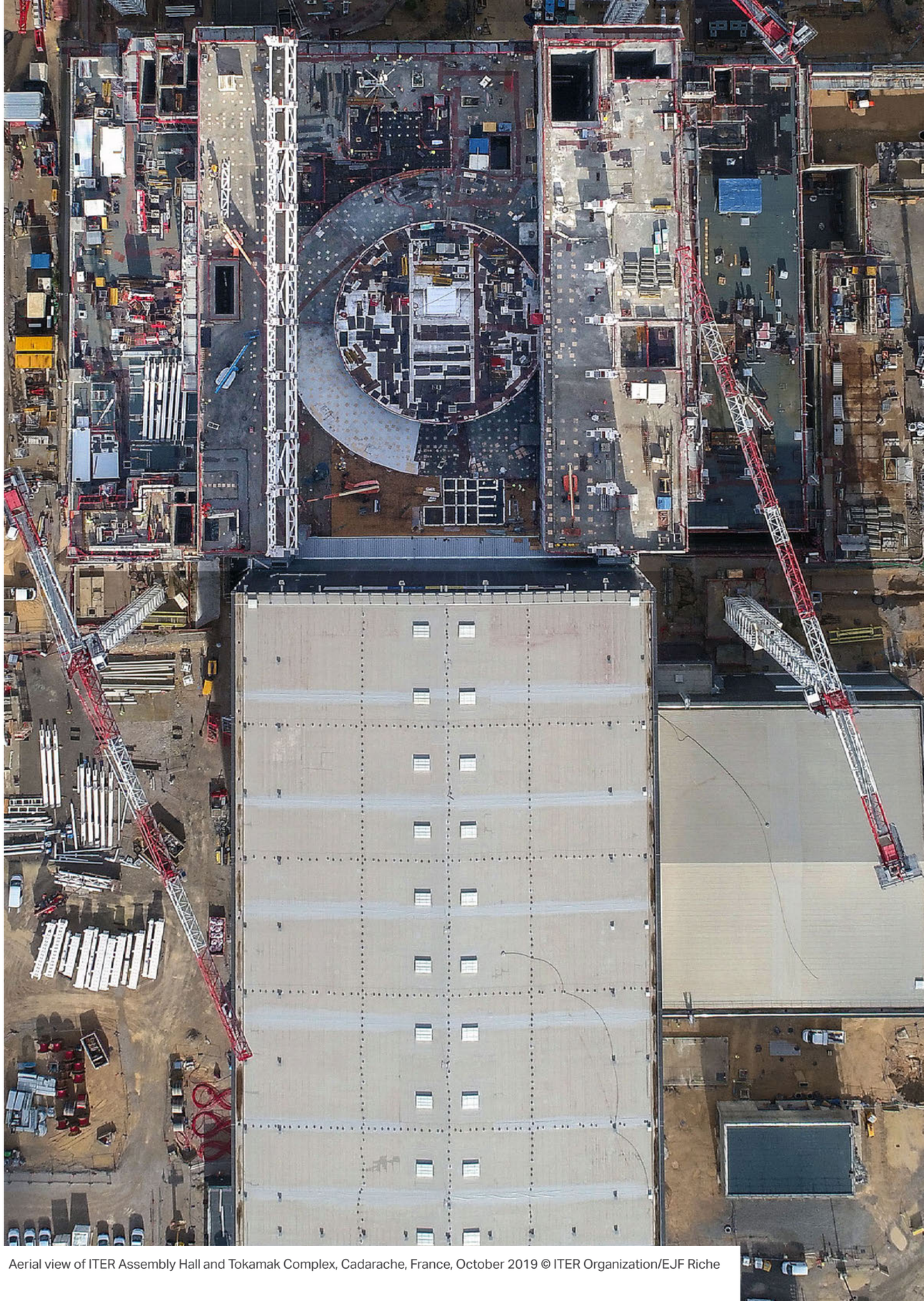
First phase of infrastructure works and galleries completed

Works on the site unfolded both above and below ground. In the maze below the ground, the piping and cabling of the project crossed the site. In December 2019, the site infrastructure works on deep buried networks, and galleries, connecting the ITER buildings came to completion.

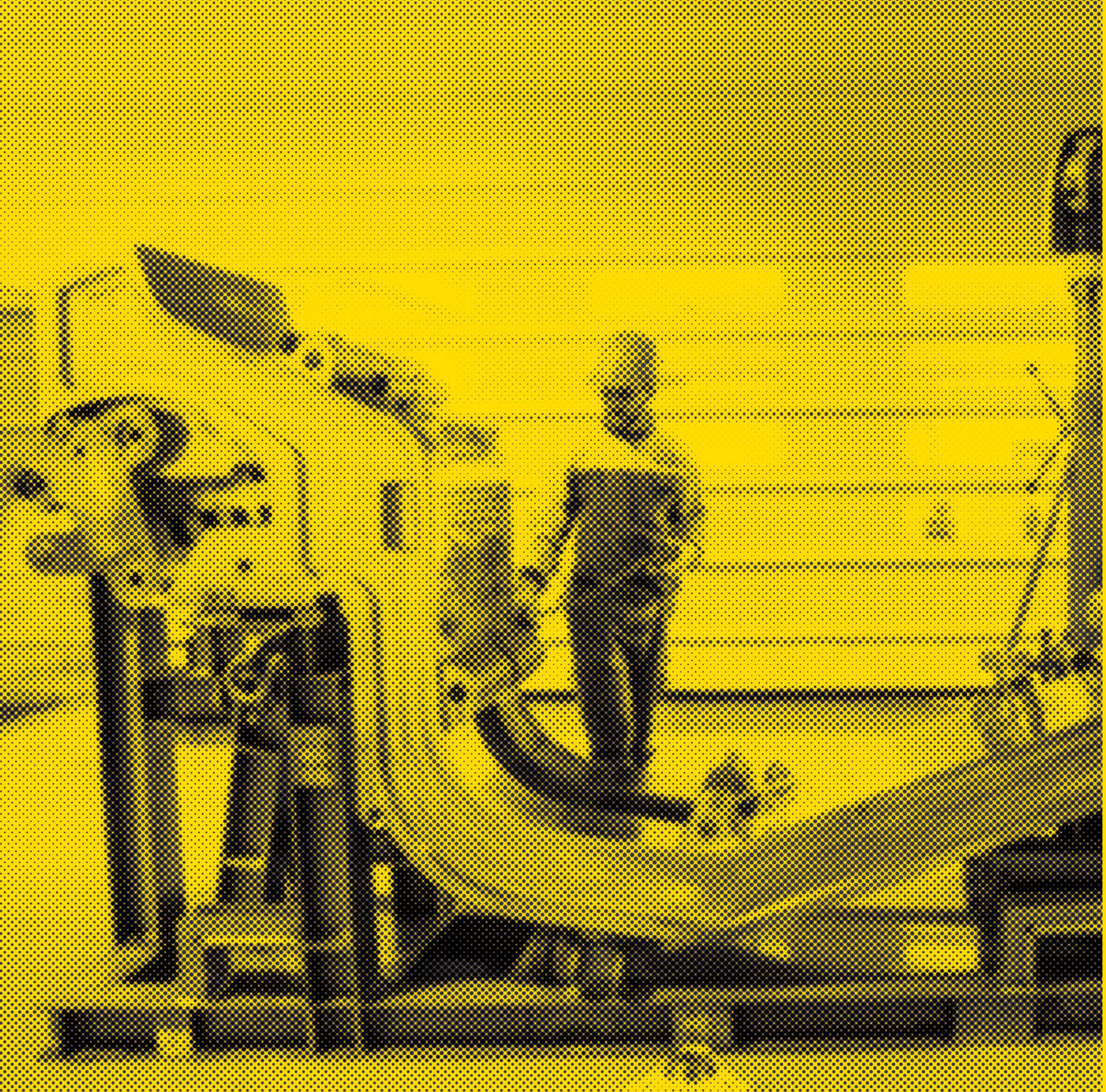
Getting ready for Assembly

F4E gave ITER Organization access to the 60 m-tall Assembly Hall to start assembly activities, with full building testing and commissioning progressing, and takeover planned for the following year. A major milestone was reached with the successful energisation of the first bay of the Pulsed Power Electrical Network. Electrical works continued with the progressive energisation of the ITER buildings and areas.

Inside the Assembly Hall, pipping and HVAC testing are performed whilst other contractors are coating its 6 500 m² floor with epoxy resin, Cadarache, France, October 2019 © ITER Organization



Aerial view of ITER Assembly Hall and Tokamak Complex, Cadarache, France, October 2019 © ITER Organization/EJF Riche

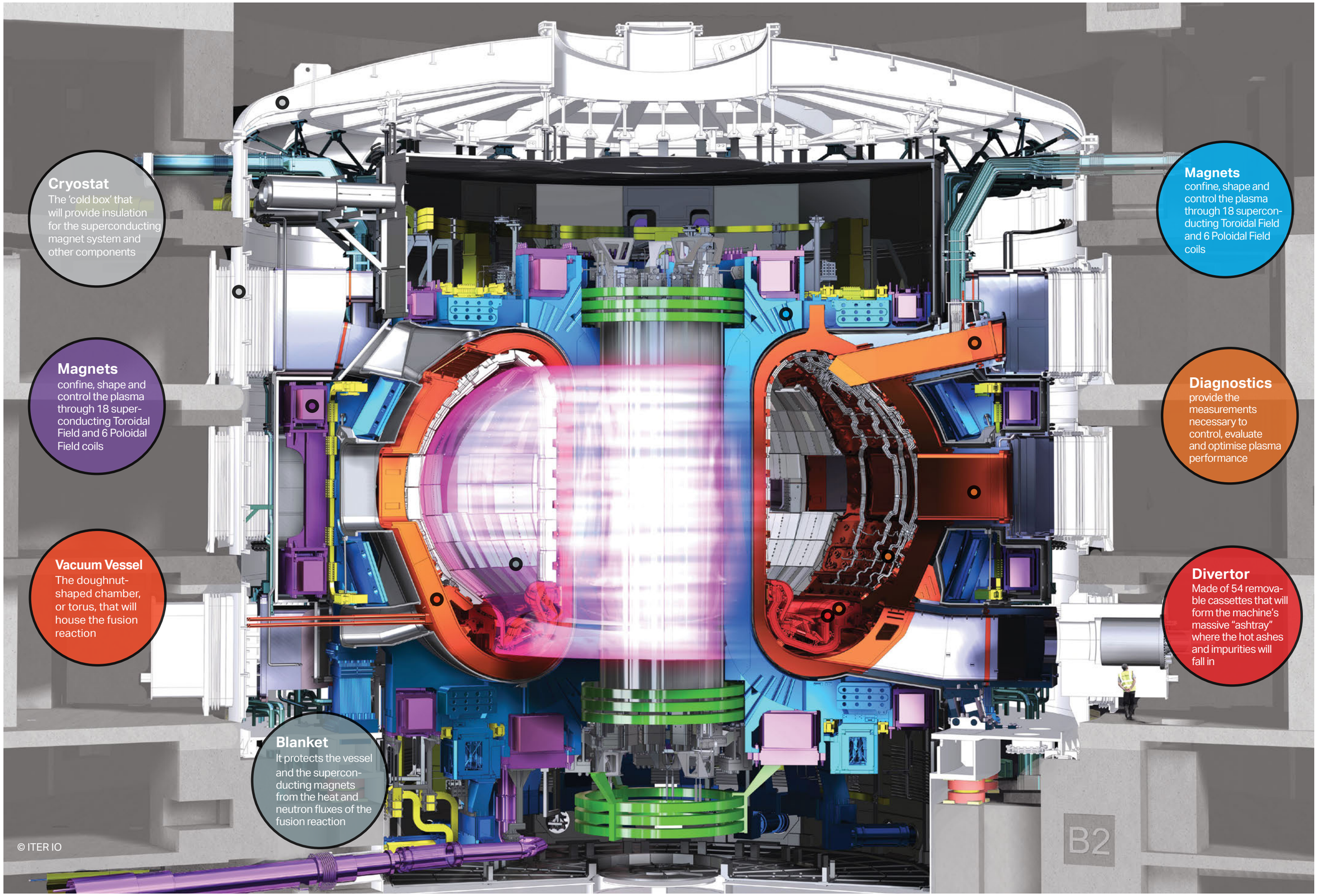


02

Manufacturing the ITER components

ITER is the biggest international scientific partnership to test the potential of fusion energy. It's an impressive technology puzzle that will generate new knowledge and stimulate industrial expertise to manufacture its components.

Europe's contribution to ITER, financed by the EU budget, amounts to roughly 50% making it the biggest of all Parties. It is a one-of-a-kind opportunity for industry, SMEs and fusion laboratories to get involved and be part of an emerging energy market. The manufacturing of components spreads all over Europe encompassing an impressive supply chain of at least 520 main contractors and approximately 1670 subcontractors.


Cryostat
The 'cold box' that will provide insulation for the superconducting magnet system and other components
Magnets
confine, shape and control the plasma through 18 super-conducting Toroidal Field and 6 Poloidal Field coils
Vacuum Vessel
The doughnut-shaped chamber, or torus, that will house the fusion reaction
Blanket
It protects the vessel and the super-conducting magnets from the heat and neutron fluxes of the fusion reaction
Magnets
confine, shape and control the plasma through 18 superconducting Toroidal Field and 6 Poloidal Field coils
Diagnostics
provide the measurements necessary to control, evaluate and optimise plasma performance
Divertor
Made of 54 removable cassettes that will form the machine's massive "ashtray" where the hot ashes and impurities will fall in
© ITER IO
B2

MAGNETS

ITER will rely on a sophisticated system of superconducting magnets. Think of the central solenoid as its backbone. The correction coils will act as guards to reduce any magnetic errors resulting from the position and geometry of other coils.

To confine ITER's 150 million ˚C plasma, and keep it away from the walls of the Vacuum Vessel, a first layer of magnets consisting of the Toroidal Field (TF) coils is used. Europe is manufacturing ten out of the 18 TF coils for ITER, involving more than 700 people from 40 industrial partners.

To cope with the tremendous forces due to the powerful magnetic fields, six Pre-Compression Rings (PCRs) will tightly hold the TF Coils in place. An extra set of three will be manufactured as spares in case there is a need in future to replace the lower set. Europe is providing all nine Pre-Compression Rings (PCR) using a cutting-edge fiberglass technology.

Finally, six Poloidal Field (PF) coils embrace the TF coils from top to bottom in order to maintain the plasma's shape and stability. Europe is responsible for five of them. Four must be built on-site because of their size while one is being manufactured in China under contract with F4E.

Work in progress Toroidal Field coils

Contracts signed	100%
Tooling	100%
Qualification	100%
Manufacturing	91%

Work in progress Poloidal Field coils

Contracts signed	100%
Tooling	93%
Qualification	85%
Manufacturing	32%

Work in progress Pre-Compression Rings

Contracts signed	100%
Tooling	100%
Qualification	100%
Manufacturing	55%

"The results we have obtained so far represent ten years of hard work and careful planning. Our strategic thinking helped us to analyse upfront, and to define the proper implementation strategy."

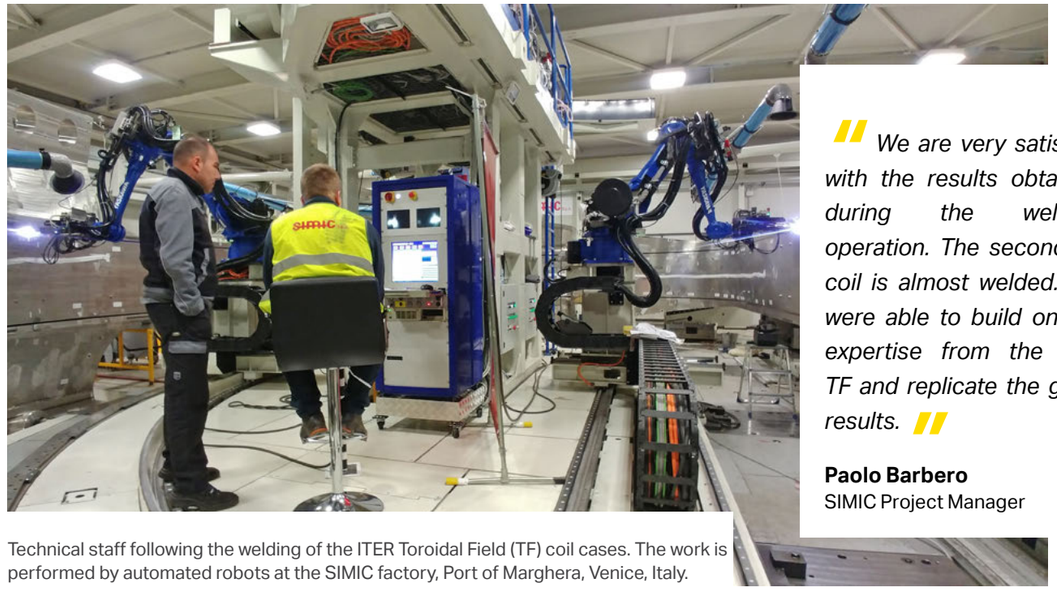
Alessandro Bonito-Oliva
F4E Magnets Programme Manager

One of Europe's Toroidal Field (TF) coils on the assembly rig where gap filling operations are performed. Thermal mats cover the entire coil to raise the temperature of the component so that the resin injected hardens as it fills in the space between the coil and its case. The work is performed at the SIMIC factory, Port of Marghera, Venice, Italy. Ten of the 18 TF coils will be delivered by F4E and its suppliers

Toroidal Field (TF) coils

First European TF coil on the verge of completion

F4E achieved a major milestone with the successful insertion and welding of the first of the ten European TF coils into its case. This is the proof that F4E has been able to conduct all first of a kind and complex operations needed for the fabrication of one coil and ready to replicate them for the remaining nine.



"We are very satisfied with the results obtained during the welding operation. The second TF coil is almost welded. We were able to build on the expertise from the first TF and replicate the good results."

Paolo Barbero
SIMIC Project Manager

Technical staff following the welding of the ITER Toroidal Field (TF) coil cases. The work is performed by automated robots at the SIMIC factory, Port of Marghera, Venice, Italy.

How is Europe producing its share of TF coils?

The fabrication of Europe's TF coils kicked off in ASG Superconductors (La Spezia, Italy), where technicians rolled out the entire fabrication process starting with the spooling of the conductor until the production of the inner-structure of the magnet, known as Winding Pack. This stage also counts on the contribution, either by means of components or expertise, of Iberdrola Ingeniería y Construcción, ICAS consortium, Elytt, SIMIC, CNIM.

Then, to become a fully-fledged ITER magnet, the massive component needs to go through a series of cryogenic and electrical tests and to be inserted into its coil case, which is welded, gap-filled with epoxy resin, and machined to make sure its steel panoply is tight and well fitted. These final steps take place in SIMIC (Marghera, Italy).

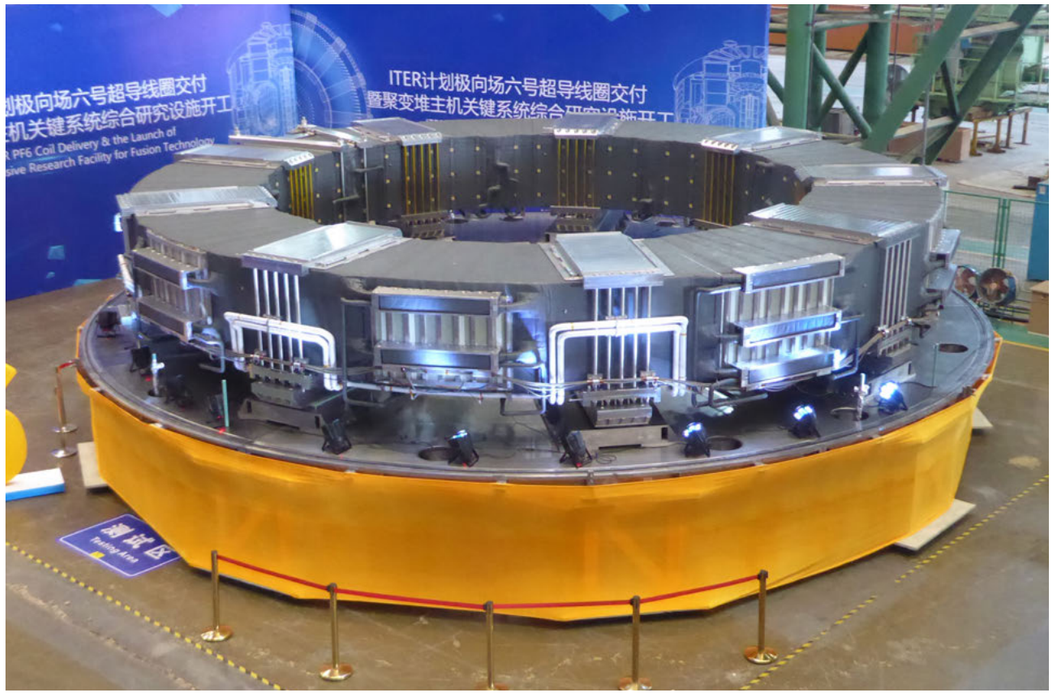
TOROIDAL FIELD COILS

The gigantic "D" shaped coils will be the biggest Niobium-tin (Nb3Sn) magnets ever produced, which once powered with 68 000 A will generate a magnetic field of 11.8 Tesla—about 250 000 times the magnetic field of the Earth! Each coil is approximately 14 m high, 9 m wide and weighs 110 t. When inserted into its metallic case its total load will exceed 300 t, which compares to that of a Airbus 350.

Poloidal Field (PF) coils

First of the six ITER Poloidal Field coils manufactured

In China, at the Institute of Plasma Physics, Chinese Academy of Sciences (ASIPP), the final assembly of the sixth PF coil (PF6) manufactured under contract by F4E was also completed. This achievement brought an end to three years of qualification stages plus another three of fabrication. In autumn, the coil entered the phase of final acceptance tests.



Poloidal Field coil 6 completed in China before final testing.

Manufacturing thrill for ITER magnetic rings

F4E introduced important changes in collaboration with industrial suppliers to stabilise the production of the Poloidal Field (PF) Coils. For the four coils manufactured on the ITER site, the winding pack assembly was completed leading to the final stage of manufacturing of one coil. The production of the Double Pancakes for another coil also progressed. F4E took measures to adapt the planning and tooling of larger coils.

"I recall when the winding operations started, during which we had to learn how to work as one team, and to become familiar with the tooling. The number of people involved has gradually increased and in parallel, we mastered the fabrication techniques. Now we have solid know-how and this also explains why the speed of production has accelerated."

Pierluigi Valente
F4E Senior Technical Officer

Poloidal Field coil 5 positioned to the impregnation table, in the PF coils factory, November 2019, Cadarache, France © F4E

"We revised our working method, improved the training of personnel, and restructured the work between various parties to meet our tight deadlines. We are already installing an additional crane and will erect an annex to carry out the demolding process and some of the manufacturing steps of PF3 and PF4."

Thierry Boutboul
F4E Project Manager

ITER Poloidal Field coils factory on-site, where four of the five coils that Europe is responsible for will be manufactured.

PF COILS FACTORY IN FRANCE

The construction of the PF coils factory was undertaken by F4E together with a number of industrial partners. The factory is about the size of two football pitches: approximately 250 m long, 45 m wide and 17 m high. It includes regular services (heating, ventilation and air conditioning, electrical, piping), two overhead cranes (one standard crane with a capacity of 25 t and another crane especially adapted with a capacity of 40 t), one gantry crane to lift 400 t, offices, technical rooms and workshop space.

Pre-Compression Rings

Production on the roll for ITER Pre-Compression Rings

F4E started the series production of the Pre-Compression Rings (PCRs) using a pultrusion-based technology. By the end of the year, six of the nine rings had been manufactured and five of them successfully proof-tested.

Technicians carrying out checks on the first ITER Pre-Compression Rings undergoing production. F4E is collaborating with CNIM for the manufacturing of the nine rings which will absorb the fatigue and deformation felt by the ITER Toroidal Field (TF) coils.

"The time invested in prototyping and qualification has paid off. After having validated all processes, and carefully examined the production techniques, the fabrication of the nine PCRs became more straightforward."

Eva Boter
F4E Project Manager, responsible for the contract with CNIM

Technician at the CNIM production facility where the ITER Pre-Compression Rings are being manufactured. © CNIM

"Initially, we started working with one supplier using a specific technology. To maximize the probability of success, we explored in parallel an alternative technology, relying on a distinct supply chain using different materials. The latter has proven to be successful. Thanks to the excellent collaboration with our suppliers and the close monitoring of the development and production phases, we have managed to meet the quality standards and to meet the time schedule for the delivery of the PCRs."

Alessandro Bonito-Oliva
F4E Programme Manager for Magnets

"The materials we have opted for respond well to the different tolerance tests performed. Consequently, we are continuing production as planned."

Angela Hernandez
F4E Technical Support Officer, responsible for the contract with EXEL Composites

A prototype of the ITER Pre-Compression Ring being inserted in the CNIM Pre-Compression Rings Facility, La Seyne sur Mer, France © CNIM

PRE-COMPRESSION RINGS

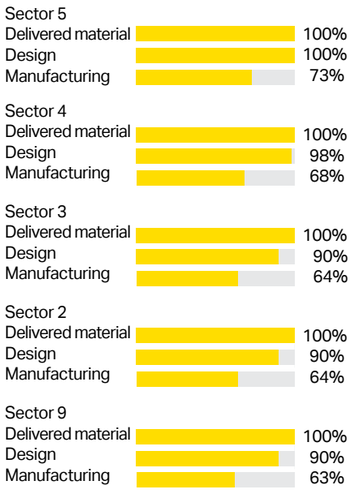
The fiberglass composite rings, consisting of more than a billion miniscule glass fibers, are glued together with a high performance epoxy resin. The rings will have a diameter of approximately 5.5 m, a cross-section of nearly 300 mm x 300 mm and will weigh roughly 3 t. These will be among the largest composite structures ever manufactured as a single piece and are capable of withstanding tremendous forces to keep the TF coils in place (radial force of 7 000 t/coil).

VACUUM VESSEL

The ITER plasma, where the fusion reactions will take place, will be under vacuum inside a special double-walled container, the Vacuum Vessel. Within this doughnut-shaped vessel, plasma particles collide and release energy without touching its walls thanks to magnetic confinement.

Europe is providing five of the nine vacuum vessel sectors of thick special grade stainless steel. Manufacturing these first of a kind components is very challenging due to the strict technical requirements, application of new techniques, and sheer size of the components as each sector is 12 m high, 6.5 m wide and 6.3 m deep. The sectors weigh approximately 500 t each. Nine European companies are involved in their fabrication.

Work in progress



Lower segment of sector 5 of the ITER Vacuum Vessel before installation of In Wall Shielding Blocks. Works performed in Mangiarotti, located in Monfalcone, Italy. Europe is responsible for five out of the nine sectors of the component. F4E has signed a contract with the AMW consortium consisting of Ansaldo Nucleare, Mangiarotti, Walter Tosto.

"The progress of the most complex segment demonstrates how as one team we pulled together our resources, mitigated risks and delivered in line with the technical requirements"

Cristian Casanova
Acting F4E Vacuum Vessel Programme Manager

Important milestone in the manufacturing of sector 5

F4E has entrusted the manufacturing of the five sectors to the consortium of Ansaldo Nucleare, Mangiarotti S.p.A and Walter Tosto S.p.A , plus an extensive chain of sub-suppliers. After nearly two years, some of the most challenging manufacturing tasks were completed. The consortium achieved the installation of the poloidal ribs that connect from top to bottom the inner-shell with the outer-shell of the vacuum vessel. On the segments of sector 5, works kicked off for the outer-shell welding stage, the last operation before final segment machining and assembly of the four segments into sectors.

Lower segment of sector 5 of the ITER Vacuum Vessel loaded on a trailer to go through radiographic tests. Works performed in Mangiarotti, located in Monfalcone, Italy.

"The manufacturing approach that we opted for in the production of the sectors is reverse engineering. Any distortions resulting from fabrication are taken into account and compensated in the fabrication of the other parts. It is a time-consuming exercise, but necessary, so that the end result is in compliance with the tight tolerances requested. For the size of such component and of such geometry this is no easy task."

Andres Dans Alvarez De Sotomayor
F4E Senior Technical Officer

"Significant progress has been achieved during the last months, and in the case of the poloidal ribs they were completed earlier than initially foreseen. The good collaboration between suppliers, F4E, ITER Organization and the other ITER Parties played an important role."

Fabio Ceccanti
F4E Project Manager

F4E STAFF EXPLAINS THEIR WORK ON THE VACUUM VESSEL

Scan the code to watch the video

Overcoming technical challenges in welding

Using electron beam welding on the huge pieces of the vacuum vessel was challenging. F4E reached an agreement with the suppliers to increase the resources on the project on condition that certain schedule performance indicators were met. The first positive results were witnessed by the end of the year.

Before welding: Inspection at ProBeam of the last sector 5 assembly with a central port arriving from Walter Tosto.

REMOTE HANDLING

Remote handling helps us to carry out tasks without being physically present. It is widely used in space exploration missions, underwater repairs or challenging maintenance works. The limited space inside ITER together with the weight and exposure of some of the components to radiation will require the use of remote handling systems during maintenance. Europe is responsible for four of the six-major remote handling systems of ITER. For each of them it carries out design activities, R&D and manufacturing in order to deliver the appropriate tooling.

Work in progress Divertor RH
Contract signed 33%
Design 66%

Cask & Plug RH
Contract signed 12%
Design 42%

Neutral Beam RH
Contract signed 19%
Design 50%

In Vessel Viewing System
Contract signed 16%
Design 65%

ITER Divertor Remote Handling Preliminary Design Review concluded

The design of the Divertor Remote Handling System (DRHS) has been reviewed by a panel of experts from F4E, ITER Organization and industries. Based on the conclusions of the panel, a specifically appointed Steering Committee chaired by the F4E Director gave its green light to the launch of the final design activities that include also advanced laboratory tests. The DRHS will be used in ITER to replace the divertor cassettes which will be damaged when receiving very high heat loads during plasma operations. Around 10 000 elementary tasks will need to be carried out in order to replace the full divertor - composed of 54 cassettes- over six months. Man in the loop robotics, a specially developed hydraulic system, advanced pipe welding and cutting tools, new radiation resistant electronics cameras, innovative software and powerful computers will be among the technologies deployed to perform the tasks.

"We want to learn from this exercise and draw lessons for the other Remote Handling packages that will go through their respective Preliminary Design Reviews in 2019."

Carlo Damiani
F4E Remote Handling Programme Manager

Members of staff of F4E, ITER Organization, experts and companies participating in the Preliminary Design Review of the ITER Divertor Cassette Remote Handling system procured by Europe.

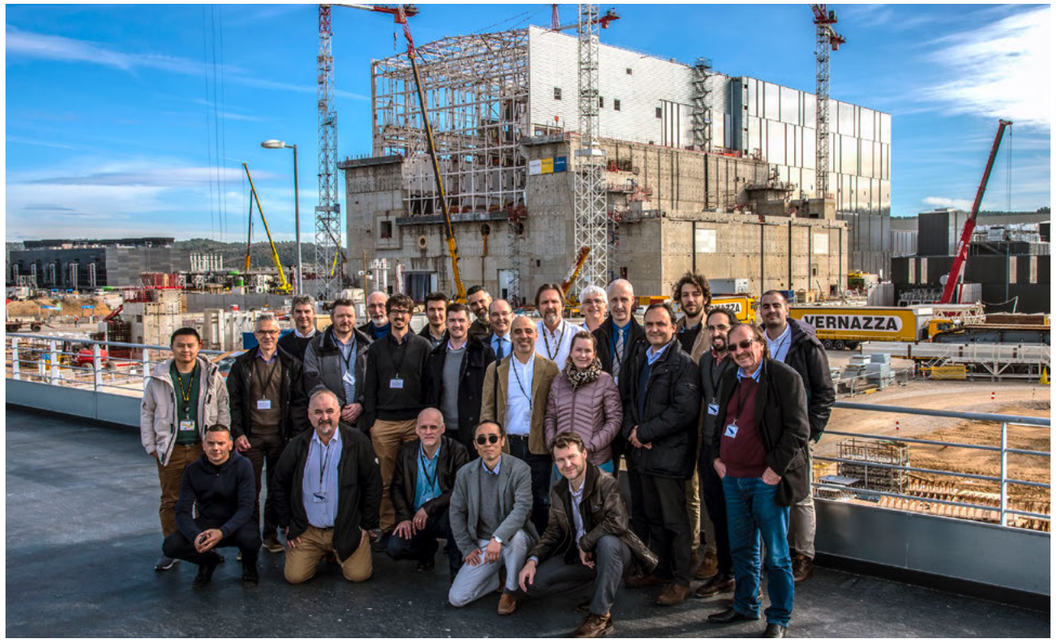
Operating remotely a 180 m monorail crane system

The Preliminary Design Review of the monorail crane system was successfully completed. A panel of experts from F4E, responsible for the Neutral Beam Remote Handling System (NBRHS), ITER Organization, and independent experts from laboratories and other companies, contributed to the review of this system which will be part of the NBRHS. The design of such crane has been developed by Jacobs (former Wood), F4E's main contractor for the design and manufacturing of the system, and its specialised subcontractor Reel.

The 180-m long monorail system hosts the transfer trolley picking up and transporting components in the Neutral Beam Cell. Such crane is meant to work in combination with other NBRHS devices like the so-called beam source maintenance equipment, the beam line transporter, two manipulator arms and a variety of tools for component bolting and unbolting for pipe cutting and welding etc. To understand the complexity the crane designers are dealing with, try to imagine a train positioned upside down running on a rail mounted to the roof in a limited space full of equipment and following a complex and reconfigurable railway. The bulky equipment also needs a high level of operational flexibility and must act in perfect coordination with the tooling and manipulators. The monorail system, able to carry payloads up to 40 t, will need to comply with the anti-seismic requirements applying to the Tokamak building, where the ITER device will operate, and will have to be perfectly aligned the Neutral Beam Injectors when these have to be repaired. It is estimated that every 18 months maintenance works would need to be conducted which may take up to six months.

"The completion of the Preliminary Design Review of the monorail leads us towards the Final Design Review scheduled to take place in early 2022. From this moment on, we will have two years to complete the fabrication of the system in order to be installed in the ITER machine for first plasma operations."

Marco Van Uffelen
F4E Project Manager for the Neutral Beam Remote Handling System



Experts contributing to the partial Preliminary Design Review of the Neutral Beam Remote Handling system on the ITER site

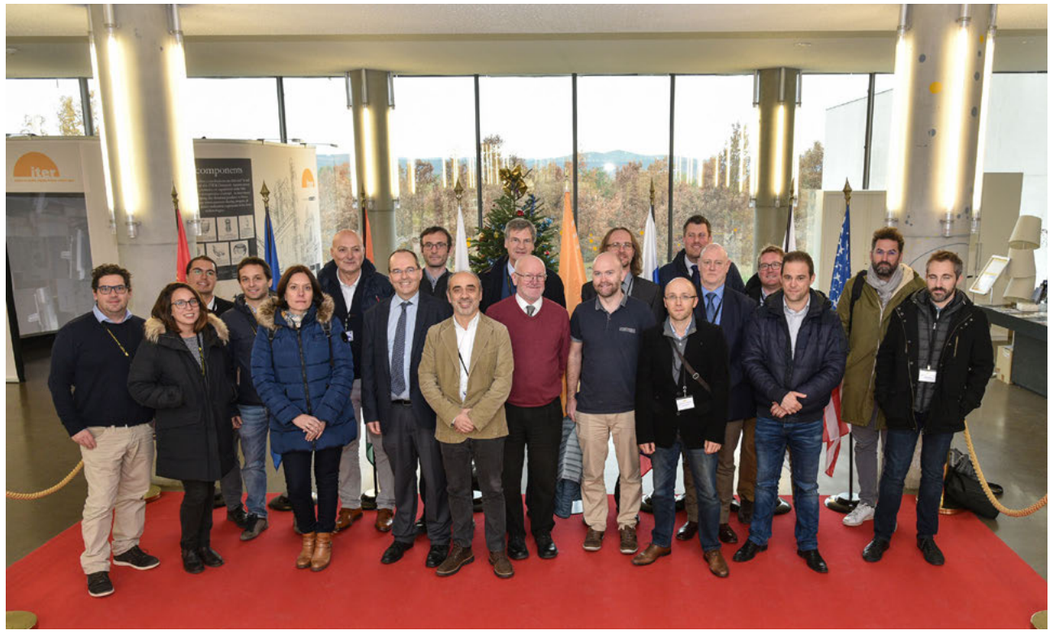
Collecting information from one billion points in the vessel

ITER will require a sophisticated and agile inspection system to perform a series of checks inside the machine. Cutting-edge technologies bringing together metrology instruments, high-tech vision and robotics will be deployed to create a one billion pixel 3D map of the plasma-facing surfaces inside the ITER device. The In-Vessel Viewing System (IVVS) will help scientists inspect changes, such as erosion, on In-Vessel components. With the help of six probes, located in different ports inside the lower part of the machine, the IVVS will measure nearly 100% of the surface of the In-Vessel components with at least one measurement per mm^2 offering an excellent image.

Members of a panel composed of F4E, ITER Organization, and independent experts gathered for the Preliminary Design Review (PDR) of the IVVS. More than 35 participants attended the meeting during which it was discussed if the proposed design fully met the requirements, and whether the design process was robust enough for the complexity, quality, and safety of the system. Representatives from big and small-medium sized companies contributed to the IVVS design (and presented it to the panel), such as Veolia Nuclear Solutions (UK), ASE Optics Europe (Spain), Optima Systems Consultancy (UK), 3D Scanners UK (UK), Cedrat Technologies (France), IDOM (Spain), Micronor (Switzerland), Bridger Photonics Inc. (US).

"The completion of the Preliminary Design Review is an important step towards the fabrication of the ITER In-Vessel Viewing System. What was until recently considered a conceptual design is gradually starting to resemble to a proper system."

Gregory Dubus
F4E Project Manager for In-Vessel Viewing System

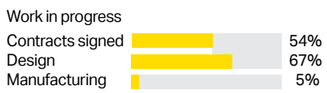


Participants from F4E, ITER Organization, independent experts and company representatives at the Preliminary Design Review Meeting held at ITER Organization, December 2019, Cadarache, France

DIAGNOSTICS

The Diagnostics systems will help scientists to study and control the plasma behaviour, measure its properties and extend our understanding of plasma physics. This system will act as "the eyes and ears" of the scientists and engineers offering them insight thanks to a wide range of cutting edge technologies.

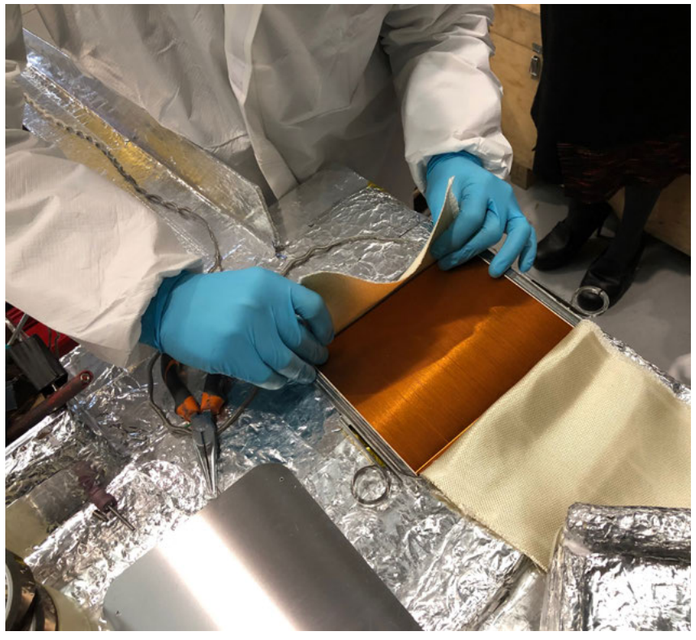
ITER will offer an unparalleled view of the entire plasma and the duration of the plasma pulse is 100 times longer than any fusion device currently in operation. With the extreme environment in the vessel and large energy inside the plasma, the diagnostic systems will also help to ensure the safe operation of the machine. Europe is responsible for roughly 25% of all Diagnostics in ITER, involving more than 60 companies and research laboratories.



Europe's first Diagnostic installed

The installation of the Continuous External Rogowski (CER) coils marked the installation of the first diagnostic provided by Europe. The CER coils are to be located outside the ITER vacuum vessel, within the cases of three Toroidal Field (TF) coils. They measure the total electric current flowing in the ITER plasma.

F4E also delivered a second set of 270 magnetic coils, known as Outer Vessel Coils, which will measure the magnetic field strength surrounding the ITER machine core. Finally progress was made with the manufacturing of the diagnostics magnetics Inner Vessel Coils (IVC). F4E signed contracts for three distinct types of IVC sensors, and manufacturing started. Located in a high vacuum environment, IVC will measure local magnetic field in various frequency ranges.



Manufacturing activities on one of the Outer Vessel Coil sensors

F4E signs Diagnostics Engineering Services contract

F4E signed a contract for manufacturing engineering support for the Diagnostics systems with AVS (Spain). This engineering company will assess F4E's on-going Diagnostics design works in terms of manufacturing feasibility, cost and risks and provide expert guidance to F4E and European fusion laboratories.

"As we are now approaching the finalisation of the preliminary design phase for most of the Diagnostics systems it makes sense to bring on-board European industrial companies to complement the work done by the European fusion labortaories."

Sandra Julià Torres
F4E Project Manager

"After having successfully delivered countless turnkey projects such as accelerators, astrophysics, neutron sources, space and synchrotron main facilities, AVS is excited to help F4E and the EFLs to bring fusion a step closer."

José Miguel Carmona
Head of Fusion and Beams Area at AVS

First design of Diagnostics "cable gatekeeper" approved

Several Diagnostics systems, which will be connected to the exterior through high-tech cabling, will study the plasma inside the vacuum vessel. F4E started developing cable 'gatekeepers' or feedthroughs to guarantee the integrity of the vacuum inside the chamber. In total, F4E is supplying 75 feedthroughs to ITER, of five different design variants.

F4E worked closely with IDOM to develop a preliminary design which was approved by ITER in April. On this basis, a final design will be developed, and manufacturing is planned to start in 2021.

"We have been positively surprised by IDOM's capability of producing an innovative design solution for the feedthroughs that meets all our stringent and numerous requirements whilst remaining simple to manufacture."

Miguel Pérez Lasala
F4E Project Manager

"We carried out a great deal of R&D in order to find the optimal technical solution. Our next challenge will be to deliver a final design to F4E, fully qualified, on a constrained schedule."

Amaya Martínez Jiménez
IDOM Project Engineer

F4E has worked closely with IDOM to develop the design which will be the basis for the production of these feedthroughs.

TEST BLANKET MODULES

Experts working in the area of Test Blanket Modules (TBM) systems are among those who will use ITER to understand how tritium can be continuously bred in order to keep the fusion reaction going. Without a doubt, the lessons drawn will have significant implications towards the design of future fusion reactors like DEMO. In essence, they will be generating a new nuclear system and licensing using advanced materials and top fabrication techniques.

F4E strengthened its collaboration with EUROfusion

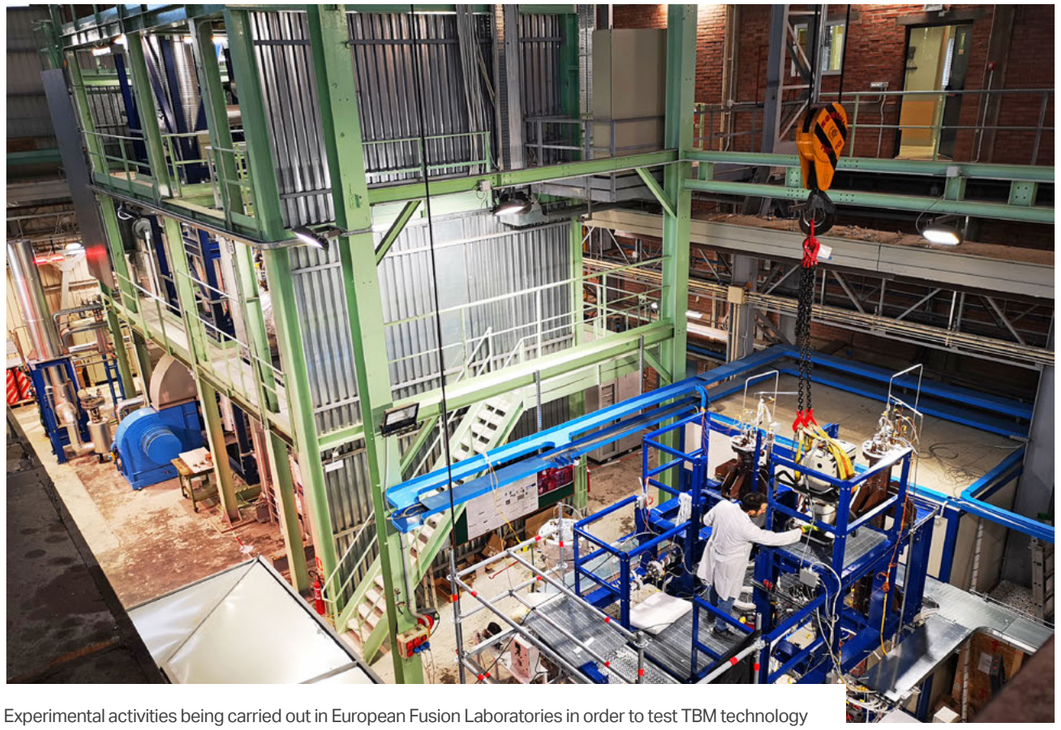
F4E and EUROfusion – the European consortium of fusion research laboratories –formalised the joint organisation of their resources in research programmes for tritium breeding technology. In September, they signed a Memorandum of Understanding as well as a multi-annual programme plan for the joint execution of the TBM systems programme. To cement this relationship, EUROfusion laboratories seconded four engineers to the joint TBM Project Team at F4E Cadarache.

Steel for Fusion

Joint efforts by F4E and EUROfusion were made on EUROFER97 – the European steel chosen for the TBM – to demonstrate its weldability as well as its resistance to neutron irradiation. EUROFER97 is less susceptible to radioactivity than other types of steel when experiencing the neutrons produced in fusion devices. The objective is to make EUROFER97 the standard for longer-term programmes such as DEMO.

Promising developments on Preliminary Design Activities

EUROfusion laboratories brought the conceptual design of the Water-Cooled TBM System close to its final stage. For the Helium-Cooled system, F4E prepared the next phase of engineering design and signed five contracts with industrial partners. This work will bring it to the level required for preliminary or final design reviews.



Experimental activities being carried out in European Fusion Laboratories in order to test TBM technology

IN-VESSEL

The extremely hot temperature of the fusion plasma will be mostly felt by the In-Vessel components, otherwise known as plasma-facing components, due to their direct exposure to high heat and neutron fluxes. The divertor, likened to a massive 'ashtray" where the plasma ashes and impurities are diverted to, consists of 54 cassettes, all to be manufactured by Europe, and is located at the lower part of the machine. The blanket is made of the 440 modules, resembling to blocks, covering the walls of the vacuum vessel. Europe is responsible for the production of 215 of them.

Work in progress

Blanket Cooling Manifold
Design & Qualification 95%

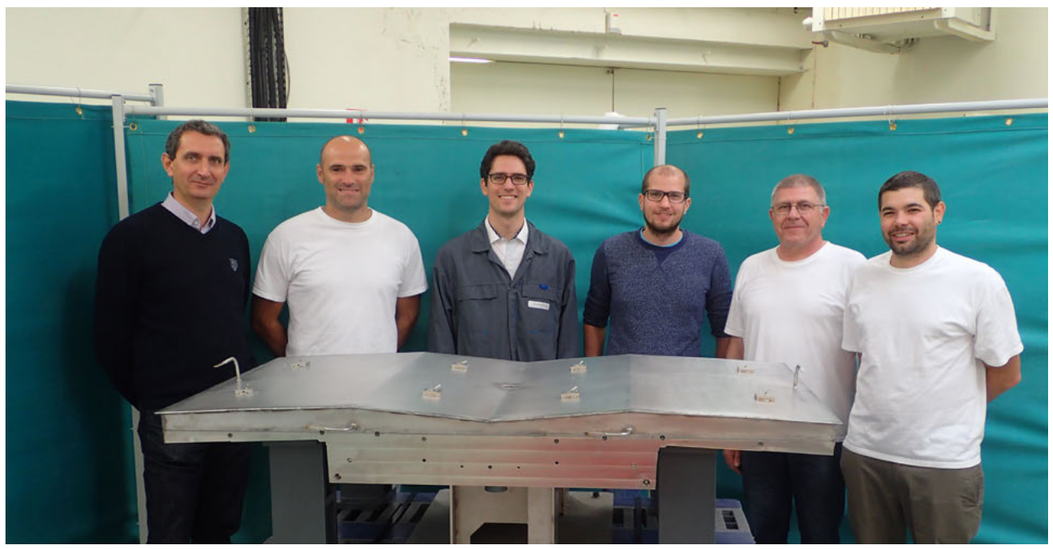
Blanket & First Wall Panels
Qualification 100%

Divertor Vertical Target
Qualification 45%

Divertor Cassette Body
Qualification 100%
Design and Engineering 60%

Great progress on the First Wall Panels

The vacuum vessel will be covered on the inside by a layer of 440 First Wall Panels. Covering a surface of 600 m^2, these 1 x 1.5 m thick metallic blocks shield the vacuum vessel and the external machine components. As a first-of-a-kind component, much effort was put in developing conceptual designs, starting will smaller mock-ups leading to full-size prototypes. F4E has been working with three companies in the prototyping phase: Framatome, Atmostat and a consortium consisting of Iberdrola, Wood and Leading. All three companies completed their first wall panel full-scale prototype and announced their willingness to participate in the coming call for tender.



Members of the Atmostat team involved in the manufacturing of a full-scale prototype of the ITER first wall panel, financed by F4E.

ITER first wall panel full scale prototype manufactured by Iberdrola, Leading and Wood, financed by F4E.

ITER first wall panel full-scale prototype manufactured by Framatome, financed by F4E.

" Due to the fact that we scaled up our prototypes, there was a direct impact on the manufacturing process. Next, we will perform a series of strict quality tests to check the performance of the equipment in high temperatures. "

Stefano Banetta
F4E Project Manager

" Better insight and more know-how have been acquired after years of work in this area. The successful manufacturing of the three full-scale prototypes has paved the way for the launch of the F4E call for the production of the first-wall panels "

Patrick Lorenzetto
F4E Programme Manager

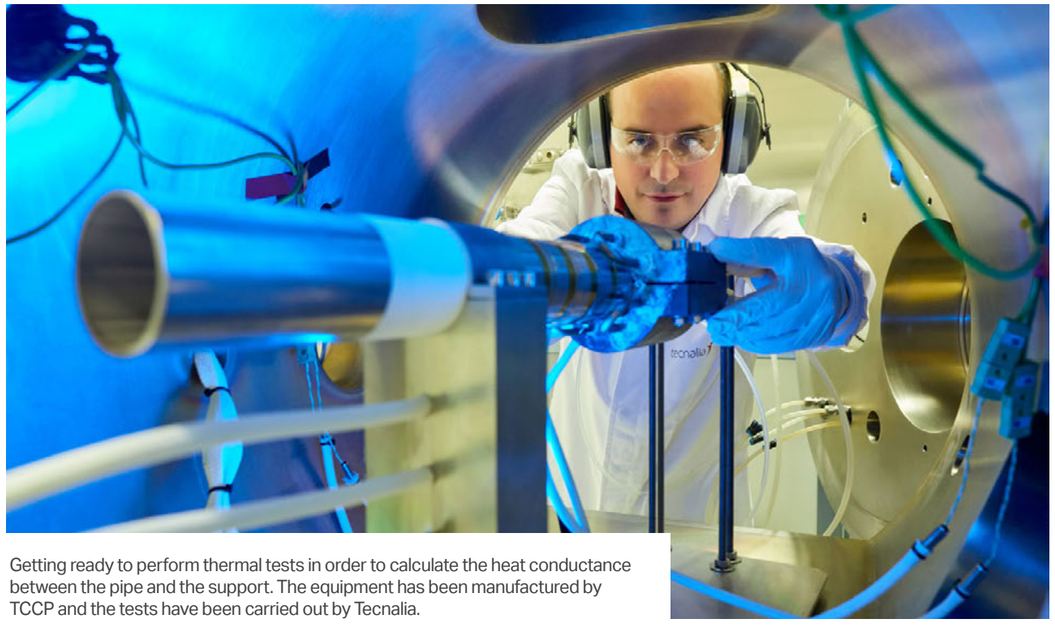
Prototyping the Blanket cooling system

To cool down the First Wall panels, a network of pipes branching into several openings (Blanket Cooling Manifold) will deliver pressurised water to cool them down. Inside this structure, measuring roughly 9 m, water will flow to remove up to 736 MW of thermal power. A simpler and more practical design is under preparation due to the limited availble space in the vacuum vessel.

"Space, vacuum conditions and high temperatures are important factors that come to play at the stage of fabrication. But above all, we need to be practical, reasonable and creative so that we end up with a piece of equipment that fits and works well with the ITER environment."

Georges Dellopoulos
F4E Project Manager

Technician applying three levels of torque to test the restrain of the support equipment manufactured by TCPP. The tests have been performed by Tecnalia. The works are financed by F4E, responsible for the ITER Cooling Blanket Manifold.



Getting ready to perform thermal tests in order to calculate the heat conductance between the pipe and the support. The equipment has been manufactured by TCCP and the tests have been carried out by Tecnalia.

CRYOPLANT AND FUEL CYCLE

The ITER machine will have to cope with extreme temperature fluctuations. Cold helium will circulate inside the magnets to bring their temperature down to -269 ˚C in order to confine the hot plasma. The magnets, thermal shields and cryopumps will have to be cooled down and maintained with the help of one of the most advanced cryogenic systems to date. The cryoplant can be described as a massive refrigerator that will generate the freezing cold temperatures required for the fusion machine. Europe is responsible for the Liquid Nitrogen (LN2) Plant and its auxiliary systems.

Work in progress

LN2 Plant
- Contracts signed 95%
- Design 100%
- Manufacturing 100%
- Installation & Commissioning 45%

Vacuum Pumping
- Contracts signed 31%
- Design 13%
- Manufacturing 20%

Tritium Plant
- Contracts signed 32%
- Design 35%
- Manufacturing 18%

REMS and Rad Waste
- Contracts signed 1%
- Design 9%
- Manufacturing 0%

LN2 Plant on the verge of completion

The Liquid Nitrogen (LN2) Plant and its auxiliary systems will cool down, process, store, transfer and recover the cryogenic fluids of the machine. F4E completed the installation of all remaining equipment, conducted most of on-site pipe fitting and welding, and carried out the first pressure acceptance tests. Also, the manufacturing of the quench line header components was launched.

Integration of the 80 K loop cold boxes

Design validation and component qualification for ITER vacuum systems

Europe provides the cryopumps needed to obtain a high vacuum in the vacuum vessel and the cryostat. F4E made progress in designing the front end cryodistribution system, qualifying technologies used in MITICA cryopumps (ITER Neutral Beam Test Facility), and the successful manufacturing and acceptance tests of the double-walled warm regeneration lines. F4E also signed the contract for the eight Torus and cryostat cryopumps.

Delivery of the supports of the warm regeneration lines

How to spot leaks in the vacuum systems?

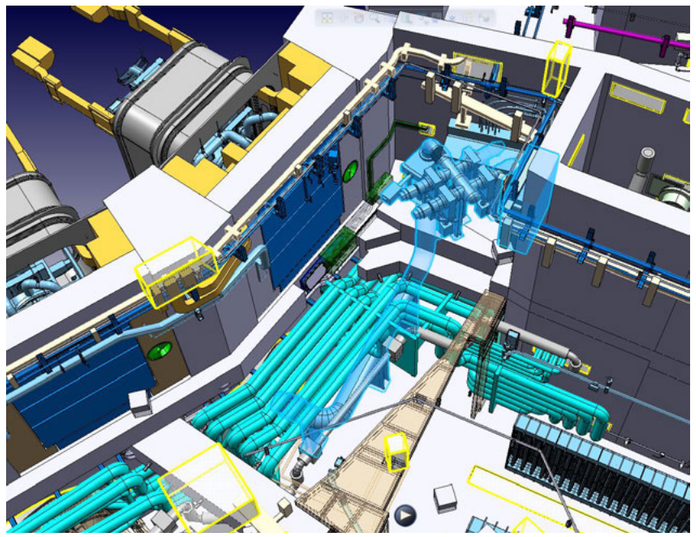


Illustration of the leak detection equipment for the ITER Vacuum Vessel

Vacuum systems will have an important role to play in ITER. The sheer size of the machine poses a challenge in delivering the right level of vacuum to its different components: The vessel, the neutral beam front components, and the massive cryostat will need to remain leak-tight and operate in vacuum. F4E launched a call for tender for the procurement of those systems.

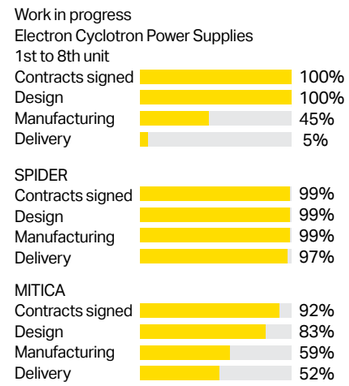
NEUTRAL BEAM AND ELECTRON CYCLOTRON POWER SUPPLIES AND SOURCES

To heat up the ITER plasma at 150 million ˚C, roughly ten times the temperature at the core of the Sun, we will need powerful heating systems using high-energy beams. This requires the fabrication and testing of new equipment before manufacturing the ITER components.

For this reason the ITER Neutral Beam Test Facility (NBTF), located in Padua, Italy, has been set up consisting of two test beds:

- **SPIDER (Source for Production of Ion of Deuterium Extracted from Radio Frequency plasma), will help scientists to develop the ion source, one of the critical elements needed for the operation of the ITER Neutral Beam Injectors.**
- **MITICA (Megavolt ITER Injector and Concept Advancement) will develop and test a full-size prototype of a Neutral Beam Injector.**

The NBTF receives contributions from F4E, ITER Organization, India's and Japan's ITER Domestic Agencies, and Italy's Consorzio RFX, the host of the infrastructure.

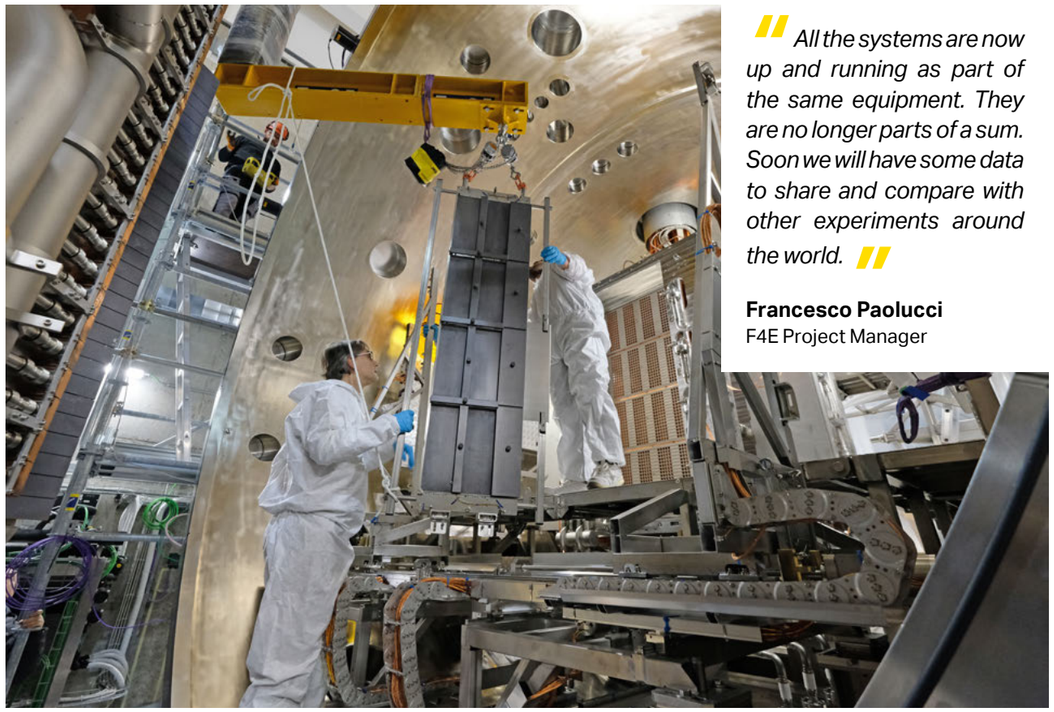


Aerial View of the Neutral Beam Test Facility in Padua, Italy

SPIDER

One year of experiments for SPIDER

In May, SPIDER, the world's most powerful negative ion source, produced its first hydrogen beam marking one year of operation, fixing of technical issues and fine-tuning of equipment. Thanks to the commissioning of its diagnostics, scientists can now see the footprint of the beam source with infrared cameras and thus confirm its operation. With SPIDER now reaching its full potential, a promising future awaits the fusion community.



"All the systems are now up and running as part of the same equipment. They are no longer parts of a sum. Soon we will have some data to share and compare with other experiments around the world."

Francesco Paolucci
F4E Project Manager

Members of Consorzio RFX installing diagnostics equipment, the STRIKE calorimeter, in SPIDER so as to monitor the operation of the beam source, March 2019, Padua, ITER Neutral Beam Test Facility.

BUILDING SPIDER

SPIDER was constructed between 2012 and 2018. F4E, Consorzio RFX, ITER India, ITER Organization, together with approximately 120 companies, have contributed to this experiment by means of components, infrastructure and know-how. The value of components paid by F4E is in the range of 34 million EUR, while India invested roughly 3 million EUR. Consorzio RFX financed the construction paying approximately 25 million EUR.

MITICA

Europe is one of the main contributors to MITICA and provides a large part of the equipment such as power supplies, the cryoplant, cooling, vacuum and gas introduction systems, the SF6 plant, and all main injector components (beam source, vacuum vessel, etc.).

MITICA beam source vacuum vessel successfully installed and tested

In June, the vacuum vessel of the MITICA beam source was successfully installed, and later tested. The metallic box weighing 57 t will house the components of the beam source. One of the most delicate parts of the installation was the alignment of the vacuum vessel to its high voltage bushing, provided by Japan, to which the components of the beam source vessel will be connected.

MITICA beam source vacuum vessel delivered to ITER Neutral Beam Test Facility, Consorzio RFX, Padua, Italy. The component has been manufactured by De Pretto Industrie and financed by F4E.

Cryoplant installation completed

Important progress was made on the equipment of the MITICA cryoplant that will maintain the vacuum in the vessel as well as cool down its cryogenic pump. F4E, in collaboration with Air Liquide, successfully completed its installation in spite of the complex technical environment and multiple interfaces.

Cryolines connecting the main cold box with the auxiliary cold box, ITER Neutral Beam Test Facility, MITICA, Padua, Italy

Success for high voltage tests

High voltage insulating tests were successfully carried out on the power supplies which resulted in the acceptance and the hand over to to ITER Organization (IO) of most of EU components. Likewise, the SF6 Handling System was also finally accepted and handed over to IO.

Engineers from F4E, Consorzio RFX, ITER Japan, ITER Organization, and the companies involved in fabrication of the MITICA High Voltage Deck and High Voltage Bushing Assembling, standing inside the High Voltage Hall of MITICA below the connection between the Insulating Transformer from Japan (to the left) and the High Voltage Deck (to the right), ITER Neutral Beam Test Facility, Padua, Italy, July 2019

MITICA

MITICA's beam source will measure 3 x 3 x 4.5 m and will weigh 15 t and produces negative ions. Thanks to a powerful accelerator, they will travel at high energy through 8960 holes and eventually land on a calorimeter, which measures the beam power based on the level of the heat produced. Given the fact that MITICA mimics the ITER Neutral Beam Injectors, scientists will be able to have good estimates of the heating power that will be transmitted to the ITER plasma.

F4E signed last major contract for MITICA

The contract for the production and delivery of MITICA's beam line components was signed with the AVS-Tecnalia consortium. It took two years for the design and prototyping to address critical technologies and refine industrial and manufacturing specifications. This was the last main contract for the NBTF under F4E responsibility.

"The signature of the final procurement provides the final in-kind and financial contribution of the EU to this international experiment. In the years to come F4E will have to concentrate on the follow up of these contracts and the delivery of the ITER equipment."

Tullio Bonicelli
F4E Programme Manager

"The size and characteristics [of the Neutral Beam] make it a-first-of-a-kind negative ion injector. The calorimeter will be able to absorb as much thermal energy as that produced by half a million light bulbs of 35 W."

Gonzalo Micó
F4E Project Manager

Representatives of F4E, Consorzio RFX, ITER Organization, AVS-TECNALIA consortium checking prototypes produced by AVS-TECNALIA consortium

ELECTRON CYCLOTRON

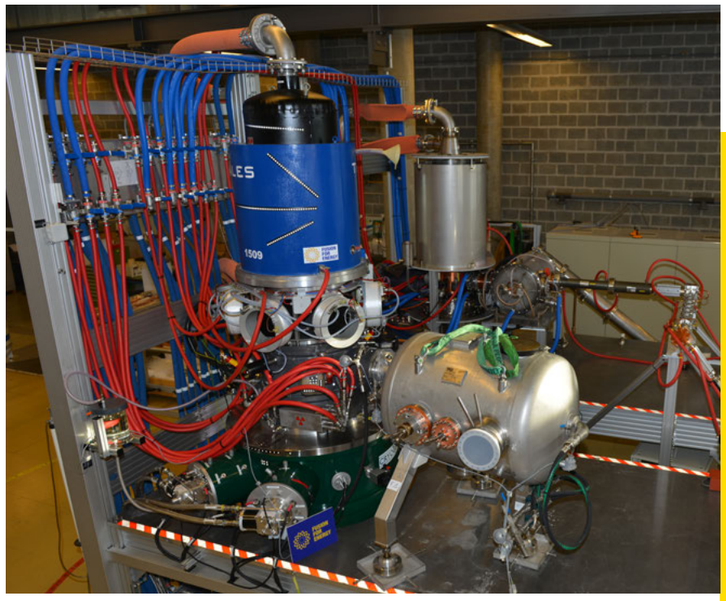
The Electron Cyclotron (EC) is one of the power supplies that will be used to raise the temperature of the ITER plasma. It will convert electricity from the grid and supply it to the gyrotrons, the devices that generate strong electromagnetic waves, which in turn, will transfer their energy to the electrons of the ITER plasma to heat it up and confine it better. Gyrotrons will require high and stable voltages.The EC power supplies need to guarantee the accurate amount of power, and ensure that its supply is in line with ITER's operation. It takes expertise to develop a piece of equipment that can provide this amount of power and switch it off in less than 10 micro-seconds!

First EC Power Supplies delivered to ITER

F4E delivered to Cadarache the first of the eight EC power supplies under its responsibility, as well as testing equipment. Factory testing of power supplies modules was successfully completed.
Meanwhile, in Falcon, an F4E test facility hosted by the Swiss Plasma Center, tests were completed on the 1MW European gyrotron prototype for ITER. After further inspections, further improvements were identified.

F. Albajar, F4E Technical Responsible Officer, Darshan Parmar, ITER Organization Technical Responsible Officer, Paco Sanchez Arcos, F4E Project Manager, supervising the delivery of Europe's first High Voltage Power supply unit delivered to ITER.

High Voltage Power supply unit procured by F4E and manufactured by Ampegon © Fusion for Energy



European gyrotron, Falcon facility, Swiss Plasma Centre

EC / BEAM SOURCE

The Electron Cyclotron (EC) power supplies convert electricity from the grid and supply high and stable voltages to the gyrotrons. These complex devices generate strong electromagnetic waves, which in turn, transfer their energy to the ITER plasma to heat it up.

The EC power supplies need to guarantee the accurate amount of power (20 MW), and ensure that its supply is in line with ITER's operation. It takes expertise to develop a piece of equipment that can provide this amount of power and switch it off in less than 10 microseconds!

ANTENNAS AND PLASMA ENGINEERING

Large antennas will channel the electromagnetic waves generated by two heating systems – the Electron Cyclotron (EC) and the Ion Cyclotron (IC) – to heat ITER's plasma to the temperatures required for fusion to happen. EC Launchers will help scientists to target specific parts of the plasma by guiding the waves with the help of mirrors. F4E is working on these projects with support on engineering from companies and European fusion laboratories.

Work in progress

EC Launcher
- In-vessel Design 90%
- Ex-vessel Design 65%
- Manufacturing 8%

IC Antenna
- Design 48%
- Manufacturing 0%

EC Control System
- Design 80%
- Manufacturing 0%

Testing activities at FALCON

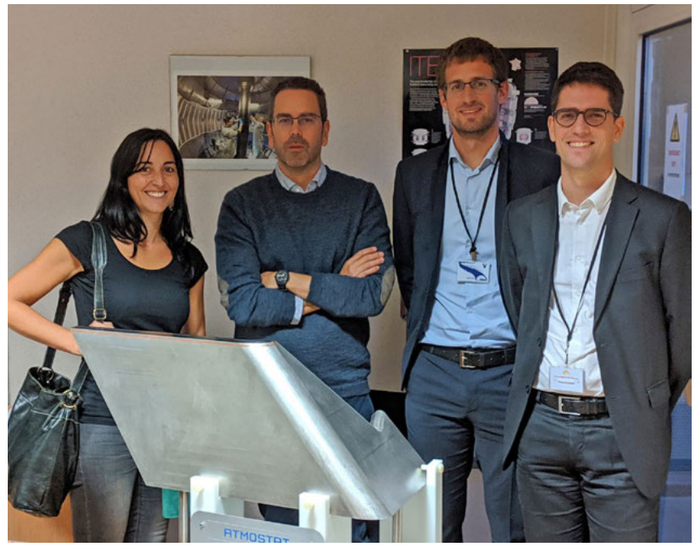
At the FALCON facility, Swiss Plasma Center, interesting results were produced in testing the first mock-ups of the ex-vessel waveguides and a prototype of miter-bend with a 50 mm diameter. F4E's collaboration with General Atomics (GA) has also been fruitful allowing a direct comparison between components of different manufacturers and a more flexible facility thanks to the components provided by GA.

Short waveguide mock-ups (CuCrZr) and three 1.2 m waveguide mock-ups, in Stainless Steel, CuCrZr and Aluminium, manufactured by TBB under F4E contract.

Final Design Review completed for the EC Upper Launcher

Four ITER EC Upper Launchers will each inject up to 8 MW of microwave power into ITER in order to help start-up the plasma and counteract any instabilities. After an intense activity of design integration and finalisation performed by F4E and industrial partners, the Upper Launcher successfully passed its Final Design Review.

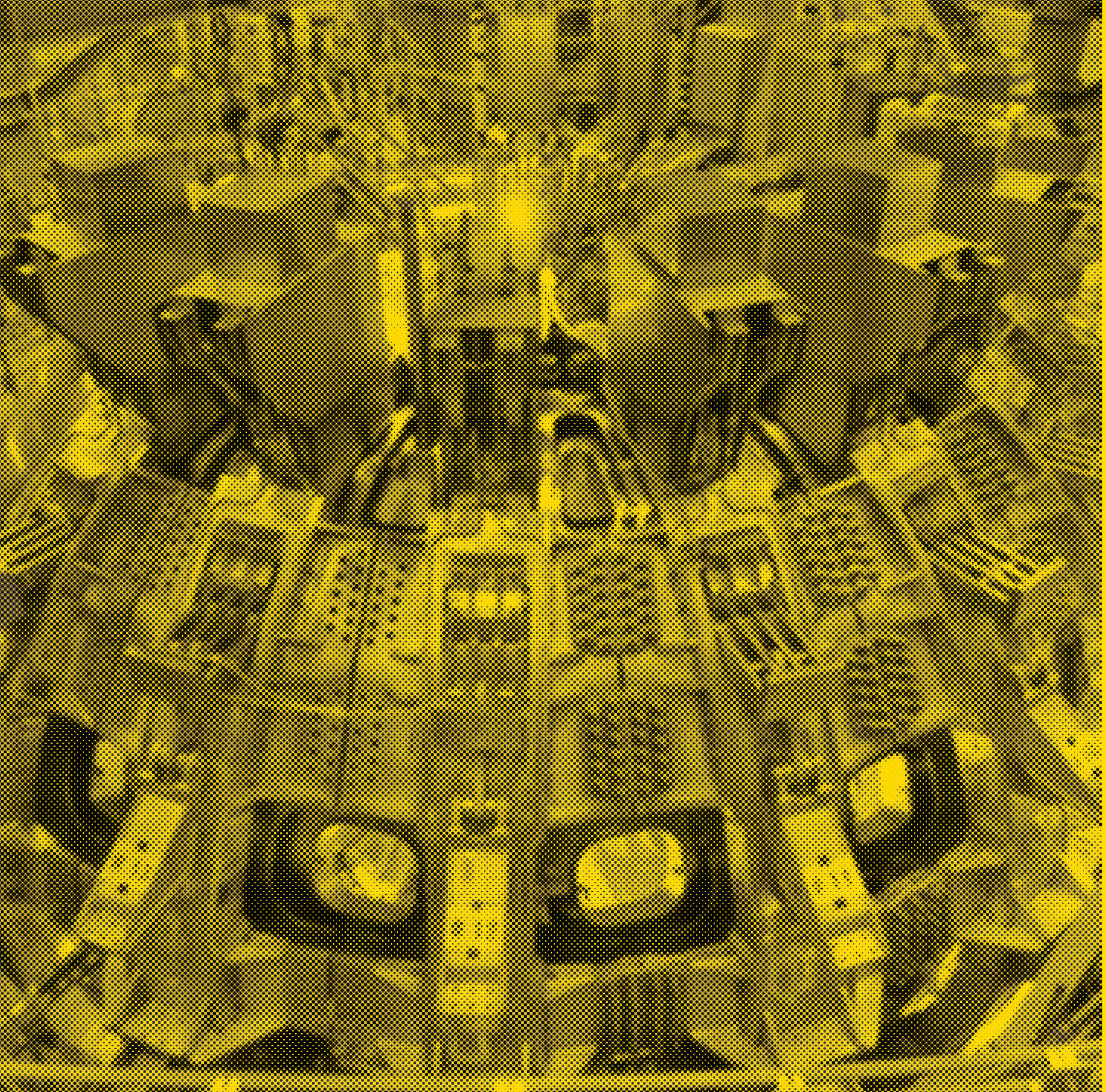
This positive outcome is the result of efficient prototyping with qualified suppliers. For instance, in October, F4E and ATMOSTAT presented to ITER Organization a prototype of the Blanket Shield Module (BSM). This plasma-facing part of the Upper Launchers will be able to withstand temperatures up to approximately 350 °C during ITER operation, thanks to a state of the art cooling system, as well as ultra-vacuum environment of the vacuum vessel, through metal joints of the highest quality.



Europe's Blanket Shield Module corner mockup, produced by ATMOSTAT

Production started for 60 diamond disks

Unbreakable, transparent and able to dissipate heat five times better than that of copper, diamonds are particularly useful for ITER's tokamak Electron Cyclotron (EC) heating system. The EC System will heat the plasma by transferring the energy of electromagnetic waves into the electrons of the plasma. Gyrotrons will generate those electromagnetic waves that will be guided into the vacuum vessel by 56 beam-lines. Both the gyrotrons and the chamber have to remain vacuum-tight. Radiofrequency waves propagate in a manner similar to light, therefore, the only way to get them from the gyrotrons into the chamber is through a diamond window. Situated at the core of the window, those 80 mm diameter disks will ensure the safe and efficient transmission of the waves' very high power for durations of up to 50 minutes. The production of 60 diamond disks started towards the end of the year with Diamond Material, a German SME.



03

The Broader Approach

Taking a step closer to fusion energy through Research & Development

Uniting broad vision and precision to address short and long term fusion research challenges summarises the spirit of collaboration between Europe and Japan in this area. In February 2007, an Agreement was signed between the two Parties complementing the ITER project in order to accelerate the realisation of fusion energy through R&D and the development of key technologies.

The Broader Approach consists of three main projects:

- The Satellite Tokamak Programme (STP) JT-60SA “satellite” facility of ITER in order to model proposals for optimising plasma;
- The International Fusion Materials Irradiation Facility - Engineering Validation and Engineering Design Activities (IFMIF-EVEDA) to carry out testing and qualification of advanced materials in an environment similar to that of a future fusion power plant;
- The International Fusion Energy Research Centre (IFERC) through the DEMO Design Research and Development Coordination Centre, the Computational Simulation Centre and the Remote Experimentation Centre.

JT60-SA

When completed, the JT-60SA tokamak will the second largest tokamak in the world after ITER. Located in Naka, Japan, this device is the upgrade of an existing tokamak into capable of long pulse operation. The upgrade involved the complete dismantling of the old device, the refurbishing of the buildings, the upgrade of power supply and heating systems. When completed, this facility will support the operation of ITER through complementary experiments to improve the design of the future DEMO reactor.

Getting closer to first plasma

F4E and its Japanese counterpart (QST) made steady progress. The assembly of the torus was almost completed as well as the cryostat and thermal shields. This is great step towards the target of First Plasma in 2020. F4E has delivered all of the components under its responsibility.

The presence of F4E personnel at the Naka site in Japan 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.

View of the JT60-SA as operation insertion of the central solenoid advances, Naka, Japan, May 2019

IFMIF/EVEDA

Reproducing the conditions of the future fusion reactors is the challenge of the International Fusion Materials Irradiation Facility (IFMIF). This accelerator-based facility aims to test materials under the conditions of the DEMO fusion device, which will follow ITER. This should allow us to improve the durability of such materials and minimise their activation. The Engineering Validation and Design Activities (EVEDA) for IFMIF are being conducted in Rokkasho, Japan.

Europe and Japan celebrate major milestone in validating LIPAc

To validate the design of the IFMIF neutron source, scientists are building LIPAc (Linear IFMIF Prototype Accelerator). This initiative brings together QST (Japan) and F4E, co-ordinating the contributions to IFMIF from INFN (Italy), CIEMAT (Spain), CEA Saclay (France) and SCK•CEN (Belgium). To accelerate the beam of charged particles with the highest efficiency, LIPAc relies on the world's longest Radio Frequency Quadruple (RFQ): 9.8 m.

After successful commissioning and tests, the scientists managed to accelerate a 125 mA-deuterium beam at 5 MeV at 90% efficiency. It's the first time a beam is accelerated at such intensity and energy. In parallel, further activities for the preparation of the commission phase were conducted to improve the reliability, the control system and the radio frequency power systems.

"We have proof that we can transport the high-energy beam with minimal losses. This is not only a breakthrough for the project, it is a fantastic achievement for those in the field of physics."

Philippe Cara
IFMIF-EVEDA Project Leader

The team of engineers from the Broader Approach parties involved in the LIPAc tests performed in July, Rokkasho, Japan. They managed to accelerate a beam of deuterium with 125 mA at 5 MeV reaching nearly 90% of transmission.

"The IFMIF accelerator will become the most powerful Linear accelerator (Linac) in the world working in continuous wave."

Hervé Dzitko
F4E Project Manager for IFMIF/EVEDA

IFERC

The International Fusion Energy Research Centre (IFERC) Project is hosted in Rokkasho, Japan and comprises three sub-projects:

- The Computational Simulation Centre (CSC) hosted “Helios”, a supercomputer which offered the fusion community the possibility to run simulations. In 2019 the CSC prepared the framework for an exchange of computer time between Europe and Japan to allow joint projects in their respective supercomputers.

- The Demonstration Reactor (DEMO) activities aim at reinforcing collaboration with EUROfusion in the area of materials, design and planning. This year, the DEMO Activity Integrated Project Team continued working on pre-conceptual DEMO designs.

- ITER Remote Experimentation Centre (REC) started working on offering Europeans remote access to JT-60SA and the LIPAc accelerator, after having successfully demonstrated remote participation in experiments with the WEST device in Cadarache.

Experts in the IFERC Remote Experimentation Centre control room (Rokkasho, Japan) following remote tests on the WEST experiment in France

04

Working together with stakeholders

F4E actively engaged with European and national policy-makers through periodic updates and the communication of success stories highlighting the direct and indirect benefits of the project. ITER is a motor of economic growth, innovation and competitiveness, ultimately making a contribution to a sustainable energy mix for the future.

With the support of various F4E committees and the network of ITER Industrial Liaison Officers (ILOs), various initiatives were undertaken to reach out to industry, SMEs and research organisations in order to get involved.

To strengthen the spirit of partnership between ITER Parties, Europe maintained its firm commitment to building stronger ties by improving the flow of information and the exchange of good practice.

F4E Director strengthens ties with Japanese partners

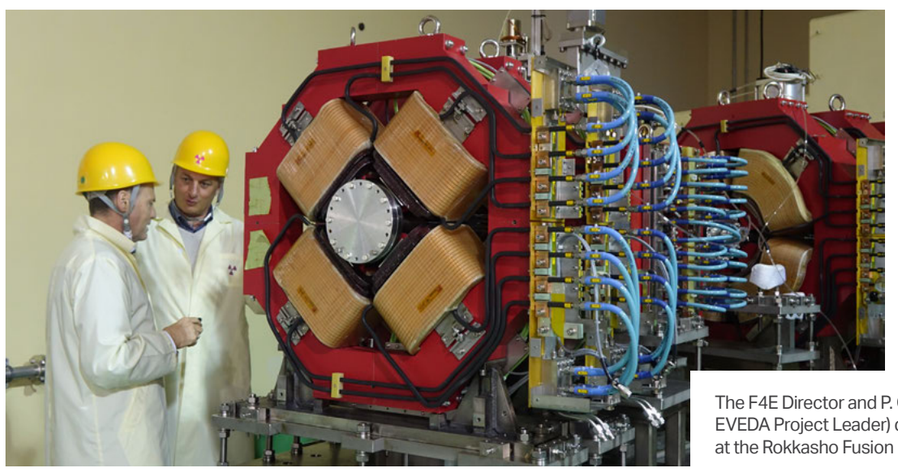
F4E has strong collaborations with Japan through the Broader Approach agreement as well as on the shared ITER projects in areas such as magnets, remote handling and neutral beam heating systems. To deepen working relationships with our Japanese colleagues, F4E Director Johannes Schwemmer visited Japan.

The F4E Director first visited Rokkasho where the sites for the International Fusion Energy Centre (IFERC) and the International Fusion Materials Irradiation Facility (IFMIF/EVEDA) are located. Travelling on to Naka, the F4E Director visited the JT-60SA Satellite Tokamak under construction and met with the top management. Finally, he then visited the main industrial supplier for the cases that will be used for the Toroidal Field Coils being manufactured by F4E.

"I am very impressed by the professionalism and dedication of our Japanese partners which in practice translates to fruitful collaboration and progress concerning Broader Approach and work related to ITER."

Johannes Schwemmer
F4E Director

From left to right: S. Ohira (QST), J. Schwemmer (F4E), P. Cara (IFMIF/EVEDA), K. Sakamoto (QST) and S. Ishida (QST) standing right in front of the LIPAc.



The F4E Director and P. Cara (IFMIF/EVEDA Project Leader) during the visit at the Rokkasho Fusion Institute.

European Parliament sets ITER as an example of European added value

The Budgetary Control Committee of the European Parliament organised a public hearing on the added value of EU funding. The hearing was moderated by its Vice-Chair, MEP Martina Dlabajova. The F4E Director reported on the collaboration of companies and research centres generating success stories and spin-offs thanks to their involvement in ITER. For example, progress made in the field of robotics was successfully used in healthcare, improvements in the fabrication process of superconducting magnets proved conducive to upgrades in MRI.

From left to right: Giovanni Grasso (ASG Superconductors), C.J.M. Heemskerk (HiT), Massimmo Garribba (DGENER Director), Johannes Schwemmer (F4E Director)

Chairman of European Parliament Budget Committee visits the ITER site

In the PF Coil Facility, from left to right: Bernard Bigot (ITER Organization Director-General), Jean Arthuis (Chairman of the Budget Committee, European Parliament), Johannes Schwemmer (F4E Director)

Jean Arthuis, Chairman of the Budget Committee of the European Parliament visited the ITER site on February 2019. The MEP, and former Minister of National Economy and Finance, was welcomed on the site by Bernard Bigot, ITER Organization Director-General, Johannes Schwemmer, F4E Director, and Jan Panek, Head of the ITER Unit at European Commission´s Directorate-General for Energy.

F4E Director showcases ITER contribution and visits U.S. fusion R&D hubs

The success of ITER depends on a strong partnership between Europe and the six other countries involved in the project. To this end, F4E Director, Johannes Schwemmer, visited the United States in order to develop relationships, and exchange knowledge related to ITER with key U.S. contacts within the Department of Energy, U.S. ITER and U.S. fusion laboratories. F4E's Director held a keynote speech at the plenary session of the 28th IEEE Symposium on Fusion Engineering (SOFE).

He also visited General Atomics in California – the company building the ITER Central Solenoid – as well as the Oak Ridge National Laboratory (ORNL) in Tennessee where he had the opportunity to see SUMMIT, the most powerful supercomputer in the world and Proto-MPEX, a plasma material testing prototype. In addition, the F4E Director shared experience on procurement during meetings with the U.S. ITER Domestic Agency.

F4E Director J. Schwemmer in front of the SUMMIT supercomputer together with Director J. Wells.

General Atomics' Central Solenoid Fabrication Facility

F4E strengthens cooperation with FAIR Scientific Research facility

F4E signed a cooperation agreement with the international accelerator facility FAIR (Facility for Antiproton and Ion Research in Europe). This is the largest research project under construction in Darmstadt, Germany. When it becomes operational in 2025, FAIR will provide scientists from all over the world new insights into the structure of matter and the evolution of the universe from the Big Bang to the present. The cooperation agreement will support scientific and administrative collaboration to exploit synergies for industrial activities, including industrial policies, market intelligence, contracts management, standardisation of quality criteria and procurement practices.

From left to right: Jörg Blaurock (FAIR's Technical Director), Ursula Weyrich (FAIR's administrative director), Gebhard Leidenfrost (F4E CFO and Head of Commercial Department), Leonardo Biagioni (F4E Deputy Head of Commercial Department), Paolo Giubellino (FAIR Scientific Director).

Member of the European Court of Auditors visits ITER

Ms Gall-Pelcz in the in the PF Coil Facility, at ITER site.

Ms Gall-Pelcz, member of the European Court of Auditors (ECA) visited the ITER site. Every year, the ECA publishes a report on the annual accounts of F4E that forms the basis for the European Parliament's procedure known as the "discharge" and confirms that F4E has used its annual budget appropriately.

"I am very impressed with the ITER construction site and the considerable progress achieved. It is useful to look beyond the figures as the money spent here is invested in knowledge, jobs and most importantly in our future."

Ildikó Gáll-Pelcz
member of the European Court of Auditors

05

EVENTS

Spreading the word on fusion energy and Europe's contribution to ITER

F4E participated in various events to communicate how ITER and fusion power are part of the European Union's long-term strategy in delivering sustainable energy and smart growth.

Our members of staff reached out to science and business communities, technology and innovation clusters and different audiences interested in fusion research.

In this section we look back at some of the key events which marked the year.

ITER Business Forum 2019 – 1100 business speed dates in search of commercial romance

Celebrating innovation and its commercial benefits, was the objective of the bi-annual ITER Business Forum. This year's edition brought together nearly 500 companies from all over the world, keen to unleash their business potential, among which a total of 80 companies and laboratories. Their objective was to showcase their expertise and identify potential partners to seal lucrative deals.

Organised by Agence ITER France in Antibes, in the South of France, this event combined intense networking, B2B meetings, speeches by key ITER personalities and social events. Among them, F4E Director Johannes Schwemmer, summed up the win-win relationship between ITER and Europe's economy, while Gerassimos Thomas, the European Commission's Deputy Director-General for Energy, explained how fusion could be in the long run part of the sustainable energy mix and encouraged attendees to "paint a new future and sustain this level of progress."

A delegation of politicians from the regional French authorities; J. Vayron (Director of Agence ITER France), G. Thomas (Deputy Director-General, DG Energy, European Commission), J. Schwemmer (F4E Director), B. Bigot (ITER Organization Director-General) welcomed by B. Blanc, (Assystem).

"Everyone stands a chance! IBF gives you the keys to understanding and better preparing your case for the project."

Jacques Vayron
Director of Agence ITER France

L. Schmieder, F4E's Project Manager for Buildings, Infrastructure and Power Supplies, during a B2B meeting with companies

F4E representatives at the corporate stand, (L-R): B. Perier, V. Saez, G. Saibene, L. Biagioni, G. Leidenfrost, N. Van de Ven.

Fusion shaping Europe's energy future

The Barcelona Energy Days took place on 6 June 2019 and focused on "Shaping Europe's Energy Future". The event, co-organised by UPC BarcelonaTech University, the Government of Catalonia, the City Halls of Barcelona and Sant Adrià de Besòs, and Fusion for Energy (F4E), highlighted different paths to our energy future with key interventions from Megan Richards, Director of Energy Policy in the European Commission, and Jesús Izquierdo, F4E Associate Chief Engineer The need to develop sustainable energy mix for the future, was one of the key messages together with the long-term contribution f fusion power.

(L-R): Adriana Farran (Dean at the Barcelona East School of Engineering), Ruth Soto (Member of Municipal Council of the City of Sant Adrià de Besòs), Gemma Fargas (Vice-Rector of Social Responsibility and Equality, UPC BarcelonaTech), Stavros Chatzipanagiotou (F4E Head of Communication).

Sweden gets organised to strengthen industrial participation in ITER

Leonard Biagioni, Deputy Head of F4E Commercial Department, presenting business opportunities.

On 6 June 2019, Big Science Sweden and Vinnova, Sweden's governmental agency supporting innovation, organised an industrial day on ITER. More than 60 representatives from government, academia and industry (such as Sandvik, Skanska, ABB AB Energy Industries, and Smarter Electronic Systems), attended the event, many of which already contribute to the European Spallation Source (ESS) located in Lund. The conference was opened by Stina Billinger, State Secretary for Enterprise and Innovation, emphasizing the importance of increased international cooperation on research and innovation, for a sustainable world, and reiterating Swedish commitment to large science projects such as ITER and ESS, as part of the vision to make Sweden the first nation free of fossil fuels.

The key messages from the seminar underlined the progress of the ITER project and highlighted the upcoming business opportunities. Special attention was given to the transfer of experience from the ESS construction (which is close to completion) to the ITER construction: this aspect was mentioned as a priority by both government and industry representatives.

ITER captivates audiences at EU Sustainable Energy Week

The EU Sustainable Energy Week (EUSEW), organised by the European Commission, has celebrated its 14th edition. Over time the event has grown in size, popularity and has become a reference to several policy communities, companies, laboratories, activists. By bringing together more than 4 000 participants, 380 speakers contributing to more than 90 policy sessions, it has become the ideal setting to network, make political declarations, launch new projects highlighting our commitment to cutting down greenhouse gas emissions by making Europe a pioneer in the production of sustainable, clean and efficient energy. A session on fusion explained its merits, the investment undertaken by the EU, and its contribution to ITER- the biggest scientific collaboration aiming to bring a step closer this abundant energy.

(L-R) P.Nieckchen, Eurofusion; S. Tabachnikoff, ITER Organization; E. Righi, European Commission, Directorate General for Research; S. Loupasis, European Commission, Directorate General for Energy at the European Union

Sustainability Energy Week 2019, Belgium, Brussels , June 2019 © European Union

ITER builds up momentum at the European Research and Innovation Days

In its first edition, the European Research and Innovation Days exceeded all expectations by attracting more than 3000 participants. During the three day event, held in Brussels on 24-26 September under the auspices of the European Commission's Directorate General (DG) for Research and Innovation, policy-makers, industry, laboratories and the science community stressed the importance of investing in those areas, building networks and bridges with other continents.

The ITER exhibit, in the format of a compact movie theatre, travelled to Brussels offering a gripping visual narrative of the progress so far. Aerial views and the testimonies of key personalities involved in the ITER project were projected. To complement the cinematic visuals with persuasive hard talk, Dr. Bernard Bigot, ITER Organization Director-General, was one of the guest speakers at the "Euratom - research for all" session making the case for fusion research. He explained the principles of fusion energy, the technology involved and the significance of the ITER project.

(L-R) Katja Rauhansalo, ITER Organization; Aris Apollonatos, F4E, standing in front of the ITER exhibit and making the case for EU research at the European Research and Innovation Days, Brussels, September 2019.

(L-R) Concluding remarks by Elena Righi-Steele, Head of Euratom Research, DG Research and Innovation; Patrick Child, Deputy Director-General of DG Research and Innovation; Eric Van Walle, Director-General of SCK CEN; Bernard Bigot, Director-General of ITER Organization; Nathan Paterson, Foratom, at the European Research and Innovation Days, Brussels, September 2019.

FUSION FOR ENERGY

2019

Annual Activity Report

Parts II – V

This report fulfils the requirement of Article 48
of F4E's Financial Regulation on the provision of
a Consolidate Annual Activity Report (Parts II - V)

Edited by Antoine Le Gall

Table of Contents

List of Acronyms

ABAC	(Accrual-based Accounting); Accounting and budgetary tool of the European Commission and F4E
AMC	Administration and Management Committee
BA	Broader Approach Agreement
BPM	Business Process Management
CA	Contract Agent
DA	Domestic Agency
DACC	Deviations Amendments and Contract Changes tool
DEMO	Demonstration Fusion Reactors
EAC	Estimate At Completion
EC	Electron Cyclotron
ECA	European Court of Auditors
ECH	Electron Cyclotron Heating
EcoSys®	Enterprise Project Control System
EDPS	European Data Protection Supervisor
EU	European Union
EUROfusion	European Consortium for the Development of Fusion Energy
EVEDA	Engineering Validation and Engineering Design Activities
EVM	Earn Value Management
F4E	Fusion for Energy
FC	Framework Contract
FO	Official
FR/IR	Financial Regulation/Implementing Rules
FWC	Framework Contract
GB	Governing Board
HPC	Hold Point Clearance
HR	Human Resources
HVPS	High Voltage Power Supply
IAC	Internal Audit Capability
IAEA	International Atomic Energy Agency
IAS	Internal Audit Service
IC	ITER Council
IC	Ion Cyclotron
ICT	Information and Communication Technology
IDM	ITER Document Management (software)
IFERC	International Fusion Energy Research Centre
IFMIF	International Fusion Materials Irradiation Facility
IMS	Integrated Management System
IN-DA	Indian ITER Domestic Agency
IO	International Organisation
IP	Intellectual Property
IPR	Internal Panel Review
IPTs	Integrated Project Teams
IRS	Integrated Reporting System
ISC	Improvement Steering Committee

ITER IO	ITER International Fusion Energy Organization
IUA	ITER Unit of Account
KPI	Key Performance Indicator
'Lean Six Sigma' methodology	A set of techniques and tools for process improvement
LIPAc	Linear International Fusion Materials Irradiation Facility Prototype Accelerator
MAP	Multi-Annual Plan
MFF	Multi-Annual Financial Framework
MITICA	Megavolt ITER Injector and Concept Advancement
MS	Management Standards
MTA	Milestone Trend Analysis
NBTF	Neutral Beam Test Facility
NRC	Non-Conformity Report
OLAF	European Anti-Fraud Office
OPS	Overall Project Schedule
PA	Procurement Arrangement
PBS	Plant Breakdown Systems
PCC	Procurement and Contracts Committee
PCR	Project Change Request
PGM M/IMP	Programme Management and Implementation
PS	Power Supply
PSM	Project Steering Meeting
Q1/2/3/4	Quarter
QA	Quality Assurance
QC	Quality Control
QMS	Quality Management System
R&D	Research and Development
RAPID	F4E-developed tool which follows up on the implementation of audit actions
RMV	Requirements Management and Validation
SAT	Site Acceptance Test
SMEs	Small and Medium Enterprises
SNE	Seconded National Expert
SOAP	Sign-Off Authorisation Policy
SPI	Schedule Performance Index
SPIDER	Source for Production of Ions of Deuterium Extracted from Radio Frequency plasma
TA	Temporary Agent
TAP	Technical Advisory Panel
TSS	Technical Support Services
VC	Voluntary Contributor
WBS	Work Breakdown Structure
WP	Work Programme

Part II. (a) Management

2.1 Major Developments

In 2019, F4E has consolidated and benefited from the measures over the last five years to improve its performance and management.

Some of the highlights of this year include:

- F4E established and adopted its own its own Health and Safety (H&S) Management System followed by eight procedures and two instructions;
- Completed Corporate Actions in response to Annual Assessments and other evaluations increased from 62% to 86% despite the total number of actions increasing from 138 to 205;
- F4E signed 91 contracts and grants in 2018 for a total value of € 229m increasing the total investment by F4E to just over € 4.2bn;
- F4E implemented 99.8 % of commitment appropriations (100 % individual) and 97.1 % of payment appropriations, giving confidence in the improved robustness of project planning;
- To reinforce the matrix structure in the ITER Delivery Department, delegations were given to Project Managers (increasing the number of Authorising Officers from 47 to 105);
- Transparency in Human Resource (HR) matters was increased with the publication of quarterly metrics and dedicated HR notices for all-staff;
- A framework governing the relations between F4E and the Trade Unions and Staff Associations was signed to benefit social dialogue with the organisation;
- Measurable efficiency gains were achieved through improvement projects targeting the time to recruit, the time to procure as well as signing and paying of contracts;
- F4E completed four improvement projects on the Estimate at Completion processes, the tool for contract deviations, document management and reducing schedule delays.
- F4E's action implementation rate in response to recommendations of the internal auditor increased from 79 % in 2018 to 87 % in 2019.
- The independent annual assessment concluded that F4E has put in place adequate tools to monitor cost, schedule and risk for the management of the ITER projects;
- The European Parliament granted F4E a discharge for its implementation of the 2018 budget;
- An updated Anti-Fraud Strategy was adopted by F4E's Governing Board in late 2019 together with an action plan;
- A "green week" was launched in 2019 with a number of initiatives that resulted in drastic reductions in plastic consumption in cafeterias, offices and meeting rooms;
- A new Business Process Management policy frame was introduced with a full process mapping and the compilation of a complete portfolio of working procedures;
- A contract for external support for a leadership development programme was concluded including individual and group coaching as well as a 360 degree assessment.

2.2 Safety

2.2.1 Health and Safety

In the year 2019, F4E could establish and adopt its own Health and Safety (H&S) Management System. It is a tailor-made body of procedures and measures to safeguard occupational health and follows the first of the corporate objectives “Safety First!”. Due to its strong involvement in construction and manufacturing tasks for the ITER project, F4E felt obliged to create such a system and ensure its proper roll-out across the whole organisation.

The H&S Management System of F4E is based on a hierarchy of norms, which oblige any employer in terms of a duty to care for its staff and external collaborators under F4E contracts. It derives from the Council Directive of 12 June 1989 on the introduction of measures to encourage improvements in the safety and health of workers at work (89/391/EEC). On the basis of this Directive and in consultation with the services of the Commission, F4E elaborated a H&S Policy which was ultimately adopted by the Administration and Management Committee of the Governing Board on 14 June 2019 as an Implementing Rule.

The F4E H&S Management System was developed by F4E’s H&S Working Group. Decisions by the H&S Working Group and all documents of the H&S Management System have been duly consulted with the Staff Committee and the Heads of Departments of the organisation. The H&S Implementing Rule laid the foundation for a host of individual procedures to shape the F4E H&S Management System as follows:

Procedure	Description
Risk Assessment and Preventive Measures	This Procedure establishes: • The methodology to identify hazards in Offices and Non-Offices environments and their related occupational risks • How the H&S Coordinator/External Preventive Service (EPS) evaluates the risks and recommends preventive measures to be implemented in order to reduce or eliminate the risks Records: Individual Risk Assessment.
Occupational Accidents Investigations	This Procedure establishes: • How the investigation of an accident / incident involving an F4E staff member is conducted • How corrective measures have to be taken regarding to the investigation Records: Accident Investigation Reports.
Worker’s Training and Information	This Procedure establishes: • How needs for occupational trainings are detected at F4E • How trainings are conducted Records: Training certificates, tests, attendance registers, etc.

Procedure	Description
Emergency Plan	This Procedure establishes: • The general framework for the development and implementation of the Emergency Plans applicable to F4E Headquarters (Barcelona) and Permanent Sites (Cadarache and Garching). Records: Emergency Plans for Barcelona, Cadarache and Garching.
Coordination among Undertakings	This Procedure establishes: • The coordination processes to be followed by F4E and other companies & organisations when working in the same premises. Records: Information Demands to EPS, Trainings.
Personal Protective Equipment	This Procedure establishes: • The methodology and conditions to request and provide Personnel Protective Equipment (PPE) to workers. Records: PPE Delivery Receipts, PPE Request Forms.
Health Surveillance	This Procedure establishes: • How F4E conducts the Health Surveillance of workers. Records: Medical Aptitude Forms, Medical Reports, etc.
Consultation and Participation of Workers	This Procedure establishes: • The methodology of consultation and participation of workers relating to H&S matters. Records: Decisions of the H&S Committee, nominations of H&S Staff representatives

Besides the H&S Procedures, the following instructions were developed in order to regulate specific H&S matters outside of the scope of the H&S Procedures:

a) Working Instruction for Staff on mission

b) Working Instruction for the Protection against Radiation

In order to ensure the implementation of the H&S Management System, F4E has also appointed a **Health & Safety Coordinator**, whose task is to advice in all occupational health matters, being the main point of contact for H&S matters in F4E. The H&S Coordinator is also in charge of driving all the relevant measures following the H&S Management System and acts as Radiation Protection Officer of F4E

The H&S Coordinator reports annually to the Director and Senior Management about the risk assessments performed, the procurement of personal protective equipment, H&S trainings organised for F4E teams as well as specific accident/incident investigations. The latest report dates from 19 December 2019.

In addition to the H&S Coordinator, F4E appointed H&S Site responsible persons for Cadarache and Garching in order to support the H&S Coordinator in monitoring and reviewing the implementation and compliance of the H&S Management System on both sides.

In order to ensure that the staff support and accept these measures, the **Health & Safety Committee** was created. This Committee is constituted by three members appointed by the F4E Director and an equal number of members appointed by the Staff Committee. The Committee is supposed to scrutinize the implementation of the overall H&S Management System.

2.2.2 Nuclear Safety

Nuclear safety is a priority for F4E and is one of its top Corporate Objectives. F4E is not the nuclear operator of ITER and, as such, is not directly responsible for the assembly and operation of the nuclear facility. Nevertheless as a major contributor and the principal external "intervener" to the ITER Project (along the other Domestic Agencies), F4E has the responsibility to give to nuclear safety the attention it deserves and apply a nuclear safety culture.

This is spearheaded by F4E's Nuclear Safety Unit, which provides the relevant expertise during design and manufacturing phases. This year, the team performed four nuclear safety inspections, in complement to the Quality audits (performed by another F4E team). The French Nuclear Safety Authority (ASN) also conducted inspections that did not show any major issue related to the F4E work.

Nuclear safety culture improvement was this year's focus. Experts from ENSTTI[1] provided two workshops to the nuclear safety-relevant F4E staff, while a new internal training focussing on basics was created for the entire F4E personnel (8 sessions for about 50 participants in 2019). F4E also made progress in implementing improvement actions in response to recent assessments and audits.

2.3 Governing Board

As the body responsible for the supervision of F4E in the implementation of its activities, the Governing Board meets at least twice a year and is composed of all Member States of the EU, Euratom and Switzerland as an associated country.

The Governing Board met on three occasions during 2019, while the Bureau – its preparatory body which comprises Euratom, France, all the Committees' Chairs and three GB members elected by the Governing Board every two years – convened seven times with the aim of reviewing key documents and propose recommendations on Governing Board decisions.

The summaries of the meetings of the Governing Board are made public and accessible via F4E`s website: https://fusionforenergy.europa.eu/governing-board/

Here follows an overview of the main items discussed and key decision taken in 2019:

Governance

At its 45th meeting in December, the Governing Board elected its new Chair, Dr. Beatrix Vierkorn Rudolph. At the same meeting, the Governing Board elected Ms. Maria Faury as Chair of the Administration and Management Committee, Dr. Radomir Panek as Chair of the Technical Advisory Panel and Ciaran Spillane as Chair of the Audit Committee. The Governing Board also elected

[1] ENSTTI: European Nuclear Safety Training and Tutoring Institute.

Gabor Veres (Hungary), Carlos Martinez Riera (Spain) and Xavier Raymond (Switzerland) as members of the Bureau for a mandate of two year.

F4E Progress

The Governing Board supervised the advancement of F4E's activities and commended the achievements of F4E both on the ITER Project and in the Broader Approach Projects.

Action Plans

The Governing Board oversaw the development and implementation of F4E's action plans in response to the recommendations of the Ad Hoc Groups of experts (Neutral Beam, Buildings and MAP). At the end of 2019, F4E had implemented 85% percent of all corporate actions. In particular, the Governing Board praised that F4E implemented a more comprehensive Earned Value Management (EVM) system and adopted a more consistent reporting on project performance through the adoption of a Project Booklet.

Annual Assessment

In accordance with the requests of the Council, the Governing Board oversaw the 8th annual assessment of F4E with a focus on cost containment, schedule control, risk control and human resources management. The procedure and outcome of this assessment is described in Part II. (b) of this report on 'External Evaluations'.

Critical projects

The Governing Board and Bureau have been particularly attentive on the supervision of the schedule, cost estimates and budget for the critical projects, in particular the Buildings and the Vacuum Vessel. In the case of the Buildings, F4E has responded by implementing various cost containment measures, which proved largely successful at maintaining the project within set budget.

The Governing Board discussed the risk related to the cost increase of the Buildings project and endorsed an action plan to address the recommendations put forward by the expert group created by the Technical Advisory Panel. Throughout the year, the Governing Board and Bureau received regular updates on the evolution of the Buildings' cost from the management and pushed F4E to find cost containment opportunities. F4E has responded by optimising its cost estimates and by implementing various cost containment measures, which proved successful at maintaining the project within the budget.

The governance bodies have closely monitored the progress and performance of the Vacuum Vessel project, in view of mitigating the risk posed by delays of the European sectors. F4E has provided regular updates of the project performance to the Technical Advisory Panel, Governing Board and Bureau, which have requested F4E to implement performance enhancement measures. The management has responded to the governance recommendations by adopting a performance acceleration plan, which is monitored by the Bureau on a monthly basis.

The governance has also advanced the discussion on the challenges posed by upcoming projects such as the Hot Cell and discussed the strategy for its future procurement.

In addition, the Governing Board endorsed a new contract strategy for the Poloidal Field Coils with the aim of enhancing the project performance and mitigate risks.

Project Planning and Budget

The Governing Board adopted the Multi Annual Programming Document 2020-2024 and endorsed the key assumptions underpinning the Single Programming Document 2021. The Governing Board delegated to the Bureau the adoption of the draft Single Programming Document to be transmitted to the European Commission by the end of January 2020.

The Governing Board adopted the 1st, 2nd and 3rd Amendment to the 2019 Work Programme and the 1st and 2nd Amendment to the 2019 Budget and the 2020 Budget.

In 2019, the Governing Board has thoroughly discussed the evolution of the Estimate at Completion, which has remained broadly stable until 2020 and 2035. Nevertheless, the governance bodies have noted that the level of the management reserve, which serves to cover for unexpected risks that may occur within the project timeline, remains low/marginal.

Annual Accounts, Audit matters and Regulations

The Governing Board approved the 2018 Annual Accounts and noted the noted the European Court of Auditors Report on the 2018 Annual Accounts.

The Governing Board approved the Internal Audit Capability Annual Audit Plan for 2020 and adopted an updated Anti-Fraud Strategy for F4E.

In line with the new Framework Financial Regulation of EU (2019/715) on the framework financial regulation for the bodies set up under the TFEU and Euratom Treaty, the Governing Board adopted the new F4E Financial Regulation in December 2019.

International Agreements

The Governing Board adopted many international agreements for collaboration between F4E and its scientific and technical partners. Notably, the Governing Board adopted the Cooperation Arrangement between IO the Broader Approach Activities and the ITER Project and the Memorandum of Understanding on Collaboration in Fusion Research and Development between Fusion for Energy and EUROfusion.

2.4 Corporate Action Plans

The Corporate Action Plans respond to recommendations from Annual Assessments (see Part II. (b) External Evaluations) and Ad-Hoc Groups of the Governing Bodies, Governing Board Actions and also own-initiative actions.

During the course of 2019, the **overall percentage of completed Corporate Actions increased from 62% to 86%**. In particular, all remaining actions were implemented for the:

- 3rd Annual Assessment of F4E;
- 2015 F4E Director Action Plan;
- 2016 F4E Director Action Plan.

This increased percentage of completed actions was achieved despite an increase in the total number of actions during 2019 from 138 to 205 through the addition of the following new plans:

- 7th Annual Assessment of F4E (7 new actions);
- Ad-Hoc Group on the Buildings (33 new actions);
- Governing Board Actions (27 new actions).

To improve the follow-up of Corporate Actions, all such actions dating back to 2014 were introduced into F4E's database for action tracking (known as RAPID) used for audit follow up. This improvement was welcomed by F4E's Governing Board on 5 April 2019.

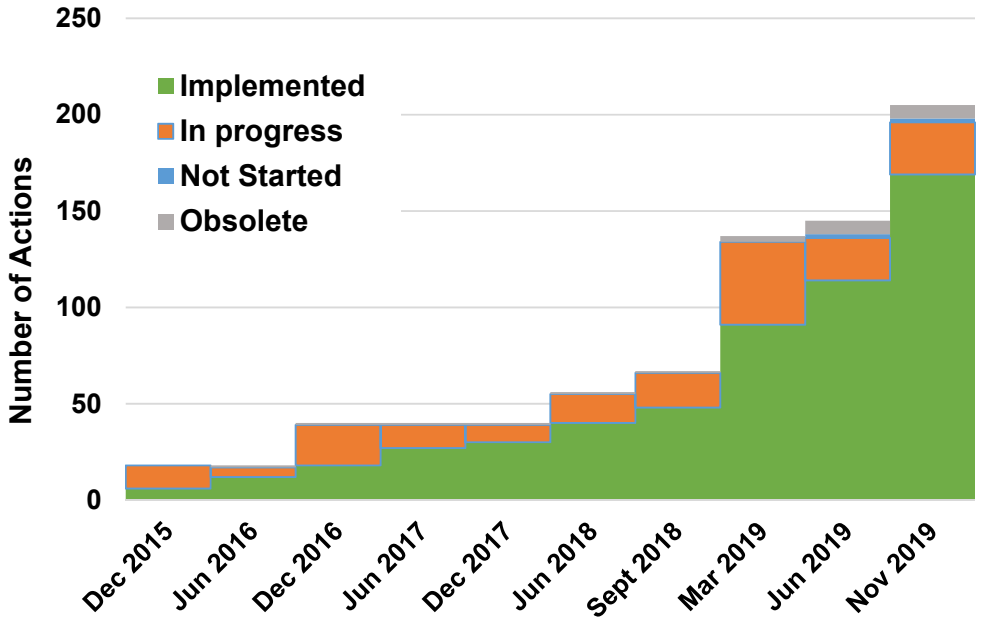


Figure 1: Evolution of the implementation of F4E's corporate level actions since 2015

2.5 Budgetary and Financial Management

The 2019 financial statements and the budget implementation are detailed in the 2019 Final Annual Accounts, attached to the present Annual Activity, and in the 2019 Budgetary and Financial Management Report, published separately.

2.5.1 Establishment of the 2019 Budget

F4E 2019 budget was initially adopted by F4E's Governing Board[2] for the amount of € 674.71m in commitment appropriations and € 781.35m in payment appropriations.

It was successively amended in the Governing Board meetings of July and December 2019 Governing Board meetings.

The final available appropriation, including the carryover from the previous year were € 729.71m in commitment appropriations and € 761.19m in payment appropriations.

2.5.2 Contributions to the 2019 Budget in Revenue

The distribution of the 2019 revenue ensures a fair balance between contributors, in line with their relative contribution for the overall period of ITER construction is shown below.

Figure 2: 2019 Revenue (Payment Appropriations)

The final statement of revenue was almost entirely cashed, including the outstanding revenue from the previous year. Only a small amount was still due at the year-end, corresponding to a part of the membership contribution of Spain, amounting to € 0.21m.

[2] *Decision of the F4E Governing Board F4E_D_2BEFRX adopted on 12/12/2018*

2.5.3 Implementation of the 2019 Budget

Commitments	**99.8%**	**of Implementation of the final available budget**		
		Final Budget: 729.71	Execution: 728.10	EUR million
	107.9%	compared to the original budget		
		Original Budget: 674.71	Execution: 728.10	EUR million
	100.0%	in individual commitments		
		Execution: 728.10	Ind.Commit.: 728.10	EUR million
Payments	**97.1%**	**of implementation of the final available budget**		
		Final Budget: 761.19	Execution: 738.90	EUR million
	94.6%	compared to the original budget		
		Original Budget: 781.35	Execution: 738.90	EUR million

Table 1: Summary of the Situation with Commitments and Payments by end-2019

2.5.3.1 Implementation of the 2019 Administrative Expenditure

The permanent monitoring of the administrative requirements allowed F4E to obtain a balance between the actual needs and the budget. An increase of the administrative expenditure was required during the year, due to the following elements:

- Salaries: Compared to the initial draft budget established in the 2017 edition of the Resource Estimates Plan, the additional needs were mainly due to the new trend of positive adjustments of salaries since 2017 while the vacancy rate was maintained at low level all along the year 2019
- Missions: The development of a specific tool for the management of mission expenditure has allowed a precise allocation of missions between operational and administrative expenditure. The total expenditure for mission was decreased compared to the original budget.

The Director met the additional needs by transfers adopted according to Article 27 of F4E's Financial Regulation. The **Error! Reference source not found.** provides the detail of the transfers. The entire administrative budget was committed and 84.1 % was paid at the end of the year.

2.5.3.2 Implementation of the 2019 Operational Commitments

The statement of operational expenditure, developed in **Error! Reference source not found.** was modified with two amending budgets in July and December 2019 in order to reflect the changes in the statement of revenue and to align the operational budget in commitment appropriations, with the successive amendments to the 2019 Work Programme. 99.8 % of the budget was implemented in individual direct commitments.

2.5.3.3 Implementation of the 2019 Operational Payments

The statement of operational expenditure, in **Error! Reference source not found.** was modified by two amended budgets in order to reflect the changes in the statement of revenue. The Director adopted transfers within the Title 3 according to the needs at the year-end to ensure a complete final implementation.

The final implementation rate for operational payment was 97.1%, representing € 22.3m of non-executed payments. The execution of the 2019 budget was limited due to the contribution of ITER Organization for the Reserve Fund received at the end of the year, preventing its implementation by F4E, and the normal carry over to 2020 in the administrative expenditure.

2.5.4 Impact of the 2019 Budget in Commitment

2.5.4.1 Main Commitments

The main operational commitments for the 2019 budget are:

- € 224.20m for the in-cash contribution to the ITER Organization;
- € 95.70m for the execution of TB12 – Design and Build of Buildings 34, 37, 71 non PIC, 75 non PIC;
- € 38.62m for the Magnet Supply Contract;
- € 36.63m to fund additional scope, quantities and complexity increase for the TB03 contract (Buildings);
- € 32.83m to fund additional scope of the Architect Engineering contract (Buildings);
- € 30.58m to fund additional scope, quantities and complexity increase for the TB16 contract (Buildings);
- € 18.99m for the Manufacture of the Torus and Cryostat Cryo pumping System;
- € 13.31m for the Supply of the Beam Line Components;
- € 179.68m in about 550 commitments for smaller contracts.

2.5.4.2 Action Extending for More than One Financial Year

The entire operational budget of F4E is in dissociated appropriations and more than 600 open commitments from the 2019 budget amounting to € 399.20m covering actions extending for more than one financial year (final date of implementation after 31 December 2019).

2.5.4.3 Actions Carried Forward to 2020

F4E's obligations amount to € 1 267.63m at the time of closure of the 2019 budget. It corresponds to the total amount left over on open budgetary commitments, and is detailed as follows:

(EUR)

2019 budget Heading	Open Commitments at the beginning of 2020				
	from previous year (1)	from 2019 budget (2)	Total (3)=(1)+(2)	To be de-committed (4)	Net Total (5)=(3)-(4)
TITLE 1 - STAFF EXPENDITURE	**0.00**	**1,356,087.63**	**1,356,087.63**	**0.00**	**1,356,087.63**
TITLE 2 - OTHER OPERATING EXPEND.	**0.00**	**3,185,297.32**	**3,185,297.32**	**0.00**	**3,185,297.32**
Total TITLE 1 & 2	**0.00**	**4,541,384.95**	**4,541,384.95**	**0.00**	**4,541,384.95**
CH 31 - ITER CONSTRUCTION INCLUDING ITER SITE PREPARATION	649,758,331.58	252,488,460.25	902,246,791.83	3,551,740.00	**898,695,051.83**
CH 32 - TECHNOLOGY FOR ITER	4,920,117.40	1,454,500.27	6,374,617.67		**6,374,617.67**
CH 33 - TECHNOLOGY FOR BROADER APPROACH AND DEMO	4,938,581.14	2,103,209.21	7,041,790.35		**7,041,790.35**
CH 34 - OTHER EXPENDITURE	2,513,798.04	10,101,850.75	12,615,648.79		**12,615,648.79**
CH 35 - ITER CONSTRUCTION - APPROPRIATIONS ACCRUING FROM THE HOST STATE CONTRIBUTION	199,160,295.59	116,239,703.93	315,399,999.52		**315,399,999.52**
CH 36 - APPROPRIATION ACCRUING FROM THIRD PARTIES TO SPECIFIC ITEM OF EXPENDITURE	2,588,673.07	20,380,008.94	22,968,682.01	2,225.00	**22,966,457.01**
Total TITLE 3	**863,879,796.82**	**402,767,733.35**	**1,266,647,530.17**	**3,553,965.00**	**1,263,093,565.17**
Total	**863,879,796.82**	**407,309,118.30**	**1,271,188,915.12**	**3,553,965.00**	**1,267,634,950.12**

Table 2: Open budgetary commitments at the closure of F4E's 2019 budget

The total amount of open commitments is decreased by € 44.27m compared to the situation at the end of 2018[3].

Notes:

- Unpaid administrative expenditures carried forward from 2018 were cancelled;
- Title 1: There was no balance leftover on the 2019 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;
- There are no global commitments from the 2019 Budget to be carried over for implementation in individual commitments in 2020, except a small amount to be de-committed on the Chapter 36 (€ 2225). An old outdated global commitment amounting to € 3.55m is also to be de-committed.

[3] *Decision of the F4E Governing Board B F4E_D_2GTMHU 2018 Final Annual Accounts 10/07/2019*

2.5.5 Interest Charged by Suppliers through Late Payments

During 2019 F4E has processed 2 476 payment transactions (excluding salaries). Payments of invoices falling under Title 3 (operational expenditure) increased by 2 % over 2018. F4E paid € 5 392 in late interest in 2019.

2.5.6 Procurement Procedures in 2019

In line with the focus that F4E has on achievement of ITER First Plasma, the procurement procedures continued in 2019 to progress in the design and prototype manufacturing phases of the systems and components for the EU's in-kind obligation to ITER.

During 2019 43 Operational Procurement Procedures were launched, 74 Procurement Contracts were awarded and 75 were signed, for a total value of around € 225m.

Of the 74 Operational Contracts awarded, 50 contracts were awarded under a Negotiated Procedure, 19 under an Open Procedure and five under a Competitive Procedure, for a total amount of € 61m, € 29m and € 133, respectively. Regarding Restricted Procedures, no contracts were awarded in 2019.

For what concerns administrative activities, six Administrative Procurement Procedures were launched, and 16 Procurement contracts (Direct or Framework) were signed for a total value of € 4m. During 2019, no grant procedures nor agreements were published or signed.

2.5.6.1 Type of Operational Procurement Procedures

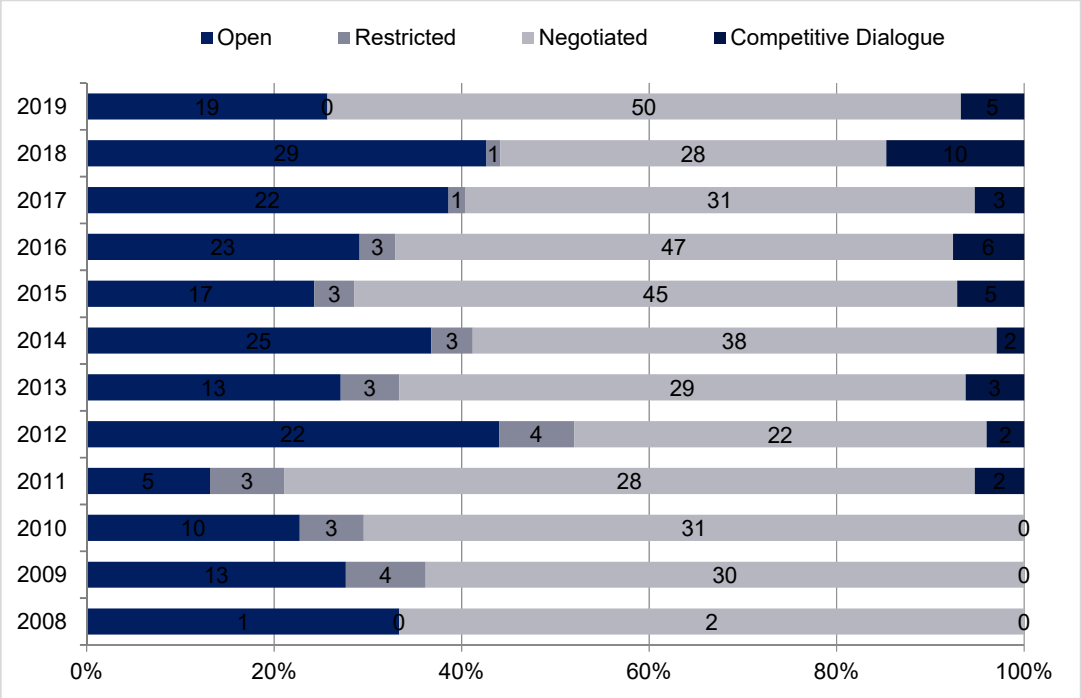


Figure 3: Number of operational contracts awarded by procurement procedure

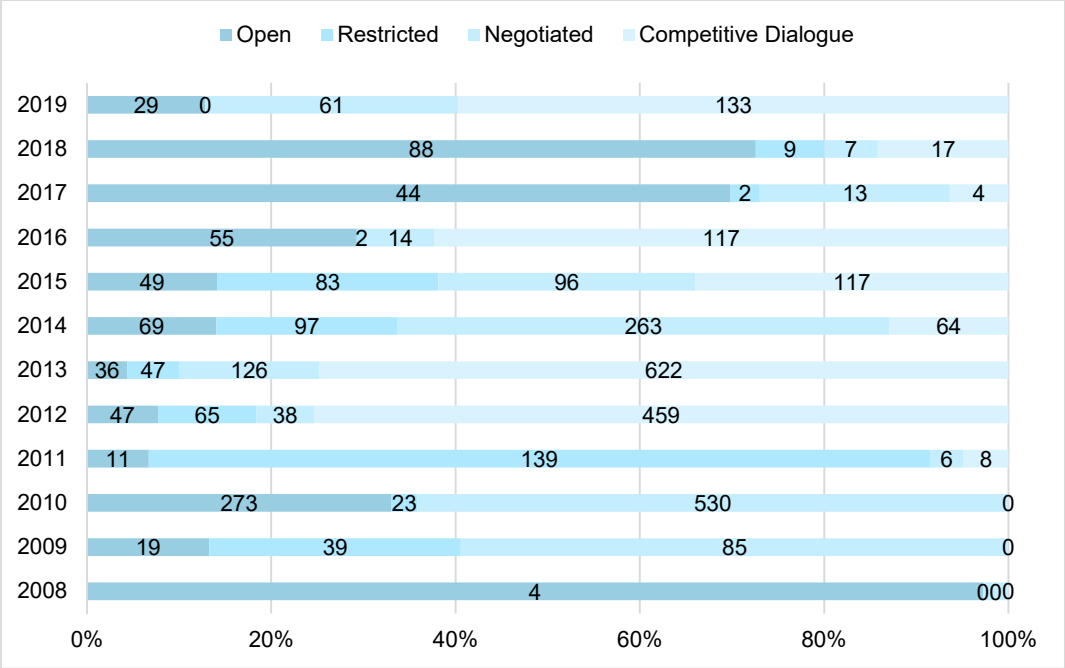


Figure 4: Value of operational contracts awarded by procurement procedure (€ million)

2.5.7 The 2019 and Previous Budgets

The graphs below show the evolution of available F4E budgets in commitment and payment appropriations and the execution since F4E became financially autonomous in 2008.

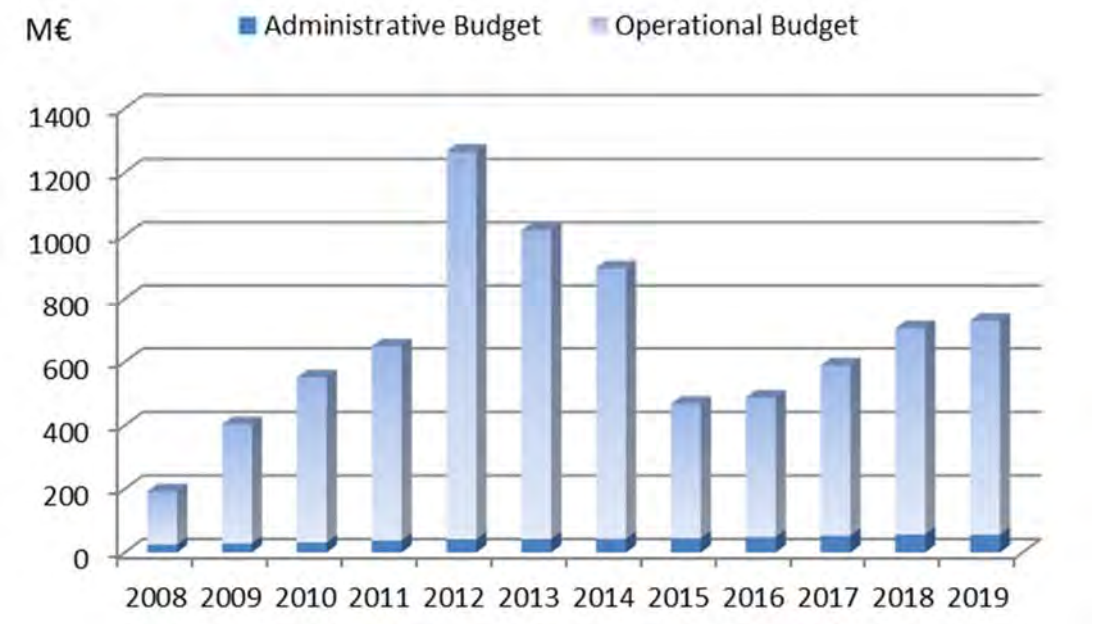


Figure 5: Evolution of the Budget in commitment appropriations since 2008

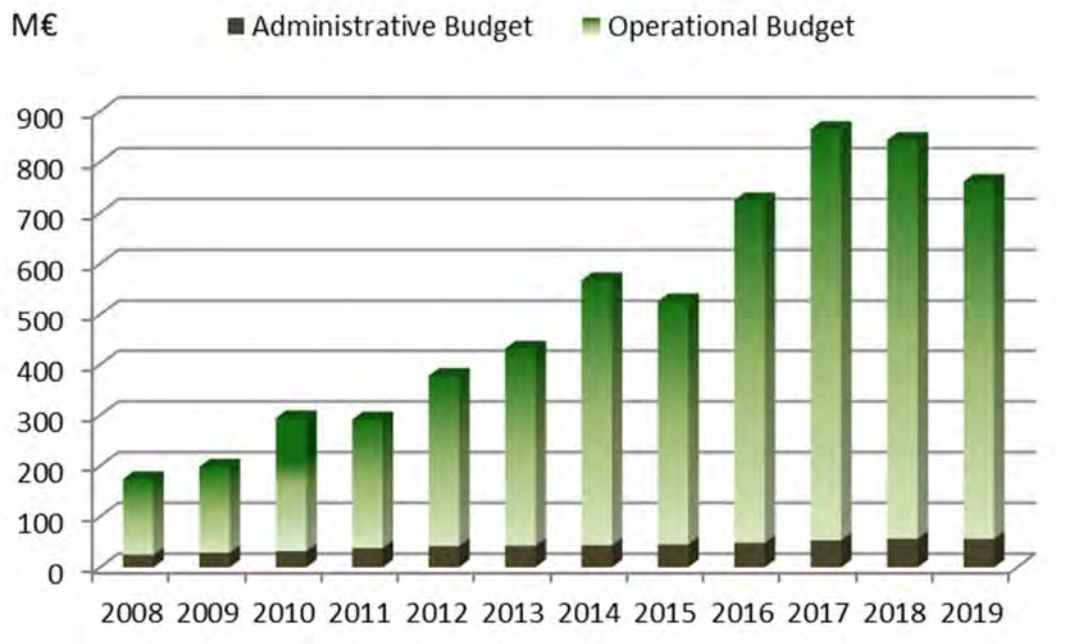


Figure 6: Evolution of the Budget in payment appropriations since 2008

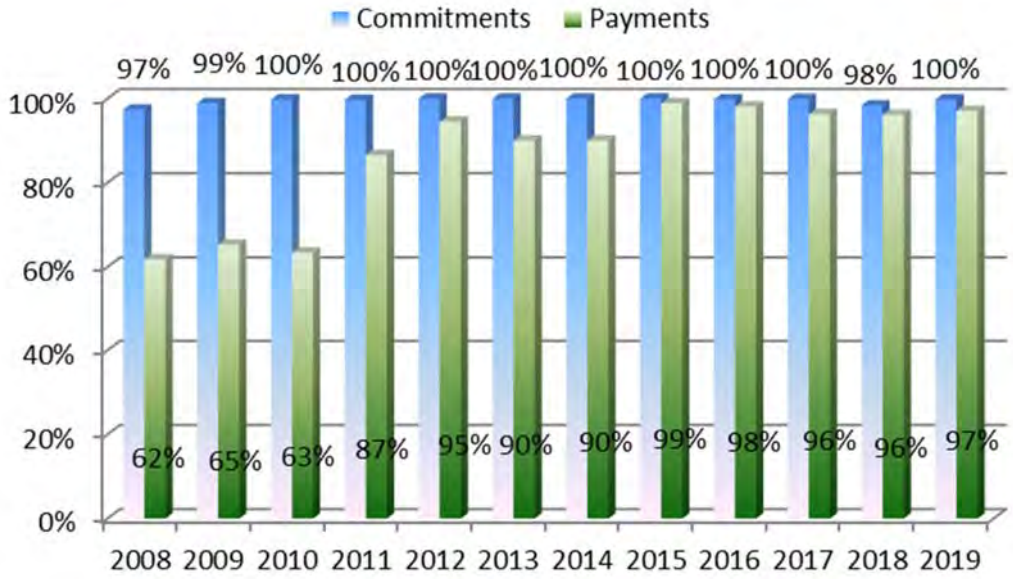


Figure 7: Evolution of the budget implementation since 2008 in commitments and payments

2.5.8 Cost and benefits of controls

F4E performs a yearly calculation of the cost of controls in compliance with article 48 of the F4E FR and to provide as an input to the Directorate-General Energy of the European Commission for publication in its Annual Activity Report under the cost of controls of entrusted entities.

This exercise consists of estimating all the staff (FTEs) assigned and involved in control activities within the organisation. Once the number of FTEs is calculated, it is converted into a monetary

value additionally to the budget used for other cost control activities (audit contracts, quality inspectors, etc). F4E follows the guidelines provided by Directorate-General Budget and Directorate-General Energy, containing some general principles to perform this exercise, detailing in particular the functions that have to be considered as 100% control (financial, legal, quality, procurement activities, IT, etc.).

For the year 2019, the result of this calculation is that out of the 437 staff members at F4E, 84% (366 FTEs) spent their time in control activities. The cost of these FTEs is calculated by using a pro rata of the number of staff by category (Administrator, Assistant, Contractual Agent FG-IV and the rest of contractual agents), and using the yearly costs per category as indicated by the Commission. The result of this calculation is that the 366 FTEs dedicated to control activities at F4E have an estimated cost of 40 529 961 EUR.

In addition to this, F4E calculated the payments made on contracts for control activities (quality inspectors for different components, nuclear inspectors, adjudicators for buildings contracts and external audit firms carrying out audits on grant beneficiaries and performing the annual statutory accounts audit), which resulted in a total of 2 625 135 EUR.

As a conclusion and based on the principles provided by the Commission, the cost of controls estimated value for 2019 is 43 155 096 EUR representing 6% of the budget in both commitment and payment appropriations.

The benefits of control cannot be quantified due to the nature of activities that F4E performs, providing in-kind contributions to the ITER project. However, F4E's controls bring about significant qualitative benefits, which are confirmed by the external assurance sources, in particular by the yearly granting of discharge on the F4E budget by the European Parliament and the unqualified opinion of the European Court of Auditors on the F4E Annual Accounts.

2.6 Delegation and sub-delegation of the powers of budget implementation

Delegations and Sub-Delegations in F4E during 2019 were permanent followed the organisational structure, with a clear segregation between administrative and operational project management, empowering staff members within their areas of responsibility. In July 2019, an organisational change took place to reinforce the matrix in the ITER Delivery Department, and a new role was created for the Project Managers (PjM) and Heads of Group (HoG), receiving a financial sub-delegation level 2. As a consequence, the number of authorising officers in F4E increased significantly (from 47 AOD/AOS in 2018, to 105 AOD/AOS in 2019).

Each staff member who received a (sub)-delegation for the implementation of the 2019 budget has been requested to provide his/her individual 'Declaration of Assurance' for the budgetary area for which they were responsible.

In total, 105 Declarations of Assurance were received for 2019; none of these contained a reservation or raised any issue of significance that may have an impact on the F4E Director's Declaration of Assurance. Notwithstanding this, two observations have been included in the F4E Director's Declaration of Assurance to draw the attention of the reader to the most significant risks F4E is addressing at a corporate level. The first observation relates to those risks that may lead to cost increases and schedule delays, which are inherent to the magnitude and complexity of the ITER in-kind contributions, in particular in the areas of the buildings, vacuum vessel, superconducting magnets and remote handling. The second observation relates to Internal Audit Capability (IAC)'s conclusions in its audit report related to Nuclear Safety Management and Culture,

which resulted in two critical and eight very important recommendations. It should be underlined that these risks do not call into question the legality and regularity of the underlying transactions of the 2019 annual accounts.

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

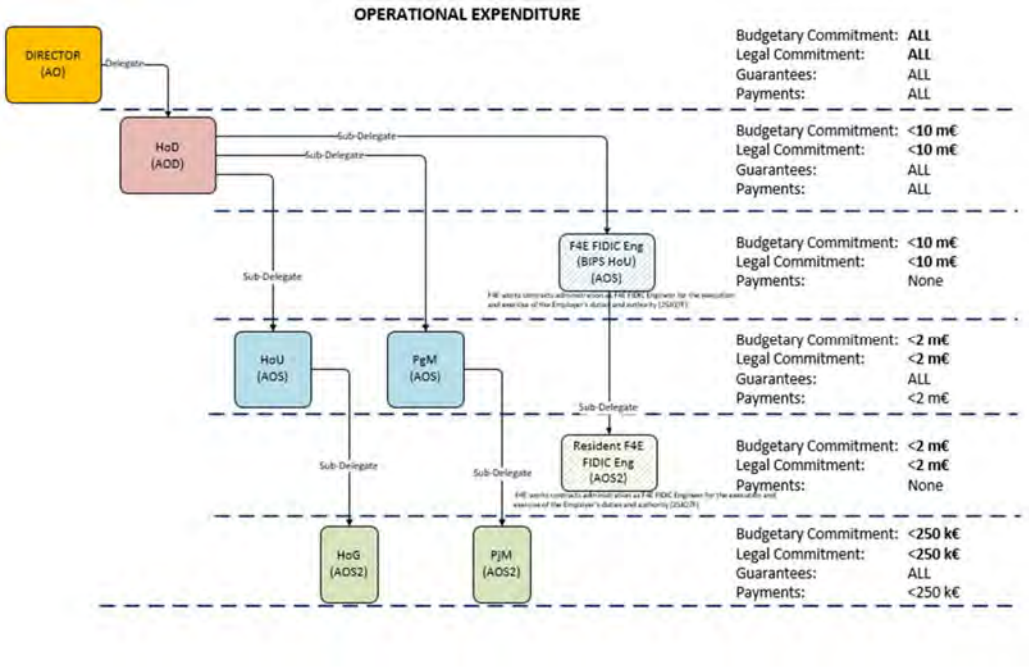


Figure 8: Schematic showing the framework of the delegations for operational expenditure

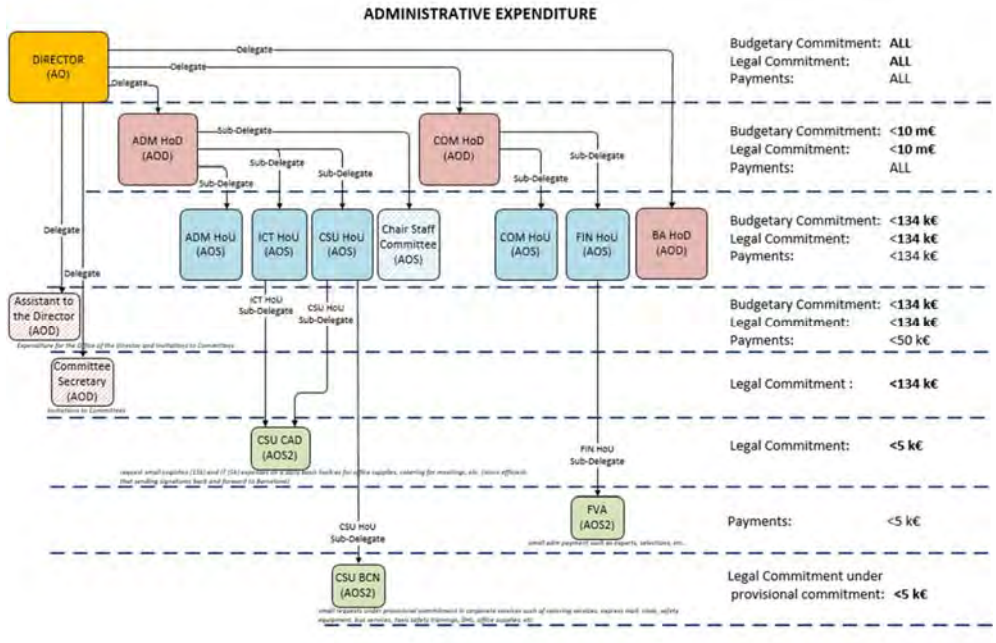


Figure 9: Schematic showing the framework of the delegations for administrative expenditure

2.7 Human Resources (HR) Management

2.7.1 Major HR Developments

Staff Evolution, Selections and Recruitment

As of 31 December 2019, the occupied posts at F4E included 51 Officials, 222 Temporary Agents and 165[4] Contract Agents. In addition, F4E relied on the support of 11 interim staff (in FTE[5]) and two Seconded National Experts.

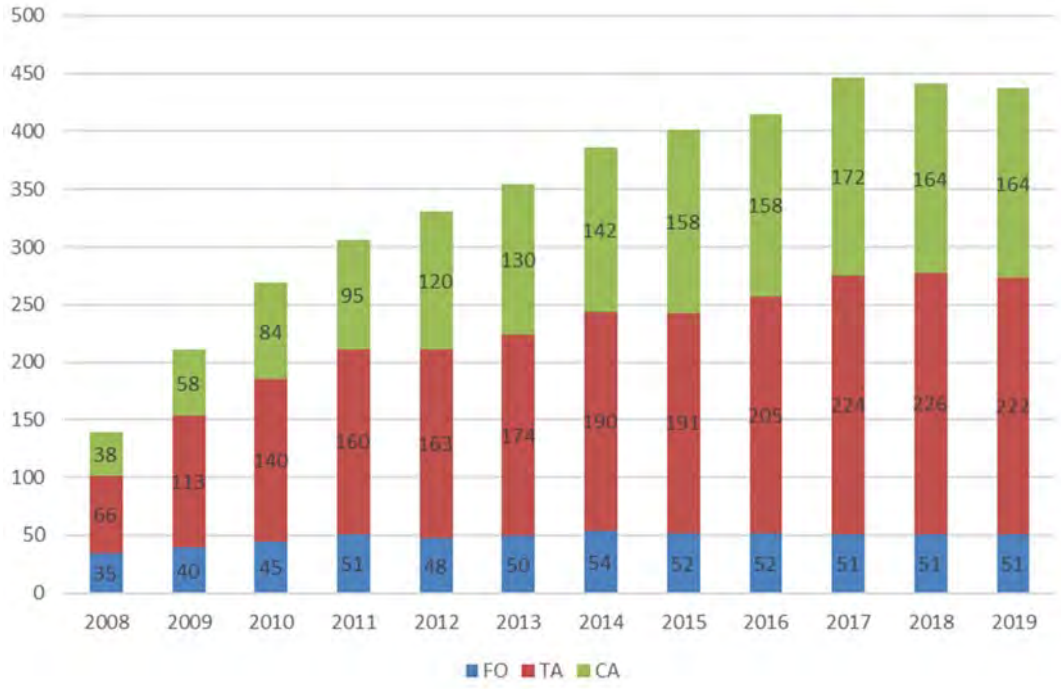


Figure 10: Staff evolution from 2008 to 2019 where FO stands for Officials, TA for Temporary Agents and CA for Contract Agents.

[4] Of which 164 in place and one accepted offer letter

[5] Full Time Equivalent

During 2019, 13 vacancy notices were published externally for eight Temporary Agents and five Contract Agents. Overall, 14 selection procedures were completed: five of which published in 2018 and the remaining nine published in 2019.

Department	FO	TA	CA
Director	-	-	-
ITER Programme	-	-	1 FGIII
ITER Delivery	-	1 AD	1 FGIV
Broader Approach Programme & Delivery	-	1 AD	-
Project Management	-	-	4 FGIV
Commercial	-	1 AD	1 FGIV
Administration	-	1 AD	-

Table 3: Recruitments distributed by type of contract, category and department

A total of four Temporary Agents and seven Contract Agents took up duties as per the following table (distributed by type of contract, category and department):

Changes to the Establishment Plan during 2019:

- Three CA IV posts were returned to the European Commission as part of phasing out schedule of 24 short term posts granted in 2015.
- Conversion of one FO AST post into one FO AD post as part of the certification procedure and as foreseen in F4E Governing Board Decision of 3 December 2014 laying down the provision of Article 45a of the Staff Regulations.
- Conversion of one TA AST post into one TA AD post in order to accommodate the reclassification of an AST function into an AD level function.

HR Metrics and Reporting System

In 2019 F4E made available to staff its HR metrics as a means of promoting transparency and a better understanding of HR decisions. These quarterly metric reports contain quarterly updates of HR data in a variety of domains such as selections, absenteeism, learning and development, working time, promotions, etc. In line with its ambition to improve in this area, the reports emphasize diversity related figures. The reports are readily available on the dedicated Intranet page as well as in the HR staff notices.

HR Satisfaction Survey and Feedback Sessions

In 2018, HR launched its first ever satisfaction survey. By and large, the results were positive and appreciative of the customer service and support offered by the HRU. The survey also identified a number of areas for further improvement mostly in the areas of (i) communication and (ii) support during selection proceedings. On the basis of the collected feedback, the following initiatives were implemented throughout 2019:

- New HR Intranet page;
- Launch of a dedicated HR Notice for all staff;

- Systematic notification of staff transfers, newcomers and leavers;
- Delivery of HR feedback sessions;
- Enhancement of Learning and Development activities;
- Quarterly publication of HR Analytics and Metrics ;
- Increased HR presence during selections.

Traineeship Programme 2019

At the beginning of October 2019, F4E welcomed its fifth and largest ever intake of trainees. Under the scheme, 25 trainees stayed with F4E for a 9-month period. Coming from all over Europe, the trainees were assigned across both support and operational services and in all three F4E locations (Barcelona, Cadarache and Garching).

New HR Notice

In keeping with its ambitions of transparency and staff engagement, the regular HR Notices allow for direct and targeted communication with staff on the latest developments affecting and involving staff. The notices also remind colleagues about statutory and administrative provisions and the corresponding procedures. In addition, the communications discuss dedicated topics in an informative and informal way avoiding any legalistic and technical jargon. A popular section of the publication is the update on all internal transfers, relocations, new arrivals and departures.

Training/Career Development

In line with its ambition, F4E enhanced its needs driven approach to Learning and Development (L&D).

During 2019 L&D activities were designed to contribute in particular to the following key corporate objectives: improvement of F4E as a working place, staff engagement and the enhancement of focus and agility. This was achieved through training initiatives on leading and managing change, mediation and conflict resolution as well as creative thinking or stakeholder management.

Special focus was also put on strengthening the link between the F4E competency framework and the different L&D activities.

Implementing Rules

F4E adopted Implementing Rules on: (a) types of post and post titles; (b) health and safety, (c) conditions of employment of contract staff employed under the terms of Article 3a thereof and (d) the non-application of the European Commission Decision concerning the maximum duration for the recourse to non-permanent staff in the Commission services.

Health

Following the very positive outcome of the 2018 health campaign 'Healthy Minds' aimed at stress prevention, the F4E Medical Service together with HR initiated a series of actions targeting mindfulness and wellbeing at work. Specifically, this included: application for stretching, mindfulness exercises, well-being videos and articles on relaxation techniques or concentration.

Regarding the organisation of the medical service, the following framework contracts were signed during the year:

- Provision of Medical Advisor and Nurse
- Provision of Medical Controller services
- Provision of medical tests

Flexitime Data

The number of authorised days of leave under the flexitime scheme is provided in Annex VI. d. Flexitime scheme in 2019. The table shows the number of days recuperated per type of contract, category and grade as well as the overtime. On average, 26 % of the overtime declared by staff members was recuperated.

Agreement with Trade Unions and Staff Associations

In May 2019, a framework agreement governing the relations between F4E and the Trade Unions and Staff Associations (TUSA) was signed. This agreement provides a structured framework for relations with staff representatives and is expected to benefit social dialogue within the organization.

Diversity

Gender balance: The general orientations were developed in line with the Commission's policy for these issues. The figures for F4E are consistent with workforce statistics in the industry sectors related to the core tasks of the Agency and show a predominance of male staff (64%).

		Official		Temporary Agents		Contract Agents		Grand Total	
		Staff	%	Staff	%	Staff	%	Staff	%
Female	Administrator level	12	23.5%	42	18.9%	0	0.0%	54	12.3%
	Assistant level (AST & AST/SC)	8	15.7%	10	4.5%	0	0.0%	18	4.1%
	FGII, FGIII, FGIV	0	0.0%	0	0.0%	87	52.7%	87	19.9%
	Total female	**20**	39.2%	**52**	23.4%	**87**	52.7%	**159**	36.3%
Male	Administrator level	26	51.0%	150	67.6%	0	0.0%	176	40.2%
	Assistant level (AST & AST/SC)	5	9.8%	20	9.0%	0	0.0%	25	5.7%
	FGII, FGIII, FGIV	0	0.0%	0	0.0%	78	47.3%	78	17.8%
	Total male	**31**	60.8%	**170**	76.6%	**78**	47.3%	**279**	63.7%
Grand Total		**51**	100%	**222**	100%	**165**	100%	**438**	100%

Table 4: Gender balance on 31 December 2019

Geographical balance: F4E endeavours to have a balanced geographical balance. Nevertheless, this is highly dependent on the nationality of applicants to the vacancies or calls for expression of interest. In this respect, the strong representation of Spanish nationals (32%) reflects the location of the F4E Headquarters in Spain. They are followed by Italian nationals (20%) and French nationals (19%).

Nationality	AD + AC FG IV		AST/SC- AST + CA FGI/CA FGII/CA FGIII		TOTAL	
	Number	% of Total Staff members in AD and FG IV categories	Number	% of Total Staff members in AST SC/AST and FG I, II and III categories	Number	% of total staff
Belgian	**8**	2.4%	**10**	9.2%	**18**	4.1%
British	**14**	4.3%	**4**	3.7%	**18**	4.1%
Bulgarian	**3**	0.9%	**1**	0.9%	**4**	0.9%
Czech	**2**	0.6%	**2**	1.8%	**4**	0.9%
Dutch	**5**	1.5%	**0**	0.0%	**5**	1.1%
Estonian	**1**	0.3%	**0**	0.0%	**1**	0.2%
Finnish	**3**	0.9%	**1**	0.9%	**4**	0.9%
French	**66**	20.1%	**18**	16.5%	**84**	**19.2%**
German	**10**	3.0%	**6**	5.5%	**16**	3.7%
Greek	**5**	1.5%	**3**	2.8%	**8**	1.8%
Hungarian	**6**	1.8%	**0**	0.0%	**6**	1.4%
Irish	**5**	1.5%	**2**	1.8%	**7**	1.6%
Italian	**68**	20.7%	**20**	18.3%	**88**	**20.1%**
Lithuanian	**0**	0.0%	**4**	3.7%	**4**	0.9%
Maltese	**1**	0.3%	**0**	0.0%	**1**	0.2%
Polish	**5**	1.5%	**0**	0.0%	**5**	1.1%
Portuguese	**10**	3.0%	**1**	0.9%	**11**	2.5%
Romanian	**8**	2.4%	**1**	0.9%	**9**	2.1%
Slovak	**1**	0.3%	**0**	0.0%	**1**	0.2%
Spanish	**103**	31.3%	**36**	33.0%	**139**	**31.7%**
Swedish	**4**	1.2%	**0**	0.0%	**4**	0.9%
Croatian	**1**	0.3%	**0**	0.0%	**1**	0.2%
TOTAL	**329**	100%	**109**	100%	**438**	100.0%

Table 5: Geographical balance on 31 December 2019

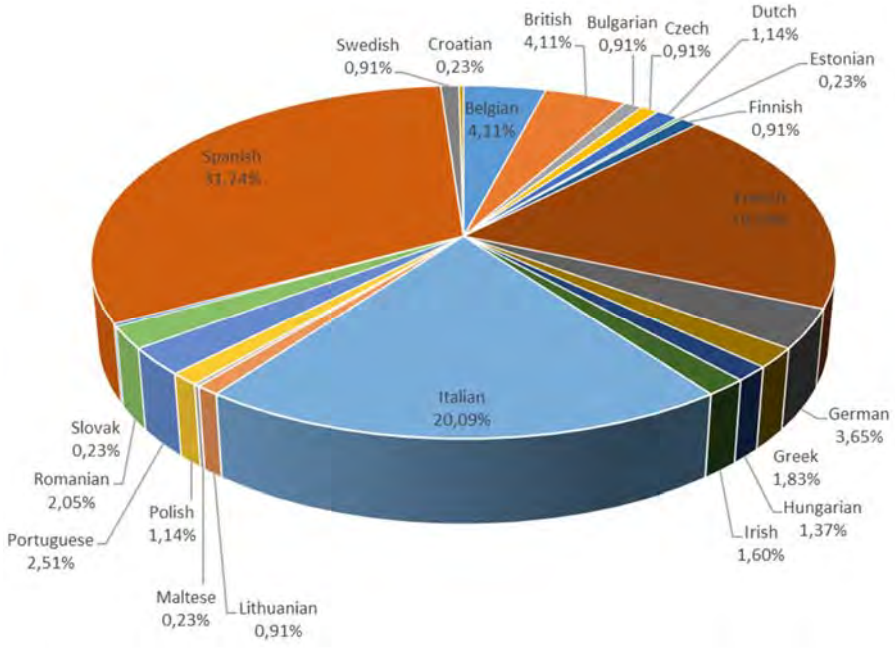


Figure 11: Geographical distribution - All F4E staff

2.7.2 The Results of the Screening/Benchmarking Exercise

The benchmark is provided in Annex 2 and is based on a methodology and approach consistent with the Communication C(2014) 9641 from the European Commission on the reporting on Resources Management. According to this methodology, F4E staff are classified in different categories depending on the area of work. 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 VI. c. Benchmarking Exercise). Some of the key conclusions are:

- 14% of the posts in F4E are assigned to **Administration Support and Coordination** functions, 75% belong to **Operational** functions and 11% are so called **Neutral** functions. There are no major changes in those headings compared to 2018.
- The majority of the Operational posts are found in the Programme Management and Implementation (PGM M/IMP) category. This represents 65% of the total posts.
- Following the re-organizations of the Commercial and ITER-Delivery Departments, there has been a transfer of some staff from Programme Management to Coordination activities. This explains the variation in those subheadings compared to 2018.

2.7.3 Staff Engagement Survey Follow-Up

Since 2014 and on a rolling two-year basis, F4E conducts staff engagement surveys, aimed at giving employees a platform for structured feedback and to help identify areas of weakness and where improvements may be needed. The staff engagement survey of 2018 showed a higher total favourable score of 56% compared to 54% in 2016, indicating progress. To put these figures in perspective, these can be compared with the average favourable scores among other EU agencies of 62% in 2016 and 59% in 2018 showing that F4E have moved closer to the average in 2018.

In light of the 2018 survey results, in early 2019 each line manager engaged with their teams to discuss results, their meaning, and how they could be adequately addressed. These exchanges culminated in the identification of improvement actions that are specific to the unit and of a more corporate nature. The corporate level actions were compiled and voted upon in a first-of-a-kind interactive town hall meeting in April 2019 in order to determine priorities. The top five responses were as follows:

1. Mobility and secondment schemes with the ITER Organization and EU bodies;
2. Promotion of policies such as teleworking and flexitime;
3. Coaching for managers to promote values and “lead by example”;
4. Communicating the “why” for changes including options considered;
5. Recognising that there are no “quick fixes” and sustained behavioural changes are needed.

During the second half of 2019 and through to 2020 work had been underway at different levels to implement improvements in all these areas. For example, interactions among the middle management teams have intensified; pilot actions have been used before changes are decided for implementation, more consultation before decisions are taken, etc. By the end of 2019, a contract was placed with an external company to provide a leadership development programme including individual and team coaching and 360 degree assessments.

2.8 Strategy for efficiency gains

F4E manages its corporate improvement projects triggered by a Senior Management decision which is then implemented through its various committees and networks. In 2016, F4E set up an **Improvement Steering Committee** (ISC) to provide a dedicated forum to set priorities on corporate improvement actions and align management views. This committee monitors results and proposes corrective actions if needed. The **Project Steering Meeting** focuses on activities linked to fulfilling the technical programmes of the ITER Project.

F4E uses the **DMAIC** (Define, Measure, Analyse, Improve, and Control) **approach** which forms part of the Lean Six Sigma methodology (a set of techniques and tools for process improvement). This ensures that processes are more efficient and effective to achieve efficiency gains. Results are measured over a certain period with key performance indicators to confirm the positive trends, and corrective actions taken if needed to further streamline F4E's core activities. By the end of 2019, the following efficiency gains from a series of improvement projects were achieved:

Project Name	Achievements	Conclusion (objective vs achievement)
Time to recruit	Reduction of the average lead time to recruit by 32 % of efficiency gain • Before = 152 days • End 2019 = 103 days	Improvement achieved on time to finalise a selection procedure from the launch of the publication to the reserve list of candidates. Electronic tool being developed to manage the steps toward digitalisation.
Time to procure	Reduction of the average lead time to procure for open procedure by 28% of efficiency gain. • Before = 287 days • End 2019 = 207 days	Improvement achieved on the time from approved Contract Procurement Strategy (CPS) to contract signature.
Time to sign and pay	Reduction of the average time to sign a contract (from award to legal commitment) by 62% • Before = 35 days • End 2019 = 13 days Reduction of average time to prepare the Technical Assessment Report, of the supplier deliverables related to a payment, by 25% • Before =16 days • End 2019 = 12 days Reduction of the average time to pay for the 30 days payment type by 17%. • Before = 23 days • End 2019 = 14 days	Financial Transactions – improvement achieved and good performance of the improved process for the time to sign and to pay. An electronic tool is in development to process the budgetary commitment, contract signature (legal commitment), deliverable acceptance report, payment. Meaning that all the contractual cycle will be digitalised as the process reached a high maturity and efficiency level.
DACC (Deviation, Amendment and Contract Changes) tool	Reduction of the average time to perform a contractual deviation by 67 % of efficiency gain: • Before: 90 days • End 2019: 30 days	100% Deviations and Contract changes being performed through DACC.

Table 6: Overview of Improvement Projects

In 2017, a **Business Process Management frame** was introduced and fully rolled out in 2019 with full process mapping and the compilation of a complete portfolio of working procedures. This strengthens the process approach and aligns improvement priorities with IT tool developments, key to optimising efficiency (eg DACC tool, Contract Management tool).

2.9 Assessment of Audit Results during the Reporting Year

2.9.1 Internal Audit Service (IAS)

The Internal Audit Service (IAS) of the European Commission launched an audit in early 2019, on Project Management of ITER Deliverables, and performed the follow up on Implementation of Procurement Arrangements.

Implementation of Procurement Arrangements limited review

As for the follow-up on the 'Implementation of Procurement Arrangements limited review' which was finalised in February 2019, the IAS concluded that out of the five recommendations accepted by F4E Management (out of the six issued by the IAS), three had been effectively implemented but two still remain open:

1. Establish a commercial Project Change Request (PCR) process to monitor the cost of changes, aligned with the requirements of the ITER Reserve Fund mechanism.
2. Strengthen and enforce procedures on the cost impact assessment of changes imposed by the ITER Organization (IO).

Those recommendations were not effectively implemented but the criticality was downgraded from 'very important' to 'important' due to the actions already taken. During 2019, F4E implemented additional actions in order to address the IAS remaining risks identified. In March 2020, the IAS provided the result of its review on these additional actions and concluded that four out of five actions under review were fully implemented.

Project Management of ITER deliverables

As part of the audit risk assessment carried out in 2018 and as defined in the IAS's strategic audit plan for 2019–2021, the IAS defined the scope of the audit on project management of ITER deliverables in January 2019 and the fieldwork took place in March and April 2019.

The audit aims to assess if the management and control systems put in place by F4E are adequately designed, effective and efficient to ensure that its project management activities related to deliverables to ITER support the timely delivery of the planned project deliverables, at the required level of quality and within the planned budget.

The IAS issued the draft report in March 2020. F4E is now assessing the findings and conclusions.

Annual report of the IAS

Article 78(7) of the F4E Financial Regulation[6] provides that, beyond reporting on its findings and recommendations in audit reports, "*the internal auditor shall also report to the Governing Board, or where the Constituent instrument allows it, a body delegated by the Governing Board and to the Director in any of the following cases:*

- *Critical risks and recommendations have not been addressed;*

[6] https://industryportal.f4e.europa.eu/IP_PAGES/keyreference.aspx

- *There are significant[7] delays in the implementation of the recommendations made in previous years."*

Since there were no open critical recommendations or significantly delayed very important recommendations, the IAS did not issue the report foreseen in Article 78(7).

The status of implementation of the IAS audit actions is provided in section 2.10(a) Follow-up of Recommendations and Action Plan for Audits of this report.

2.9.2 Internal Audit Capability (IAC)

In 2019, F4E's Internal Audit Capability (IAC) delivered four assurance engagements, issued one summary audit report and initiated two audits.

IAC completed the Audit of Nuclear Safety Management; Validation of User Access Rights in ABAC; Follow Up of the Audit of Selection and Recruitment of Human Resources; Follow Up of the Audit of Contracts in the area of ITER Neutral Beam and Electron Cyclotron Power Supplies and Sources and a Summary Audit Report on the Operational Audits.

These engagements resulted in 19 new recommendations, all of them accepted or accepted with comments by the management. In addition 24 recommendations have been followed up, with 20 of them (83%) considered as implemented and therefore closed.

In addition, IAC concluded a preliminary study for the planned Audit of the Vacuum Vessel Project as well as the preliminary study and audit planning for the Audit of the Reliability of data used in Financial Planning, Forecasting and Monitoring.

Throughout the year, IAC also provided continuous support in the area of Ethics and Anti-Fraud.

Significant audit management tasks were also performed in 2019, in particular preparation of IAC's 2018 Annual Report, 2020 Annual Plan, conclusion of the inter-agency framework contract for "Provision of Internal Audit Support Services for Internal Audit Capabilities" and signature of two specific contracts.

Regarding IAC's compliance with the regulatory and standard framework applicable to it and in line with the professional standards of internal auditing, the Head of IAC confirms that, he has been free from interference in determining the scope of internal auditing, performing work and communicating results.

Regarding IAC's opinion of F4E's overall system of internal control, while drawing attention to the areas with important risk exposures and control issues audited or reviewed by IAC in 2019 as described in the paragraph below, nothing has come to IAC's attention, which would cause the IAC to believe that the Overall System of Internal Control of Fusion for Energy is not Analysed and Managed in all material respects, with the exception of the Nuclear Safety Management, which was considered as Outlined and Operated.

In the course of its main assurance engagements performed in 2019, the IAC identified areas with important risk exposures and control issues with possible impact on the achievement efficiency and effectiveness of operations, and in particular with respect to the compliance with ITER Generic Safety Requirements; compliance with Management and Internal Control Standards; adherence to the Risk Tolerance Policy; performance of the nuclear safety control activities; attendance on the nuclear safety trainings and management of external staff.

[7] *Recommendations are considered significantly delayed if they are still open more than 6 months after the original expected date of implementation.*

2.9.3 European Court of Auditors (ECA)

In November 2019, the European Court of Auditors (ECA) adopted the final report on the 2018 annual accounts of F4E, now based on a new approach presenting the report on two main parts:

Part I is devoted to a general analysis of the Joint Undertakings (JUs) management systems and common observations deriving from the key risks identified that may impact all EU JUs.

Part II is devoted to 2018 F4E Statement of Assurance, where ECA provides a reasonable assurance for the implementation of the budget of F4E, concluding that:

- the accounts of the JU for the year ended 31 December 2018 present fairly, in all material respects, the financial position of the JU at 31 December 2018, the results of its operations, its cash flows, and the changes in net assets for the year then ended;
- revenue and payments underlying the accounts for the year ended 31 December 2018 are legal and regular in all material respects.

Emphasis of matter

As in previous years, this annual report includes in the opinion a sub-section called 'Emphasis of Matter' raising awareness on the risks faced by F4E in relation to the cost and schedule of the overall project. The ECA refers to the new ITER project baseline approved by the ITER Council in November 2016 and which estimates the achievement of First Plasma and the start of the operational phase in 2025 with the completion of the construction phase in 2035. The previous 2010 baseline estimated the achievement of the construction phase in 2020. The new baseline is considered to be the earliest possible technically achievable date.

In relation to the cost, the ECA highlights that F4E recalculated its contribution to the project construction phase at € 12bn (in 2008 values), up from the € 6.6bn (in 2008 values) approved by the EU Council in 2010. They also refer that the estimates do not include contingencies, even though the Commission suggested that a contingency of up to 24 months in terms of an implementation timetable and 10-20 % additional funding in terms of budget would be appropriate.

While positive steps have been taken to improve the management and control of F4E's contribution to project construction phase, the ECA considers that there remains a risk of further cost increases and delays in project implementation compared to the current approved baseline.

The ECA also refers that in April 2018, the Council of the EU mandated the Commission to approve the new ITER baseline on behalf of Euratom and reaffirmed the commitment to make resources available within the limits of the next Multiannual Financial Framework (MFF) without prejudice to any subsequent MFF negotiations, which will determine the details of the future funding.

Finally, it states that on 29 March 2017, the United Kingdom notified the European Council of its decision to withdraw from the EU and Euratom. This may have a significant effect on the post-2020 activities of the F4E JU and the ITER project.

Observations of current and previous years

In addition, the 2018 ECA annual report also included 12 observations that do not affect the overall assurance: five observations corresponding to the findings of the year 2018 and seven observations following on previous years' findings.

The following table provides an overview of the status of these observations at the end of 2019:

Area	In Progress	Implemented	No Action	Total
Implementation of the 2018 budget			1	**1**
Payment appropriations		1		**1**
Cost Based Management (mission charged on operational budget)	1			**1**
Shortcomings in Recruitment (place of employment)			1	**1**
Key controls of the Joint Undertaking's Supervisory and Control System			1	**1**
TOTAL from 2018	**1**	**1**	**3**	**5**
Follow up of previous year's comments				
Presentation of the Accounts		1		**1**
Key controls of the Joint Undertaking's Supervisory and Control Systems		1		**1**
Operational procurement contracts and grants – Negotiated procedures		1		**1**
Intellectual property rights and industrial policy		1		**1**
Anti-fraud Strategy		1		**1**
Follow up of Declarations of Interest		1		**1**
Shortcomings in internal communication strategies		1		**1**
Total from Follow up		**7**	**-**	**7**
GRAND TOTAL	**1**	**8**	**3**	**12**

Table 7: Observations made by the ECA and actions taken by F4E

The status of the action in progress is the following:

- **Cost Based Management (missions charged on operational budget) –** The following different actions have been and are being implemented in order to improve transparency when reporting on the use of operational budget:
    a) Improve the mission's management tool (MiMa) in order to book the cost of missions identified as project-related directly to Title 3;
    b) Clarify the descriptions under Title 3.4 in the budgetary comments;
    c) Include in the final Annual Accounts 2018 a description of the expenditure charged against the Budget chapter B034-Other (operational) expenditure;
    d) Develop a policy establishing the basis to consider if a mission "is" or "is not" project-related;
    e) Review the F4E commitment and payment processes to reflect the administrative nature of some items under the operational Title 3.4;
    f) Set up a special report on the use of Title 3.4

The 2018 ECA annual report also confirms that F4E has implemented all the seven observations from previous years.

2.10(a) Follow-up of Recommendations and Action Plan for Audits and Evaluations

The status of the implementation of the internal audit action plans as of March 2020 is as follows:

Overview per Audit:

Audit Name	Audit Source	Nr. Recom.	Nr. Actions	In Progress	Implemented	Cancelled	Obsolete	Implemented %
Selection and Recruitment follow up concluded on 9 additional recommendations	IAF	27	47	1	42	3	1	97.67%
Implementation of Procurement Arrangements	IAS	6	15	1	14	0	0	93.33%
In-Vessel Contracts Audit	IAF	10	43	0	43	0	0	100.00%
Technical Support Services Audit	IAF	8	16	0	16	0	0	100.00%
Broader Approach Agreement Audit	IAF	8	9	2	7	0	0	77.78%
Nuclear Safety Management	IAF	10	23	16	7	0	0	30.43%
		69	153	**20**	**129**	**3**	**1**	**86.58%**
				13.07%	**84.31%**	**1.96%**	**0.65%**	

Table 8: 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)

Progress was made implementing audit actions during 2019, with the rate of implementation slightly increasing (86,58% in 2019 compared to 79.45% in 2018) as F4E dealt with a similar portfolio to last year (153 actions in 2019 compared to 152 actions in 2018).

During 2019, F4E issued a new action plan in response to the new IAC audit report on **Nuclear Safety Management**, with a total of 23 actions. The IAC audit on **Neutral Beam Contracts** (22 actions) is now considered fully implemented after the follow-up. It is therefore, no longer reported in F4E portofolio, which at the end of 2019 contained 153 actions of which 129 are implemented.

Two audits from IAC are considered as fully implemented by F4E Management and are ready for review by the auditor:

- **IAC audit on In-Vessel Contracts (43 actions):** audit report issued in May 2017.
- **IAC audit on Technical Support Services (16 actions):** audit report finalised in June 2018.

Four action plans are in the process of being implemented. The detailed status is as follows:

- **IAC audit on Selection and Recruitment:** Out of the four remaining recommendations three were implemented at the end of 2019. The last one still in progress relates to the "Responsibilities and grades consistency" which is mostly implemented with the Job landscape project that is still in the process of consultation with the Unions before being effectively implemented.

- **IAS limited review on Implementation of Procurement Arrangements:** After the follow-up, which was finalised in February 2019, the IAS concluded that out of the five recommendations accepted by F4E Management (out of the 6 issued by the IAS), three had been effectively implemented but two had not been adequately and effectively implemented. The IAS assessed that, in view of the actions already taken, their priority was downgraded from 'very important' to 'important'. F4E devoted time and resources in order to implement both recommendations by the end of 2019. The IAS reviewed early in January 2020 the status of implementation, and concluded that four actions, out of five taken for review, were implemented. The re-opened action relates to the review of a process related to project changes requests.
- **IAC audit on Broader Approach Agreement:** The IAC issued the final report of the audit in October 2018. The report highlighted achievements and several areas of strength in the management of the BA activities and projects. The weaknesses detected are mainly in the area of internal controls, processes and project management. Eight recommendations were issued (all accepted by F4E management) of which two are very important, five important and one desirable. The F4E management proposed an action plan with nine actions. By the end of 2019, seven of those actions were already implemented and the two remaining ones have as target date the first semester of 2020.
- **IAC audit on Nuclear Safety:** The IAC finalised the audit report in October 2019. The scope of the audit covers the management and compliance aspects of F4E's nuclear safety management. The report concluded on ten recommendations (two Critical, related to ownership and assurance on ITER Generic Safety Requirements and the implementation of management standards, and eight recommendations rated Very Important). The proposed action plan included a total of 23 actions. By the end of 2019, seven actions out of 23 were already implemented, in particular all of them related to the Critical recommendations.

Overview per Criticality of Actions

	In Progress	Implemented	Cancelled	Obsolete	Totals	Implemented %
Critical	9	12	0	0	**21**	**57.14%**
Very Important	8	73	2	0	**83**	**90.12%**
Important	3	43	1	1	**48**	**93.48%**
Desirable	0	1	0	0	**1**	**100.00%**
Totals	**20**	**129**	**3**	**1**	**153**	**86.58%**
	13.07%	**84.31%**	**1.96%**	**0.65%**		

Table 9: 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)

Tracking of the implementation of audit audits for F4E management and stakeholders was ensured through a specific tool (RAPID). The tool was enhanced in 2019 in order to link the findings to the related Process area impacted giving a holistic view of the activity areas concerned and the related management attention required and improvement actions.

2.10(b) Follow-up of Recommendations issued following investigations by the European Anti-Fraud Office (OLAF)

No follow-up of any OLAF recommendations took place during the reporting period.

2.11 Follow-up of Observations from the Discharge Authority

For the financial year 2017, the European Parliament (EP) granted, in its plenary session of March 2019, the Discharge in respect of the implementation of the budget to F4E and the closure of its accounts. They issued 21 observations with regards to some aspects of the project, in relation to the "Emphasis of Matter" of the European Court of Auditors raising concerns on the cost and schedule risk of F4E and the ITER project, and in relation to procedural aspects of F4E internal control.

In June 2019, F4E submitted a report to the EP on the measures taken in the light of the observations accompanying the EP's discharge decision for 2017, in accordance with Article 107 of the F4E Financial Regulation. Out of 21 observations of the European Parliament, 15 were reported as "No Action" required from F4E, and the remaining six were reported as "Implemented".

2.12 Environment management

F4E shares the same headquarters building in Barcelona with several companies; therefore, the room for manoeuvre to reduce its impact on the environment is limited and EMAS registration very difficult. However, after having identified the actions in our remit, F4E launched in October 2019 a "Green Week" that has encouraged its 450 staff members with a campaign for plastic and waste reduction. Targeted actions in the cafeteria, offices and meeting rooms had an immediate impact on plastic consumption, which has been drastically reduced. In addition, waste reduction and recycling have become more efficient and are now an accepted practice. Staff was also encouraged to reduce paper consumption and make energy savings

Information awareness campaign:

- Posters at each floor's entrance and kitchen to raise awareness on mobility, energy saving, waste management and sustainable food;
- Publication of articles related to these issues;
- Stickers above the copy machines to avoid printing;
- Stickers above light switches in kitchens to switch off the light when the kitchen is unused.

Suppression of plastic in the entire building and reduction of single-use items and packaging

In the cafeteria:

- Creation of a salad bar, instead of ready to go salad prepared in plastic bowls;
- Replacement of plastic bowls by bamboo for take away;

- Replacement of cutlery by cutlery made of bamboo for take away;
- Replacement of plastic bottles at the cafeteria by the installation of a water fountain

For staff:

- Replacement of plastic bottles by glass bottles to be returned to the provider for meetings with externals;
- Use of washable glasses in meetings instead of plastic bottles or plastic glass;
- Distribution to every staff member of a reusable bamboo coffee cup and a reusable glass bottle;

Waste reduction and management:

- Installation of a recycling station in the cafeteria for staff has to sort organic waste, plastic and rest.
- Installation in ten kitchens, of recycling bins to sort organic, plastic and rest.

2.13 Assessment by Management

In light of the achievements summarised in section 2.2 of this report, the management consider that 2019 was a successful year. In particular, the results measured by corporate action implementation, audit action implementation, budget implementation and efficiency gains, point towards a maturing of the organisation.

Looking ahead to 2020, the focus will be to improve the level of nuclear safety culture, enhance leadershop and trust, clarify roles and responsibilities in the matrix structure, ensure the efficient management of externally contracted resources, complete the framework for the management of project changes eminating from the ITER Organization and further improve financial controlling.

Part II. (b) External Evaluations

The April 2018 Council Conclusions on the reformed ITER project state that “the independent annual assessments of the progress of ITER have to be continued and intensified with a focus on performance and project management, including cost containment, schedule project control as well as risk management”.

In order to meet the Council request for an enhanced annual assessment, the Governing Board instructed F4E to contract three independent experts of recognised standing to asses F4E according to the terms of reference for the 2019 exercise, i.e. on cost containment, schedule control, risk control and human resources management.

From August to December, the experts reviewed many documents and conducted a number of interviews during visits to F4E’s offices and ITER Organization. The Final Report was received by the Governing Board in December 2019.

In its executive summary, the panel recognised that the Senior Management has put in place adequate tools to monitor cost, schedule and risk and commended the systematic use of EcoSys, Primavera and Risk register as management tools. Nevertheless, the experts identified some weaknesses in the areas of human resources, leadership and nuclear safety culture and put forward 15 recommendations for improvement. Consequently, the Governing Board requested F4E in December 2019, in consultation with the Bureau, to develop the assessment recommendations into an action plan with clear deliverables and suitable target dates. The governance bodies of F4E will closely monitor the implementation of this plan with regular updates from the management.

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

3.1 Effectiveness of Internal Control Systems

3.1.1 Introduction

In 2019 F4E's Governing Board adopted an update of F4E's 'Internal Control Strategy' 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 along three main lines of defence of the IIA (Institute of Internal Auditors) and combines the two control environments within which F4E operates - the ITER-wide quality system (intended to ensure the performance of ITER and the compliance with the nuclear safety requirements), and the European Commission Internal Control Framework (inspired by the internationally recognised COSO framework).

- *1st LAYER (or 1st LINE OF DEFENCE) ESTABLISH AND INFORM*: Internal controls as defined by F4E Management for application by all F4E Staff and providing adequate training and raising awareness.
- *2nd LAYER (or 2nd LINE OF DEFENCE) MANAGEMENT ASSURANCE*: The Management puts in place the 2nd layer of defence by establishing risk management and compliance functions to help build and/or monitor the first line-of-defence controls. These are specialised functions and which provide the information on internal control set out in this report.
- *3rd LAYER (or 3rd LINE OF DEFENCE) INDEPENDENT ASSURANCE* Internal auditors (IAS/IAC) who provide the Governance bodies and Senior Management with comprehensive assurance based on the highest level of independence and objectivity within the organisation.

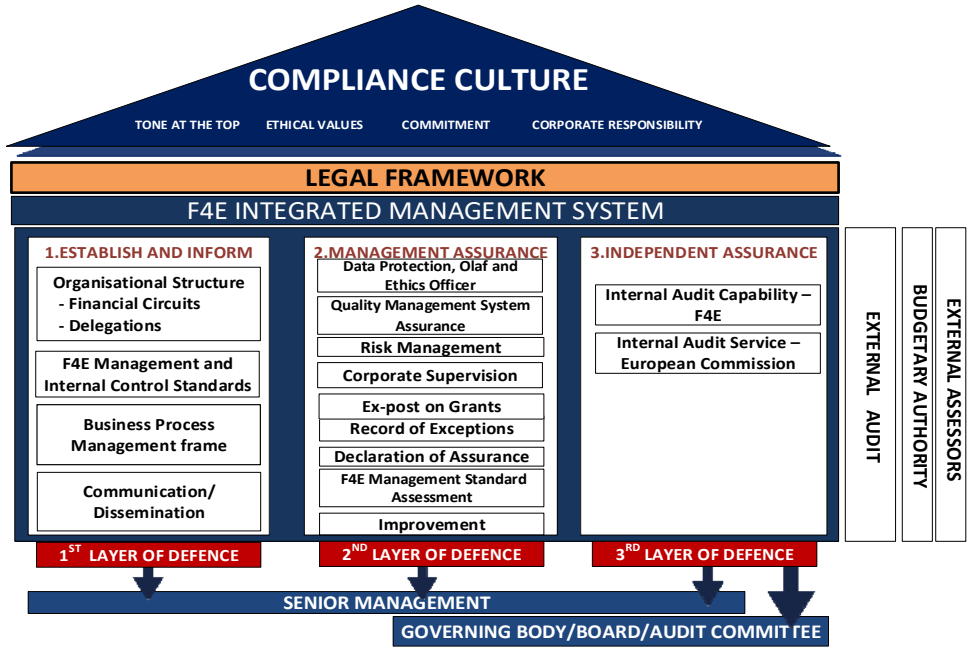


Figure 12: Schematic showing the three main lines of defence

The control objectives, based on Article 30 of F4E's Financial Regulation are:

(i) effectiveness, efficiency and economy of operations;

(ii) reliability of reporting;

(iii) safeguarding of assets and information;

(iv) prevention, detection, correction and follow-up of fraud and irregularities;

(v) adequate management of the risks relating to the legality and regularity of the underlying transactions, taking into account the multi-annual character of programmes as well as the nature of the payments concerned.

The F4E Management and Internal Control Standards (F4E MICS), provide the framework for the F4E Integrated Management System (IMS) and form part of the overall F4E Internal Control Strategy which aims to optimise how F4E operates and delivers (quality, efficiency and effectiveness). The MICS support the performance of the IMS to reach its objectives, by facilitating internal control and the assessment of F4E operations in a methodical and transparent way.

The main conclusions of the assessment of the information provided by the F4E management assurance functions are described below, sections 3.1.2 to 3.1.8.

This includes the results of the independent assurance functions described in sections 2.9 Assessment of Audit Results during the Reporting Year', 2.10(a) Follow-up of Recommendations and Action Plan for Audits', and Part II (b) 'External Evaluations'.

3.1.2 Data Protection, OLAF and Ethics Officer

The functions of Anti-Fraud, Ethics and Data Protection Officer of F4E were established in 2015, with a direct reporting line to the Director. These independent functions are one of the components of the second line of defence of the F4E Integrated Management System.

Anti-Fraud Strategy

The Anti-Fraud (OLAF) & Ethics Officer (AFEO) coordinated and drafted the F4E's Anti-Fraud Strategy, including its new Action plan for the next 4 years. The Governing Board adopted it end of 2019. It sought enforcement of the management of conflicts of interests (CoIs) in particular regarding selections of staff and the phase of contract implementation and payments. Therefore, special attention was given to the management of CoI Declarations. The CoI Register has also been developed and an assessment of the Declarations of Interest is being done. New Actions for 2020-2023 have been elaborated on the basis of a comprehensive risk assessment done by the Risk Officer in close collaboration with the Ethics Officer and the correspondents of the respective departments.

The Ethics Officer ensured that the Ethics Point on the intranet is regularly updated and refers to the Staff Ethics and Conduct (European Commission) as well as to the Ombudsman Public Service Principles of the EU. All awareness raising sessions are also published there. In addition to the general sessions for all staff on Ethics & Compliance launched since 2018, in 2019, the Ethics Officer also gave a presentation to all managers and the ITER department on how to manage conflicts of interest, in particular regarding the newly established assessment of General Declarations of Interest. In addition she facilitated, together with the commercial department, information to the procurers and lawyers on red flags and use of the check list.

Data Protection

In 2019, the Data Protection Officer (DPO) continued implementing the Data Protection Reform. Awareness and provided awareness raising sessions for all staff, explaining the new culture of accountability and prominent roles of the process owners acting as controllers in their respective area. The DPO advised on updating the Records and Privacy Notices and closely involved IT and the Document Management Officer. Guidelines and templates were drafted e.g. for data breaches and access requests and contract clauses were adapted. According to Art.25 EU-DPR, the F4E DPO established the GB decision (adopted end 2019) being the legal basis in case F4E will need to restrict data subjects rights.

The F4E DPO maintained close contacts with the DPOs of other EUIs and in particular with the European Data Protection Supervisor (EDPS). The F4E DPO actively participated in the two inter agencies DPO/EDPS Network meetings and is member of the Working Group on international transfers. She is convincing ITER IO of the importance to establish equivalent protection of personal data.

The DPO in 2019 handled complaints with the EDPS, together with the responsible unit, e.g. in cases addressed to the EDPS regarding access requests.

OLAF (European Anti-Fraud Office)

The Ethics Officer dedicated time to individual concerns (in cases colleagues ask for advice in addition or instead of going to HR or managers). The Ethics Officer is also the single and confidential contact point for OLAF. Further information is set out in Section 2.8 b. Follow up of recommendations issued following investigations by OLAF.

3.1.3 Quality Management and Assurance

In 2019, F4E continued the implementation and development of the Quality Management System through four main activity areas:

- Business Process Management
- Quality Assurance in Support of the Operational Projects
- Quality Management System and Supplier Audits
- Continual Improvement of the Quality Management System

Business Process Management

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 GSR Part 2, 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 approach F4E has continued to strengthen its ‘process strategy by assessing the maturity of the various elements of its ‘process map’ showing the links between all activities to carry out across the organisation.

The main activities developed in 2019 where:

- Revision the F4E Management and Quality Programme (superseding the QA Programme for ITER Project) and implementation of the Management and Quality Policy;
- Continuation of the contract management improvement exercise with the further development of the online database and electronic tool for the management of the contract modifications, connection with the project changes, and including the development of the BIPS modules with contingency and reserve fund management;
- Update of all the processes to reflect the 2019 reorganisation of the ITER-D and Commercial departments and the introduction of the new F4E Financial Regulation;
- Coordination of the Business Process Management framework implementation across the organisation. Reinforcing the common frame of documents types and standards, simplified the approval flow yet securing consistency, defined the process map and process groups to classify all processes available, developed improvement plans per process groups, and moved to navigation by process in the F4E manual;
- Implementation of the Documentation Management Policy at corporate level through the coordination of the Documentation Management Officer (DMO), with the support of the DMO assistants.

The statistics of the working procedures development during 2019 (either new developments or updates of existing ones) were:

Process Group (PG)	Standard	Policy	Process	Procedure	Total by PG
Corporate Planning Financial Controlling & Reporting	3	8	4	16	31
Organisation & Management System	2	20	5	16	42
Projects Delivery			6		6
Operational Procurement & Contract/ Grant Implementation		7	21	7	34
Human Resources			10		8
Financial Management			2	1	3
Administrative Expenditure		1	16		17
Infrastructure & Logistics		3		14	17
Communication Management			2		2
Total releases by Type in the year	**5**	**39**	**66**	**54**	**164**

Table 10: Statistics on the process development status

As part of the Integrated Management System, an F4E Manual (hosted on F4E's intranet accessible to all staff) 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).

Quality Assurance in Support of the Operational Projects

Quality Assurance (QA) is defined as part of Quality Management focused on providing assurance that quality requirements will be fulfilled.

One of the major QA 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 Management and Quality 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 Management and Quality Programme (including full review of the management specifications) for compliance with the F4E MQP and issue of the follow-up documentation templates;
- Training on QA 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 QA to the kick-off and progress meetings, as well as the control point quality-related visits;
- Perform monitoring, audits and assessments of the Quality Management System implementation within the suppliers.

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.

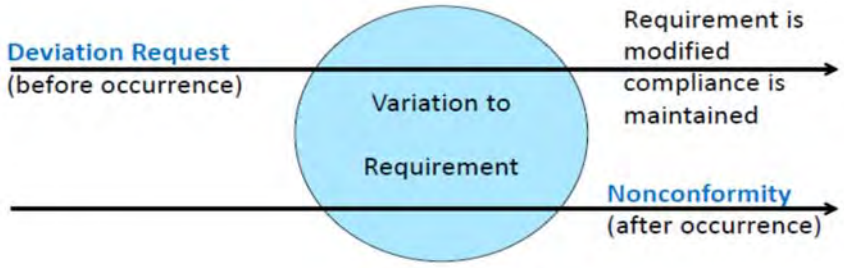


Figure 13: Schematic representation of the Deviation and Nonconformity

- 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 2019 the main types of nonconformities (includes from Supplier Audits) are represented in the table below:

Nonconformities (F4E classification)	Cases	(~) %
Major (impact on customer critical requirements)	292	46
Minor (impact on customer non-critical requirements)	247	39
Relevant (impact on F4E contract, but not on customer requirements)	79	13
Technical Exception (no impact on F4E contract or customer requirements)	0	0
Pending classification	10	2
Total	628	--

Table 11: Statistics on nonconformities by type

- Corrective actions are triggered by the occurrence of Nonconformity to eliminate the cause and prevent repetition.
- In 2019 the main types of deviations are represented in the tables below:

Deviations (F4E classification)	Cases	(~) %
Level A (no impact on F4E contract or customer requirements)	30	5
Level B (impact on F4E contract, but not on customer requirements)	206	33
Level C (impact on customer requirements)	268	43
Cancelled or still to be defined (in the process of assessment)	115	19
Total	619	--

Table 12: Statistics on deviations by impact

Deviations (by type)	Cases	(~) %
F4E DR (Deviation Request by F4E, internally or to customer)	98	16
Supplier DR (Deviation Request by the supplier to F4E)	234	38
ITER IO DR (Deviation Request by ITER IO towards F4E)	232	37
Deviation Notice/Order (deviation by F4E towards supplier)	36	6
Dropped / Not Finished	19	3
Total	619	-

Table 13: Statistics on deviations by type

Quality Management System and Supplier Audits

A Quality Management System Audit aims at providing F4E and its stakeholders reasonable assurance that the system is adequately implemented according to the standards. F4E is developing and implementing an annual audit programme to assess that the Quality Management system requirements are properly fulfilled by F4E Programme Teams and F4E Suppliers. A Quality Management system audit 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 Supplier Audits is to ensure that F4E Suppliers comply with the Quality Plan and it is effectively implemented. The internal Quality Management System 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.

The auditee Action Plan, once approved by the audit team, is followed up to ensure its correct implementation and closure by 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.

At the end of 2018 the 'Annual Quality Management System Programme' and the "Annual Supplier Audit Programme" for 2019 were developed and approved for implementation.

In 2019, out of the 32 Quality Management System planned:

Quality Management System Audits	Cases	(~) %
Supplier Audit - Operational Contracts	21	*66*
Supplier Audit – Cancelled/Postponed	7	*22*
Internal on quality management system implementation	2	*6*
Internal on QMS – Cancelled/Postponed	2	*6*
Total	32	-

Table 14: Statistics on quality management system and supplier audits by type

The global results of the Quality Management System and Supplier audits are detailed in the table below:

Audit Result	**Internal QMS Audit**		**Supplier Audit**	
	Cases	(~) %	Cases	(~) %
with an Acceptable Result	1	*50*	19	*90*
with an non-Acceptable Result	1	*50*	*2*	*10*

Table 15: Statistics on the results of quality management system and supplier audits

These audits resulted in 214 findings, classified as follows:

Audit Finding	**Internal QMS Audit**		**Supplier Audit**	
	Cases	*(~)* %	Cases	*(~)* %
Strong Areas	2	11	32	16
Improvement Areas	13	68	130	64
Nonconformities	4	21	40	20
Total	19	-	202	-

Table 16: Statistics on the findings of quality management system and supplier audits

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

Continual Improvement of the Quality Management System

The Management and Internal Control Standards 19 ‘Assessment’ and 20 ‘Correction of Deficiencies and Corrective Action’ reinforce the need for 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 these requirements, F4E performed the several improvements in 2019, see further details in section 3.1.8.

3.1.4 Corporate Risk Management

The Integrated Management System (IMS) and its Management and Internal Control Standards (MICS) provide the basis for the Risk Management framework at F4E. Standard 8 specifies that F4E has a system to manage risks at corporate and project level. In particular, F4E performs regular risk analysis at project and corporate level, proposes mitigating actions and monitors and reports on its implementation.

Overview of Risk and Opportunity Management (ROM) activities in 2019

The process to identify, assess and monitor the risks and opportunities was updated in 2017 and, is based on the “market standard” process and ISO 31000 for risk management. In this update, ‘opportunities’ was improved as well as the step on monitoring and implementation of action plans.

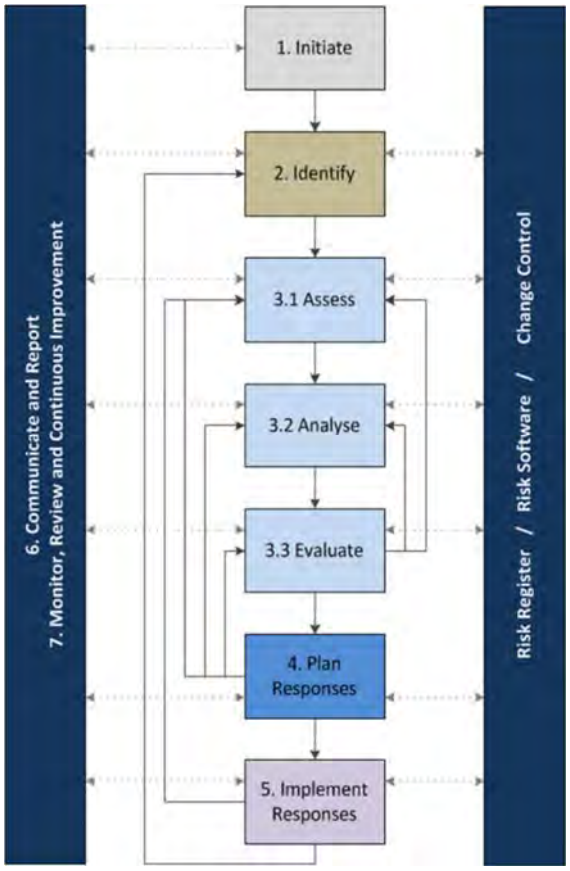


Figure 14: Risk & Opportunity Management Procedure

With the support of the tool Primavera P6 Risk, risks and opportunities are included in the Risks register and evaluated with an assessment in the following categories: Probability, Cost impact and Schedule impact. This information is then analysed on the three levels of the current framework: Corporate, Project and Supplier level depending on the needs.

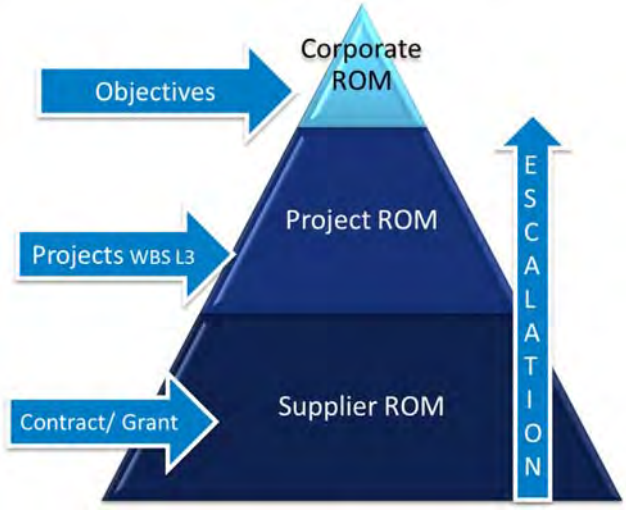


Figure 15: Risk & Opportunity Management Framework

The risk log has been updated in accordance with the 2019 Corporate Objectives to monitor the mitigating actions and the current status of the risks identified. The policy on Risk Tolerance approved by the GB at the end of 2016 was implemented in the Corporate Risk Management process during 2017 and communicated to all staff. This policy will be updated in 2020.

3.1.5 Corporate Supervision Functions

The corporate functions at F4E supervise the legality and regularity of transactions as well as the sound financial management.

Internal Review Panel

The Internal Review Panel (IRP) is an internal function of F4E, for reviewing the correctness of the procedural aspects followed for contracts and framework contracts. Its scope is to review procurement procedures with a value equal to or above € 1m and grants or framework partnership agreements with a maximum F4E contribution equal to or above € 400k.

In the past, the IRP proved to be a useful tool to ensure the procedural correctness of the procurement and grant files it examined. The uniform control of the files it analysed allowed the IRP to identify and address recurrent issues by issuing recommendations which have been translated into the relevant processes and procedures.

As a consequence, the F4E processes and procedures attained a high degree of maturity. This, together with the effective internal control mechanisms and the now obligatory involvement of legal officers in the evaluation of files which would previously have to be presented to the IRP have reduced the need to recur to the IRP. In 2019, the IRP has not been called upon.

Surveillance of financial transactions

'Financial Supervision', performed by the Finance Unit of F4E, 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. In 2019, F4E launched a financial campaign in order to assess the efficiency of the financial circuits (time to commit and pay)

and to monitor if the defined Key Performance Indicators (KPI) were met. A comparison was made in terms of 'Time to Contract' and 'Time to Pay' and the results were communicated to the Improvement Steering Committee

Based on the analysis done in regard to the KPI reports, the lead time measured has confirmed a similar trend in comparison with the previous period. Regarding 'Time to Pay', the lead time measured is on average below the contractual requirements. Two measures were proposed to gain efficiency and effectiveness which were approved by the Management.

A second Campaign was launched in November 2019, in order to assess the effectiveness of the new system implemented in 2018 to manage the mission orders charged either under TITLE I (Administrative) or under Title III (Operational) performed through the IT tool 'MIMA'. A check was also made to verify that missions were approved in line with F4E Delegations, Sub-delegations and Deputising decisions.

The analysis done showed that during 2019, MiMa has been improved to match with the new management approach. Nevertheless, a non- material error was identified, and corrective actions have been proposed to further improve the system.

Ex-post audits on Grants

In respect of F4E grants, which are similar to the Horizon 2020 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 performed either with in-house resources (financial verifications) or 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; in 2019, F4E's commitments on grants represented only 0.13% of the total of € 728m of operational commitment appropriations for the year. In order to efficiently use the resources available, the selection of beneficiaries to be audited focuses on the top beneficiaries and on Risk-Based Method.

In 2019, the staff in charge of performing the ex-post activity executed three financial verification audits on grants. Two of them are still on-going, and one has been concluded, reporting on minor issues related to the category of indirect costs, with no material impact.

Regarding the on-going audits started in previous years, during 2019, F4E has closed two audits and two other ones are still on-going; the first case concerns an audit for which the cost claim was received in December 2019, and F4E communicated the need to organise a fieldwork in in order to understand the new methodology used. The second concerns a joint audit launched in December 2016 with the Research European Agency – REA. During the contradictory phase, the beneficiary did not agree and provided some remarks, which are under examination.

3.1.6 Records of exception

The obligation to record exceptions, in accordance with the principle of sound financial management, stems directly from the requirement to implement the budget in compliance with effective and efficient internal controls (Art. 30.3 of F4E's Financial Regulation).

The internal control system should ensure, inter alia, that prior approval is given to control overrides or deviations from the F4E Financial Regulation. To this extent, a policy and a process have been put in place since 2011 (last update 2019) to ensure that exceptions are documented, justified, centrally logged and duly approved before action is taken.

During 2019, three exceptions have been registered, all of them detected ex-post. For each of them, actions were proposed to remedy the situation. Remedial actions are monitored by Internal Control,

ensuring an audit trail and overview, as well as easier identification of internal control weaknesses. It has proven to be an important control mechanism for F4E, not only to document deviations and exceptions from financial regulatory frameworks, but also to help identify root causes and remedy them when possible.

3.1.7 Compliance and Effectiveness of F4E Management and Internal Control Standards

The F4E Management and Internal Control Standards (F4E MICS), provide the framework for the F4E Integrated Management System (IMS).

At the end of 2018, the Governing Board adopted a revised framework adapting it to the 2017 EC Internal Control Framework, renaming it 'F4E Management and Internal Control Standards'. Monitoring criteria, comprising baselines, indicators and targets for measuring the effectiveness of the implementation of the Management Standards (MS), were also introduced with the aim of facilitating the identification of any deficiencies in the internal control system.

Figure 16: Schematic showing F4E's Internal Control Framework

In last year's Annual Activity Report, F4E concluded that the Management Standards were, in accordance with the information and data assessed at the time, effectively implemented in F4E, with improvements necessary for some standards or their requirements. The different actions undertaken during 2019 in order to strengthen the prioritised standards (the numbering relates to the 2016 version of the standards as applicable in 2018) were the following:

- Awareness-raising and training in CoI management and follow-up, effective communication of job mobility opportunities, providing training related to the ITER Delivery reorganisation aimed to match organisational priorities and workloads, update of working procedures to incorporate the new organisational roles and responsibilities as well as to make decision-making more transparent by establishing Charters for Committees and meetings
    - (MS 15, Communication, MS 3 Ethics and Organisational Values, MS 4 Human Resources, MS 7 Objectives and Performance Indicators, MS 9 Operational Structure, responsibility and delegations)

- Response to audit recommendations and improvement projects in the area of human resources, Project Change Request management and the drafting of a new process on asset management
    - (MS 4 Human Resources, MS 10 Working Procedures, MS 13 Reporting and Management Supervision, and MS 17 Accounting and Financial Reporting)
- The Director's action plan defined a set of actions to address Staff Engagement Survey results and the F4E Strategic Action set out in sections 2.7.3 and 2.4.

The assessment for 2019 took into consideration the status of the monitoring criteria based on the achievement of targets set for each of the standards for the first time.

It was conducted on three levels: i) monitoring criteria and targets, ii) analysis of questionnaire and comments and iii) an overall assessment adding the information sources provided by the internal and external assurance providers.

Strengths

F4E's internal control system has been built up and improved over the past years, in line with the EC framework. Most of the targets of the F4E Monitoring Criteria KPIs were reached, and those which were narrowly missed or unachieved are under review. The participation in the questionnaire and the overall positive results confirmed progress of Staff's awareness of the system. The positive replies given by the Staff to the questions were overall higher in 2019 for the majority of the standards. 300 comments were provided by Staff, which were used as information to better assess the statistical responses to the questionnaire.

Identification of deficiencies on Management Standards (MICS) Level

Those areas which demonstrated the need for improvement were linked to specific requirements, and never the entire Standard. The overall assessment also confirmed areas to prioritise already identified by other internal controls and results of audits.

The overall assessment of the effective implementation of the MICS concluded that the System, Standards and their requirements are **present** but noted that some improvements are necessary to ensure their full implementation:

i) Several Management Standards have been identified with No deficiency. No improvement actions are foreseen other than maintenance actions.

ii) The following MS were identified with having Minor deficiencies with low impact on the functioning of the standard. Those areas are under continual improvement and actions considered as minor are needed:

MS 6 Accountability, Appraisal and Promotion; MS 7 Mission, objectives, indicators and reporting; MS 8 Risk and opportunity Management; MS 11 Infrastructure and Work Environment; MS 12 Control activities and Strategy; MS 14 Business Process Management and Exceptions; MS 15 Information and Documentation; MS 16 Internal Communication; MS 20 Correction of deficiencies and Corrective Action.

iii) The following MS were identified as having a Moderate deficiency, with moderate impact on the functioning of the standard. Here the MS is in place but some actions are needed to have it fully implemented:

MS 2 Ethics and Integrity; MS 4 Operational Structure, responsibility, delegations; MS 5 Human resources, competence and continuity MS 10 Change assessment; MS 19 Assessments.

iv) There was no MS identified as having a Critical deficiency.

Assessment on Component level

The global assessment of each of the components taking into account the ranking of standards within each component concluded that the Control environment component showed the need for most attention being classified as having the greatest number of standards where deficiencies had been identified with a moderate impact on its functioning. (MS 2 Ethics and Integrity, MS 4 Operational Structure, responsibility, delegations and MS 5 Human resources, competence and continuity).

For the Risk assessment, Control Activities, Information and Communication, Monitoring Activities components a combination of moderate and minor deficiencies were identified within the MS with a low impact on their functioning. Therefore the conclusion is that an overall minor deficiency with low impact on the functioning of the component exists. Actions undertaken to strengthen the implementation of the MS concerned, will be tackled through the continual improvement approach or integrated as sub-areas of priority improvement projects.

Assessment of Overall System

The overall assessment taking into account the individual MICS and the components conclude that the system has the level of **overall minor deficiency** with low impact on the functioning of the system. This signifies that the System, Standards and their requirements are **present** but some improvements are necessary to ensure their full implementation.

Priority improvement actions for 2020

Improvement actions to correct the deficiencies identified will be conducted in the frame of F4E's improvement activities and have been clustered into categories in line with the Overall assessment of the F4E Integrated Management System. The areas identified are listed in 3.2 Conclusions of assessment of internal control systems.

3.1.8 Improvement

Introduction

In line with Management Standard 12.2, the F4E Internal Control Strategy outlines all the contributions to the "assurance chain" which provide the F4E Director with information on the state of Internal Control in F4E. It also supports the organisation in the identification of the priorities to be addressed when defining the area(s) of improvement.

Information collected from the different assurance functions is analysed and structured into areas of improvement, and centralised in F4E's RAPID database. In 2019, RAPID included audit actions and a wider range of improvement actions like those responding to recommendations from the Annual assessment, Governing Board actions, Committee ad hoc groups and Business Process Management (BPM) rolling plans. The analysis of this information leads to an integrated assessment identifying areas of improvements in a holistic manner. All actions are linked to Process groups and F4E Management and Internal Control Standard areas. This feeds into the Overall Assessment of the Integrated Management System, which identifies areas of activities that require varying degrees of attention and improvement.

Decisions on improvement initiatives are made in the Senior Management Meeting, then steered centrally by the relevant governance bodies in place (Improvement Steering Committee, Project Steering Meeting) and implemented across the organisation to answer to recommendations, mitigate the risks identified and secure the achievement of F4E objectives.

Improvement projects are also launched to enhance overall activities in a holistic approach going further than just addressing audit actions (e.g. Document Management in 2018) but to strengthen the overall activity impacted.

Follow up of the areas of improvement

In addition to the specific improvement actions identified to improve the effective implementation of some of F4E Management Standards (set out in the previous section 3.1.8), the F4E's Improvement Steering Committee has continued to coordinate the following improvement actions.

Follow-up of improvement actions carried out in the frame of the Improvement Steering Committee

Coordination was successful in the projects with the following positive results:

Improvement Type - Process Efficiency (lead type as main KPI) – see section 2.6 on efficiency gains strategy

Improvement Type – Tool Development

Project name	Project Sponsor	Achievements	Conclusion (objective vs achievement)
DACC	Director	100% Dev and Contract changes being performed through DACC, -> efficiency gain on Deviation is about 67 % on average	Objective 100% achieved KPIs monitored online from 90 days to 30 on average
EAC	PM Head of Department	Mechanism to inform PM & SM on significant variances of EAC compared to budget in a timely manner enabling them to decide sufficiently in advance on mitigation/recovery actions.	Overall EAC process and methods were strengthened and process is effective
Change process task force (Scope 2 of integrated change control)	ITER-P Head of Department	Develop PCR Tool, Consolidate Project Changes related processes along the full life cycle, and address IAS recommendations	PCR Tool being finalised and further enhancement planned. IAS recommendations addressed

Improvement Type - Effectiveness and compliance

Project name	Project Sponsor	Achievements	Conclusion (objective vs achievement)
Document Management	ADMIN Head of Department	DMO appointed, DM network set up, back log monitored and controlled. Overall IDM backlog reduction by 75%	System implemented and being monitored. Reduction achieved. IAS recommendations addressed
Integrating F4E Change control (phase 1)	PM Head of Department	100% of the new PCRs and BCRs will have the impacted PAs/ITAs identified and their technical, cost and schedule impact logged 100% of new changes are logged with documented related decision, decision status and decision authority.	Achieved on the end of Phase 1. Phase 2 passed to the PCR tool development.

Improvement Type - Delivery Effectiveness

Project name	Project Sponsor	Achievements	Conclusion (objective vs achievement)
Reduce Schedule Delays	PM Head of Department	Transferred to the ITER-D improvement projects	Analysis made and concluded with a transference

In relation to Business Process Management (BPM), the new policy frame has been rolled out during the course of 2019, with a full process mapping and the compilation of a complete portfolio of working procedures. The approach is central to ensuring the integration of new requirements flowing from improvement actions. Additionally, F4E translated the new legal requirements stemming from the Financial Regulation into the set of working procedures and delegation decisions which necessitated Staff to adapt to new practices and terminology for budget, financial and project management. The BPM approach and various networks in place enabled the transition to be made smoothly and in time. Training sessions and awareness raising provided to Staff have resulted in a consistent application of the policy. F4E was also recognised in this area as best practice in this field by the EC Community of Best practices. A maturity assessment of all ICT systems has been made with the identification of priority action for 2020. Follow-up is centralised in an Annual Rolling Plan, which is regularly monitored.

At the end of 2019, a BPM annual assessment leading to the identification of improvement areas was conducted.

The work coordinated by the ISC feeds into the reporting on the F4E Strategic Action Plan which is presented to the Governing Board.

3.2 Conclusions and Assessment of Internal Control Systems

The conclusion of the overall assessment of the Integrated Management System (the internal control system of F4E) is that the system is **effective overall with some improvements needed**. This means that the system is in place but on the whole minor improvements are needed, with some moderate deficiencies needing some priority improvement action. Further details of the assessment by MICS (Management and Internal Control Standards) can be found in section 3.1.7.'Compliance and Effectiveness of Management and Internal Control Standards'

There have been many positive outcomes in 2019, and the IMS has proved to fulfil its objective of providing a framework to achieve the internal control objectives, providing reasonable assurance to the Director.

The considerable reduction of records of exceptions and significant increase in the implementation rate of audit recommendations (87% end of 2019) support the conclusion that a mature system is in place.

Furthermore there have been a reduced number of observations from the European Court of Auditors as well as the very good rate of implementation of the budget 2019 (99.8% execution in commitments appropriations and 97.1% of execution in payments appropriations).

However, F4E will strengthen its coordination of improvement activities in order to further reduce the associated risks of achieving its objectives both on a project and organisational level.

The priority improvement areas which have been identified and proposed as needing action in light of the overall analysis of information sources, audits and assessments are:

- **Nuclear Safety Culture and Management**: Focus on responding to the audit recommendations made by IAC and the Annual Assessment introducing a nuclear safety culture and appropriate structure.
- **Changes coming from IO**: Focus on completing the development of a framework for the management of changes emanating from IO including Project Change Request process and electronic tool, Direct Implementation and PA Change Notice processes.
- **Financial Controlling**: Developing cost engineering methods, implement overall financial control strategy within processes to strength the system to address the project cost and scope risks, focused on accuracy and overall enhancement of the system.
- **People and Culture**: Project defining principles and enhancing leadership, coaching and trust. The actions will encompass those areas identified under the Annual Assessment and the actions of the Anti-Fraud Strategy.
- **Role & Responsibility of the Matrix Functions**: Clarification and Definition of the accountability chain within the decision making process, in particular the matrix functions and ITER-P/D versus COM and PM departments (RASCI of the matrix Programme).
- **Insourced resources**: Development of a framework to ensure an efficient management of contracted and insourced resources.
- **The enhancement of efficient and transparent decision making** across the organisation on key F4E activities (SMM, PSM, ISC, Department and team level, etc...) and improved communication to tackle the recommendation made in the 2019 F4E Management Assessment on reinforcing trust.

The assessment confirms that improvement actions launched will benefit from tighter coordination and clear decision making. Communicating effectively, avoiding a silo approach, in order to follow through the implementation of intended actions has also been identified on several levels as an effective tool to enhance staff engagement.

3.3 Statement of the Manager in charge of Risk Management

I, Kevin Baker the undersigned, make the following declaration.

In my capacity as Senior Manager in charge of risk management, I declare that in accordance with F4E's Internal Control Framework, I have reported my advice and recommendations on the corporate and project risks and opportunities to the Director and to the F4E governance bodies. I also reported the key risks related to overall project budget and schedule in my Declaration of Assurance.

Kevin Baker
Head of the Project Management Department
Barcelona 8 May 2020

3.4 Statement of the Manager in charge of Internal Control

I, Vincenzo Esposito the undersigned, make the following declaration.

In my capacity as Manager in charge of internal control, I declare that in accordance with F4E's Internal Control Framework, I have reported my advice and recommendations on the overall state of internal control to the Director.

Vincenzo Esposito
Head of the Process and Organisational Improvement Unit
Barcelona, 8 May 220

Part IV. Management Assurance

4.1 Review of the elements supporting assurance

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

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

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

The conclusion of the overall assessment of the Integrated Management System (the internal control system of F4E) is that the system is **effective overall with some improvements needed**. This means that the system is in place but overall minor improvements are needed, with some moderate deficiencies needing some priority improvement action. Further details can be found in section 3.2 ‘Conclusions of assessment of internal control systems’.

4.2 Reservations

The Authorising Officer identifies the overall impact of a weakness as to whether it should be disclosed as a reservation in his declaration of assurance. The benchmark for this judgement is the materiality criteria which are assessed both in quantitative and qualitative terms.

In quantitative terms, F4E quantifies the potential financial impact of a weakness in monetary terms. Then it uses the threshold used by the European Commission and the European Court of Auditors, a 2% residual error rate. This means that if the errors in the transactions affected by the weakness and which remain after correction represent more than 2% of the total budget they are disclosed as a reservation.

In qualitative terms, F4E assesses the nature and scope of the weakness, the compensatory measures and effective corrective actions together with any potential reputational impact.

For the year 2019, the Authorising Officer has not made any reservation in its declaration of assurance as none of the weaknesses identified were material enough, neither in quantitative nor qualitative terms.

Part V. Declaration of Assurance

I, undersigned, Johannes P. 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 2019 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 (ECA), 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 and compliance functions, the ex-post controls on grants and the Governing Board annual assessment of F4E.

- Without qualifying this reasonable assurance, I would like to highlight the risks observed by the ECA in the "Emphasis of Matter" section of their 2018 Annual Report: *"While positive steps have been taken to improve the management and control of the ITER project construction phase, there remains a risk of further cost increases and delays in project implementation compared to the current approved baseline"*.

- I confirm that the risks F4E is facing do not call into question the legality and regularity of the underlying transactions in relation to the 2019 annual accounts. F4E is addressing them through the implementation of mitigating actions to address the most significant risks in the ongoing ITER in-kind delivery projects, in particular the buildings, the vacuum vessel and the superconducting magnets. F4E is closely monitoring the associated project risks, in particular those related to cost and schedule, to ensure that the current MFF[8] budget cap until 2020 is respected, and the impact on the total cost and schedule is minimised.

- F4E has also started to apply lessons learnt and pre-emptively work on risk mitigation for the ITER second and third phase projects which are still in a very early phase. The largest and most challenging are the hot cell building as well as the remote handling and heating neutral beam systems.

- I believe that the actions noted above, as well as the continuous improvement programme launched in 2016, are enhancing F4E's project performance allowing to mitigate the related risks. Nevertheless, I concur with the highlighted observation of the ECA that, as inherent to a project of this magnitude, there remains a risk of further cost increases and schedule delays that F4E management, the F4E Governing Board and the ITER Organisation are addressing. F4E is also continuously enhancing its Integrated Management System and, in particular, Nuclear Safety culture and management to address the risks reported by the Internal Audit Capability and the F4E Annual Management Assessment from the Governing Board. As part of it is long term transformation F4E is improving leadership and management values to reinforce F4E Corporate culture as a co-operative matrixed high tech project organisation.

[8] Multiannual Financial Framework (http://ec.europa.eu/budget/mff/index2014-2020_en.cfm)

- I 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 P. Schwemmer
Director
May 2020

Annexes

Annex I: Analysis and Assessment of the Governing Board

Having regard to Article 4 of the Statutes annexes to the Council decision 2007/198/Euratom establishing the European Joint Undertaking for ITER and the Development of Fusion for Energy and art 48 of F4E's Financial Regulation,

the Governing Board,

1. Welcomes that the ITER Organisation confirms that in 2019 67 % was achieved for the scope of work for First Plasma in 2025 based on ITER's performance metrics, including design, component manufacturing, building construction, shipping and delivery, assembly and installation. This means also that 53 % for all work required for the construction of ITER has been achieved.

2. Welcomes the progress made on the development of the Euratom contribution to the ITER project in 2019 and notes:

    a. F4E delivered 16 of the main ITER Council and Governing Board milestones, 21 are expected to be delivered on time, but 20 milestones are at risk to being delayed.

    b. In the area of buildings

        - the pouring of the last concrete was an important milestone towards the completion of the civil engineering works at the Tokamak building
        - F4E installed all the steel structure columns and beams needed to support the 2 000 t rooftop structure of the Tokamak building
        - The bioshield was completed and further progress was made with the installation of the port cell doors.
        - F4E gave ITER IO access to the 60m-tall Assembly Hall to start assembly activities
        - F4E handed over to ITER IO the Magnet Power Conversion buildings and the ones for Electrical Power Supplies;

    c. F4E introduced important changes in collaboration with industrial suppliers to stabilise the production of the Poloidal Field (PF) coils

    d. F4E achieved a major milestone with the successful insertion and welding of the first of the ten European TF coils into its case

    e. F4E Implemented a new amendment on the Vacuum Vessel Contract aiming to secure sufficient resources applied by the consortium and increased working time. The progress on the vacuum vessel is scrutinized every month by the Governing Board and the Bureau.

3. Congratulates F4E for the excellent progress of the projects under the Broader Approach in collaboration with Japan, especially

    - 99,7 % of the EU contributions to the Satellite Tokamak (JT-60 SA),
    - 98 % of the EU contributions to the IFMIF/EVEDA project and
    - 100 % of the EU contributions to the IFERC project

    has been delivered.

4. Welcomes that F4E continues to forecast that it will remain within the agreed cap of 6.6 Bn € on commitments up to the end of 2020.

5. Welcomes both the full implementation of the commitment appropriations at the level of 99.8 % (100 % individual) of the final annual budget and the payment appropriations at the level of 97,1 %; both is an increase as to 2018

6. Noted the European Court of Auditors Report on the 2018 Annual Accounts.

7. Welcomes that measurable efficiency gains were achieved through improvement projects and that the completed Corporate Actions in response to Annual Assessments and other evaluations increased from 62 % to 86 % despite the total number of actions increased from 138 to 205.

8. Requested that the 8th Annual Assessment concentrated on cost containment, schedule control, risk control and human resources management. The results were reported at the Governing Board meeting in December 2019 and the Governing Board instructed F4E to develop an action plan and tasked the Bureau with the supervision of its implementation.

9. Welcomes that F4E established and adopted in 2019 its own Health & Safety Management System and appointed a Health & Safety Coordinator, whose task is to give advice in all occupational health matters

For the Governing Board

Beatrix Vierkorn-Rudolph
Chair of the Governing Board

10 July 2020

Annex II: Achievement of 2019 Work Programme Objectives

Action 1. Magnets

Milestone ID	Scope Description	Forecast Date	Milestone Type	End 2019 Status
EU11.1A.19546	HPC - IO Approval for Assemble cooling pipe and instrumentation (8.4.4) TFWP01	Q3 2019	GB23 Predecessor	Achieved
EU11.1A.21823	Completion of Ground Insulation / TFWP14	Q3 2019	IC67/GB54 Predecessor	Achieved
EU11.1A.22866	Completion of TF-EU01 Gap Filling	Q4 2019	IC53/GB15 Predecessor	Achieved
EU11.3B.554730	PF5 DP1 completed. Last PF5 DP	Q2 2019	IC42/GB12 Predecessor	Achieved

Action 2. Vacuum Vessel

Milestone ID	Scope Description	Forecast Date	Milestone Type	End 2019 Status
EU15.1A.3037140	S5 PS1_Inner Assembly Part with T-RIB at the back to Divertor Rail Machining	Q1 2019	IC58/GB16 Predecessor	Achieved
EU15.1A.3037380	S5 PS2-A2_RH Global Sub-Assy - Dim. Check after EB Weld. and Plugs Welding on Port Region Susb-assy (Nr.2 plates)	Q2 2019	IC58/GB16 Predecessor	Achieved
EU15.1A.109090	S9 PS1_EBW WELDING REPAIR (17th step)	Q4 2019	GB25 Predecessor	Not achieved and example of non-conformities during Electron Beam Welding technical that have impacted the schedule

Action 3. In Vessel – Blanket

Milestone ID	Scope Description	Forecast Date	Milestone Type	End 2019 Status
EU.16.01.20870	Delivery of Full Scale Prototype to Plzen, Czech republic - OPE-443 Lot 1	Q4 2019	GB37 Predecessor	Not achieved due to delays for completion of the test facility
EU.16.01.21470	Final Non Destructive Examination for Full Scale Prototype - OPE-443 Lot 2	Q3 2019	WP2019 Objective	Achieved
EU.16.01.21550	Delivery of First Scale Prototype to Plzen, Czech republic - OPE-443 Lot 2	Q4 2019	GB37 Predecessor	Not achieved due to delays for the completion of the test facility

Action 4. In Vessel – Divertor

Milestone ID	Scope Description	Forecast Date	Milestone Type	End 2019 Schedule Status
EU17.01.100140	Cassette Body Series Quality Plan Approved	Q2 2019	GB38 Predecessor	Achieved

Milestone ID	Scope Description	Forecast Date	Milestone Type	End 2019 Schedule Status
EU17.2B.92950	F4E to send IO the Qualification of the CuCrZr/316L tube-to-tube joint - OPE-567-01-01	Q4 2019	GB45 Predecessor	Not achieved due to technical difficulties met by the company to achieve the quality required for this welding qualification
EU17.2B.83150	Qualification of the load carrying capability of W attachment - OPE-567-03-01 (II.11)	Q4 2019	GB45 Predecessor	Achieved

Action 5. Remote Handling

Milestone ID	Scope Description	Forecast Date	Milestone Type	End 2019 Schedule Status
EU23.01.900820	ADP approved for Manufacturing of Rad Hard BiSS ASICs Front End Electronics	Q4 2019	GB42 Predecessor	Achieved
EU23.05.02020	NBRHS Monorail crane (Incl. other first priority items) PDR Meeting-Session 1 Closure	Q4 2019	GB42 Predecessor	Achieved
EU57.01.14047300	M12 - Acceptance Data Package #2 (Initial TO#08 Scope) Approved by F4E	Q4 2019	GB47 Predecessor	Achieved
EU57.01.52460	EU IVVS PDR Meeting Complete	Q4 2019	GB47 Predecessor	Achieved

Action 6. Cryoplant and Fuel Cycle

Milestone ID	Scope Description	Forecast Date	Milestone Type	End 2019 Schedule Status
EU31.03.29300	CPS for Procurement of components for Primary & Cryostat Leak Detection System Approved	Q4 2019	GB18/IC76 Predecessor	Achieved
EU31.01.104400	Published Final Call for Tender for Procurement Torus and Cryostat Cryopumps	Q4 2019	GB33 Predecessor	Achieved
EU31.03.28000	Published Call for Expression of Interest for Procurement of components for Primary & Cryostat Leak Detection & Localisation System	Q4 2019	GB35 Predecessor	Achieved

Action 7. Antennas and Plasma Engineering

Milestone ID	Scope Description	Forecast Date	Milestone Type	End 2019 Status
EU52.01.950120	Testing of TL prototypes: 63.5mm window mock testing completed	Q4 2019	GB44 Predecessor	Not achieved due to recurring issues to find a company and obtaining quotes (very small shipment) that would pick up the window in Japan and deliver it to Switzerland (a non–EU country), issues related to custom and insurance.

Milestone ID	Scope Description	Forecast Date	Milestone Type	End 2019 Status
EU52.01.950130	Manufacturability study of UL Port Plug completed	Q4 2019	GB46 Predecessor	Achieved
EU52.01.950140	UL Port Plug Final Design Review	Q3 2019	GB46 Predecessor	Achieved
EU52.01.950110	Full prototype of GCC Plant Control System implemented in FALCON	Q4 2019	GB46 Predecessor	Achieved

Action 8. Neutral Beam and EC Power Supplies and Sources

Milestone ID	Scope Description	Forecast Date	Milestone Type	End 2019 Status
EU53.06.06970	Start of Commissioning of ISEPS of MITICA	Q4 2019	Execution Milestone	Achieved
EU53.06.07920	Stage # 2 of Contract for EU-HVD1 & EU-Bushing - Start of Performance NBI-1	Q4 2019	GB30 Predecessor	Achieved
EU53.TF.08700	Task Order Signed for SC#1 (Stage 2) MITICA Beam Line Components	Q4 2019	Contract Signature	Achieved
EU53.TF.40710	Task Order #4 Signed for NBTF MITICA CODAS and Interlock	Q3 2019	Contract Signature	Achieved

Action 9. Diagnostics

Milestone ID	Scope Description	Forecast Date	Milestone Type	End 2019 Status
EU55.01.203550	Contract Signed for Procurement and Delivery for Inner-Vessel Coils - Sensor Heads (LTCC) - Lot 1	Q2 2019	Contract Milestone	Achieved
EU55.06.681710	Receipt of Approval of Preliminary Design Review for Feedthroughs components from IO to EU-DA	Q2 2019	GB36 Predecessor	Achieved
EU55.14.632140	Preliminary Design Review Meeting EQ01 - T04	Q4 2019	Annual Objective	Achieved

Action 10. Test Blanket Modules

Milestone ID	Scope Description	Forecast Date	Milestone Type	End 2019 Status
EU56.01.130320	Contract Signed for FWC Preliminary Design of TBMs set	Q4 2019	Contract Milestone	Achieved
EU56.01.1226780	Task Order F4E-OFC-0950-01-01 Signed for Preliminary Design of TBMs set phase I	Q4 2019	Contract Milestone	Achieved
EU56.01.1230420	Contract Signed for FWC Preliminary Design of Ancillary Systems	Q4 2019	Contract Milestone	Achieved
EU56.01.1232800	FwC signed for Safety Analysis for TBS Preliminary Design	Q4 2019	Contract Milestone	Achieved

Action 11. Site and Buildings and Power Supplies

Milestone ID	Scope Description	Forecast Date	Milestone Type	End 2019 Status
EU62.05.20916	RFOC Tokamak Building (11) Central Pit	Q2 2019	GB13/IC50 Predecessor	Achieved
EU62.05.060	Construction of Assembly Building (13) Completed	Q4 2019	GB51/IC43	Postponed March 2020
EU62.05.273130	Contract Signed for TB12 Contract	Q3 2019	Predecessor of GB34	Achieved
EU62.05.20929	Ready for TB02 Crane rails installation in the Crane Hall area	Q4 2019	GB13/IC50 Predecessor	Achieved

Action 12. Cash Contributions

•In 2019 F4E paid € 224.20m for the in-cash contribution to the ITER Organization in accordance with the ITER Organization's Budget as approved by Euratom in the ITER Council.

Action 13. Technical Support Activities

Milestone ID	Scope Description	Forecast Date	Milestone Type	End 2019 Status
EU.ES.02.51240	Contract Signed for Engineering Support services in the area of Thermo Hydraulics and Fluid Dynamics	Q4 2019	Contract Signature	Achieved
EU.ES.02.58460	Contract signed for Supp. in the area of struct. dynamics for earthquake and dynamic-type transient loads	Q4 2019	Contract Signature	Achieved
EU.PM.49340	OMF-0937-01 signed for QA Support to BIPS Project Team	Q3 2019	Contract Signature	Achieved
EU.PM.3033480	FwC F4E-OMF-0937 signed for Quality & Surveillance Inspection	Q2 2019	FWC Signature	Achieved
EU.PM.3023240	Task Order 07 OMF-436 Lot 5 signed for CE Marking Support activities	Q1 2019	Contract Signature	Achieved
EU.PM.45380	Task Order 19 OMF-0783 Lot 1 signed for Expert Support in Deviation and PCR control	Q1 2019	Contract Signature	Achieved
EU.PM.3035120	Task Order 04 OMF-0783 Lot 2 signed for Support in Technical Issues Management	Q1 2019	Contract Signature	Achieved
EU.PM.3004900	Extension of Convention 3 for Gendarmerie for Real Convoys. Period 2020-2024	Q4 2019	Contract Signature	Achieved
EU.PM.3063500	Task Order 08 OMF-0895 Lot 1 signed for Planning & Scheduling Support	Q1 2019	Contract Signature	Achieved
EU.PM.3063650	Task Order 03 OMF-0895 Lot 1 signed for Project Performance Management Support	Q1 2019	Contract Signature	Achieved
EU.PM.3062150	Task Order 01 OMF-0895 Lot 3 signed for Planning Support	Q3 2019	Contract Signature	Achieved
EU.PM.3060400	Task Order 02 OMF-0895 Lot 2 signed for Risk Management Support	Q4 2019	Contract Signature	Achieved

Milestone ID	Scope Description	Forecast Date	Milestone Type	End 2019 Status
EU.PM.3058900	Task Order 03 OMF-0831-Lot 2 signed for SAP Business Objects Support	Q4 2019	Contract Signature	Achieved

Action 14. Broader Approach

Milestone ID	Scope Description	Forecast Date	Milestone Type	End 2019 Status
EU.BA.01.6520	Approval of Report on Factory Test for the ECH PS and its delivery on site (D2)	Q4 2019	Delivery Milestone	Delayed to Q1 2020
EU.BA.01.6580	Delivery of JT-60SA Toroidal Field Magnet - Spare TF coil 1 and spare winding pack	Q4 2019	Delivery Milestone	Achieved
EU.BA.01.6420	Delivery of Beam Dump Ionization Chambers	Q3 2019	Delivery Milestone	Achieved
EU.BA.01.14140	Cryomodule components delivered for its assembly	Q4 2019	WP Milestone	Largely achieved with the exception of solenoids, expected in Q1 2020
EU.BA.01.5260	Delivery of software codes and reports on remote participation tests	Q3 2019	Delivery Milestone	Achieved

Annex III Core Business Statistics

Key Performance Indicators for 2019

ITER Project Progress

- 67.3% for the scope of work achieved for First Plasma in December 2025
- 53.3% for all the work required for the construction of ITER

F4E's Contributions to ITER

- 42.9% of In-Kind Contributions achieved
- 35% share of in-kind contributions to ITER among members
- 46% share of in-cash contributions to ITER among members

Broader Approach Project Progress

- 99.7% of the EU contributions to the Satellite Tokamak (JT-60SA) delivered
- 98% of the EU contributions to the IFMIF/EVEDA project delivered
- 100% of the EU contributions to the IFERC project delivered

F4E Project Performance

- F4E's current and planned budget compared to Estimate at Completion is 105%
- 94% Schedule Performance achieved on the basket of internal milestones
- For the main ITER Council and Governing Board milestones, F4E has:
    - 16 achieved
    - 21 which are expected to be delivered on time
    - 20 at risk of being delayed

F4E Procurement

- 91 contracts signed in 2019 for a value of €229m
- Total cumulative value of contracts €4211m

F4E Annual Budget Performance

- Annual Commitment €728m - 99.8% of Budget Implemented
- Annual Payments €739m - 97.1% of Budget Implemented

F4E Quality

- F4E has 124 F4E Non-Conformity Reports (NCRs) open for > 12 months compared to 489 NCRs still open giving a ratio of 25% (above the internal target of 10%)

F4E Human Resources

- 438 Staff (51 Officials, 222 Temporary Agents & 165 Contract Agents)
- 64% Male and 36% (Female) Staff
- Assignment of human resources to different areas:
    - 66% for ITER
    - 7% Broader Approach and DEMO
    - 27% Commercial and Administration
- 4.8% Vacancy Rate above target of 4%
- 3.2% Turnover Rate below target of 4%
- 1.78% Absenteeism Rate below target of 2%

F4E Organisational Improvement

- Implemented 86% of Corporate Actions
- Implemented 87% of Internal Audit Actions

Background

F4E has identified specific Key Performance Indicators (KPI) in order to measure how effectively the organisation achieves the target set in different project (i.e. schedule, cost, risk, etc.) and programmatic areas (i.e. annual budget consumption, quality, etc.). F4E updates these KPIs on a monthly basis and reviews them at the level of its Senior Management and takes action to address events or risk that could threaten their achievement.

For the EU contributions to ITER, the basis for the adopted KPIs is the F4E current baseline, in schedule, cost and budget. F4E ensures that the baseline is maintained through change control processes together with the ITER Organization. Dashboards are available with the possibility of drilling down for more details, both at a global F4E level and individually per Programme. KPI information is included in many F4E documents and reports to its governing bodies.

"Technical" Indicators

In relation to F4E's obligation to provide in kind contributions to the **ITER Project**:

- The ITER Council approves, monitors and updates a set of high-level monitoring milestones – the so-called **ITER Council (IC) milestones**, which track the overall progress of the project in all the seven ITER Domestic Agencies (including F4E) and the ITER Organization. These milestones are suitable for tracking progress as they cover a larger group of components at different stages of their development. Most of them are key to achieve the ITER First Plasma, but some of them also relate to post-First Plasma systems;
- To complement the ITER Council milestones, an expanded set of high-level milestones are approved, monitored and updated by F4E's Governing Board – the **Governing Board (GB) milestones** which are solely applicable to F4E. Their status is reported to F4E's Governing Board and other governance bodies on a monthly basis and subject to change control by the Governing Board. The complete list of F4E's Governing Board and ITER Council milestones for 2019 is provided in F4E's Multi-annual and Annual Programme document (MAP);

- In addition, F4E uses a basket of **additional technical milestones** to monitor more precisely its own performance. F4E has selected such milestones by making sure that they cover important activities inside the organisation and therefore can provide a meaningful measure of F4E performance. These include Procurement Arrangement signatures, commitments >€ 2m, Calls for tender, contract signatures >€ 2m and project execution milestones. These are described in Table 17 ;
- Relying on the 262 milestones for 2019 (shown in Table 17 below), one can infer a **Schedule Performance Index (SPI)** that measure the performance of F4E according to the number of milestones achieved during the year compared with the amount initially forecasted (baseline of the year). The Schedule Performance Index is calculated on the basis of a moving annual average which is reviewed on a monthly basis by F4E's Senior Management and reported regularly to its Governing Board;
- **Earned Value Management (EVM)** is a project management technique for measuring project performance and progress in an objective manner. F4E has implemented an Earned Value Management system which provides monthly Schedule Performance Index (SPI) and Cost Performance Index (CPI), and the trend of these metrics. This EVM system is based on ITER Credits and Actual Payment data. The EVM Dashboard is shared with F4E's external stakeholders at the end of each month.

ITER Council and Governing Board Milestones	Milestones against which the ITER Council and Governing Board will measure the project.
PA Signature	Signatures of PAs. ITA signatures and PA amendment signatures are not included.
Call for Tender	Publication of a Call for Tender.
Commitments above €2m	Any commitment above 2 million Euros.
Project Execution Milestones	Milestone in the on-going execution of a project. These milestones are selected by the project teams at the end of the previous year.
Work Programme Objectives	Objectives set in the Work Programme
F4E Gates Design Review	F4E Gates Design Reviews
Delivery	Delivery Milestones

Table 17: Technical objectives and KPIs used for monitoring purposes

- To monitor projects against their budgets, the **Estimate at Completion (EAC)** is calculated by F4E on a monthly basis using three elements (a) actual costs already incurred, (b) estimate of future costs, (c) estimate of likely impact of future risks. F4E follows an industry standard process for its EAC. The monthly update process is complemented by biannual deep-dive reviews to assess in more detail the quality of the estimates and the associated assumptions at programme and project level. F4E systematically presents the EAC at each biannual Governing Board meeting.

Contributions to **Broader Approach (BA) 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. The accounting of contributions is tracked by an Earned Value Management approach using credits. In addition, the Broader Approach projects are monitored by the achievement on time of the milestones defined in the Project Plan approved by the Broader Approach Steering Committee. The complete list of F4E's Broader Approach milestones for 2019 are provided in F4E's MAP. Each of these milestones is assigned a credit value that is used to allow an Earned Value calculation of the overall level of achievement against the Planned Value.

"Non-Technical" Indicators

Despite the fact that F4E is an organisation with obvious technical objectives, F4E acknowledges that the same attention shall be granted to other relevant tasks that are non-technical but still very important for the organisation to run smoothly. They are then translated into objectives to be achieved by the organisation. The Non-Technical Objectives and their KPIs are shown in

They are Corporate Objectives and for this reason they are related both to ITER and Broader Approach projects. The calculation methodology for these milestones is explained in F4E's MAP.

Other "non-technical" indicators but for which targets are not currently set but are monitored internally and, in some cases, reported on a biennial basis to F4E's Governing Board, include the staff attrition rate, gender balance, time to place contracts and grants and time to recruit.

AREA	OBJECTIVE
Overall Costs	- Cost estimation until 2020 should be less than total budget available until 2020
Annual budget	- Implementation of Annual budget achieved [100%]
Annual payment	- Implementation of payment fully achieved. [100%]
Quality	- To reduce the number of Long Non Conformity Report (NCRs) compared to the previous year. IO defines Long NCRs the ones open for more than 180 Days. NCRs to be closed in less than 9 months on average
Human Resources	- Staff Turnover rate should be less than < 4%

Table 18: Non-technical objectives and KPIs used by F4E

To ensure the widespread awareness of F4E's performance against the above technical and non-technical objectives, F4E has created a 'dashboard' showing the most important KPIs which is not only used for monthly reporting to the Project Steering Meeting and stakeholders but also shown on screens located on every floor of F4E's offices at the Barcelona headquarter offices.

The F4E dashboard consists of four parts:

1) **General part on the overall progress**. It provides a summary of the progress through the current status, against the baseline, for the achieved ITER credits for EU in-kind procurements, milestones completion, ratio of assigned budget vs cost, commitments and payments implementation;
2) **A multiannual part**: it shows the evolution over the past months of indexes such as the achieved ITER credit, the estimate at completion (EAC), the schedule performance index (SPI) and the forecast of completion of the key milestones selected by the F4E and ITER Organization supervising boards;
3) **An annual part**: it shows, for the current year, both achieved and forecast evolution of achieved ITER credit, commitments, payments and annual objectives of the organisation.
4) **Earned Value Management (EVM)**: this system provides monthly Schedule Performance Index (SPI) and Cost Performance Index (CPI), and the trend of these metrics. This EVM system is based on ITER Credits and Actual Payment data.

Annex IV Statistics on Financial Management

Annex IV. a. Evolution of the Statement of Expenditure in Commitment

Evolution of the Statement of Expenditure in Commitment (EUR)

Heading of the 2019 Budget	Original budget 12 Dec. 2018 (1)	Amending budget 1 10 July 2019 (2)	Amending budget 2 10 Dec. 2019 (3)	Transfers adopted by F4E Director (4)	Final budget (5)= Σ(1 to 4)	Additional revenue (6)	Carried over from 2018 (7)	Final appropriations (8)= Σ(5 to 7)	Final implementation (9)	% implem. (10)= (9)/(8)
CH 11 STAFF EXPENDITURE IN THE ESTABLISHMENT PLAN	32,952,832.40			1,352,206.14	34,305,038.54			34,305,038.54	34,305,038.54	100.0%
CH 12 EXTERNAL STAFF EXPENDITURE (CA, IS AND SNE)	11,022,500.00			-217,094.65	10,805,405.35			10,805,405.35	10,805,405.35	100.0%
CH 13 MISSIONS AND DUTY TRAVEL	450,000.00			440,000.00	890,000.00			890,000.00	890,000.00	100.0%
CH 14 MISCELLANEOUS EXPENDITURE ON STAFF RECRUITMENT AND TRANSFER	853,000.00			-364,975.78	488,024.22			488,024.22	488,024.22	100.0%
CH 15 REPRESENTATION	10,000.00			-4,000.00	6,000.00			6,000.00	6,000.00	100.0%
CH 16 TRAINING	663,000.00			-67,633.24	595,366.76	2,031.26		597,398.02	597,398.02	100.0%
CH 17 OTHER STAFF MANAGEMENT EXPENDITURE	2,422,000.00			376,508.53	2,798,508.53	3,356.25		2,801,864.78	2,801,864.78	100.0%
CH 18 TRAINEESHIPS	151,000.00			25,186.84	176,186.84			176,186.84	176,186.84	100.0%
TITLE 1 - Commitment	48,524,332.40	0.00	0.00	1,540,197.84	50,064,530.24	5,387.51	0.00	50,069,917.75	50,069,917.75	100.0%
CH 21 BUILDINGS AND ASSOCIATED COSTS	1,428,000.00			-520,839.68	907,160.32		489,339.68	1,396,500.00	1,396,500.00	100.0%
CH 22 INFORMATION AND COMMUNICATION TECHNOLOGIES	3,570,400.00			-4,971.23	3,565,428.77			3,565,428.77	3,565,428.77	100.0%
CH 23 MOVABLE PROPERTY AND ASSOCIATED COSTS	261,000.00			-103,000.00	158,000.00			158,000.00	158,000.00	100.0%
CH 24 EVENTS AND COMMUNICATION	306,000.00			-6,291.83	299,708.17			299,708.17	299,708.17	100.0%
CH 25 OUTSOURCING AND OTHER CURRENT EXPENDITURE	1,244,000.00			5,488.02	1,249,488.02	567.46		1,250,055.48	1,249,488.02	100.0%
CH 26 POSTAGE AND TELECOMMUNICATIONS	391,000.00			-20,400.00	370,600.00			370,600.00	370,600.00	100.0%
CH 27 EXPENDITURE ON FORMAL AND OTHER MEETINGS	355,400.00			98,798.06	454,198.06			454,198.06	454,198.06	100.0%
CH 28 APPROPRIATION ACCRUING FROM THIRD PARTIES TO THE BUILDING REFURBISHMENT EXPENDITURE	p.m.			0.00	0.00			0.00	0.00	-
TITLE 2 - Commitment	7,555,800.00	0.00	0.00	-551,216.66	7,004,583.34	567.46	489,339.68	7,494,490.48	7,493,923.02	100.0%
Total TITLE 1 & 2 - Commitment	56,080,132.40	0.00	0.00	988,981.18	57,069,113.58	5,954.97	489,339.68	57,564,408.23	57,563,840.77	100.0%

Evolution of the Statement of Expenditure in Commitment (EUR) (cont'd)

Heading of the 2019 Budget	Original budget 12 Dec. 2018 (1)	Amending budget 1 10 July 2019 (2)	Amending budget 2 10 Dec. 2019 (3)	Transfers adopted by F4E Director (4)	Final budget (5)= Σ(1 to 4)	Additional revenue (6)	Carried over from 2018 (7)	Final appropriations (8)= Σ(5 to 7)	Final implementation (9)	% implem. (10)= (9)/(8)
CH 31 ITER CONSTRUCTION - INCLUDING SITE PREPARATION	**468,541,368.00**	-2,364,000.00	17,084,140.23	-890,076.68	**482,371,431.55**	337,824.27	152,676.55	**482,861,932.37**	**482,595,361.97**	**99.9%**
CH 32 TECHNOLOGY FOR ITER	**3,304,000.00**	-804,000.00	-500,000.00	-528,563.45	**1,471,436.55**			**1,471,436.55**	**1,471,436.55**	**100.0%**
CH 33 TECHNOLOGY FOR BROADER APPROACH AND DEMO	**11,800,000.00**	-1,300,000.00	-5,500,000.00	-731,189.51	**4,268,810.49**			**4,268,810.49**	**4,268,810.49**	**100.0%**
CH 34 OTHER EXPENDITURE	**4,982,000.00**	7,018,000.00	1,197,794.00	1,160,848.46	**14,358,642.46**	28,932.00		**14,387,574.46**	**14,387,574.46**	**100.0%**
CH 35 ITER CONSTRUCTION - APPROPRIATIONS ACCRUING FROM THE HOST STATE CONTRIBUTION	**130,000,000.00**				**130,000,000.00**		14,944,913.65	**144,944,913.65**	**144,944,913.17**	**100.0%**
CH 36 APPROPRIATION ACCRUING FROM THIRD PARTIES TO SPECIFIC ITEM OF EXPENDITURE	**p.m.**				**0.00**	12,894,715.56	11,314,653.69	**24,209,369.25**	**22,872,935.91**	**94.5%**
TITLE 3 - Commitment	**618,627,368.00**	**2,550,000.00**	**12,281,934.23**	**-988,981.18**	**632,470,321.05**	**13,261,471.83**	**26,412,243.89**	**672,144,036.77**	**670,541,032.55**	**99.8%**
Total BUDGET in Commitment Appropriations	**674,707,500.40**	**2,550,000.00**	**12,281,934.23**	**0.00**	**689,539,434.63**	**13,267,426.80**	**26,901,583.57**	**729,708,445.00**	**728,104,873.32**	**99.8%**

Annex IV. b. Evolution of the Statement of Expenditure in Payment

Evolution of the Statement of Expenditure in Payment Appropriations (EUR)

Heading of the 2019 Budget	Original budget 12 Dec. 2018 (1)	Amending budget 1 10 July 2019 (2)	Amending budget 2 10 Dec. 2019 (3)	Transfers adopted by F4E Director (4)	Final budget (5)= Σ(1 to 4)	Additional revenue (6)	Carried over from 2018 (7)	Final apprpriations (8)= Σ(5 to 7)	Implementation			
									On B2019 commitments (9)	On B 2018 commitments (10)	Final (11)=(9)+(10)	% (12)= (11/(8)
CH 11 STAFF EXPENDITURE IN THE ESTABLISHMENT PLAN	**32 952 832.40**			1 352 206.14	**34 305 038.54**			**34 305 038.54**	34 305 038.54		**34 305 038.54**	**100.0%**
CH 12 EXTERNAL STAFF EXPENDITURE (CA, IS AND SNE)	**11 022 500.00**			-217 094.65	**10 805 405.35**		210 271.74	**11 015 677.09**	10 647 569.40	183 042.86	**10 830 612.26**	**98.3%**
CH 13 MISSIONS AND DUTY TRAVEL	**450 000.00**			440 000.00	**890 000.00**		1 290 241.59	**2 180 241.59**	376 957.92	1 058 136.72	**1 435 094.64**	**65.8%**
CH 14 MISCELLANEOUS EXPENDITURE ON STAFF RECRUITMENT AND TRANFER	**853 000.00**			-364 975.78	**488 024.22**		48 078.70	**536 102.92**	417 850.34	6 497.06	**424 347.40**	**79.2%**
CH 15 REPRESENTATION	**10 000.00**			-4 000.00	**6 000.00**		6 364.77	**12 364.77**	3 972.18	1 138.60	**5 110.78**	**41.3%**
CH 16 TRAINING	**663 000.00**			-67 633.24	**595 366.76**	2 031.26	217 675.48	**815 073.50**	307 606.02	162 027.67	**469 633.69**	**57.6%**
CH 17 OTHER STAFF MANAGEMENT EXPENDITURE	**2 422 000.00**			376 508.53	**2 798 508.53**	3 356.25	355 386.87	**3 157 251.65**	2 478 648.88	255 050.45	**2 733 699.33**	**86.6%**
CH 18 TRAINEESHIPS	**151 000.00**			25 186.84	**176 186.84**			**176 186.84**	176 186.84		**176 186.84**	**100.0%**
TITLE 1 - Payment appropriations	**48 524 332.40**	**0.00**	**0.00**	**1 540 197.84**	**50 064 530.24**	**5 387.51**	**2 128 019.15**	**52 197 936.90**	**48 713 830.12**	**1 665 893.36**	**50 379 723.48**	**96.5%**
CH 21 BUILDINGS AND ASSOCIATED COSTS	**1 428 000.00**			-520 839.68	**907 160.32**		1 069 085.43	**1 976 245.75**	884 510.32	501 800.16	**1 386 310.48**	**70.1%**
CH 22 INFORMATION AND COMMUNICATION TECHNOLOGIES	**3 570 400.00**			-4 971.23	**3 565 428.77**		1 843 564.89	**5 408 993.66**	1 855 574.45	1 708 494.22	**3 564 068.67**	**65.9%**
CH 23 MOVABLE PROPERTY AND ASSOCIATED COSTS	**261 000.00**			-103 000.00	**158 000.00**		104 680.22	**262 680.22**	84 254.49	62 639.11	**146 893.60**	**55.9%**
CH 24 EVENTS AND COMMUNICATION	**306 000.00**			-6 291.83	**299 708.17**		81 915.85	**381 624.02**	181 553.00	54 467.09	**236 020.09**	**61.8%**
CH 25 OUTSOURCING AND OTHER CURRENT EXPENDITURE	**1 244 000.00**			5 488.02	**1 249 488.02**	567.46	379 435.75	**1 629 491.23**	885 116.75	274 808.78	**1 159 925.53**	**71.2%**
CH 26 POSTAGE AND TELECOMMUNICATIONS	**391 000.00**			-20 400.00	**370 600.00**		196 285.16	**566 885.16**	225 092.19	144 986.25	**370 078.44**	**65.3%**
CH 27 EXPENDITURE ON FORMAL AND OTHER MEETINGS	**355 400.00**			98 798.06	**454 198.06**		148 151.57	**602 349.63**	192 524.50	138 592.64	**331 117.14**	**55.0%**
CH 28 APPROPRIATION ACCRUING FROM THIRD PARTIES TO THE BUILDING REFURBISHMENT EXPENDITURE	**p.m.**			0.00	**0.00**			**0.00**	0.00	0.00	**0.00**	-
TITLE 2 - Payment appropriations	**7 555 800.00**	**0.00**	**0.00**	**-551 216.66**	**7 004 583.34**	**567.46**	**3 823 118.87**	**10 828 269.67**	**4 308 625.70**	**2 885 788.25**	**7 194 413.95**	**66.4%**
Total TITLE 1 & 2 - Payment	**56 080 132.40**	**0.00**	**0.00**	**988 981.18**	**57 069 113.58**	**5 954.97**	**5 951 138.02**	**63 026 206.57**	**53 022 455.82**	**4 551 681.61**	**57 574 137.43**	**91.3%**

Evolution of the Statement of Expenditure in Payment Appropriations (EUR) (cont'd)

Heading of the 2019 Budget	Original budget 12 Dec. 2018 (1)	Amending budget 1 10 July 2019 (2)	Amending budget 2 10 Dec. 2019 (3)	Transfers adopted by F4E Director (4)	Final budget (5)= Σ(1 to 4)	Additional revenue (6)	Carried over from 2018 (7)	Final apprpriations (8)= Σ(5 to 7)	Implementation			
									On B2019 commitments (9)	On B 2018 commitments (10)	Final (11)=(9)+(10)	% (12)= (11/(8)
CH 31 ITER CONSTRUCTION - INCLUDING SITE PREPARATION	**563 673 628.23**	-3 500 000.00	-56 768 480.10	-6 911 637.93	**496 493 510.20**	337 824.27	9 854 054.62	**506 685 389.09**	-	-	**506 485 472.61**	**100.0%**
CH 32 TECHNOLOGY FOR ITER	**4 200 000.00**			2 642 102.19	**6 842 102.19**			**6 842 102.19**	-	-	**6 842 102.19**	**100.0%**
CH 33 TECHNOLOGY FOR BROADER APPROACH AND DEMO	**7 400 000.00**			937 082.18	**8 337 082.18**			**8 337 082.18**	-	-	**8 337 082.18**	**100.0%**
CH 34 OTHER EXPENDITURE	**5 000 000.00**			2 343 472.38	**7 343 472.38**	28 932.00		**7 372 404.38**	-	-	**7 372 404.38**	**100.0%**
CH 35 ITER CONSTRUCTION - APPROPRIATIONS ACCRUING FROM THE HOST STATE CONTRIBUTION	**145 000 000.00**				**145 000 000.00**		2 198 145.43	**147 198 145.43**	-	-	**147 198 145.43**	**100.0%**
CH 36 APPROPRIATION ACCRUING FROM THIRD PARTIES TO SPECIFIC ITEM OF EXPENDITURE	**p.m.**				**0.00**	7 414 844.60	14 311 525.34	**21 726 369.94**	-	-	**5 094 087.85**	**23.4%**
TITLE 3 - Payment appropriations	**725 273 628.23**	**-3 500 000.00**	**-56 768 480.10**	**-988 981.18**	**664 016 166.95**	**7 781 600.87**	**26 363 725.39**	**698 161 493.21**	**0.00**	**0.00**	**681 329 294.64**	**97.6%**
Total BUDGET in Payment Appropriations	**781 353 760.63**	**-3 500 000.00**	**-56 768 480.10**	**0.00**	**721 085 280.53**	**7 787 555.84**	**32 314 863.41**	**761 187 699.78**	**53 022 455.82**	**4 551 681.61**	**738 903 432.07**	**97.1%**

Annex IV. c. Transfers approved by the Director on the 2019 Budget

Transfers approved by the Director on 2019 Budget

(EUR)

2019 Statement of Expenditure (EUR)		Transfer no 1		Transfer no 2	Transfer no 3		Transfer no 4	Transfer no 5	Transfer no 6	Transfer no 7	Transfer no 8		Transfer no 9		Transfer no 10		Total Transfers	
Title/Chapter/Heading		Commitment	Payment	Commitment	Commitment	Payment	Payment	Payment	Payment	Payment	Commitment	Payment	Commitment	Payment	Commitment	Payment	Commitment	Payment
A-11	STAFF IN ACTIVE EMPLOYMENT										1 352 206.14	1 352 206.14					**1 352 206.14**	**1 352 206.14**
A-12	EXTERNAL STAFF EXPENDITURE INCLUDING CONTRACTUAL										-217 094.65	-217 094.65					**-217 094.65**	**-217 094.65**
A-13	MISSIONS AND DUTY TRAVEL										440 000.00	440 000.00					**440 000.00**	**440 000.00**
A-14	MISCELLANEOUS EXPENDITURE ON STAFF RECRUITMENT				-72 720.00	-72 720.00					-290 015.78	-290 015.78	-2 240.00	-2 240.00			**-364 975.78**	**-364 975.78**
A-15	REPRESENTATION AND EVENTS										-4 000.00	-4 000.00					**-4 000.00**	**-4 000.00**
A-16	TRAINING										-194 941.24	-194 941.24	128 000.00	128 000.00	-692.00	-692.00	**-67 633.24**	**-67 633.24**
A-17	OTHER STAFF MANAGEMENT EXPENDITURE										376 508.53	376 508.53					**376 508.53**	**376 508.53**
A-18	TRAINEESHIPS										25 186.84	25 186.84					**25 186.84**	**25 186.84**
A-1	**STAFF EXPENDITURE -TOTAL**	**0.00**	**0.00**	**0.00**	**-72 720.00**	**-72 720.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1 487 849.84**	**1 487 849.84**	**125 760.00**	**125 760.00**	**-692.00**	**-692.00**	**1 540 197.84**	**1 540 197.84**
A-21	BUILDINGS AND ASSOCIATED COSTS	-489 339.68	-489 339.68								-31 500.00	-31 500.00					**-520 839.68**	**-520 839.68**
A-22	INFORMATION AND COMMUNICATION TECH.												-4 971.23	-4 971.23			**-4 971.23**	**-4 971.23**
A-23	MOVABLE PROPERTY AND ASSOCIATED COSTS										-103 000.00	-103 000.00					**-103 000.00**	**-103 000.00**
A-24	EVENTS and COMMUNICATION										-6 291.83	-6 291.83					**-6 291.83**	**-6 291.83**
A-25	OUTSOURCING AND OTHER CURRENT EXPENDITURE				72 720.00	72 720.00					-67 231.98	-67 231.98					**5 488.02**	**5 488.02**
A-26	POSTAGE AND TELECOMMUNICATIONS										-20 400.00	-20 400.00					**-20 400.00**	**-20 400.00**
A-27	EXPENDITURE ON FORMAL AND OTHER MEETINGS										98 798.06	98 798.06					**98 798.06**	**98 798.06**
A-2	**BUILDINGS, EQUIPMENT AND OTHER OPERATING EXPENDITURE - TOTAL**	**-489 339.68**	**-489 339.68**	**0.00**	**72 720.00**	**72 720.00**	**0.00**	**0.00**	**0.00**	**0.00**	**-129 625.75**	**-129 625.75**	**-4 971.23**	**-4 971.23**	**0.00**	**0.00**	**-551 216.66**	**-551 216.66**
B3-1	ITER CONSTRUCTION - INCL. SITE PREPARATION	489 339.68	489 339.68	-2 000 000.00			-2 000 000.00	-4 000 000.00	-5 000 000.00	-2 500 000.00	-1 358 224.09	-1 358 224.09	1 978 115.73	7 780 862.62	692.00	-323 616.14	**-890 076.68**	**-6 911 637.93**
B3-2	TECHNOLOGY FOR ITER AND DEMO								5 000 000.00				-528 563.45	-2 613 893.51		255 995.70	**-528 563.45**	**2 642 102.19**
B3-3	TECHNOLOGY FOR BROADER APPROACH AND DEMO									2 500 000.00			-731 189.51	-1 562 917.82			**-731 189.51**	**937 082.18**
B3-4	OTHER EXPENDITURE			2 000 000.00			2 000 000.00	4 000 000.00					-839 151.54	-3 724 840.06		68 312.44	**1 160 848.46**	**2 343 472.38**
B3-5	ITER CONSTRUCTION - HOST STATE CONTRIBUTION																**0.00**	**0.00**
B3-6	APPROP. ACCR. FROM THIRD PARTIES TO SPECIFIC ITEM																**0.00**	**0.00**
B-3	**OPERATIONAL EXPENDITURE - TOTAL**	**489 339.68**	**489 339.68**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**-1 358 224.09**	**-1 358 224.09**	**-120 788.77**	**-120 788.77**	**692.00**	**692.00**	**-988 981.18**	**-988 981.18**
TOTAL		**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Annex IV. d. Statistics on Financial Management Budget – Procurement Data

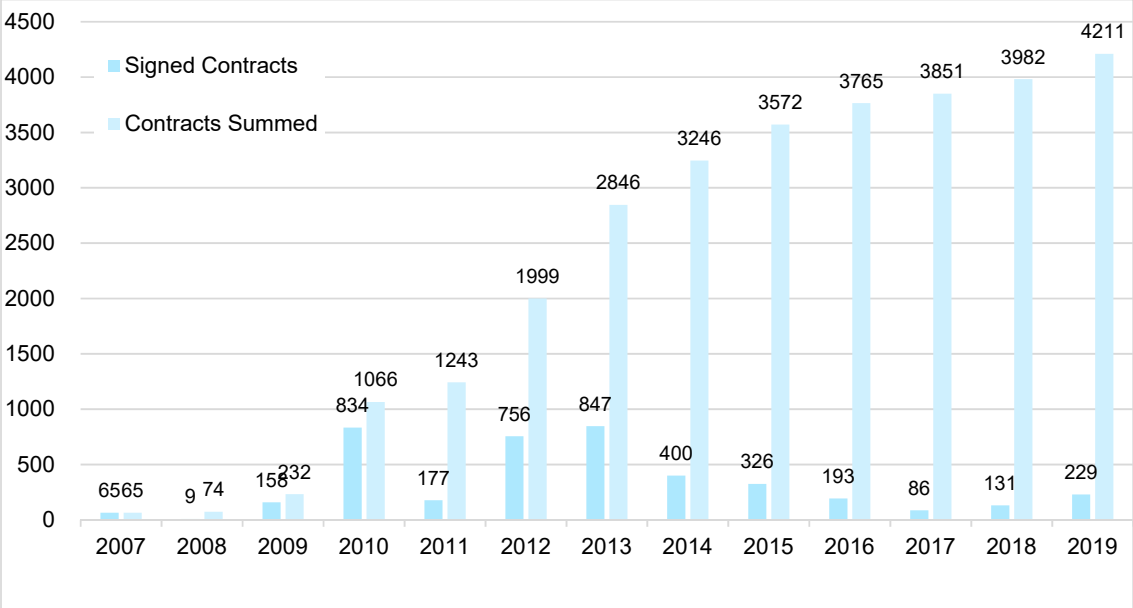


Figure 17: Annual and cumulative value of operational and administrative contracts and grants signed by F4E (€ million, in-year values)

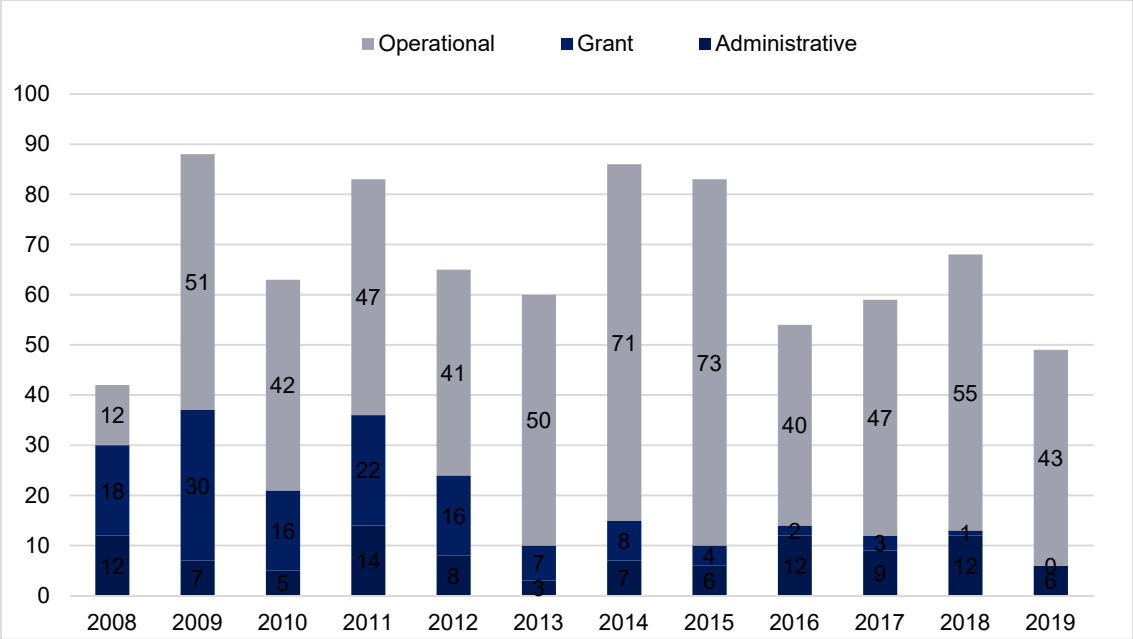


Figure 18: Procurement and grant procedures launched

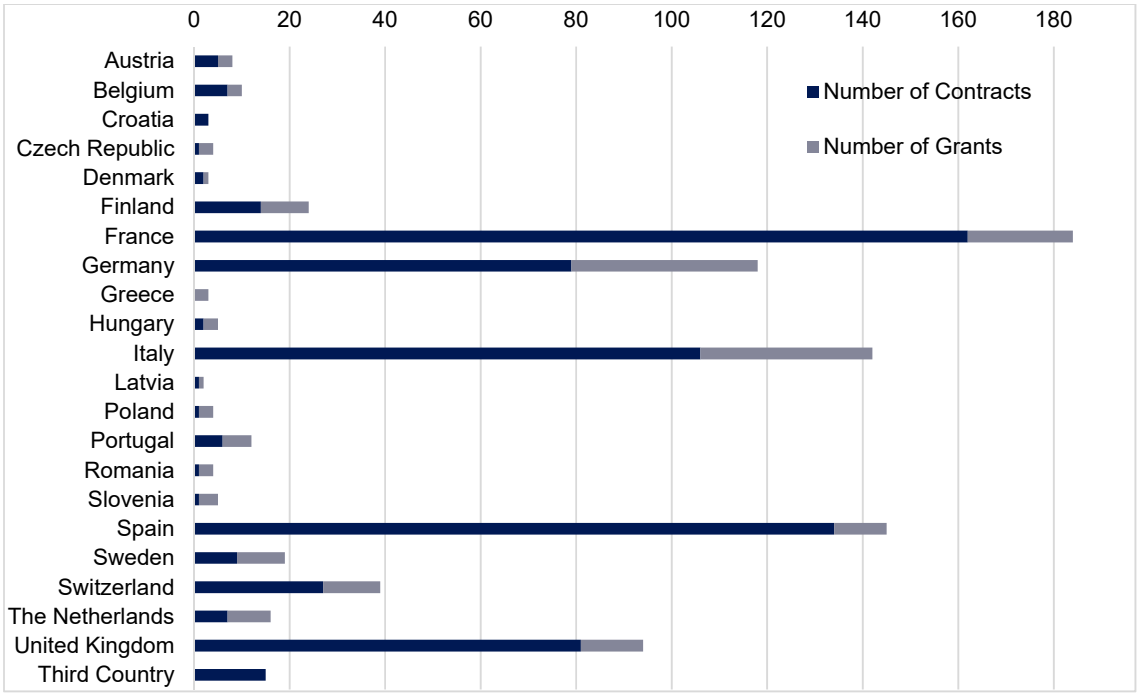


Figure 19: Geographical distribution of awarded contracts and grants (Number in the period 2008-2019)

Annex IV. e. Implementation of the F4E Work Programme 2019

2019 Work Programme		Grant		Procurement		Cash Contribution		TOTAL	
		Amount (€)	Variation (%)	Amount (€)	Variation (%)	Amount (€)	Variation (%)	Amount (€)	Variation (%)
B3-1 & B3-5 ITER Construction	Original WP	1,693,000	-	343,923,630	-	252,596,570	-	**598,213,200**	**-**
	Last amended WP	985,958	-42%	385,693,091	12%	231,231,080	-8%	**617,910,129**	**3%**
	Execution	920,710	-7%	402,420,140	4%	224,199,425	-3%	**627,540,275**	**2%**
B3-2 Technologies for ITER	Original WP	0	-	2,039,000	-	1,265,000	-	**3,304,000**	**-**
	Last amended WP	0	-	1,850,000	-9%	150,000	-88%	**2,000,000**	**-39%**
	Execution	0	-	1,471,437	-20%	0	-100%	**1,471,437**	**-26%**
B3-3 Broader Approach	Original WP	0	-	11,575,000	-	225,000	-	**11,800,000**	**-**
	Last amended WP	0	-	4,477,722	-61%	522,278	132%	**5,000,000**	**-58%**
	Execution	0	-	3,757,542	-16%	511,269	-2%	**4,268,810**	**-15%**
B3-4 Other Expenditure	Original WP	0	-	4,982,000	-	0	-	**4,982,000**	**-**
	Last amended WP	0	-	15,226,726	206%	0	-	**15,226,726**	**206%**
	Execution	0	-	14,387,574	-6%	0	-	**14,387,574**	**-6%**
B3-6 Reserve Fund	Original WP	0	-	10,700,000	-	0	-	**10,700,000**	**-**
	Last amended WP	0	-	26,000,000	-	0	-	**26,000,000**	**-**
	Execution	0	-	22,872,935	-12%	0	-	**22,872,935**	**-12%**
TOTAL	**Original WP**	**1,693,000**	**-**	**373,219,630**	**-**	**254,086,570**	**-**	**628,999,200**	**-**
	Last amended WP	**985,958**	**-42%**	**433,247,539**	**16%**	**231,903,358**	**-9%**	**666,136,855**	**6%**
	Execution	**920,710**	**-7%**	**444,909,628**	**3%**	**224,710,694**	**-3%**	**670,541,032**	**1%**

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

Flexibility Clause of the Work Programme

A **'flexibility' clause** has been introduced in the Work Programme since 2017 in order to limit the changes in the implementation of the budget compared to the substance of the Work Programme adopted by the Governing Board, and last defined in the Article 2 of the Governing Board decision approving the third amendment to the Work Programme 2019[9]:

> *The Governing Board hereby delegates to the Director of Fusion for Energy the power to make non substantial amendments to the annual Work Programme approved by the Governing Board. Amendments are considered to be "non-substantial" if*
>
> *(a) they do not lead to an increase of:*
>
> *i. more than 10% of the Financial Resources allocated to the corresponding Action in the Annex V of the annual Work Programme for the year, or more than EUR 0.2 million for Actions with allocation of below EUR 2 million for the year; and*
>
> *ii. more than 3% of the total operational expenditure in Title 3 of the annual Budget for the given year*

[9] Decision of the F4E GB F4E_D_2HRKEN 3rd Amendment of the 2019 Work Programme adopted on 10/12/2019

and if:

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

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

The Budget 2019 has been implemented in full respect of this flexibility clause:

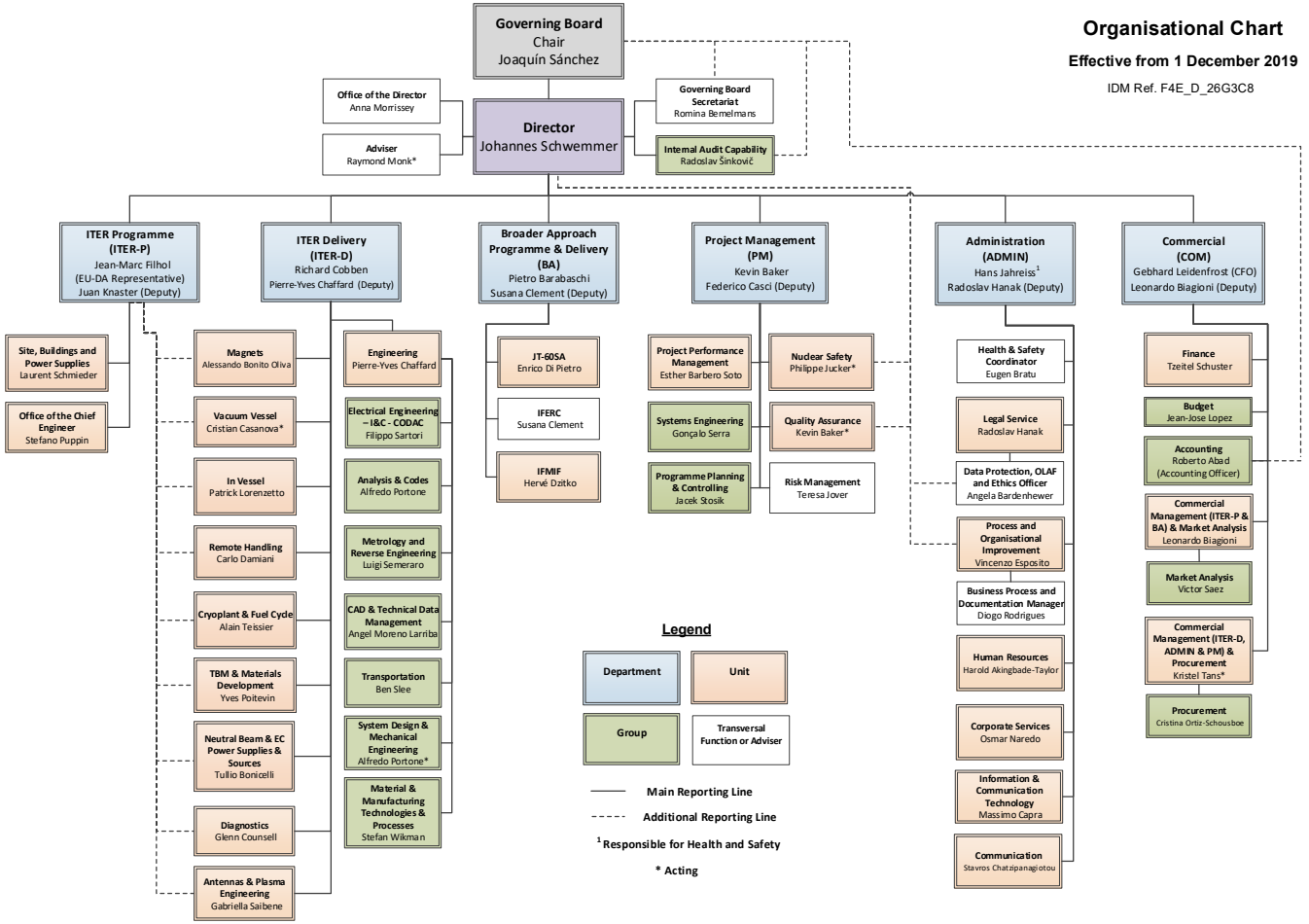
Implementation of the Work Programme (EUR)

Action #	Action	Budget WP2019	Budget WP2019 Amendment 1	Budget WP2019 Amendment 2	Budget WP2019 Amendment 3	Final Implementation	
						Amount	%
1	Magnets	16 536 831	58 536 831	72 200 000	70 956 750	70 171 464	-1%
2,3,4,10[1]	Main Vessel	33 040 942	33 040 942	15 100 000	15 756 737	12 019 837	-31%
5	Remote Handling	17 781 559	17 781 559	13 000 000	13 043 414	14 211 232	8%
6	Cryoplant & Fuel Cycle	8 403 856	8 403 856	28 000 000	20 948 633	20 769 248	-1%
7	Antennas and Plasma Engineering	5 329 337	5 329 337	5 125 000	5 313 343	4 656 342	-14%
8	Neutral Beam and EC Power Supplies and Sources	26 773 199	26 773 199	21 900 000	18 560 211	20 241 395	8%
9	Diagnostics	16 170 926	16 170 926	12 800 000	8 255 171	7 507 779	-10%
11	Site and Buildings and Power Supplies	169 969 643	169 969 643	199 500 000	257 569 507	272 752 051	6%
12	Cash Contributions	293 099 374	251 099 374	226 374 688	230 216 338	224 199 425	-3%
13	Technical Support Activities	29 963 533	29 963 533	28 200 000	20 323 252	19 691 224	-3%
14	Broader Approach	11 930 000	11 930 000	11 000 000	5 193 500	4 318 810	-20%
	Total	**628 999 200**	**628 999 200**	**633 199 688**	**666 136 855**	**670 538 807**	

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

The reason for the discrepancy of 31% between the planned and actual commitments for the "Main Vessel" activities shown in the table above is that a task order for high-heat flux testing of a prototype of a First Wall panel was moved to 2020 due to the availability of the test facility.

Annex V Organisational Chart



Annex VI Establishment Plan and Additional Information on Human Resources Management

Annex IV. a. Establishment Plan

	Authorised Posts (EP 2019)		Filled as of 31/12/2019	
	FO	TA	FO	TA
AD 16	0	0	0	0
AD 15	0	1	0	0
AD 14	5	2	0	1
AD 13	14	7	9	6
AD 12	14	21	11	9
AD 11	3	23	5	21
AD 10	0	28	1	22
AD 9	0	39	9	55
AD 8	1	37	1	32
AD 7	1	21	1	20
AD 6	2	25	1	26
AD 5	0	1	0	0
Subtotal	**40**	**205**	**38**	**192**
Total AD	**245**		**230**	
AST 11	4	0	1	0
AST 10	2	0	0	0
AST 9	4	0	3	0
AST 8	1	1	2	0
AST 7	0	3	0	1
AST 6	0	9	1	5
AST 5	0	11	2	9
AST 4	0	3	2	8
AST 3	0	0	2	7
AST 2	0	0	0	0
AST 1	0	0	0	0
Subtotal	**11**	**27**	**13**	**30**
Total AST	**38**		**43**	
Total FO/TA	**283**		**273**	

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

KEY FUNCTIONS	TYPE OF CONTRACT (OFFICIAL, TA OR CA)	FUNCTION GROUP, GRADE OF RECRUITMENT	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/ Programme 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/Neutral
Officer	FO/TA	From AD5 to AD8	Administrative/Operations/Neutral
Assistant	FO/TA	From AST1	Administrative/Operations/Neutral
Head Of Administration	TA	AD13	Administrative
Head Of Human Resources	TA	AD11	Administrative
Head Of Finance	FO	AD10	Neutral
Head Of Ict	TA	AD9	Administrative
Secretary/Clerk	CA	II	Administrative/Operations/Neutral
Mail Clerk	Interim	II	Administrative
Data Protection Officer	FO	AD12	Administrative
Accounting Officer	FO	AD7	Neutral
Internal Auditor	FO	AD7	Administrative
Secretary To The Director	Interim	II	Operations

Annex VI. c. Benchmarking Exercise

Screening type	Screening category	Description	Year 2019* (%)	Year 2018* (%)
Administrative Support and Coordination (overhead)	**Administrative support**		**12.72 %**	**12.63 %**
	DOC	Document management	0.00 %	0.00 %
	HR	Human resource management	4.31 %	4.07 %
	IA	Internal auditing and control (procedural aspects)	0.86 %	0.86 %
	ICT	Information and communication technologies	4.09 %	4.28 %
	LOG	Logistics, facilities management and security	2.80 %	3.00 %
	RES DIR/HoA	Head of Administration	0.65 %	0.43 %
	Coordination		**1.72 %**	**1.71 %**
	LEGAL	Legal (administrative matters, including DP)	0.43 %	0.43 %
	COMM	External communication & information	1.08 %	1.07 %
	GEN COORD	General coordination activities	0.22 %	0.21 %
Operational	**Operational**		**74.57 %**	**74.52 %**
	TOP COORD	Top operational coordination (Director/HoD)	7.33 %	5.14 %
	PGM M/IMP	Programme management and implementation	62.72 %	64.67 %
	EVAL	Evaluation and impact assessment	1.08 %	1.28 %
	GEN OPER	General operational activities	3.45 %	3.43 %
Neutral	**Neutral**		**10.99 %**	**11.13 %**
	FIN	Finance, accounting, contract management and administrative procurement	6.68 %	6.42 %
	CONT	Quality management and internal audit and control (with focus on financial aspects)	4.31 %	4.71 %

* Posts allocated in the Staffing Plan (Staff members and SNEs)

Annex VI. d. Flexitime scheme in 2019

Category	Grade	Overtime (days)	Recuperation (days)
AST	3	12.77	3.11
	4	8.91	4.32
	5	16.49	4.32
	6	9.24	2.75
	7	19.35	9.50
	8	22.35	5.25
	9	2.16	0.50
	10	-	-
	11	18.74	4.00
AD	6	21.21	5.88
	7	11.78	4.45
	8	14.23	5.11
	9	16.52	3.72
	10	32.55	4.96
	11	19.54	3.73
	12	16.92	2.63
	13	13.87	0.13
CA Group II	4	2.04	1.00
	5	7.97	5.17
	6	4.12	0.92
	7	14.26	3.25
CA Group III	8	-	-
	9	5.63	2.68
	10	4.79	2.39
	11	6.95	2.86
	12	2.33	0.00
CA Group IV	13	13.49	2.90
	14	11.33	4.15
	15	9.86	2.88
	16	8.31	3.91
	17	14.30	9.50
	18	19.22	4.00
Average in F4E		13.95	3.71

Annex VI. f. List of implementing rules to the Staff Regulations adopted in 2019

In 2019 F4E adopted the following implementing rules:

a) Decision of 14 June 2019 on types of post and post titles;

b) Decision of 14 June 2019 on health and safety policy;

c) Decision of 15 November 2019 on the general provisions for implementing Article 79(2) of the Conditions of Employment of Other Servants of the European Union, governing the conditions of employment of contract staff employed under the terms of Article 3a thereof;

d) Decision of 15 November 2019 on the non-application of the European Commission Decision concerning the maximum duration for the recourse to non-permanent staff in the Commission services.

Annex VII. Human and Financial Resources by Activity

Actions	Final 2019 execution (EUR)		Staff
	Commitments	Payments	
ADMINISTRATIVE EXPENDITURE	57,563,840.77	57,574,137.43	125
ITER CONSTRUCTION INCLUDING THE ITER SITE PREPARATION	664,800,785.51	666,150,110.27	292
TECHNOLOGY FOR ITER	1,471,436.55	6,842,102.19	15
TECHNOLOGY FOR BROADER APPROACH AND DEMO	4,268,810.49	8,337,082.18	32
TOTAL	**728,104,873.32**	**738,903,432.07**	**464**

The numbers provided in the table above show a summary of the situation at 31 December 2019.

Annex VIII. Contribution, grant and service level agreements. Financial Framework Partnership Agreements

Ongoing Grant Agreements and Framework Partnership Agreements

Reference	Date of Signature	Total Amount	of which Committed in 2019	Duration	Counterpart	Short Description
F4E-FPA-327-06 (PMS-DG)	31/05/2017	€78,749.00	€69,023.00	36 months	Agenzia Nazionale per le Nuove Tecnologie, l'Energia e lo Sviluppo Economico Sostenibile-ENEA(Leader)	Preliminary Design and R&D Activities for Rnc In-Port System
F4E-FPA-328-07 (PMS-DG)	19/12/2016	€213,734.00		27 months	Agenzia Nazionale per le Nuove Tecnologie, l'Energia e lo Sviluppo Economico Sostenibile-ENEA(Leader)	Prototype Testing And Updating Of Design Documentation
F4E-FPA-364-05	26/10/2016	€887,510.00		33 months	Max-Planck-Gesellschaft zur Forderung der Wissenschaften e.V. — Max-Planck-Institut fur Plasmaphysik(IPP)	Prototype Testing
F4E-FPA-364-06	22/10/2018	€1,390,426.00		42 months	Max-Planck-Gesellschaft zur Forderung der Wissenschaften e.V. — Max-Planck-Institut fur Plasmaphysik(IPP)	Development Of The Design And Critical Prototyping
F4E-FPA-372-04	08/11/2016	€320,000.00		46 months	Agenzia Nazionale per le Nuove Tecnologie, l'Energia e lo Sviluppo Economico Sostenibile-ENEA(Leader)	Experimental tests in support of the Preliminary design of the European TBS
F4E-FPA-375-02	12/07/2013	€984,080.00		87 months	Instituto Superior Tecnico (Leader)	FPA-375: Coordination Support Office
F4E-FPA-375-04	27/07/2015	€980,427.00		44 months	Instituto Superior Tecnico (Leader)	R&D And Prototyping For In-Vessel Components (PPR Gaps 4 & 6)
F4E-FPA-375-05	30/09/2015	€735,830.00	€16,482.00	57 months	Instituto Superior Tecnico (Leader)	R&D For In-Port-Plug Components (PPR Gaps 3&5)
F4E-FPA-375-06	26/03/2019	€429,362.00	€429,362.00	22 months	Instituto Superior Tecnico (Leader)	Design Of PPR In-Vessel Sub-System And Testing

Reference	Date of Signature	Total Amount	of which Committed in 2019	Duration	Counterpart	Short Description
F4E-FPA-384-04 (DG)	28/11/2017	€394,444.00		29 months	Max-Planck-Gesellschaft zur Forderung der Wissenschaften e.V. — Max-Planck-Institut fur Plasmaphysik(IPP) (Leader)	Open Call For Proposals: Framework Partnership Agreement: Diagnostic Development And Design: Bolometers
F4E-FPA-384 (DG)-05	30/07/2018	€1,498,654.00		36 months	Max-Planck-Gesellschaft zur Forderung der Wissenschaften e.V. — Max-Planck-Institut fur Plasmaphysik(IPP) (Leader)	F4E-FPA-384-SG05 Development Of The Design And Prototyping
F4E-FPA-393 (DG)-05	23/05/2018	€1,061,364.00		39 months	Danmarks Tekniske Universitet(Leader)	Development Of The Design And Critical Prototyping
F4E-FPA-407-04 (DG)	22/09/2017	€4,133,875.00	€196,401.00	38 months	Commissariat à l'énergie atomique et (Leader)	Development Of The Design And Prototyping: Equatorial Visible/Infrared Wide Angle Viewing System
F4E-FPA-408 (DG)-04	19/04/2018	€3,982,402.38	€182,442.38	41 months	Forschungszentrum Julich Gmbh (Leader)	F4E-FPA-408-SG04 Development Of The Design And Prototyping Of The Core-Plasma Charge Exchange Recombination Spectrometer
F4E-GRT-0869-01	29/08/2017	€100,000.00		30 months	United Kingdom Atomic Energy Authority	Modelling Of ITER Scenarios To Assess The Application of ITER Heating, Fuelling And Impurity Seeding
F4E-GRT-0901-01	09/03/2018	€955,442.00		36 months	VTT Technical Research Centre of Finland Ltd (Leader)	Development And Integration Of 3D Machine Vision, Hlcs Modules And Genrobot At DTP 2
F4E-GRT-0974-01	20/12/2018	€249,986.00		24 months	Tuotekehitys Oy Tamlink	Prototyping And Testing Of Hydraulic Digital Valves For The Divertor Remote Handling System

[This annex is new under the guidelines for the Consolidated Annual Activity Reports of Agencies adopted by the Commission on 20 April 2020. F4E is in the process of clarifying the requirements for this annex and compiling the complete dataset including Service Level Agreements and Contribution Agreements]

Annex IX. Environmental Management

[This annex is new under the guidelines for the Consolidated Annual Activity Reports of Agencies adopted by the Commission on 20 April 2020 and refers to actions required in the new template for the Single Programming Document (not foreseen in F4E's 2019 Multiannual Programming Document. Nevertheless, F4E provides a description of actions it has taken to improve environmental management in section 2.10 of this report.]

Annex X. Annual Accounts

See following pages

FUSION FOR ENERGY

FINAL ANNUAL ACCOUNTS

Financial statements
&
Budget implementation

Twelfth financial year – 2019

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 final accounts, together with the opinion of the F4E Governing Board, are 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:
https://fusionforenergy.europa.eu/key-reference-documents/

Table of Contents

1. Certification letter from F4E Accounting officer

The annual accounts of Fusion for Energy (F4E) for the year 2019 have been prepared in accordance with the Title IV Chapter 4 Section 3 and Title XIII of the Financial Regulation applicable to the general budget of the European Union[1], the accounting rules adopted by the Commission's Accounting Officer and the accounting principles and methods adopted by myself.

I acknowledge my responsibility for the preparation and presentation of the annual accounts of F4E in accordance with Article 77 of the Financial Regulation.

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, 20 May 2020

[1] Financial Regulation (EC, Euratom) n° 966/2012 of the European Parliament and of the Council of 25 October 2012, last amended on 18/07/2018 (EU, Euratom) n° 2018/1046.

2. Introduction

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 19th 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 (IO).
- In relation to the obligations stemming from the Broader Approach Agreement with Japan (BA): to provide components, equipment, materials and other resources for BA activities and to prepare and coordinate Euratom's participation in the implementation of BA activities.
- In relation to DEMO: to prepare and coordinate a programme of research, development and design activities other than ITER and BA activities, in preparation for the construction of a demonstration fusion reactor and related facilities, including the IFMIF (International Fusion Materials Irradiation Facility).

Regarding the ITER project, F4E is responsible for the management of the Union's contribution to the ITER project with a budget cap of EUR 6 600 million (in 2008 values) until 2020.

In November 2016, the Council of ITER Organization approved a new ITER project baseline for the scope, schedule and the cost of the project. The overall project schedule for operations 'First Plasma' and 'Deuterium-Tritium' was approved. Following the approval of the new ITER project baseline, F4E set the new timetable and recalculated the related cost at completion of the F4E's contribution to the project construction phase.

The new schedule endorsed by the ITER Council set out a four-stage approach, making December 2025 the deadline for achieving the first strategic milestone of the project construction phase ('First Plasma') and December 2035 the estimated completion date for the whole construction phase.

In addition to the construction phase, F4E will have to contribute to the ITER operational phase and to the subsequent ITER deactivation and decommissioning phases. The contribution to the deactivation and the decommissioning phases were estimated at EUR 95 540 000 (in 2001 values) and EUR 180 200 000 (in 2001 values).

[2] Council decision 2015/224/Euratom of 10 February 2015 Amending Decision 2007/198/Euratom establishing the European Joint Undertaking for ITER and the Development of Fusion Energy and conferring advantages upon it.

For the next Multiannual Financial Framework (MFF) period 2021-2027, the European Commission has proposed Euratom contribution to F4E amounting to a total indicative value of EUR 6 070.0 million of which EUR 5 987.7 million (in current value)[3] of direct contribution to the project. The ITER Host State and Membership contributions will be added to this figure still subject to the final decision by the EU Budgetary Authority on the next MFF 2021-2027

F4E revenue is made up of the:

- Euratom contribution

The contribution from Euratom constitutes the main source of revenue for F4E. This contribution is foreseen at the Article 16 of the EU MFF for the period 2014-2020[4] as contribution to the financing of large scale projects.

The annual contribution is determined in the European Union General Budget in commitment and in payment appropriations, as well as the F4E establishment plan. The revenue received from Euratom is earmarked for operational expenditure and for administrative expenditure (running costs).

- The ITER Host State Contribution (France)

The contribution from the ITER Host State constitutes the second source of revenue for F4E. It corresponds to the commitment from the Host State to cover 9.09% of the total costs of the ITER construction phase, equivalent to 20% of F4E budget for ITER construction excluding expenditure related to Transportation and Test Blanket Modules. The precise scope, conditions and the global amount of the French contribution for the ITER construction phase have been established in a formal exchange of letters between France and the European Commission in 2011[5].

- The Membership contributions (F4E Members except Euratom)

The Annual Membership Contributions are established and adopted annually within the budget. It corresponds to 10% of the administrative budget and are not assigned revenue.

- Reserve Fund and other tasks requested by IO

The revenue from the Reserve Fund managed by the IO is assigned to the implementation of change orders originating from IO which take place in the framework of the contractual relationships between F4E and the various suppliers.

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[3] Legislative financial statement annexed to the Commission Proposal (2018) 445 for a Council Decision amending Decision 2007/198/Euratom, establishing the European Joint Undertaking for ITER and the Development of Fusion Energy.

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

[5] Contribution financière française à la construction d'ITER - Letter from The Haut Representant Français pour ITER to the EU Commission on 08/09/11 and reply on 17/11/11.

The revenue from the Reserve Fund and from other requested tasks is earmarked for financing the corresponding requests for change from IO introduced after 05/03/2015.

2019 Accounts

The 2019 financial statements of F4E and its reports on budget implementation for 2019 have been prepared in conformity with:

- The Council Decision establishing F4E,
- The Financial Regulation (FR) applicable to the general budget of the European Union,
- The F4E FR[6],
- The « Inventory directive » (EC n° 643/2005),
- The European Commission's consolidation manual for the 2019 closure.

The accounts have also been drawn up in accordance with the accounting rules adopted by the Accounting Officer of the European Commission (EC). As an EU body, F4E is fully consolidated in the EU accounts.
Articles 80.1 and 82.1 of the general FR state 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 2019 has been transmitted to the President of the European Court of Auditors (ECA) in a separate note. It includes no reservation from the F4E Accounting Officer.
In line with Article 70.6 of the FR applicable to the general budget of the EU, Ernst & Young has been appointed as independent external auditor in order to verify that the 2019 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.

[6] F4E Financial Regulation adopted by F4E Governing Board on 9-10/12/2019 – F4E(19)-GB45-45.

Section I. 2019 Financial Statements

3. Balance Sheet

3.1. Assets

Consolidation account	ASSETS		Note n°	31.12.2019 (1)	31.12.2018 (2)	Variation (3)=(1)-(2)
	A. NON-CURRENT ASSETS					
210000	**Intangible assets**		**7.2.1.**	**258 989.00**	**455 148.00**	**-196 159.00**
	Tangible fixed assets			**1 211 007.00**	**787 205.00**	**423 802.00**
220000		Land and buildings		0.00	0.00	0.00
230100		Plant and equipment	**7.2.1.**	468 427.00	16 659.00	451 768.00
240100		Furniture and vehicles		96 735.00	169 787.00	-73 052.00
241100		Computer hardware		630 635.00	573 595.00	57 040.00
242100		Other fixtures and fittings		15 210.00	27 164.00	-11 954.00
298100	**Non-current pre-financing**		**7.2.2.**	**66 476 537.75**	**52 354 537.35**	**14 122 000.40**
	TOTAL NON-CURRENT ASSETS			**67 946 533.75**	**53 596 890.35**	**14 349 643.40**
	B. CURRENT ASSETS					
310000	**Inventories**			**0.00**	**0.00**	**0.00**
	Current pre-financing			**33 369 204.15**	**25 204 374.79**	**8 164 829.36**
406141		Current pre-financing (gross amount)	**7.2.2.**	69 743 259.40	85 831 970.24	-16 088 710.84
406142		Current pre-financing (cut off)		-36 374 055.25	-60 627 595.45	24 253 540.20
	Current receivables			**219 736 766.51**	**243 461 729.18**	**-23 724 962.67**
401200		Current receivables - Member States		16 051 235.73	28 127 695.12	-12 076 459.39
410000		Sundry receivables	**7.2.3.**	61 820.19	56 009.59	5 810.60
490002		Deferrals/Accruals with IO		202 705 588.88	214 779 433.68	-12 073 844.80
490013		Accrued income		918 121.71	498 590.79	419 530.92
500000	**Central treasury, Cash and cash equivalents**		**7.2.4.**	**11 171 229.73**	**5 565 303.26**	**5 605 926.47**
	TOTAL CURRENT ASSETS			**264 277 200.39**	**274 231 407.23**	**-9 954 206.84**
	TOTAL			**332 223 734.14**	**327 828 297.58**	**4 395 436.56**

Fig. 1 Balance Sheet – Assets

3.2. Liabilities

Consolidation account	LIABILITIES		Note n°	31.12.2019 (1)	31.12.2018 (2)	Variation (3)=(1)-(2)
	A. NET ASSETS/LIABILITIES			**-16 062 698.09**	**-28 044 872.93**	**11 982 174.84**
100000		Reserves	**7.2.5.**	0.00	0.00	0.00
140000		Accumulated surplus/deficit		-28 044 872.93	11 922 775.91	-39 967 648.84
141000		Economic result of the year - Profit (+)/Loss (-)		11 982 174.84	-39 967 648.84	51 949 823.68
	B. NON-CURRENT LIABILITIES			**213 222 656.19**	**195 093 433.30**	**18 129 222.89**
163000		Non-current provisions	**7.2.6.**	213 222 656.19	195 093 433.30	18 129 222.89
170000		Other non current financial liabilities		0.00	0.00	0.00
TOTAL A+B				**197 159 958.10**	**167 048 560.37**	**30 111 397.73**
	C. CURRENT LIABILITIES					
483000	**Current provisions**		**7.2.6.**	**0.00**	**0.00**	**0.00**
440000	**Accounts payable**			**63 551 321.37**	**79 105 757.31**	**-15 554 435.94**
441000		Current payables vendors		62 637 547.38	77 404 386.83	-14 766 839.45
443000		Sundry payables	**7.2.7.**	89 599.86	377 378.71	-287 778.85
440019		Pre-financing received from Euratom		824 174.13	1 316 734.17	-492 560.04
441009		Current payables with EU		0.00	7 257.60	-7 257.60
491000	**Accrued charges and defferred income**			**71 512 454.67**	**81 673 979.90**	**-10 161 525.23**
491010		Accrued charges	**7.2.8.**	69 520 747.37	81 482 479.90	-11 961 732.53
491090		Deferrals/accruals with EU/IO		1 991 707.30	191 500.00	1 800 207.30
TOTAL C. CURRENT LIABILITIES				**135 063 776.04**	**160 779 737.21**	**-25 715 961.17**
TOTAL				**332 223 734.14**	**327 828 297.58**	**4 395 436.56**

Fig. 2 Balance Sheet – Liabilities

4. Statement of Financial Performance

Consolidation account			Note n°	2019 (1)	2018 (2)	Variation (3)=(1)-(2)
	A. NON-EXCHANGE REVENUES			**720 298 162.61**	**794 608 221.00**	**-74 310 058.39**
745919		Revenue from Euratom		568 429 586.50	658 594 110.15	-90 164 523.65
745911		Revenue from other contributors (Member States)		150 600 000.00	134 920 000.00	15 680 000.00
		Other non exchange revenue	**7.3.1**	1 268 576.11	1 094 110.85	174 465.26
	B. EXCHANGE REVENUES			**13 111 315.50**	**13 654 634.47**	**-543 318.97**
744910		Reserve Fund		12 396 366.30	13 646 994.26	-1 250 627.96
74*/75*		Other revenues		714 949.20	7 640.21	707 308.99
TOTAL REVENUE				**733 409 478.11**	**808 262 855.47**	**-74 853 377.36**
	A. OPERATIONAL EXPENSES		**7.3.2.**	**661 225 934.13**	**790 847 485.72**	**-129 621 551.59**
600140		Expenses with third parties		661 225 934.13	790 847 485.72	-129 621 551.59
	B. OTHER EXPENSES			**60 201 369.14**	**57 383 018.59**	**2 818 350.55**
620100		Staff costs		47 451 130.62	46 196 428.14	1 254 702.48
630199		Property, plant and equipment related expenses	**7.3.3.**	2 205 857.33	2 037 117.72	168 739.61
64*/65*		Other expenses		10 544 381.19	9 149 472.73	1 394 908.46
TOTAL EXPENSES				**721 427 303.27**	**848 230 504.31**	**-126 803 201.04**
SURPLUS (+) / DEFICIT (-) OF THE YEAR				**11 982 174.84**	**-39 967 648.84**	**51 949 823.68**

Fig. 3 Statement of Financial Performance

5. Cash Flow Statement (indirect method)

		2019	2018
Cash Flows from ordinary activities			
Surplus/(deficit) from ordinary activities		**11 982 174.84**	**-39 967 648.84**
Operating activities	Amortization (intangible fixed assets) +	236 395.81	282 484.17
Adjustments	Depreciation (tangible fixed assets) +	500 864.99	-31 425 902.17
	Increase/(decrease) in Provisions for risks and liabilities	18 129 222.89	23 711 039.23
	Increase/(decrease) in Value reduction for doubtful debts	0.00	0.00
	(Increase)/decrease in Stock	0.00	0.00
	(Increase)/decrease in Long term Pre-financing	-14 122 000.40	55 078 981.68
	(Increase)/decrease in Short term Pre-financing	-8 164 829.36	32 296 476.79
	(Increase)/decrease in Long term Receivables	0.00	0.00
	(Increase)/decrease in Short term Receivables	23 724 962.67	-37 650 103.21
	(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	-27 016 350.83	104 049 054.81
	Increase/(decrease) in Liabilities related to consolidated EU entities	1 300 389.66	-136 269 187.08
Net cash Flow from operating activities		**6 570 830.27**	**-29 894 804.62**
Cash Flows from investing activities			
	Increase of tangible and intangible fixed assets (-)	-949 806.80	66 540 482.00
	Proceeds from tangible and intangible fixed assets (+)	-15 097.00	-34 984 197.00
Net cash flow from investing activities		**-964 903.80**	**31 556 285.00**
Net increase/(decrease) in cash and cash equivalents		5 605 926.47	1 661 480.38
Cash and cash equivalents at the beginning of the period		5 565 303.26	3 903 822.88
Cash and cash equivalents at the end of the period		**11 171 229.73**	**5 565 303.26**

Fig. 4 Cash Flow Statement

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 2018	**11 922 775.91**	**-39 967 648.84**	**-28 044 872.93**
Balance as of 1 January 2019	**11 922 775.91**	**-39 967 648.84**	**-28 044 872.93**
Fair value movements	0.00	0.00	0.00
Allocation of the Economic Result of Previous Year	-39 967 648.84	39 967 648.84	0.00
Economic result of the year	0.00	11 982 174.84	11 982 174.84
Balance as of 31 December 2019	**-28 044 872.93**	**11 982 174.84**	**-16 062 698.09**
Account	140000	141000	

Fig. 5 Statement of Changes in Net Assets

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 98 of F4E FR 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.

IPSAS 11 – Construction contracts :

Most of the components that make up ITER will be delivered by the ITER parties (including F4E) “in-kind” (providing directly the components rather than contributing only cash).

The EU contribution to IO through F4E is established on the ITER Agreement and Common Understanding on Procurement Allocation and its amendments, and it comprises mainly buildings, magnets, vessels and other engineering components.

On the basis of the Procurement Arrangements (PA), F4E launches procurements and conclude contracts with the industry. The industry delivers usually directly to IO, which also performs the acceptance. IO then informs F4E about the acceptance, i.e. IO recognises the credits to F4E. In order to consider that the PA obligations have been fulfilled by each party, the 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 and this is released to the specific Party whenever the milestone has been achieved and the related documentation verified by IO. Therefore 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.

As there is no specific EC accounting rule covering those operations, F4E refers to IPSAS rule n° 11 “Construction contracts”.

The ITER Agreement and Common Understanding on Procurement Allocation and its amendments together with the F4E Statutes can be considered as a binding arrangement and therefore as a construction contract according to IPSAS 11.

From an IPSAS 11 perspective, F4E can be considered as contractor and the agreement with Euratom as a construction contract.

Based on the accounting guidance applicable to the type of transactions managed by F4E, the cost of the items, acquired or constructed, incurred with the purpose of the final manufacture of the research components that F4E agreed to deliver **should be expensed when incurred**.

The recognition as an expenses is the approach that better capture the nature of the transaction given that (i) in most of the cases the suppliers hold the economic ownership (i.e., is not presently controlled by F4E); (ii) F4E does not foresee using the assets for other purpose, or (iii) F4E agrees/foresees to provide the legal ownership to the subcontractors for no consideration after delivery.

It is to be noted that the use of IPSAS rule n° 11 (Construction contracts) is extended to the accounting of all operational contributions within the ITER and BA agreements.

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 5 000.00. 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.

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%**

Fig. 6 Depreciation Rate

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 31/12/2019, 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 following table Fig.7 provides the variation of the fixed assets in 2019 :

ASSETS		Intangible fixed assets			Tangible fixed assets							Fixed assets
2019		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
Net carrying amounts 31.12.2018			**455 148.00**	**455 148.00**		**16 659.00**	**573 595.00**	**169 787.00**	**27 164.00**		**787 205.00**	**1 242 353.00**
Adjustment 2018	+/-		6 222.00	**6 222.00**		20 686.00	10 570.00	-22 025.00	-356.00		**8 875.00**	**15 097.00**
Net carrying amounts 01.01.2019		**0.00**	**461 370.00**	**461 370.00**	**0.00**	**37 345.00**	**584 165.00**	**147 762.00**	**26 808.00**	**0.00**	**796 080.00**	**1 257 450.00**
Gross carrying amounts 01.01.2019	+	**0.00**	**2 817 365.40**	**2 817 365.40**	**0.00**	**214 219.69**	**5 050 889.90**	**765 766.07**	**823 124.23**	**0.00**	**6 853 999.89**	**9 671 365.29**
Additions	+		34 014.81	**34 014.81**		551 404.70	364 387.29				**915 791.99**	**949 806.80**
Disposals	-			**0.00**							**0.00**	**0.00**
Transfer between headings	+/-			**0.00**							**0.00**	**0.00**
Other changes :	+/-			**0.00**							**0.00**	**0.00**
Gross carrying amounts 31.12.2019		**0.00**	**2 851 380.21**	**2 851 380.21**	**0.00**	**765 624.39**	**5 415 277.19**	**765 766.07**	**823 124.23**	**0.00**	**7 769 791.88**	**10 621 172.09**
Accumulated amortization and impairment 01.01.2019	-	**0.00**	**-2 355 995.40**	**-2 355 995.40**	**0.00**	**-176 874.69**	**-4 466 724.90**	**-618 004.07**	**-796 316.23**	**0.00**	**-6 057 919.89**	**-8 413 915.29**
Depreciation	-		-236 395.81	**-236 395.81**		-120 322.70	-317 917.29	-51 027.00	-11 598.00		**-500 864.99**	**-737 260.80**
Write-back of depreciation	+			**0.00**							**0.00**	**0.00**
Disposals	+			**0.00**							**0.00**	**0.00**
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 :	+/-			**0.00**							**0.00**	**0.00**
Accumulated amortization and impairment 31.12.2019		**0.00**	**-2 592 391.21**	**-2 592 391.21**	**0.00**	**-297 197.39**	**-4 784 642.19**	**-669 031.07**	**-807 914.23**	**0.00**	**-6 558 784.88**	**-9 151 176.09**
Net carrying amounts 31.12.2019		**0.00**	**258 989.00**	**258 989.00**	**0.00**	**468 427.00**	**630 635.00**	**96 735.00**	**15 210.00**	**0.00**	**1 211 007.00**	**1 469 996.00**
Accounts				210000	221000	230000	241000	240000	242000	244000	200000	

Fig. 7 Intangible and Tangible Fixed Assets

7.2.2. 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 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	31.12.2019	31.12.2018
298100	Pre-financing given to third parties (non-current)	66 476 537.75	52 354 537.35
406141	Pre-financing given to third parties (current)	69 743 259.40	85 831 970.24
406142	Accrued charges on PF TP	-36 374 055.25	-60 627 595.45
	Total	**99 845 741.90**	**77 558 912.14**

Fig. 8 Pre-Financing

It is estimated that EUR 66.5 million of the pre-financing open at 31/12/2019 will be cleared, with eligible amounts, within a period longer than one year (after 2020).

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

Contract Reference	Contractor	Amount
OPE-301_TB04_Buildings	AXIMA	34 881 861.22
OPE-0688_TB12_Buildings	DEMATHIEU BARD CONSTRUCTION	24 943 102.97
OPE-0969 MAGNET SUPPLY CONTRACT	ASG SUPERCONDUCTORS	4 387 815.61
OPE-285_TB02_Tokamak cargo lift and crane	NKM NOELL SPECIAL CRANES	3 844 840.76
OPE-376_Test LN2 Plant & auxiliary systems	AIR LIQUIDE	3 830 965.77
OMF-444-03-01 First of a kind standard cassette bodies	WALTER TOSTO	3 511 887.00
OPE-570_PF Coils manufacturing and cold test	CNIM	2 827 709.96
OMF-0795-01-01 Supply of the beam components	AVS ADDED VALUE IND. ENG.	2 662 630.24
OPE-0966 Manufacture of the torus and cryostat cryopumping system	RI RESEARCH INSTRUMENTS	2 564 171.47
OMF-605-01-02 Supply of beam source for MITICA	ALSYOM	2 280 661.69
OPE-068-01_Supply VV Sectors	ANSALDO NUCLEARE	1 969 032.47
OPE-046 Supply of 2 Ion source and extraction pow er supplies	ENERGY TECHNOLOGY	1 607 167.68
OMF-444-01-01 Fabrication of ITER Divertor cassette bodies	SIMIC	1 295 111.00
OPE-083_Supply of high voltage decks/bushings	SIEMENS	1 040 480.34

Fig. 9 Main Operational Pre-Financings

7.2.3. 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 16 051 235.73** referring mainly to the recoverable VAT from France (EUR 10.9 million) and the amount due by IO for the last call for the Reserve fund in 2019 (EUR 4.6 million).

Sundry receivables: **EUR 61 820.19** composed mainly of advances to staff (salaries and missions) and amounts due by other EU bodies.

Deferrals and accruals: **EUR 202 705 588.88** corresponding to the deferred charges related to the 2020 cash contribution to IO.

Accrued income: **EUR 918 121.71** corresponding to the accrued revenue from the ITER Reserve fund (Cf. point below 7.4.3.2).

7.2.4. Cash and Cash Equivalents

Account	Description	31.12.2019	31.12.2018
505000	*Bank accounts:*		
505200	Central treasury (EC)	11 125 304.73	0.00
505300	Current accounts	925.00	1 516 471.93
505400	Imprest accounts/Cash in hand	45 000.00	45 000.00
505700	Short-term deposits	0.00	4 003 831.33
500000	**Total**	**11 171 229.73**	**5 565 303.26**

Fig. 10 Central treasury and Cash Equivalents

In view to increase the efficiency, F4E has externalised its treasury to the EC in May 2019. The cash position at the end of 2019 is composed of one account with the EC and three imprest accounts (petty cash).
The bank interests generated in 2019 amount to EUR 249.07.

7.2.5. Net Assets

F4E net assets are increased by the positive financial performance of the year (EUR 11 982 174.84) totalling **EUR – 16 062 698.09** as of 31 December 2019.
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 FR, 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).

7.2.6. 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. The EU Accounting rule 10 (Provision, contingent assets and liabilities) is applicable.

Non-current provision for additional financial contribution to Japan :

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 7.4.1.2 ITER Annex 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 75.0 million (2014 value).

Therefore, in compliance with the accounting rules, an amount of **EUR 86 151 425.07** has been booked as non-current provision taking into account an annual inflation rate of 2 % and no discount due to negative rates.

Non-current provision for the decommissioning fund :

When the construction of an asset requires removal after the end of its useful life and restoration of the site, then a present obligation arises at the time of its construction.

F4E shall contribute jointly through the Budget of the IO to the accumulation of the Decommissioning Fund from the date of First Plasma through the Operation Phase. This will be done by making regular payments through the IO budget.

Based on the Overall Project Cost approved by the ITER Council[7], the Decommissioning cost is estimated to EUR 530.0 million in 2001 value (not including the Deactivation cost). The EU share of the estimated costs for Decommissioning is EUR 180.2 million (34 % of EUR 530.0 million).

Based on :

- the percentage of completion as of 31.12.2019 (41.3 % according to CAS Milestone achievement - see graph below under point 7.4.1.1), this results in an applicable cost base of EUR 74.4 million in 2001 value (41.3 % of EUR 180.2 million),
- the assumption that the cost contributions will be done in equal annual instalments of EUR 15.0 million in 2001 value (180.2 divided by 12 years) during the Operation Phase 2026 to 2037,

[7] Updated Overall Project Cost (OPC) – ITER_D_26B8X9 v1.1 presented to IC-25

- the assumption that the contributions relating to the applicable cost of EUR 74.4 million will be paid into the fund in the years 2026 to 2030 (4 times EUR 15.0 million and the remaining balance of EUR 14.4 million),
- an annual inflation rate of 2 % to reflect future prices,
- the contributions in future prices are not discounted due to negative interest rates,

the resulting provision is recognised at the reporting period for an amount of **EUR 127 071 231.12** (in 2019 value).

7.2.7. Accounts Payable

Current and sundry payables are **EUR 62 727 147.24** and are composed of the balance of the 2020 cash contribution to IO (EUR 61.6 million) and suppliers' invoices received but not paid at year end and reimbursements to staff.

Pre-financing received from Euratom totalled **EUR 824 174.13** refers to the balance of the budget outturn account 2019, to be reimbursed to the EC in 2020 (Cf. point 8.6 Budget outturn account).

7.2.8. Accrued Charges and Deferred Income

In accordance with EU Accounting Rule n° 3, 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 71 512 454.67** which represents mainly invoices to be received in 2020 for services rendered in 2019, includes:

- EUR 67 247 645.99 for services rendered in 2019 on operational activities and not invoiced at 31/12/2019.
- EUR 2 923 310.22 for services rendered in 2019 on administrative expenditures and not invoiced at 31/12/2019.
- EUR 1 341 498.46 for F4E staff's untaken leave as at the end of December 2019. 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.

7.3. Notes to the Statement of Financial Performance

7.3.1. Revenue

F4E's revenues consist mainly of contributions granted by Euratom as a participation in the financing of F4E, the ITER Host State, annual membership contributions from other members than Euratom, the ITER Reserve Fund, recoveries of expenses as well as revenue from the interest received on the bank accounts.
A distinction is made in the Statement of financial performance between :

- revenue from **non-exchange transactions** (mainly from contributors) : the related receivables and revenue are recognized when the recovery orders are issued by F4E (in line with the payment needs and within the Budget approved by F4E's GB). At the end of each financial year, the surplus assessed for budget purposes on a modified cash basis is returned to Euratom (see point 8.6 Budget outturn account). The EU Accounting rule 17 – Revenue from non-exchange transactions is applicable.
- revenue from **exchange transactions** (mainly from the ITER Reserve Fund) : the revenue recognition criteria applied are those described in the EU Accounting rule n° 4.

The operating revenues, **EUR 733 409 478.11** (EUR 808 262 855.47 in 2018), include mainly the 2019:

- Euratom contribution: EUR 568 429 586.50
- ITER Host State contribution: EUR 145 000 000.00
- Membership contributions: EUR 5 600 000.00
- Revenue from ITER: EUR 12 396 366.30

7.3.2. Operational Expenses – EUR 661 225 934.13 (EUR 790 847 485.72 in 2018)

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's contractors and directly handed over to IO after acceptance by the latter – including tooling and work in progress).

The operational expenses include mainly the following items:

Contract Reference	Contractor	2019 Expenses	% cumulative expenses as of 31/12/2019 (*)
2019 Cash contribution for ITER IO	ITER IO	214 779 433.68	100.00%
OPE-286_TB03_Building	VINCI CONSTRUCTION	94 017 799.37	90.99%
OPE-301_TB04_Buildings	AXIMA/IO	28 959 476.82	45.56%
Transfer of supply of sectors #7 and #8 of the Vacuum Vessel	ITER IO	28 620 000.00	100.00%
OPE-636_TB16_Site infrastructure works	SPIE BATIGNOLLES	25 868 617.29	61.95%
OPE-068_Supply VV Sectors	ANSALDO NUCLEARE	25 718 097.52	61.92%
OPE-058_Civil engineering	ENGAGE	23 583 507.56	89.74%
OPE-428_TB06_EPD_Buildings	FERROVIAL AGROMAN	19 129 396.55	78.19%
OFC-755_Finishing and retrofit works for buildings	DALKIA FRANCE	14 448 088.36	45.58%
OPE-090_Civil engineering & construction consultancy	ALTRAN TECHNOLOGIES	8 411 975.90	90.39%
Cash contributions to Japan	JAEA/QST	7 494 355.32	85.55%
NBTF AGREEMENT_F4E-RFX-PMS_A-WP2019	CONSORZIO RFX	7 471 600.00	100.00%
OPE-570_PF Coils manufacturing and cold test	CNIM	6 671 981.31	31.55%
OPE-0969_Magnet supply contract	ASG SUPERCONDUCTORS	5 283 408.64	13.68%
OPE-053_Toroidal Field coils winding packs	IBERDROLA	5 100 426.37	94.12%
OMF-605-01-02_Supply of beam source for MITICA	ALSYOM	4 610 253.74	19.66%
PF Coils cooperation agreement between ASIPP & F4E	EVERFIT CO	4 000 000.00	94.18%
OPE-0781_Supply 3 pre compression rings	CNIM	3 144 848.72	79.74%
OFC-433-04_Design of diagnostics ports and in-vessel feedouts	IDOM	2 781 991.49	37.90%
OPE-0654_Supply impreg syst. & add. toolings	ELYTT ENERGY	2 494 871.21	84.10%
OMF-444-03-01_First of a kind standard cassette bodies	WALTER TOSTO	2 384 755.00	11.32%
OPE-025-01_Health and safety protection coordination for the Constructions	APAVE	2 378 281.30	97.78%
OPE-0585_PF Coils cold test facility	CRIOTEC IMPIANTI	2 356 186.81	73.85%
OPE-378_TB05_Buildings	FERROVIAL AGROMAN	2 332 276.51	98.85%
OPE-0688_TB12_Buildings	DEMATHIEU BARD CONST.	2 231 440.67	2.33%
OMF-567-03-01_Supply of vertical target prototype	RI RESEARCH INSTRUMENTS	2 213 080.00	53.60%
OPE-443-02_Supply of 1 full scale prototype of NHF 1st wall panel	FRAMATOME	2 118 575.01	96.52%
OPE-443-03_CA01714_Supply of prototypes (NHF 1ST wall panels)	IBERDROLA	2 097 346.34	90.93%

(*) In relation to amounts financially committed and opened at 01/01/2019

Fig. 11 Main Operational Expenses

The expenses related to experts with contracts amount to EUR 706 854.15 (EUR 504 553.77 in 2018).

7.3.3. Other Expenses – EUR 60 201 369.14 (EUR 57 383 018.59 in 2018)

- Staff expenses: **EUR 47 451 130.62** (EUR 46 196 428.14 in 2018)
  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. The above social contributions and taxes are transferred to and managed by the EU Paymaster Office (PMO).
- Property, plant and equipment related expenses: **EUR 2 205 857.33** (EUR 2 037 117.72 in 2018) refers to the yearly depreciation of fixed assets and the cost for building rent, maintenance and security.
- Other administrative expenses: the amount of **EUR 10 544 381.19** includes mainly the following items:

	2019	2018	Variation
IT costs – operational/support	2 591 546.26	2 799 590.04	-208 043.78
IT costs - development	689 666.32	293 490.73	396 175.59
Missions	2 257 494.08	2 810 701.45	-553 207.37
Office supplies & maintenance	1 672 607.87	146 294.29	1 526 313.58
Communications & publications	683 799.58	829 871.44	-146 071.86
Training	556 939.83	516 700.51	40 239.32
Interim staff	497 432.59	524 629.36	-27 196.77
Experts and related expenditure	489 509.64	546 837.98	-57 328.34
Service level agreement with EU Paymaster Office	479 720.54	425 000.00	54 720.54
Recruitment	74 953.62	22 431.69	52 521.93
Car and transport expenses	59 058.24	14 458.57	44 599.67
Interest expense on late payment	5 608.27	4 451.97	1 156.30
Legal expenses	1 595.00	7 655.74	-6 060.74
Total	**10 059 931.84**	**8 942 113.77**	**1 117 818.07**

Fig. 12 Other Administrative Expenses

7.4. Off Balance Sheet Items and Notes

7.4.1. Contingent Liabilities

A contingent liability is:

- A possible obligation that arises from past events and of which the existence will be confirmed only by the occurrence or non-occurrence of one or more uncertain future events not wholly within the control of F4E; or
- A present obligation that arises from past events but is not recognised because:
  - It is not probable that an outflow of resources embodying economic benefits or service potential will be required to settle the obligation; or
  - The amount of the obligation cannot be measured with sufficient reliability

The information provided under this note refers to the F4E open obligations (not covered by a budgetary commitment) under the ITER and BA activities.

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 (DA). 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.
The value of each component is represented by an ITER credit, earned by the DA each time that a significant design or manufacturing milestone is achieved (i.e. CAS Milestones). The granularity of the distribution of the total credit for the specific component over the milestones that are part of the lifetime of the procurement is providing a good basis for evaluating the progress of the DA in procuring the agreed component.
Regarding the update of the conversion rate between IUA (ITER Unit of Accounts) 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 2019 exchange rate euro/IUA amounts to 1 749.84.
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.

7.4.1.1. ITER PA (with IO)

(kIUA)

PA-EU in Kind Systems*	Original value (1)	Current Value (2)	Earned Credit (3)	Balance (4)=(2)-(3)	Achieved Credit (5)
Buildings and Power Supplies	423.30	513.88	223.88	290.00	244.33
Magnet	183.39	185.82	98.89	86.93	112.84
Vaccum vessel	99.36	91.43	37.15	54.28	44.84
Neutral beam Heating and Current Drive	46.30	83.50	18.22	65.28	28.91
Blanket system	26.10	40.33	0.00	40.33	0.08
Remote Handling Equipment	26.20	39.97	0.80	39.17	2.40
Divertor	31.40	27.99	2.19	25.80	2.93
Electron Cyclotron Heating & Current Drive	30.59	32.27	4.06	28.21	4.06
Diagnostics	33.27	32.05	0.29	31.76	0.51
Cryoplant & Distribution	31.50	26.37	22.98	3.39	22.98
Tritium Plant	18.22	16.72	3.25	13.47	3.25
Ion Cyclotron Heating & Current Drive	3.96	14.73	0.00	14.73	0.00
Vacuum Pumping & Fuelling	14.26	13.85	0.32	13.53	0.42
Waste Management	9.10	10.06	0.00	10.06	0.00
Radiological Protection	0.60	4.20	0.00	4.20	0.00
Total in Kind	***977.55***	***1 133.17***	***412.03***	***721.14***	***467.55***

*Each system may group one or more PAs

Fig. 13 ITER Procurement Arrangements

The amount of 1 133.17 kIUA (EU Current Share[8]) in the above table corresponds to the credit associated 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. This is the total value for EU included into the Update to the OPC document presented at the ITER Council in November 2019. This value changes frequently due to the credit adjustments through the Project Change Request (PCR) mechanism. 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 PA credit value has to be fully earned, independently of the actual cost incurred for executing the scope of work of each PA. As mentioned, for each PA key milestone an ITER credit is associated and this is released to the specific Party whenever the milestone has been achieved and the related documentation verified by IO.

Therefore 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 (i.e. formally released by IO to F4E) depending on the achievement of project milestones laid down in each PA (see earned credit column in the table above).

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

The amount of 977.55 kIUA in the table corresponds to the original value of the EU PAs as reported in the reference IO PA database. The difference between this value and the current one is due to the value refinements approved along the years by the ITER Council in order to take into account changes to the initial scope of work.

[8] Values from the "Proposal for the Update of the Overall Project Cost (OPC)" ITER_D_26B8X9 v1.1 presented to IC-25

As far as the earned ITER credit is concerned, 412.03 kIUA (as of 31/12/2019) represents about 36.4 % of the current total PAs value. The achieved credit in the table above corresponds to all milestones achieved for that area until end 2019, even if the release of the formal credit has not been requested by F4E to IO, yet. Therefore, in terms of progress of work, it is the achieved credit that should be considered and this was 467.55 kIUA at the end of 2019, corresponding to 41.3 % of the current total PAs value. The graph below shows the actual values of the achieved (but not yet released by IO) and earned credit (released by IO) vs the forecast value.

The chart shows the credit value that F4E should have earned up to end 2019 (Baseline) against the credit that was actually achieved (Achieved) and that IO should have already released as acknowledgement of the achieved milestones and the earned (Released) one. The difference between the achieved and the released (earned) credits is explained by the fact that once F4E achieves a credit milestone, all necessary data, reports and other information has to be collected and provided to IO. This information is linked to the delivery by the supplier of all the necessary documents and to the F4E approval of these deliverables. Furthermore, IO has to revise and validate the whole set of documents provided in order to confirm such achievement. For this reason, the process can last some months and hence the difference.

Regarding 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.

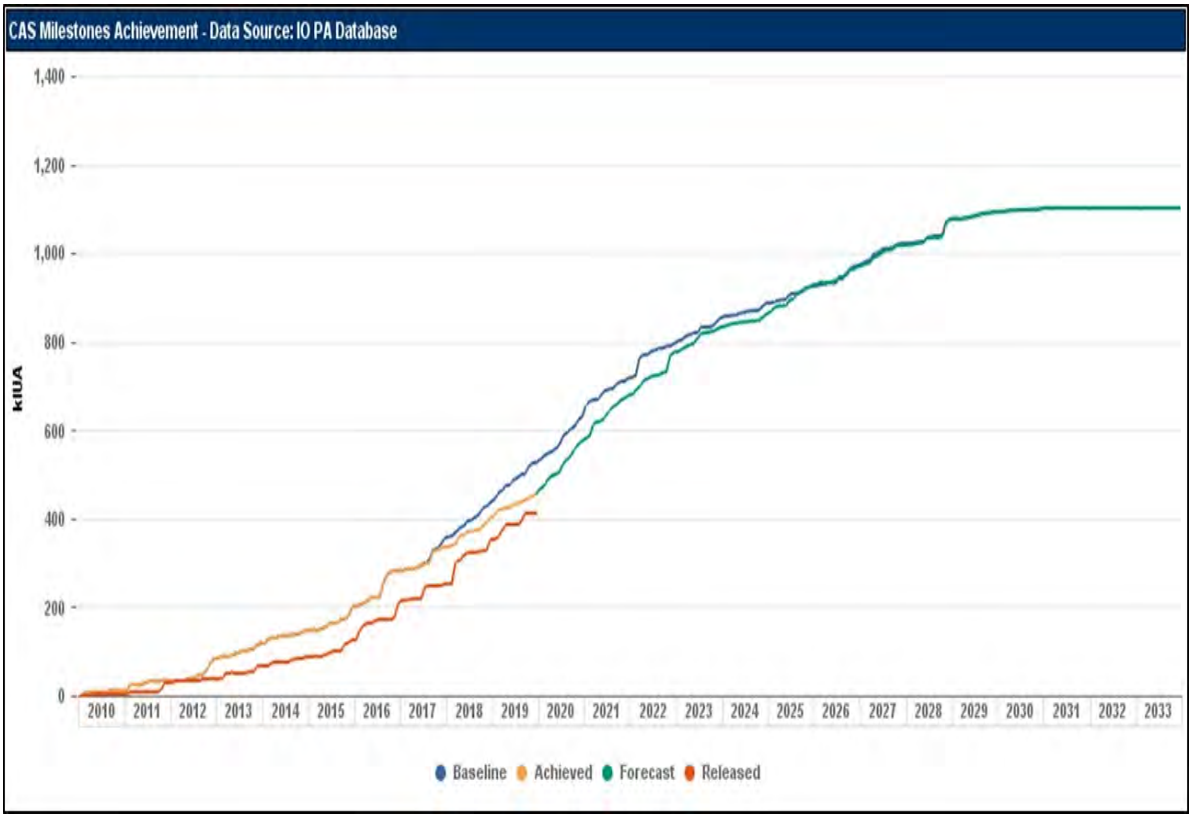


Fig. 14 CAS Milestone Achievement for Signed PAs

The baseline used for this chart is the F4E Current baseline (i.e. the schedule at the end of September 2016 plus approved baseline changes). The actuals and forecast are those in the December 2019 submitted Detailed Working Schedule. Milestones are achieved when marked as completed in the schedule and released when the credit note for the milestone is released by IO.

In April 2019, the F4E GB endorsed the F4E proposal for an Earned Value Management (EVM) system. Its deployment started in July 2019 and it is now regularly used to provide a monthly feedback to the Stakeholders on F4E performance.

The EVM scheme is based only on credited work, defined as all the PAs within which CAS milestones are found.

The Planned Value is the cumulative CAS curve in the baseline with the values recorded in the Primavera Detailed Working Schedule (DWS).

The Earned Value is the CAS curve of the achieved milestones only as recorded in the DWS and marked as completed. This does not depend on credit release from ITER (i.e. “earned credit”). Only milestones included in the Planned Value are included in the Earned value.

The Actual Costs are the payments made in ABAC for the credited work. As payments are in Euro, while credit is in IUA, a conversion is made through standard conversion rates considering their related commitments (i.e. real cost).

The graph here below shows the EVM as of end December 2019.

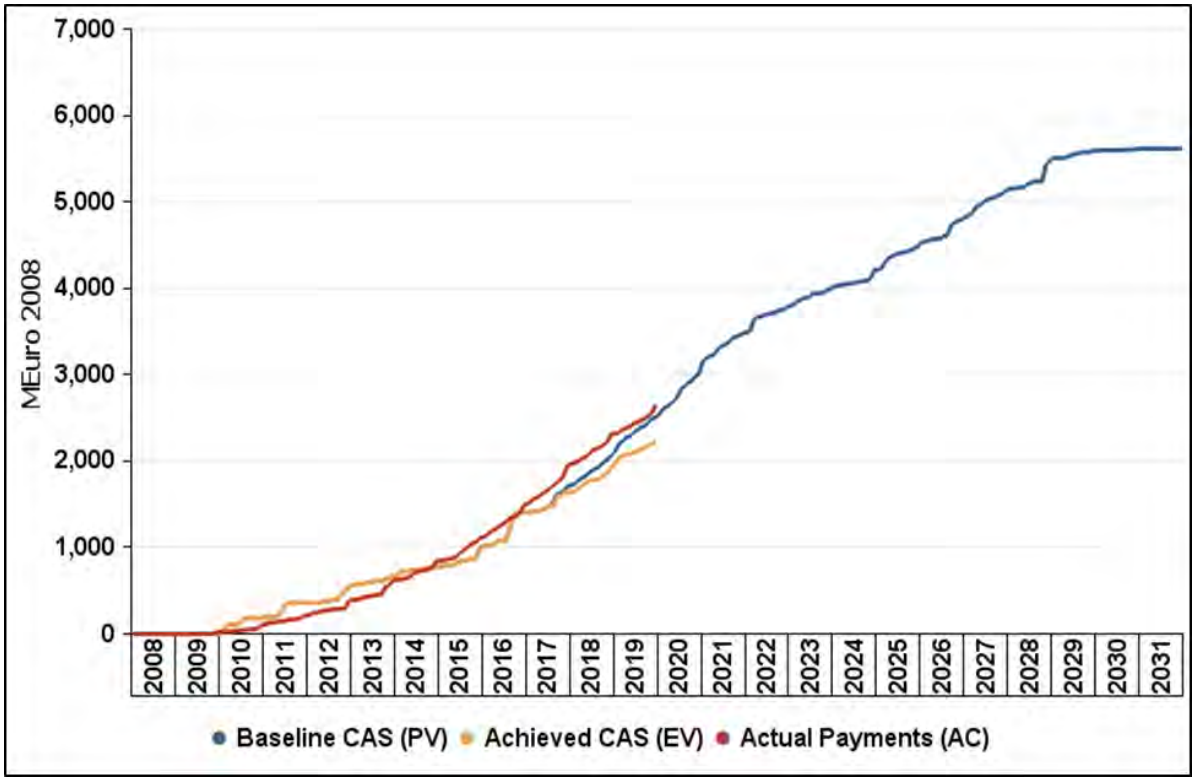


Fig. 15 Earned Value Management

More details on the actual advancement of the works achieved at the end of the year are available in the F4E Annual report 2019.

7.4.1.2. ITER Annex to PAs (JAEA)

	(kIUA)		(EUR)
Transfers of Procurement to Japan	**Value of Cash Contribution (1)**	**Cumulative Payments (2)**	**Indicative balance (3)=(1)-(2) x 1 749.84 x 1 000**
Magnet	168.60	167.36	2 169 801.60
Tritium Plant	14.06 (14.06 not yet signed)	0.00	0.00
Neutral Beam H&CD	44.99 (20.29 not yet signed)	24.70	0.00
Total to Japan	***227.65***	***192.06***	***2 169 801.60***

Fig. 16 ITER Annex to Procurement Arrangements

Regarding the arrangements signed between F4E, JAEA and IO, the transfer of procurement responsibilities from Europe to Japan is implemented through annual cash contributions or, in a limited number of cases, according to the credit released by IO upon the achievement of the milestones. In the former case, the cash contributions are based on an adequate evidence of the payments performed by QST (i.e. the Japanese DA) 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.

7.4.1.3. ITER Task Agreement

Number ITAs open as of 31/12/2019	Amount	Currency	2019 Exchange rate to Euro	Amount (EUR)
2	4 645.00	IUA	1 749.84	8 128 006.80
16	17 547 597.80	EUR		17 547 597.80
4	Voluntary	n/a		
22				***25 675 604.60***

Fig. 17 ITER Task Agreements

4 ITA were signed during 2019 for a total value of EUR 1 175 757.00.

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

As for the PA signed with ITER 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.

7.4.1.4. 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)
JT60SA	236.41	236.41	228.76	44.16	44.16	42.19	1.97
IFMIF/EVEDA	148.03	148.03	135.40	22.74	22.74	20.20	2.54
IFERC	115.55	115.55	114.84	1.80	1.80	1.77	0.03
BA_Total	***500.00***	***500.00***	***479.00***	***68.70***	***68.70***	***64.16***	***4.54***

Fig. 18 Broader Approach Agreement

The Broader Approach Agreement between Euratom and the Government of Japan envisages two Implementing Agencies, F4E and QST, 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 QST 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 QST 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 339.0 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 2019 by project.

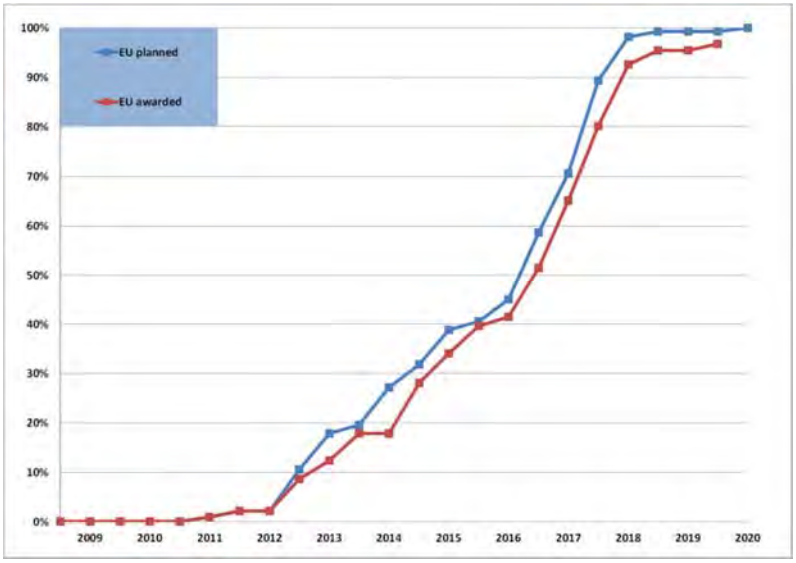


Fig. 19 JT-60SA

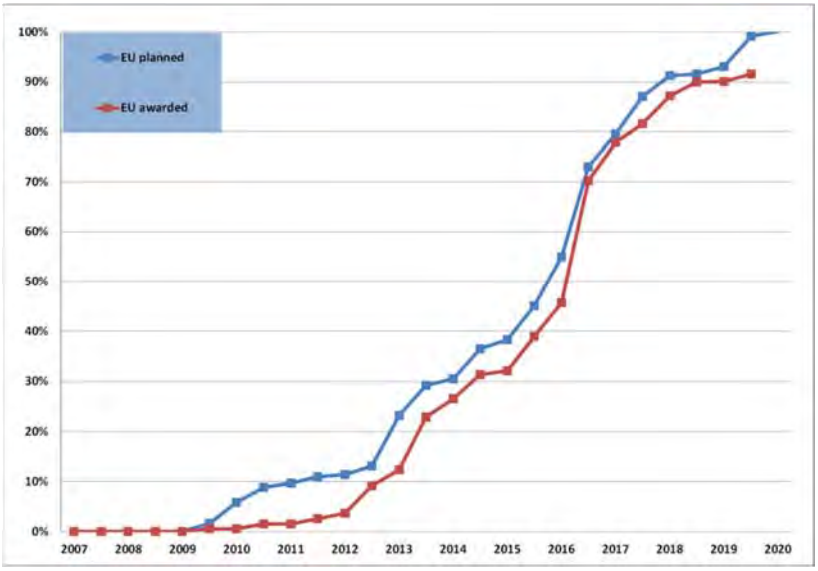


Fig. 20 IFMIF

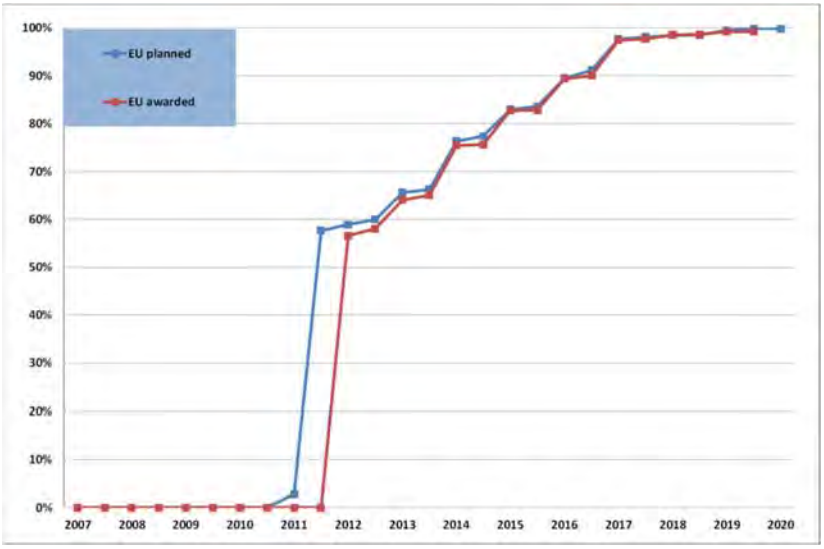


Fig. 21 IFERC

Components of the prototype accelerator (LIPAc) mentioned in Art. 6 of Annex I of the BA agreement provided by the Voluntary Contributor (CEA), have been delivered and installed on site (Japan). The agreement foresees that F4E shall retain the ownership of the components (Injector, Radio frequency power supplies, generators and their auxiliaries and control system) and shall take responsibility for shipping these components back after the dismantling of the prototypical accelerator. The transport cost are estimated to EUR 280 000. It is currently not clear if these components will be shipped back as no alternative use is foreseen after decommisioning.

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	31.12.2019	31.12.2018
901120	Guarantees for pre-financing (nominal-on going)	129 820 784.75	183 964 271.91
901180	Performance guarantees	217 249 821.26	185 234 184.81
901100	**Total - Guarantees received**	**347 070 606.01**	**369 198 456.72**

Fig. 22 Guarantees

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	31.12.2019	31.12.2018
902500	Commitments against appropriations not yet consumed*	**1 133 484 948.07**	**1 155 812 961.10**
903200	Operating lease	**0.00**	**0.00**
903300	Contractual commitment/obligations to deliver (open PAs/ITA's)**	**2 809 094 639.80**	**2 644 928 157.85**
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 above points 7.4.1.1, 7.4.1.2, 7.4.1.3 and 7.4.1.4 for details.

Fig. 23 Commitment for Future Funding

7.4.3.2. Reserve Fund

The terms of reference of the ITER Reserve Fund were approved in 2015 in order to compensate the DAs 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 Project Change Requests (PCRs) amounting to EUR 123 196 613.68. An additional amount of 11 446 885.52 EUR has been allocated to F4E under the ITER Undistributed Budget (see also point 8.4.1.1 below).
F4E recognises the revenue in the year of approval of the legal commitment/contract amendment by the IO DG (EUR 12 396 366.30 for 2019).

7.4.3.3. Services In-Kind

Under the Host agreement with Spain, the office building used by F4E is free of charge. For the year 2019, this service in-kind amounts to EUR 2 916 570.32.

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	2019	2018
Current receivables	16 051 235.73	28 127 695.12
Other receivables	61 820.19	56 009.59
Cash and deposits	11 171 229.73	5 565 303.26
TOTAL	**27 284 285.65**	**33 749 007.97**

Financial liabilities	2019	2018
Current payables	62 637 547.38	77 404 386.83
Other payables	89 599.86	377 378.71
Accounts payable with EU entities	824 174.13	1 323 991.77
TOTAL	**63 551 321.37**	**79 105 757.31**

Fig. 24 Financial Instruments

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 FR, 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 2019	< 1 year	1 - 5 years	> 5 years	Total
Payables with third parties	62 727 147.24	0.00	0.00	**62 727 147.24**
Payables with consolidated entities	824 174.13	0.00	0.00	**824 174.13**
Total liabilities	**63 551 321.37**	**0.00**	**0.00**	**63 551 321.37**

Fig. 25 Liquidity Risk - Payables

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 the EC since May 2019. F4E recovers contributions from Euratom and the ITER Host State in average 3 times per year to ensure appropriate cash management, taking into account payment time limits for the recovery of contributions and the total of payments executed in 2019. Requests to the EC are accompanied by cash forecasts.

Following the externalisation of the treasury to the EC the counterparty risk to which F4E is exposed is minimized.

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	10 953 005.93
Upper medium grade	211 400.00
Lower medium grade	0.00
Non-investment grade	0.00
Receivable from IO	4 561 749.25

Fig. 26 Credit Risk - Receivables

7.5.3. Market Risk

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

Interest rate risk arises from cash. F4E treasury has been externalised to the EC and consequently it is not exposed to interest rate risk. F4E's treasury does not borrow any money.

The vast majority of transactions are executed in EUR. It is recognised that exchange rates fluctuate and F4E accepts the risk and does not consider it to be material.

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

Fig. 27 Related Party Disclosure

The transactions of F4E with key management personnel during financial year 2019 consist only of the payment of their remuneration, allowances and other entitlements in accordance with the EU Staff Regulations.

7.7. Events after the reporting date (material non-adjusting events)

COVID-19

During the first half of 2020, the coronavirus outbreak has had huge impacts on the EU economy. As a non-adjusting event, the outbreak of the coronavirus does not require any adjustments to the figures reported in these annual accounts. For subsequent reporting periods, COVID-19 may affect the recognition and measurement of some assets and liabilities on the balance sheet and also of some revenue and expenses recognised in the statement of financial performance. Based on the information available at the date of signature of these annual accounts, the financial effects of the coronavirus outbreak cannot be reliably estimated.

BREXIT

Regarding the uncertainties related to the consequences of the exit of the United Kingdom from the EU, F4E has set up a working group composed of representatives of the different departments. This working group follows-up the evolution of the negotiations and the concrete terms of the exit itself as well as the possible impact on F4E activities.

The withdrawal agreement entered into force on 1 February 2020, setting a 'transition period' until the end of 2020. However, the possible impacts on the financial situation of F4E are still unknown, but seem to be of very limited impact according to first estimates.

Section II. Budget Implementation 2019

8. Budget Implementation

8.1. Main Facts on the Implementation of the 2019 Budget of F4E

Commitments	**99.8%**	**of implementation of the final available budget**		
		Final Budget: 729.71	Execution: 728.10	EUR million
	107.9%	compared to the original budget		
		Original Budget: 674.71	Execution: 728.10	EUR million
	100.0%	in individual commitments		
		Execution: 728.10	Ind.Commit.: 728.10	EUR million
Payments	**97.1%**	**of implementation of the final available budget**		
		Final Budget: 761.19	Execution: 738.90	EUR million
	94.6%	compared to the original budget		
		Original Budget: 781.35	Execution: 738.90	EUR million

Fig. 28 Budget Implementation 2019

8.2. The Principles for the Budget 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 budgetary accuracy**: all F4E's expenditure and revenue must be incorporated in a single budget document, must be booked on a Budget Chapter and expenditure must not exceed authorised appropriations;
- **annuality:** the appropriations 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 appropriations);
- **unit of account:** the budget is drawn up and implemented in euro (EUR) and the accounts are presented in EUR;
- **universality:** this principle comprises two rules: – the rule of non-assignment, meaning that revenue must not be earmarked for specific items of expenditure (total revenue must cover total expenditure); – the gross budget rule, meaning that all revenue and expenditure are entered in full in the budget without any adjustment against each other;

- **specification:** each item of appropriations is assigned to a specific purpose and a specific objective;
- **sound financial management:** Appropriations 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 are 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

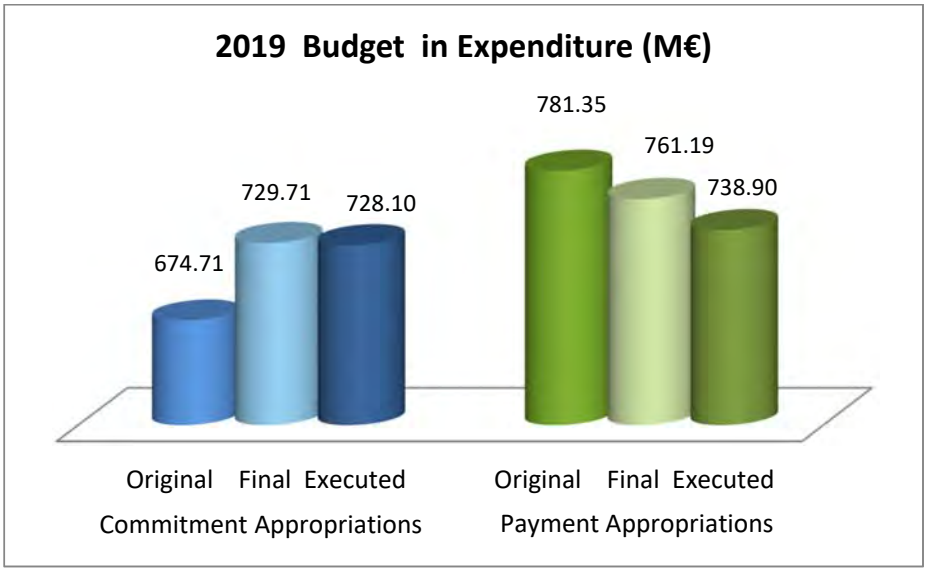


Fig. 29 Budget 2019 in Expenditure

F4E 2019 budget was originally adopted by F4E's GB[9] for the amount of EUR 674.71 million in commitment appropriations and EUR 781.36 million in payment appropriations.

It was successively amended in the July [10] and in the December[11] GB meetings.

The final available appropriations, including the carryover from the previous year were EUR 729.71 million in commitment appropriations and EUR 761.19 million in payment appropriations.

[9] Decision of the F4E GB F4E_D_2BEFRX adopted on 12/12/2018

[10] Decision of the F4E GB F4E_D_2ELKL3 adopted on 10/07/2019

[11] Decision of the F4E GB F4E_D_2HU9XW adopted on 10/12/2019

8.4. Statement of Revenue

8.4.1. Commitment Appropriations

The table in Fig. 30 describes the evolution of statement of revenue in commitment appropriations.

The changes to the statement of revenue are:

- **+ EUR 2 550 000.00** of additional Euratom contribution to align the F4E Budget with the EU budget as finally adopted by the EU Budgetary Authority;
- **+ EUR 1 900 000.00** of additional Euratom contribution to partially compensate the previous contribution from F4E to the EU defence initiative;
- **+ EUR 9 150 414.33** called from the previous unused appropriations, reutilised to balance the level of expenditure according to the final F4E Work Programme 2019;
- **+ EUR 1 231 519.90** of additional miscellaneous revenue linked to a claimed performance guarantee for non-conformities and received bank interests, both in commitments and payments appropriations (details in Fig. 45 in Annex 8.7.1);
- **+ EUR 383 961.24** of additional miscellaneous revenue cashed during 2019 and corresponding to reimbursements of undue payments (internal assigned revenue) (details in table Fig. 45 in Annex 8.7.1);
- **(-) EUR 11 250.00** of recovery order (C1) cashed but not budgeted (details in table Fig. 46 in Annex 8.7.1);
- **+ EUR 642 016.23** of carry-over from 2018 of revenue corresponding to internal assigned revenue mainly cashed at the end of 2018 (unused C4 from 2018 Accounts) (details in table Fig. 47 in Annex 8.7.1);
- **+ EUR 14 944 913.65** of assigned revenue accruing from the contribution of ITER Host State, from carry-over from 2018 accounts and from de-commitments done during 2019 – making the corresponding amounts immediately available again (external assigned revenue);
- **+ EUR 12 894 715.56** of assigned revenue from the ITER Reserve Fund and from the ITER Undistributed Budget from the same scheme as described for the ITER Host State contribution.
- **+ EUR 11 314 653.69** Carry-over from 2018 accounts and from de-commitments done during 2019 – making the corresponding amounts immediately available again (external assigned revenue).

Heading of the 2019 Budget	Original budget 12 Dec. 2018 (1)	Amending budget 1 10 July 2019 (2)	Amending budget 2 10 Dec. 2019 (3)	Final Budget (4)=(1)+(2)+(3)	Additional revenue (5)	Cancelled revenue (outturn) (6)	Final Available Revenue (7)=(4)+(5)+(6)	Carry over from Budget 2018 (8)	Final Available Budget (9)=(7)+(8)
I - 1 10 PARTICIPATION FROM THE EUROPEAN UNION TO OPERATIONAL EXPENDITURE	**348 608 200.00**	2 550 000.00	1 900 000.00	**353 058 200.00**			**353 058 200.00**		**353 058 200.00**
I - 1 11 RECOVERY FROM PREVIOUS YEARS OPERATIONAL EXPENDITURE	**140 019 168.00**		9 150 414.33	**149 169 582.33**			**149 169 582.33**		**149 169 582.33**
I - 1 20 PARTICIPATION FROM THE EUROPEAN UNION TO ADMINISTRATIVE EXPENDITURE	**49 517 000.00**			**49 517 000.00**			**49 517 000.00**		**49 517 000.00**
I - 1 21 RECOVERY FROM PREVIOUS YEARS ADMINISTRATIVE EXPENDITURE	**963 132.40**			**963 132.40**			**963 132.40**		**963 132.40**
I - 2 10 ANNUAL MEMBERSHIP CONTRIBUTIONS	**5 600 000.00**			**5 600 000.00**			**5 600 000.00**		**5 600 000.00**
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**	14 944 913.65	**144 944 913.65**
I - 4 10 MISCELLANEOUS REVENUE	**p.m.**		1 231 519.90	**1 231 519.90**	383 961.24	-11 250.00	**1 604 231.14**	642 016.23	**2 246 247.37**
I - 5 10 OTHER ASSIGNED REVENUE TO SPECIFIC ITEM OF EXPENDITURE	**p.m.**			**p.m.**			**0.00**		**0.00**
I - 5 20 OTHER ASSIGNED REVENUE FROM THE IO RESERVE FUND	**p.m.**			**p.m.**	12 894 715.56		**12 894 715.56**	11 314 653.69	**24 209 369.25**
Total Revenue	**674 707 500.40**	**2 550 000.00**	**12 281 934.23**	**689 539 434.63**	**13 278 676.80**	**-11 250.00**	**702 806 861.43**	**26 901 583.57**	**729 708 445.00**

Fig. 30 Evolution of Statement of Revenue in Commitment Appropriations

8.4.1.1. Reserve Fund and Undistributed Budget

According to the Terms of Reference of the ITER Reserve Fund[12] and to the ITER Reserve Fund Management Plan[13], 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 Director General of ITER Organization (IO-DG), implemented through the decisions of the Executive Project Board (EPB);
- The approval of the related contractual amendment, also given by the IO-DG.

The assigned revenue from the ITER Undistributed Budget covers the cost incurred by F4E on specific requests of IO-DG, mainly for resolution of cases of non-conformities (NCR) and for Direct Implementation (DI) in the best interest of the project[14].

The following revenue in commitment appropriations were opened since 2015 according to the procedures above for the Reserve Fund and the Undistributed Budget:

IO Reserve Fund (RF), Undistributed Budget (UB)	2015	2016	2017	2018	2019	Total
Contribution of F4E to the RF through the payment of the in-cash contribution						(EUR)
RESERVE FUND IN IO Budget (paid with cash contribution)	21 479 595.00	34 231 380.00	34 095 000.00	13 665 276.00	23 002 198.57	**126 473 449.57**
Obligations from the RF and UB						
RF / EPB DECISION	47 103 414.76	13 847 194.93	39 426 794.50	13 657 059.26	9 162 150.23	**123 196 613.68**
PCR	*47 103 414.76*	*12 933 863.30*	*39 281 090.98*	*13 454 203.74*	*9 162 150.23*	***121 934 723.01***
DI and NCR		*913 331.63*	*145 703.52*	*202 855.52*		***1 261 890.67***
UB / CONTRACT APPROVAL	0.00	518 107.70	546 370.49	2 467 237.65	7 915 169.68	**11 446 885.52**
PCR				*1 782 075.00*	*5 121 822.81*	***6 903 897.81***
DI and NCR		*518 107.70*	*546 370.49*	*685 162.65*	*2 793 346.87*	***4 542 987.71***
Total IO obligations	**47 103 414.76**	**14 365 302.63**	**39 973 164.99**	**16 124 296.91**	**17 077 319.91**	**134 643 499.20**
Commitment appropriations from the RF and UB						
RF / CONTRACT APPROVAL Commitment appropriations on Chapter 36 Reduction due to non approval of PCR 670 Reduction due to regularization PCR 805	1 301 314.76	14 983 791.90	714 815.39	12 646 429.26	4 071 295.99 -450 000.00 -306 263.00	**33 717 647.30** **-450 000.00** **-306 263.00**
UB / CONTRACT APPROVAL Commitment appropriations on chapter 36	-	-	-	1 000 565.00	9 579 682.57	**10 580 247.57**
Total Commitment appropriations	**1 301 314.76**	**14 983 791.90**	**714 815.39**	**13 646 994.26**	**12 894 715.56**	**43 541 631.87**
Payment appropriations from the RF and UB						
RECOVERY ORDER Opening in Payment on Chapter 36 (cashed)	0.00	4 120 733.99	11 184 575.01	13 148 645.00	7 414 844.60	**35 868 798.60**
Budgetary execution of the RF and UB						
COMMITMENTS	1 077 591.26	13 690 226.67	1 405 999.03	3 158 445.65	22 870 710.91	**42 202 973.52**
Of which Reserve Fund	*1 077 591.26*	*13 690 226.67*	*1 405 999.03*	*2 997 795.65*	*19 935 899.04*	***39 107 511.65***
Of whichUndistributed budget				*160 650.00*	*2 934 811.87*	***3 095 461.87***
PAYMENTS	0.00	0.00	4 670 979.73	9 471 448.93	5 094 087.85	**19 236 516.51**

Fig. 31 Obligations from Reserve Fund and Undistributed Budget

[12] Approved by ITER Council on 17 July 2017
[13] ICS/2015/OUT/0071(RML3XE)
[14] IC-23/10.2 (MAC-26/05.2) Proposal for ITER- Organization Non-Conformity Resolution Mechanism and Process

8.4.2. Payment Appropriations

Heading of the 2019 Budget	Original budget 12 Dec. 2018 (1)	Amending budget 1 10 July 2019 (2)	Amending budget 2 10 Dec. 2019 (3)	Final Budget (4)=(1)+(2)+(3)	Outstanding revenue from 2018 (5)	Additional requested revenue(*) (6)	Additional cashed revenue(*) (7)	Cancelled revenue (outturn) (8)	Outstanding Revenue at year end (9)	Carry over from Budget 2018 (10)	Final cash Available (11)=(4)+(5)+(6)+(9)+(10)	Final Available Budget(**) (12)=(11)+(8)
I - 1 10 PARTICIPATION FROM THE EUROPEAN UNION TO OPERATIONAL EXPENDITURE	564 000 568.00	-3 500 000.00	-58 000 000.00	502 500 568.00							502 500 568.00	502 500 568.00
I - 1 11 RECOVERY FROM PREVIOUS YEARS OPERATIONAL EXPENDITURE	16 273 060.23			16 273 060.23							16 273 060.23	16 273 060.23
I - 1 20 PARTICIPATION FROM THE EUROPEAN UNION TO ADMINISTRATIVE EXPENDITURE	49 517 000.00			49 517 000.00						5 461 798.34	54 978 798.34	54 978 798.34
I - 1 21 RECOVERY FROM PREVIOUS YEARS ADMINISTRATIVE EXPENDITURE	963 132.40			963 132.40							963 132.40	963 132.40
I - 2 10 ANNUAL MEMBERSHIP CONTRIBUTIONS	5 600 000.00			5 600 000.00	124 000.00		124 000.00		-211 400.00		5 512 600.00	5 600 000.00
I - 3 10 ASSIGNED REVENUE ACCRUING FROM THE CONTRIBUTION OF ITER HOST STATE	145 000 000.00			145 000 000.00						2 198 145.43	147 198 145.43	147 198 145.43
I - 4 10 MISCELLANEOUS REVENUE	p.m.		1 231 519.90	1 231 519.90	567.46	704 701.33	383 961.24	-11 250.00	-321 307.55	10 343 394.30	11 958 875.44	11 947 625.44
I - 5 10 OTHER ASSIGNED REVENUE TO SPECIFIC ITEM OF EXPENDITURE	p.m.			p.m.							0.00	0.00
I - 5 20 OTHER ASSIGNED REVENUE FROM THE IO RESERVE FUND	p.m.			p.m.		11 976 593.85	7 414 844.60		-4 561 749.25	14 311 525.34	21 726 369.94	21 726 369.94
Total Revenue	781 353 760.63	-3 500 000.00	-56 768 480.10	721 085 280.53	124 567.46	12 681 295.18	7 922 805.84	-11 250.00	-5 094 456.80	32 314 863.41	761 111 549.78	761 187 699.78

(*) I410: Additional revenue requested (6) and cashed (7) on top of the budgeted amount.

(**) I210: The budget available is the amount adopted by the Governing Board.

Fig. 32 Evolution of Statement of Revenue in Payment Appropriations

The breakdown of revenue by contributors in 2019 in payment appropriations is:

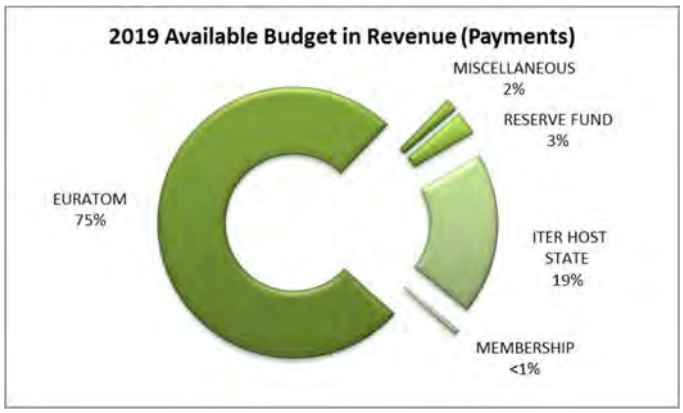


Fig.33 Revenue Breakdown in Payment Appropriations

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

- **(-) EUR 3 500 000.00** to align F4E budget with the EU Budget as finally adopted by EU Budgetary Authority;
- **(-) EUR -58 000 000.00** of transfer back of the Euratom contribution on request of F4E to align the budget for operational expenditure to the lower 2019 forecast of implementation in payments;
- **+ EUR 1 231 519.90** refer to the justification provided for the revenue in commitment appropriations , section 8.4.1;
- **+ EUR 383 961.24** refer to the justification provided for the revenue in commitments, section 8.4.1;
- **(-) EUR 11 250.00** refer to the justification provided for the revenue in commitments, section 8.4.1;
- **+ EUR 5 461 798.34** of carry-over from 2018 participation from the Euratom to the administrative expenditure; corresponding to the automatic carry-over of administrative expenditure committed in 2018 and not yet liquidated at the year-end (non-differentiated appropriations);
- **+ EUR 2 198 145.43** of additional assigned revenue accruing from the contribution of ITER Host State, carried over from 2018 accounts;
- **+ EUR 10 343 394.30** of additional miscellaneous revenue carried over from the 2018 budget and corresponding to the partial use of the recovery for the TB04 novation contract;
- **+ EUR 124 000.00** of outstanding revenue (balance of the 2018 membership contribution from Spain cashed in 2019)
- **(-) EUR 211 400.00** of outstanding revenue (2019 membership contribution from Spain partially cashed in 2019)
- **+ EUR 7 414 844.60** of 2019 assigned revenue from the ITER Reserve Fund and from the ITER Undistributed Budget;
- **+ EUR 14 311 525.34** of assigned revenue from the ITER Reserve Fund and from the ITER Undistributed Budget, carried-over from the 2018 accounts.

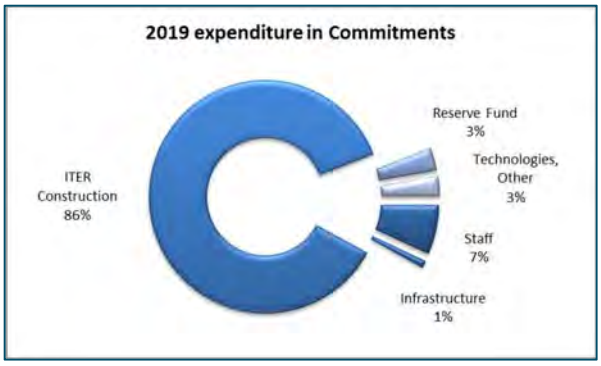
8.5. Statement of Expenditure

In line with the F4E budgetary procedure, the statement of expenditure adopted with the original 2019 budget was established based on the 2017 edition of the Resource Estimates Plan, and adjusted to the final outcome of the budgetary procedures of Euratom and France.

8.5.1. Commitment Appropriations

The statement of expenditure is aligned with the original 2019 Work Programme (WP), and 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 were implemented with the two amending budgets and through the transfers approved by the Director within the limits foreseen in article 27 of the F4E Financial Regulation. The Governing Board is duly informed about the transfers at each GB meetings with the update of the "Status of Commitments and Payments" document.
The appropriations accruing from assigned revenue and not used at the end of 2018 were automatically carried over to 2019.

A full implementation of the 2019 Budget shall be considered.
The final breakdown of the statement of expenditure in commitment appropriations is as follows:



MEUR	Budget	Cancelled	Carried over	Executed
Commitment 2019	729.7	0.1	1.5	728.1

Fig. 34 Final breakdown of the Expenditure in Commitments

Evolution of the Statement of Expenditure in Commitment (EUR)

Heading of the 2019 Budget	Original budget 12 Dec. 2018 (1)	Amending budget 1 10 July 2019 (2)	Amending budget 2 10 Dec. 2019 (3)	Transfers adopted by F4E Director (4)	Final budget (5)= Σ(1 to 4)	Additional revenue (6)	Carried over from 2018 (7)	Final appropriations (8)= Σ(5 to 7)	Final implementation (9)	% implem. (10)= (9)/(8)
CH 11 STAFF EXPENDITURE IN THE ESTABLISHMENT PLAN	32 952 832.40			1 352 206.14	34 305 038.54			34 305 038.54	34 305 038.54	100.0%
CH 12 EXTERNAL STAFF EXPENDITURE (CA, IS AND SNE)	11 022 500.00			-217 094.65	10 805 405.35			10 805 405.35	10 805 405.35	100.0%
CH 13 MISSIONS AND DUTY TRAVEL	450 000.00			440 000.00	890 000.00			890 000.00	890 000.00	100.0%
CH 14 MISCELLANEOUS EXPENDITURE ON STAFF RECRUITMENT AND TRANSFER	853 000.00			-364 975.78	488 024.22			488 024.22	488 024.22	100.0%
CH 15 REPRESENTATION	10 000.00			-4 000.00	6 000.00			6 000.00	6 000.00	100.0%
CH 16 TRAINING	663 000.00			-67 633.24	595 366.76	2 031.26		597 398.02	597 398.02	100.0%
CH 17 OTHER STAFF MANAGEMENT EXPENDITURE	2 422 000.00			376 508.53	2 798 508.53	3 356.25		2 801 864.78	2 801 864.78	100.0%
CH 18 TRAINEESHIPS	151 000.00			25 186.84	176 186.84			176 186.84	176 186.84	100.0%
TITLE 1 - Commitment	48 524 332.40	0.00	0.00	1 540 197.84	50 064 530.24	5 387.51	0.00	50 069 917.75	50 069 917.75	100.0%
CH 21 BUILDINGS AND ASSOCIATED COSTS	1 428 000.00			-520 839.68	907 160.32		489 339.68	1 396 500.00	1 396 500.00	100.0%
CH 22 INFORMATION AND COMMUNICATION TECHNOLOGIES	3 570 400.00			-4 971.23	3 565 428.77			3 565 428.77	3 565 428.77	100.0%
CH 23 MOVABLE PROPERTY AND ASSOCIATED COSTS	261 000.00			-103 000.00	158 000.00			158 000.00	158 000.00	100.0%
CH 24 EVENTS AND COMMUNICATION	306 000.00			-6 291.83	299 708.17			299 708.17	299 708.17	100.0%
CH 25 OUTSOURCING AND OTHER CURRENT EXPENDITURE	1 244 000.00			5 488.02	1 249 488.02	567.46		1 250 055.48	1 249 488.02	100.0%
CH 26 POSTAGE AND TELECOMMUNICATIONS	391 000.00			-20 400.00	370 600.00			370 600.00	370 600.00	100.0%
CH 27 EXPENDITURE ON FORMAL AND OTHER MEETINGS	355 400.00			98 798.06	454 198.06			454 198.06	454 198.06	100.0%
CH 28 APPROPRIATION ACCRUING FROM THIRD PARTIES TO THE BUILDING REFURBISHMENT EXPENDITURE	p.m.			0.00	0.00			0.00	0.00	-
TITLE 2 - Commitment	7 555 800.00	0.00	0.00	-551 216.66	7 004 583.34	567.46	489 339.68	7 494 490.48	7 493 923.02	100.0%
Total TITLE 1 & 2 - Commitment	56 080 132.40	0.00	0.00	988 981.18	57 069 113.58	5 954.97	489 339.68	57 564 408.23	57 563 840.77	100.0%

Fig.35 Evolution of the Administrative Expenditure in Commitments

Evolution of the Statement of Expenditure in Commitment (EUR) (cont'd)

Heading of the 2019 Budget	Original budget 12 Dec. 2018 (1)	Amending budget 1 10 July 2019 (2)	Amending budget 2 10 Dec. 2019 (3)	Transfers adopted by F4E Director (4)	Final budget (5)= Σ(1 to 4)	Additional revenue (6)	Carried over from 2018 (7)	Final appropriations (8)= Σ(5 to 7)	Final implementation (9)	% implem. (10)= (9)/(8)
CH 31 ITER CONSTRUCTION - INCLUDING SITE PREPARATION	**468 541 368.00**	-2 364 000.00	17 084 140.23	-890 076.68	**482 371 431.55**	337 824.27	152 676.55	**482 861 932.37**	**482 595 361.97**	**99.9%**
CH 32 TECHNOLOGY FOR ITER	**3 304 000.00**	-804 000.00	-500 000.00	-528 563.45	**1 471 436.55**			**1 471 436.55**	**1 471 436.55**	**100.0%**
CH 33 TECHNOLOGY FOR BROADER APPROACH AND DEMO	**11 800 000.00**	-1 300 000.00	-5 500 000.00	-731 189.51	**4 268 810.49**			**4 268 810.49**	**4 268 810.49**	**100.0%**
CH 34 OTHER EXPENDITURE	**4 982 000.00**	7 018 000.00	1 197 794.00	1 160 848.46	**14 358 642.46**	28 932.00		**14 387 574.46**	**14 387 574.46**	**100.0%**
CH 35 ITER CONSTRUCTION - APPROPRIATIONS ACCRUING FROM THE HOST STATE CONTRIBUTION	**130 000 000.00**				**130 000 000.00**		14 944 913.65	**144 944 913.65**	**144 944 913.17**	**100.0%**
CH 36 APPROPRIATION ACCRUING FROM THIRD PARTIES TO SPECIFIC ITEM OF EXPENDITURE	**p.m.**				**0.00**	12 894 715.56	11 314 653.69	**24 209 369.25**	**22 872 935.91**	**94.5%**
TITLE 3 - Commitment	**618 627 368.00**	**2 550 000.00**	**12 281 934.23**	**-988 981.18**	**632 470 321.05**	**13 261 471.83**	**26 412 243.89**	**672 144 036.77**	**670 541 032.55**	**99.8%**
Total BUDGET in Commitment Appropriations	**674 707 500.40**	**2 550 000.00**	**12 281 934.23**	**0.00**	**689 539 434.63**	**13 267 426.80**	**26 901 583.57**	**729 708 445.00**	**728 104 873.32**	**99.8%**

Fig.36 Evolution of the Operational Expenditure in Commitments

8.5.1.1. Administrative Expenditure

The administrative expenditure comprises non-differentiated 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 transfers approved by the Director increased the administrative budget from the operational budget by EUR 1 478 320.86 and modified the detailed allocation of the administrative expenditure according to the final needs.

Due to the non-differentiated nature of the administrative expenditure, the main changes compared to the original budget are identical in commitment and payment.

The major changes (> +/-10%) in the administrative expenditure (variation of the final implementation in % of the initial budget) are:

Title 1 – Staff expenditure (+ 3%)

Chapter 13 Missions and duty travel: +98%

The development of a specific tool for the management of mission expenditure has allowed a precise allocation of missions between operational and administrative expenditure. The total expenditure for mission was decreased compared to the original budget.

Chapter 14 Miscellaneous expenditure on staff recruitment and transfer: (-) 43%

The recruitment rate was lower than the original forecast due to the need to reduce the establishment plan by 11 positions at the beginning of 2020, therefore a reduction in the expenditure linked to recruitment: removals, travel for taking up duties, daily and installation allowances, travel expenses for medical visits.

Chapter 15 Representation: (-) 40%

Minor change in value (from EUR 10 000 to EUR 6 000) resulting from a lower implementation.

Chapter 16 Training: (-) 10%

Expenditures for training lower than forecasted, in particular regarding the technical trainings and language courses.

Chapter 17 Other staff management expenditure: +16%

Increase in the expenditure for the international schooling and medical services due to a change in the procurement structure and increase of needs for the International school.

Chapter 18 Traineeships: +17%

This increase is due to the decision to recruit more traineeship, from 16 to 27 trainees, as result of the success of this activity.

Title 2 – Building and associated cost (- 1%)

Chapter 23 Movable property and associated costs: (-) 39%

The reduction is due to the decision to postpone the purchase of new furniture and some telecommunication/audio-visual equipment for 2019 to 2020.

Chapter 27 Expenditure on formal and other meetings: + 28%

The increase is mainly due to the cost of the different expert meetings and the catering for the PM department that have been added to the yearly catering forecasts.

8.5.1.2. Operational Expenditure

The statement of operational expenditure was modified with the 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 2019 WP in July and December 2019.

To be noted, the figures for the budget chapters 35 and 36 refer to the available appropriations for the 2019 budget only, whereas the details of the 2019 implementation by funds source provided in Fig. 50, Annex 8.7.4 from ABAC refers to the appropriations of the year plus the amounts left over on the commitments carried over from the previous years. This is due to the specific management of assigned revenue in the accounting system.

The major changes (> +/-10%) in the Operational expenditure (variation of the final implementation in % of the original budget) are:

Chapter 32 Technology for ITER: (-) 55%

The variation is mainly due to an allocation reserved in the original budget for an additional commitment on the non-credited part of the NBTF Agreement finally not implemented in 2019.

Chapter 33 Technology for Broader Approach (BA) and DEMO: (-) 64%

For JT-60SA, all activities in BA Phase 1 have been implemented according to the forecast. For the remaining activities related to BA Phase 2, early implementation (lacking a timely signature between the parties for a new Joint Declaration), administrative and legal basis had to be established, thus inducing delays beyond direct control. Moreover on technical side the design and interface agreement on diagnostics and enhancements took more time than expected, pushing the tendering of most contracts to the last quarter of 2019, and so the commitment and contract signature to beginning of 2020.

For IFMIF-EVEDA the team, in charge of the definition of technical specifications of some structuring contracts for the maintenance and refurbishment of the system of the LIPAc, spent more time on the accelerator operation than expected. It was also more time consuming to work out the detailed requirements of these contracts, which are mostly based on the operational feedback in order to optimise their efficiency. This resulted in delay of launching the related call for tenders.

Chapter 34 Other expenditure: + 189%

New guidelines for the allocation of expenditures to different budget chapters have been approved in 2018 and the teams have started to implement those guidelines in the following months, after the preparation of the original Budget. In addition, the planning of the activities for engineering, the design support has improved during the months. This appropriation is intended to cover all actions usually defined as “of administrative

nature" meaning implemented through other means than the classical works, supply and service contracts defined in title 5 of the FR of F4E and defined by its scope, directly related to the ITER and BA projects. The following actions are funded against this item:

- Experts/contractors performing the work not directly linked to specific contract or delivery, including the cost to host external experts from services contracts working on F4E site;
- High-level scientific and technological analyses and evaluations carried out on behalf of F4E;
- Miscellaneous expenditure (legal, ICT, logistics, missions, building…), in particular of administrative nature but directly linked to ITER, BA and DEMO.

Chapter 35 ITER construction- appropriations accruing from the Host State contribution: +11%
The appropriations increase for this chapter is due to the carryover from the previous year, allowing the financing of additional actions foreseen in the Work Programme with a balancing on the execution on Chapter 31.

8.5.1.3. Open Commitments at 31 December 2019

The F4E obligations amount to EUR 1 267.63 million at the closure of the 2019 budget.
The total amount of open commitments is decreased by EUR 47.2 million compared to the end of 2018
The total amount left over on open budgetary commitments is detailed in the Fig. 37

(EUR)

2019 budget Heading	Open Commitments at the beginning of 2020				
	from previous year (1)	from 2019 budget (2)	Total (3)=(1)+(2)	To be de-committed (4)	Net Total (5)=(3)-(4)
TITLE 1 - STAFF EXPENDITURE	**0.00**	**1 356 087.63**	**1 356 087.63**	**0.00**	**1 356 087.63**
TITLE 2 - OTHER OPERATING EXPEND.	**0.00**	**3 185 297.32**	**3 185 297.32**	**0.00**	**3 185 297.32**
Total TITLE 1 & 2	**0.00**	**4 541 384.95**	**4 541 384.95**	**0.00**	**4 541 384.95**
CH 31 - ITER CONSTRUCTION INCLUDING ITER SITE PREPARATION	649 758 331.58	252 488 460.25	902 246 791.83	3 551 740.00	**898 695 051.83**
CH 32 - TECHNOLOGY FOR ITER	4 920 117.40	1 454 500.27	6 374 617.67		**6 374 617.67**
CH 33 - TECHNOLOGY FOR BROADER APPROACH AND DEMO	4 938 581.14	2 103 209.21	7 041 790.35		**7 041 790.35**
CH 34 - OTHER EXPENDITURE	2 513 798.04	10 101 850.75	12 615 648.79		**12 615 648.79**
CH 35 - ITER CONSTRUCTION - APPROPRIATIONS ACCRUING FROM THE HOST STATE CONTRIBUTION	199 160 295.59	116 239 703.93	315 399 999.52		**315 399 999.52**
CH 36 - APPROPRIATION ACCRUING FROM THIRD PARTIES TO SPECIFIC ITEM OF EXPENDITURE	2 588 673.07	20 380 008.94	22 968 682.01	2 225.00	**22 966 457.01**
Total TITLE 3	**863 879 796.82**	**402 767 733.35**	**1 266 647 530.17**	**3 553 965.00**	**1 263 093 565.17**
Total	**863 879 796.82**	**407 309 118.30**	**1 271 188 915.12**	**3 553 965.00**	**1 267 634 950.12**

Fig. 37 Open Commitments Carried Forward from 2019 to 2020

Note:
There are no global commitments from the 2019 Budget to be carried over for implementation in individual commitments in 2020, except a small amount to be de-committed on the Chapter 36 (EUR 2 225). An old outdated global commitment amounting to EUR 3.55 million is also to be de-committed.

8.5.1.4. Status of Unused Commitment Appropriations

According to the annuality principle of the F4E FR, 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 F4E FR also foresees the possibility to make the cancelled appropriations available again in future F4E budgets.

The corresponding amounts are as follows:

Commitment appropriation for operational expenditure (EUR)		CH 31-CH 34 Budgets	CH 35/CH 36 Assigned revenue	Total
Amount de-committed/not implemented as of 31/12/2019 (since 2008)	+	751 037 158.26	210 392 529.19	961 429 687.45
Amount budgeted again or carried over (since 2008)	-	374 936 123.33	210 392 529.19	585 328 652.52
Amount available for future budgets	=	376 101 034.93	-	376 101 034.93

Fig. 38 Status of Unused Commitment Appropriations

From 2008 to 2019, the total of de-commitments amounts to EUR 961 429 687.45.

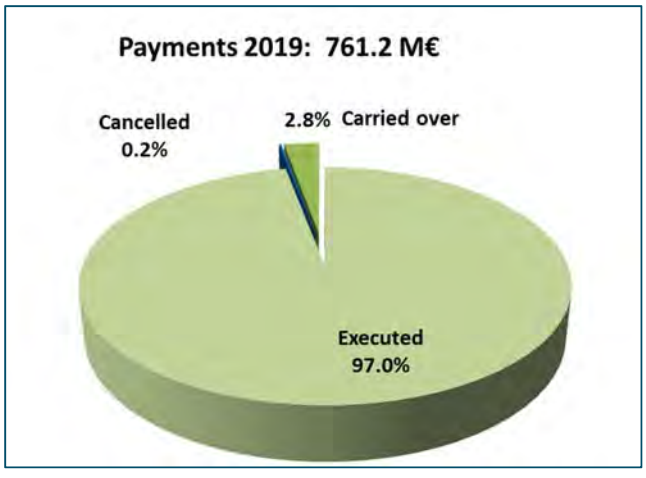
From this amount:

- EUR 210.39 million have been automatically carried over following the external assigned revenue rules,
- EUR 374.94 million have been reintroduced in the subsequent budgets on decision of the GB.

It results in a cumulative amount of unassigned commitment appropriations of EUR 376.10 million, entered in the 2020 F4E budget.

8.5.2. Payment Appropriations

The statement of expenditure was modified in the course of its implementation in accordance with the successive changes in the statement of revenue. Additional adjustments between budgetary chapters were implemented through transfers authorised by the Director, to honour all contractual obligations toward suppliers and to reach the highest possible rate of budget implementation at the year-end.



MEUR	Budget	Cancelled	Carried over	Executed
Payment 2019	761.2	1.4	21.4	738.9

Fig. 39 Final Implementation in Payment Appropriations

Evolution of the Statement of Expenditure in Payment Appropriations (EUR)

Heading of the 2019 Budget	Original budget 12 Dec. 2018 (1)	Amending budget 1 10 July 2019 (2)	Amending budget 2 10 Dec. 2019 (3)	Transfers adopted by F4E Director (4)	Final budget (5)= Σ(1 to 4)	Additional revenue (6)	Carried over from 2018 (7)	Final apprpriations (8)= Σ(5 to 7)	Implementation			
									On B2019 commitments (9)	On B 2018 commitments (10)	Final (11)=(9)+(10)	% (12)= (11/(8)
CH 11 STAFF EXPENDITURE IN THE ESTABLISHMENT PLAN	32 952 832.40			1 352 206.14	34 305 038.54			34 305 038.54	34 305 038.54		34 305 038.54	100.0%
CH 12 EXTERNAL STAFF EXPENDITURE (CA, IS AND SNE)	11 022 500.00			-217 094.65	10 805 405.35		210 271.74	11 015 677.09	10 647 569.40	183 042.86	10 830 612.26	98.3%
CH 13 MISSIONS AND DUTY TRAVEL	450 000.00			440 000.00	890 000.00		1 290 241.59	2 180 241.59	376 957.92	1 058 136.72	1 435 094.64	65.8%
CH 14 MISCELLANEOUS EXPENDITURE ON STAFF RECRUITMENT AND TRANFER	853 000.00			-364 975.78	488 024.22		48 078.70	536 102.92	417 850.34	6 497.06	424 347.40	79.2%
CH 15 REPRESENTATION	10 000.00			-4 000.00	6 000.00		6 364.77	12 364.77	3 972.18	1 138.60	5 110.78	41.3%
CH 16 TRAINING	663 000.00			-67 633.24	595 366.76	2 031.26	217 675.48	815 073.50	307 606.02	162 027.67	469 633.69	57.6%
CH 17 OTHER STAFF MANAGEMENT EXPENDITURE	2 422 000.00			376 508.53	2 798 508.53	3 356.25	355 386.87	3 157 251.65	2 478 648.88	255 050.45	2 733 699.33	86.6%
CH 18 TRAINEESHIPS	151 000.00			25 186.84	176 186.84			176 186.84	176 186.84		176 186.84	100.0%
TITLE 1 - Payment appropriations	48 524 332.40	0.00	0.00	1 540 197.84	50 064 530.24	5 387.51	2 128 019.15	52 197 936.90	48 713 830.12	1 665 893.36	50 379 723.48	96.5%
CH 21 BUILDINGS AND ASSOCIATED COSTS	1 428 000.00			-520 839.68	907 160.32		1 069 085.43	1 976 245.75	884 510.32	501 800.16	1 386 310.48	70.1%
CH 22 INFORMATION AND COMMUNICATION TECHNOLOGIES	3 570 400.00			-4 971.23	3 565 428.77		1 843 564.89	5 408 993.66	1 855 574.45	1 708 494.22	3 564 068.67	65.9%
CH 23 MOVABLE PROPERTY AND ASSOCIATED COSTS	261 000.00			-103 000.00	158 000.00		104 680.22	262 680.22	84 254.49	62 639.11	146 893.60	55.9%
CH 24 EVENTS AND COMMUNICATION	306 000.00			-6 291.83	299 708.17		81 915.85	381 624.02	181 553.00	54 467.09	236 020.09	61.8%
CH 25 OUTSOURCING AND OTHER CURRENT EXPENDITURE	1 244 000.00			5 488.02	1 249 488.02	567.46	379 435.75	1 629 491.23	885 116.75	274 808.78	1 159 925.53	71.2%
CH 26 POSTAGE AND TELECOMMUNICATIONS	391 000.00			-20 400.00	370 600.00		196 285.16	566 885.16	225 092.19	144 986.25	370 078.44	65.3%
CH 27 EXPENDITURE ON FORMAL AND OTHER MEETINGS	355 400.00			98 798.06	454 198.06		148 151.57	602 349.63	192 524.50	138 592.64	331 117.14	55.0%
CH 28 APPROPRIATION ACCRUING FROM THIRD PARTIES TO THE BUILDING REFURBISHMENT EXPENDITURE	p.m.			0.00	0.00			0.00	0.00	0.00	0.00	-
TITLE 2 - Payment appropriations	7 555 800.00	0.00	0.00	-551 216.66	7 004 583.34	567.46	3 823 118.87	10 828 269.67	4 308 625.70	2 885 788.25	7 194 413.95	66.4%
Total TITLE 1 & 2 - Payment	56 080 132.40	0.00	0.00	988 981.18	57 069 113.58	5 954.97	5 951 138.02	63 026 206.57	53 022 455.82	4 551 681.61	57 574 137.43	91.3%

Fig. 40 Evolution of the Administrative Expenditure in Payment Appropriations

Evolution of the Statement of Expenditure in Payment Appropriations (EUR) (cont'd)

Heading of the 2019 Budget	Original budget 12 Dec. 2018 (1)	Amending budget 1 10 July 2019 (2)	Amending budget 2 10 Dec. 2019 (3)	Transfers adopted by F4E Director (4)	Final budget (5)= Σ(1 to 4)	Additional revenue (6)	Carried over from 2018 (7)	Final apprpriations (8)= Σ(5 to 7)	Implementation			
									On B2019 commitments (9)	On B 2018 commitments (10)	Final (11)=(9)+(10)	% (12)= (11/(8)
CH 31 ITER CONSTRUCTION - INCLUDING SITE PREPARATION	563 673 628.23	-3 500 000.00	-56 768 480.10	-6 911 637.93	496 493 510.20	337 824.27	9 854 054.62	506 685 389.09	-	-	506 485 472.61	100.0%
CH 32 TECHNOLOGY FOR ITER	4 200 000.00			2 642 102.19	6 842 102.19			6 842 102.19	-	-	6 842 102.19	100.0%
CH 33 TECHNOLOGY FOR BROADER APPROACH AND DEMO	7 400 000.00			937 082.18	8 337 082.18			8 337 082.18	-	-	8 337 082.18	100.0%
CH 34 OTHER EXPENDITURE	5 000 000.00			2 343 472.38	7 343 472.38	28 932.00		7 372 404.38	-	-	7 372 404.38	100.0%
CH 35 ITER CONSTRUCTION - APPROPRIATIONS ACCRUING FROM THE HOST STATE CONTRIBUTION	145 000 000.00				145 000 000.00		2 198 145.43	147 198 145.43	-	-	147 198 145.43	100.0%
CH 36 APPROPRIATION ACCRUING FROM THIRD PARTIES TO SPECIFIC ITEM OF EXPENDITURE	p.m.				0.00	7 414 844.60	14 311 525.34	21 726 369.94	-	-	5 094 087.85	23.4%
TITLE 3 - Payment appropriations	725 273 628.23	-3 500 000.00	-56 768 480.10	-988 981.18	664 016 166.95	7 781 600.87	26 363 725.39	698 161 493.21	0.00	0.00	681 329 294.64	97.6%
Total BUDGET in Payment Appropriations	781 353 760.63	-3 500 000.00	-56 768 480.10	0.00	721 085 280.53	7 787 555.84	32 314 863.41	761 187 699.78	53 022 455.82	4 551 681.61	738 903 432.07	97.1%

Fig. 41 Evolution of the Operational Expenditure in Payment Appropriations

8.5.2.1. Administrative Expenditure

Due to the non-differentiated nature of the administrative expenditure, the main changes compared to the original budget are identical in commitment and in payment. They are described in section 8.5.1.1.

Nevertheless, the statement of expenditure in payment appropriations includes carry over appropriations from 2018, corresponding to administrative contracts committed but not yet paid at the end of 2018.

The amounts from the 2019 Budget committed but not paid at the end of 2019 are carried over to 2020 budget according to the rule of non-differentiated appropriations.

EUR 910 116.73 of unused payment appropriations in Title 1 and 2 carried from the previous year have been cancelled.

8.5.2.2. Operational Expenditure

97.1% of the available appropriations in payments have been implemented.

EUR 16.83 million are carried over to 2020 Budget according to the rules for assigned revenue.

To be noted, the amount of VAT paid on contracts and not yet reimbursed by Tax Authorities to F4E was 10.96 million at the 31/12/2019, lower than the previous years thanks to all efforts developed during 2019 to shorten this process. This amount was also lower than the automatic carry-over to 2020, having therefore no impact on the final execution of the 2019 budget in payment appropriations

8.5.2.3. Cancelled Payment Appropriations

(EUR)

2019 budget Heading	Unused Appropriations (1)	Carry over to 2020 (2)	Cancelled appropriation (3)=(1)-(2)
TITLE 1	**1 818 213.42**	**1 356 087.63**	**462 125.79**
TITLE 2	**3 633 855.72**	**3 185 864.78**	**447 990.94**
Total TITLE 1 & 2 Payment	**5 452 069.14**	**4 541 952.41**	**910 116.73**
CH 31 - ITER CONSTRUCTION INCLUDING ITER SITE PREPARATION	**199 916.48**	199 916.45	0.03
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	0.00	0.00	0.00
CH 35 - ITER CONSTRUCTION - APPROPRIATIONS ACCRUING FROM THE HOST STATE CONTRIBUTION	0.00	0.00	0.00
CH 36 - APPROPRIATION ACCRUING FROM THIRD PARTIES TO SPECIFIC ITEM OF EXPENDITURE	16 632 282.09	16 632 282.09	0.00
TITLE 3 - Payment	**16 832 198.57**	**16 832 198.54**	**0.03**
Total BUDGET in Payment	**22 284 267.71**	**21 374 150.95**	**910 116.76**

Fig. 42 Cancelled Payment Appropriations

The payment appropriations not used by the 31/12/2019 are cancelled except the amount automatically carried over for non-differentiated appropriations (Title 1 and Title 2) and assigned revenue (B035 and B036), according to the respective rules in the F4E FR.
Due to the almost full implementation of payments at the end of 2019 and the automatic carry over, there are no cancelled appropriations except the amounts not paid in 2019 on open administrative commitments carried over from 2018.

8.5.3. Additional Information on the Final Implementation 2018

8.5.3.1. Final Implementation of the Administrative Expenditure 2018

The definitive execution of the administrative budget 2018 is determined at the end of 2019, when the amounts carried over from the previous year corresponding to administrative actions committed but not yet paid are completed or cancelled. The execution of the payment carried over is shown with the implementation of the statement of expenditure above. The final execution of the 2018 administrative budget is therefore as follows:

(EUR)	Title 1	Title 2	Total
Final 2018 administrative budget in commitment and payment appropriations	48 799 399.02	6 589 960.97	55 389 359.99

Fig. 43 Final Implementation of the Administrative Expenditure 2018

8.5.3.2. Final Implementation of the Global Commitments 2018

For the 2018 only a technical global commitment was left over for the Reserve Fund (EUR 456 186.00) and it has been cancelled in 2019.

8.6. Budget Outturn Account 2019

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 appropriations carried over to the following year.

Budget Outturn Account		2019	2018
REVENUE			
Euratom contribution	+	569 253 760.63	659 910 844.32
ITER Host state contributions	+	145 000 000.00	130 000 000.00
Membership contributions	+	5 512 600.00	4 875 000.00
ITER Reserve Fund	+	7 414 844.60	13 148 645.00
Other revenue	+	1 604 231.14	22 950 406.36
Other non budgeted revenue	+	11 250.00	297 250.65
TOTAL REVENUE (a)		**728 796 686.37**	**831 182 146.33**
EXPENDITURE			
Title I:Staff			
Payments	-	48 713 830.12	47 133 505.66
Appropriations carried over	-	1 356 087.63	2 128 019.15
Title II: Infrastructure Expenditure			
Payments	-	4 308 625.70	3 704 172.72
Appropriations carried over	-	3 185 864.78	3 823 118.87
Title III: Operational Expenditure			
Payments	-	681 329 294.64	760 115 387.18
Appropriations carried over	-	16 832 198.54	26 363 725.39
Total Payments (b)		*734 351 750.46*	*810 953 065.56*
Total Appropriations carried over (c)		*21 374 150.95*	*32 314 863.41*
TOTAL EXPENDITURE (d)=(b)+(c)		**755 725 901.41**	**843 267 928.97**
OUTTURN FOR THE FINANCIAL YEAR (a-d)		**-26 929 215.04**	**-12 085 782.64**
Cancellation of unused payment appropriations carried over from previous year	+	910 116.73	1 064 674.13
Adjustment for carry-over from the previous year of appropriations available at 31.12 arising from assigned revenue	+	26 853 065.07	12 338 033.29
Exchange differences for the year (gain +/loss -)	+/-	-9 792.63	-190.61
BALANCE OF THE OUTTURN ACCOUNT FOR THE FINANCIAL YEAR		**824 174.13**	**1 316 734.17**
Of which Administrative expenditure		**900 324.10**	**1 064 483.52**
Of which Operational expenditure		**-76 149.97**	**252 250.65**

Fig. 44 Budget Outturn 2019

For the 2019 financial year, the balance of the budget outturn amounts to EUR 824 174.13.

8.7. Annexes

8.7.1. Detailed Tables for the Reconciliation of Chapter 4 Miscellaneous Revenue

Origin Year	Budget Chapter	Fund Source	Amount
2019		C1	1 206 654.30
2019		C1	7 500.00
2019		C1	16 875.00
2019		C1	490.60
TOTAL			**1 231 519.90**

Fig. 45 Additional Revenue Budgeted (in Amending Budget 2)

Origin Year	Budget Chapter	Fund Source	Amount
2019	A016	C4	538.72
2019	A016	C4	540.00
2019	A016	C4	719.28
2019	A016	C4	233.26
2019	A017	C4	3 356.25
2018	A025	C4	567.46
2019	B031	C4	3 295.13
2019	B031	C4	2 220.42
2019	B031	C4	132 392.27
2019	B031	C4	199 916.45
2019	B034	C4	20 832.00
2019	B034	C4	8 100.00
2019	No Budget	C1	11 250.00
TOTAL			**383 961.24**

Fig. 46 Recovery Orders Cashed in 2019

Origin Year	Budget Chapter	Fund Source	Amount
2018	CH 21	C5	489 339.68
2018	CH 31	C5	152 676.55
TOTAL			**642 016.23**

Fig. 47 Recovery Orders Cashed in 2018 and Carried over to 2019

Note: The recovery order of 489 339.68 EUR was allocated to the Chapter 21 when cashed at the end of 2018, and moved to Chapter 31 at the beginning of 2019 following further analysis on the nature of the recovery.

8.7.2. Multi-Annual Payment Schedule for the Operational Budget

Year	Commitments	Paid until end of 2013	MFF 2014-2020						Outstanding amount
			Paid 2014	Paid 2015	Paid 2016	Paid 2017	Paid 2018	Paid 2019	
<= 2007	115 445 438.21	113 121 009.41	2 062 547.93	261 880.87	-	-	-	-	-
2008	162 505 480.00	154 330 986.04	8 026 734.12	-	-	-	-	-	147 759.84
2009	295 658 870.68	234 711 366.38	26 549 875.43	13 259 338.45	8 008 925.36	9 541 166.89	1 995 858.00	595 166.88	997 173.29
2010	389 925 510.27	274 537 523.43	34 717 587.59	39 227 964.72	9 607 653.62	15 107 792.58	7 052 706.24	7 271 509.84	2 402 772.25
2011	370 662 303.45	224 611 776.68	29 962 742.34	26 739 952.54	35 305 192.97	42 950 825.08	1 186 051.53	1 003 257.15	8 902 505.16
2012	1 097 796 786.74	227 971 230.12	128 364 796.05	164 239 683.64	189 718 067.75	152 829 836.45	59 686 026.83	30 102 558.63	144 884 587.27
2013	814 550 062.74	67 053 699.98	181 415 330.39	96 759 662.07	124 738 904.24	85 677 718.98	80 349 613.29	14 030 308.08	164 524 825.71
2014	579 016 536.21	-	52 626 681.58	93 676 757.92	116 670 110.66	78 631 340.28	68 952 541.72	42 675 882.86	125 783 221.19
2015	368 778 530.04	-	-	46 616 552.99	123 149 761.09	50 541 171.89	57 643 284.14	39 324 580.84	51 503 179.09
2016	412 989 551.21	-	-	-	58 687 305.83	229 014 259.88	59 591 457.06	55 272 443.55	10 424 084.89
2017	487 297 013.99	-	-	-	-	119 010 491.88	168 993 842.63	65 041 867.40	134 250 812.08
2018	629 409 562.00	-	-	-	-	-	254 664 005.74	158 238 420.21	216 507 136.05
2019	670 541 032.55	-	-	-	-	-	-	267 773 299.20	402 767 733.35
Total	**6 394 576 678.09**	**1 296 337 592.04**	**463 726 295.43**	**480 781 793.20**	**665 885 921.52**	**783 304 603.91**	**760 115 387.18**	**681 329 294.64**	**1 263 095 790.17**

Fig. 48 Multiannual Payment Schedule (Operational)

Notes:

The actions accounted to F4E projects and implemented by the Commission and the CEA before F4E financial autonomy in 2008 are included.

For information, 1 084 commitment positions are open in ABAC on the 31/12/19.

8.7.3. Reconciliation between Budgetary and Accrual Based Accounts

	sign +/-	Amount (EUR)
Economic result (+ for surplus and - for deficit)	**+/-**	**11 982 174.84**
Adjustment 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)	**+/-**	72 976 449.12
Adjustments for Accrual Cut-off (cut- off 31.12.N)	**+/-**	-95 737 200.67
Unpaid invoices at year end but booked in charges (class 6)	**+**	62 557 680.06
Depreciation of intangible and tangible assets	**+**	722 163.80
Provisions (impact of the year)	**+/-**	18 129 222.89
Recovery Orders issued in 2019 in class 7 and not yet cashed	**-**	-5 094 456.80
Prefinancing given in previous year and cleared in the year	**+**	57 689 632.99
Prefinancing received in previous year and cleared in the year	**-**	-350 160.00
Payments made from carry over of payment appropriations	**+**	4 551 681.61
Other : Correction invoices related to assets booked as expenses	**+/-**	-67 976.15
Adjustment for budgetary items (item included in the budgetary result but not in the economic result)		
Asset acquisitions (less unpaid amounts)	**-**	-860 206.94
New pre-financing paid in the year 2019 and remaining open as at 31.12.2019	**-**	-55 722 922.55
New pre-financing received in the year 2019 and remaining open as at 31.12.2019	**+**	824 174.13
Budgetary recovery orders issued before 2019 and cashed in the year	**+**	124 000.00
Budgetary recovery orders issued in 2019 on balance sheet accounts (not 7 or 6 accounts) and cashed	**+**	28 932.00
Payment appropriations carried over to 2020	**-**	-21 374 150.95
Cancellation of unused carried over payment appropppriations from previous year	**+**	910 116.73
Adjustment for carry-over from the previous year of appropriations available at 31.12 arising from assigned revenue	**+**	26 853 065.07
Other : Invoices paid in 2019 but booked in charges in previous years	**+/-**	-77 318 011.82
total		824 207.36
Budgetary result (+ for surplus)	**+/-**	**824 174.13**
Including amount of exchange rate differences		-9 792.63
Delta not explained		33.23

Fig. 49 Reconciliation between Budgetary and Accrual Based Accounts

8.7.4. 2019 Budget Implementation – Details by Fund Source

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

			Commitment			Payment		
Official Budget Item	Budget Line Description	Fund Source	Credit Com Amount (1)	Commitment Accepted Amount (2)	% Committed (2)/(1)	Credit Pay Amount (4)	Payment Accepted Amount (5)	% Paid (5)/(4)
A01100	STAFF EXPENDITURE IN THE ESTABLISHMENT PLAN	C1	34 305 038.54	34 305 038.54	100.00%	34 305 038.54	34 305 038.54	100.00%
A01200	EXTERNAL STAFF EXPENDITURE (CA, SNE, INTERIM STAFF)	C1	10 805 405.35	10 805 405.35	100.00%	10 805 405.35	10 647 569.40	98.54%
A01300	MISSIONS AND DUTY TRAVEL	C1	890 000.00	890 000.00	100.00%	890 000.00	376 957.92	42.35%
A01400	MISCELLANEOUS EXPENDITURE ON STAFF RECRUITMENT	C1	488 024.22	488 024.22	100.00%	488 024.22	417 850.34	85.62%
A01500	REPRESENTATION	C1	6 000.00	6 000.00	100.00%	6 000.00	3 972.18	66.20%
A01600	TRAINING	C1	595 366.76	595 366.76	100.00%	595 366.76	305 574.76	51.33%
A01700	OTHER STAFF MANAGEMENT EXPENDITURE	C1	2 798 508.53	2 798 508.53	100.00%	2 798 508.53	2 475 292.63	88.45%
A01800	TRAINEESHIPS	C1	176 186.84	176 186.84	100.00%	176 186.84	176 186.84	100.00%
Total Title 1			**50 064 530.24**	**50 064 530.24**	**100.00%**	**50 064 530.24**	**48 708 442.61**	**97.29%**
A02100	BUILDINGS AND ASSOCIATED COSTS	C1	1 396 500.00	1 396 500.00	100.00%	1 396 500.00	884 510.32	63.34%
A02200	INFORMATION AND COMMUNICATION TECHNOLOGIES	C1	3 565 428.77	3 565 428.77	100.00%	3 565 428.77	1 855 574.45	52.04%
A02300	MOVABLE PROPERTY AND ASSOCIATED COSTS	C1	158 000.00	158 000.00	100.00%	158 000.00	84 254.49	53.33%
A02400	EVENTS and COMMUNICATION	C1	299 708.17	299 708.17	100.00%	299 708.17	181 553.00	60.58%
A02500	OUTSOURCING AND OTHER CURRENT EXPENDITURE	C1	1 249 488.02	1 249 488.02	100.00%	1 249 488.02	885 116.75	70.84%
A02600	POSTAGE AND TELECOMMUNICATIONS	C1	370 600.00	370 600.00	100.00%	370 600.00	225 092.19	60.74%
A02700	EXPENDITURE ON FORMAL AND OTHER MEETINGS	C1	454 198.06	454 198.06	100.00%	454 198.06	192 524.50	42.39%
Total Title 2			**7 493 923.02**	**7 493 923.02**	**100.00%**	**7 493 923.02**	**4 308 625.70**	**57.49%**

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

(cont'd)

Official Budget Item	Budget Line Description	Fund Source	Commitment			Payment		
			Credit Com Amount (1)	Commitment Accepted Amount (2)	% Committed (2)/(1)	Credit Pay Amount (4)	Payment Accepted Amount (5)	% Paid (5)/(4)
B03100	ITER CONSTRUCTION - INCL. SITE PREPARATION	C1	481 882 091.87	481 815 437.92	99.99%	496 004 170.52	496 004 170.49	100.00%
B03200	TECHNOLOGY FOR ITER	C1	1 471 436.55	1 471 436.55	100.00%	6 842 102.19	6 842 102.19	100.00%
B03300	TECHNOLOGY FOR BROADER APPROACH AND DEMO	C1	4 268 810.49	4 268 810.49	100.00%	8 337 082.18	8 337 082.18	100.00%
B03400	OTHER EXPENDITURE	C1	14 358 642.46	14 358 642.46	100.00%	7 343 472.38	7 343 472.38	100.00%
Total Title 3			**501 980 981.37**	**501 914 327.42**	**99.99%**	**518 526 827.27**	**518 526 827.24**	**100.00%**
Total C1			**559 539 434.63**	**559 472 780.68**	**99.99%**	**576 085 280.53**	**571 543 895.55**	**99.21%**

Fund Source: C4 - Internal assigned revenues (EUR)

Official Budget Item	Budget Line Description	Fund Source	Commitment			Payment		
			Credit Com Amount (1)	Commitment Accepted Amount (2)	% Committed (2)/(1)	Credit Pay Amount (4)	Payment Accepted Amount (5)	% Paid (5)/(4)
A01600	TRAINING	C4	2 031.26	2 031.26	100.00%	2 031.26	2 031.26	100.00%
A01700	OTHER STAFF MANAGEMENT EXPENDITURE	C4	3 356.25	3 356.25	100.00%	3 356.25	3 356.25	100.00%
Total Title 1			**5 387.51**	**5 387.51**	**100.00%**	**5 387.51**	**5 387.51**	**100.00%**
A02500	OUTSOURCING AND OTHER CURRENT EXPENDITURE	C4	567.46	0.00	0.00%	567.46	0.00	0.00%
Total Title 2			**567.46**	**0.00**	**0.00%**	**567.46**	**0.00**	**0.00%**
B03100	ITER CONSTRUCTION - INCL. SITE PREPARATION	C4	337 824.27	137 907.82	40.82%	337 824.27	137 907.82	40.82%
B03400	OTHER EXPENDITURE	C4	28 932.00	28 932.00	100.00%	28 932.00	28 932.00	100.00%
Total Title 3			**366 756.27**	**166 839.82**	**45.49%**	**366 756.27**	**166 839.82**	**45.49%**
Total C4			**372 711.24**	**172 227.33**	**46.21%**	**372 711.24**	**172 227.33**	**46.21%**

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

Official Budget Item	Budget Line Description	Fund Source	Commitment			Payment		
			Credit Com Amount (1)	Commitment Accepted Amount (2)	% Committed (2)/(1)	Credit Pay Amount (4)	Payment Accepted Amount (5)	% Paid (5)/(4)
B03100	ITER CONSTRUCTION - INCL. SITE PREPARATION	C5	642 016.23	642 016.23	100.00%	10 343 394.30	10 343 394.30	100.00%
Total Title 3			**642 016.23**	**642 016.23**	**100.00%**	**10 343 394.30**	**10 343 394.30**	**100.00%**
Total C5			**642 016.23**	**642 016.23**	**100.00%**	**10 343 394.30**	**10 343 394.30**	**100.00%**

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

Official Budget Item	Budget Line Description	Fund Source	Commitment			Payment		
			Credit Com Amount (1)	Commitment Accepted Amount (2)	% Committed (2)/(1)	Credit Pay Amount (4)	Payment Accepted Amount (5)	% Paid (5)/(4)
A01200	EXTERNAL STAFF EXPENDITURE (CA, SNE, INTERIM STAFF)	C8	210 271.74	183 042.86	87.05%	210 271.74	183 042.86	87.05%
A01300	MISSIONS AND DUTY TRAVEL	C8	1 290 241.59	1 058 136.72	82.01%	1 290 241.59	1 058 136.72	82.01%
A01400	MISCELLANEOUS EXPENDITURE ON STAFF RECRUITMENT	C8	48 078.70	6 497.06	13.51%	48 078.70	6 497.06	13.51%
A01500	REPRESENTATION	C8	6 364.77	1 138.60	17.89%	6 364.77	1 138.60	17.89%
A01600	TRAINING	C8	217 675.48	162 027.67	74.44%	217 675.48	162 027.67	74.44%
A01700	OTHER STAFF MANAGEMENT EXPENDITURE	C8	355 386.87	255 050.45	71.77%	355 386.87	255 050.45	71.77%
Total Title 1			**2 128 019.15**	**1 665 893.36**	**78.28%**	**2 128 019.15**	**1 665 893.36**	**78.28%**
A02100	BUILDINGS AND ASSOCIATED COSTS	C8	579 745.75	501 800.16	86.56%	579 745.75	501 800.16	86.56%
A02200	INFORMATION AND COMMUNICATION TECHNOLOGIES	C8	1 843 564.89	1 708 494.22	92.67%	1 843 564.89	1 708 494.22	92.67%
A02300	MOVABLE PROPERTY AND ASSOCIATED COSTS	C8	104 680.22	62 639.11	59.84%	104 680.22	62 639.11	59.84%
A02400	EVENTS and COMMUNICATION	C8	81 915.85	54 467.09	66.49%	81 915.85	54 467.09	66.49%
A02500	OUTSOURCING AND OTHER CURRENT EXPENDITURE	C8	379 435.75	274 808.78	72.43%	379 435.75	274 808.78	72.43%
A02600	POSTAGE AND TELECOMMUNICATIONS	C8	196 285.16	144 986.25	73.87%	196 285.16	144 986.25	73.87%
A02700	EXPENDITURE ON FORMAL AND OTHER MEETINGS	C8	148 151.57	138 592.64	93.55%	148 151.57	138 592.64	93.55%
Total Title 2			**3 333 779.19**	**2 885 788.25**	**86.56%**	**3 333 779.19**	**2 885 788.25**	**86.56%**

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

Official Budget Item	Budget Line Description	Fund Source	Commitment			Payment		
			Credit Com Amount (1)	Commitment Accepted Amount (2)	% Committed (2)/(1)	Credit Pay Amount (4)	Payment Accepted Amount (5)	% Paid (5)/(4)
B03100	ITER CONSTRUCTION - INCL. SITE PREPARATION	C8	1 010 097 174.42	926 136 902.47	91.69%	Payment appropriations under C1 Fund source		
B03200	TECHNOLOGY FOR ITER	C8	13 551 683.24	11 745 283.31	86.67%			
B03300	TECHNOLOGY FOR BROADER APPROACH AND DEMO	C8	11 252 114.99	11 110 062.04	98.74%			
B03400	OTHER EXPENDITURE	C8	6 420 325.75	5 600 478.71	87.23%			
Total Title 3			**1 041 321 298.40**	**954 592 726.53**	**91.67%**			
Total C8			**1 046 783 096.74**	**959 144 408.14**	**91.63%**	**5 461 798.34**	**4 551 681.61**	**83.34%**

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

Official Budget Item	Budget Line Description	Fund Source	Commitment			Payment		
			Credit Com Amount (1)	Commitment Accepted Amount (2)	% Committed (2)/(1)	Credit Pay Amount (4)	Payment Accepted Amount (5)	% Paid (5)/(4)
A02500	OUTSOURCING AND OTHER CURRENT EXPENDITURE	C9	53.36	0.00	0.00%	0.00		0.00%
Total Title 2			**53.36**	**0.00**	**0.00%**	**0.00**	**0.00**	**0.00%**
Total C9			**53.36**	**0.00**	**0.00%**	**0.00**	**0.00**	**0.00%**

Fund Source: R0 - Assigned revenues (EUR)

Official Budget Item	Budget Line Description	Fund Source	Commitment			Payment		
			Credit Com Amount (1)	Commitment Accepted Amount (2)	% Committed (2)/(1)	Credit Pay Amount (4)	Payment Accepted Amount (5)	% Paid (5)/(4)
A02800	APPROPRIATION ACCRUING FROM THIRD PARTIES TO THE BUILDING REFURBISHMENT EXPENDITURE	R0	0.00		0.00%	0.00		0.00%
Total Title 2			**0.00**	**0.00**	**0.00%**	**0.00**	**0.00**	**0.00%**
B3-500	ITER CONSTRUCTION - APPROPRIATION ACCRUING FROM THE ITER HOST STATE CONTRIBUTION	R0	462 598 145.43	462 598 144.95	100.00%	147 198 145.43	147 198 145.43	100.00%
B3-600	APPROPROPRIATION ACCRUING FROM THIRD PARTIES TO SPECIFIC ITEM OF EXPENDITURE	R0	29 399 203.21	28 062 769.86	95.45%	21 726 369.94	5 094 087.85	23.45%
Total Title 3			**491 997 348.64**	**490 660 914.81**	**99.73%**	**168 924 515.37**	**152 292 233.28**	**90.15%**
Total R0			**491 997 348.64**	**490 660 914.81**	**99.73%**	**168 924 515.37**	**152 292 233.28**	**90.15%**

Fig. 50 Budget Implementation – Details by Fund Source

8.7.5. 2019 Establishment Plan

Function group and grade	B 2019			
	Authorised under the EU Budget		Actually filled as of 31/12/2019	
	Permanent posts	Temporary posts	Permanent posts	Temporary posts
AD 16				
AD 15		1		
AD 14	5	2		1
AD 13	14	7	9	6
AD 12	14	21	11	9
AD 11	3	23	5	21
AD 10		28	1	22
AD 9		39	9	55
AD 8	1	37	1	32
AD 7	1	21	1	20
AD 6	2	25	1	26
AD 5		1		
AD TOTAL	40	205	38	192
AST 11	4		1	
AST 10	2			
AST 9	4		3	
AST 8	1	1	2	
AST 7		3		1
AST 6		9	1	5
AST 5		11	2	9
AST 4		3	2	8
AST 3			2	7
AST 2				
AST 1				
AST TOTAL	11	27	13	30
AST/SC TOTAL	0	0	0	0
TOTAL	51	232	51	222
GRAND TOTAL	283		273	

Fig. 51 Establishment Plan

9. Glossary and Abbreviations

ABAC	Accrual Based Accounting (accounting system used by F4E and managed by the EC).
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.
BA	Broader Approach
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/settled within one year of the balance sheet date. (e.g. vendor's payables, etc.).
DI	Direct implementation for tasks requested by IO
EC	European Commission
EPB	Executive Project Board
EU	European Union
External assigned revenues	Dedicated revenue received to finance specific items of expenditure
FR	Financial regulation
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.
GB	Governing Board
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.
NCR	Non conformity Report is a document issued by the supplier, F4E or the Customer detailing a condition that does not comply with a specified requirement.
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.
PCR	Project Change Request
RAL	Commitments resulting in payment appropriations remaining to be paid.
TB	Tender Batches
WP	Annual Work Programme