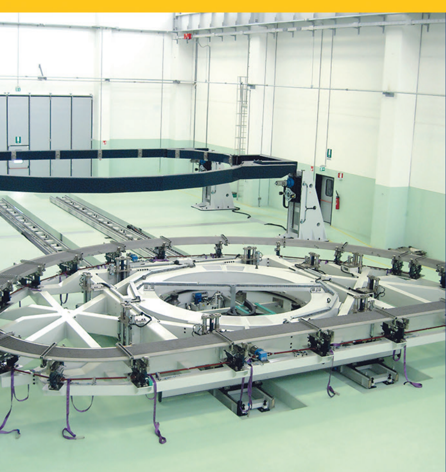
FUSION
FOR
ENERGY

ANNUAL REPORT **2013**



FUSION FOR ENERGY

Annual Report 2013

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Foreword by the Chair of the Governing Board

Fusion is the process that powers the sun and stars. Light atoms, such as hydrogen, are fused together to make heavier ones, such as helium. During fusion a small amount of mass is turned into energy, in accordance with Einstein's famous $E = mc^2$ equation. The fuels needed for fusion are widely available on the Earth and virtually inexhaustible with no greenhouse gas emissions or long-lasting radioactive waste. Furthermore, fusion reactors will be intrinsically safe. With the increasing global demand for clean and reliable energy, fusion can make a major contribution to a diverse, sustainable and secure energy supply system in a few decades from now.

However, making fusion happen is very challenging. In order for the atoms to fuse, they have to be heated to 150 million degrees and held together long enough for them to react. Since the 1950s Europe has been leading a worldwide research effort and good progress has been made, in particular, by using magnets to "hold" the hot gas in a doughnut shaped chamber. Using the JET facility at Culham in the UK, scientists and engineers have been able to demonstrate significant power production from fusion and were able to come close to the breakeven point, albeit only for a few seconds.

Consequently Europe together with China, India, Japan, Korea, Russia, United States decided in 2006 to embark on the construction of the largest fusion experiment ever, called ITER, which will be able to demonstrate the potential for commercial adoption of fusion as a power source. ITER is now being built in Cadarache in the south of France. Europe is providing about half of the components and this is the responsibility of the European Joint Undertaking for ITER and the Development of Fusion Energy (F4E).

At the ITER site, there has been significant progress during 2013. An important milestone for the project has been the commencement of the construction of the foundations of the main building housing the experiment. The Tokamak Complex will dominate the ITER site when it is completed in 2016. The building will be 80 metres tall, 120 metres long and 80 metres wide and requires 16,000 tons of rebar, 150,000 m^3 of concrete and 7,500 tons of steel for the building structures. Keeping the construction on schedule is very challenging, not only due to actual construction work, but also because the IO has had to complete the final design of the whole complex before construction could commence.

Steady progress has been made by F4E in the development of ITER components and one of the highlights of 2013 is the completion of a full sized prototype of a section of one of the main ITER magnets. In other areas under F4E's responsibility (the vacuum vessel, in-vessel systems, fuel cycle systems, plasma heating systems, diagnostics and test blanket modules), this Annual Report testifies to good progress. More and more F4E is moving from preparatory activities, such as prototyping and qualification, to manufacture and industrial fabrication. Other visible signs of progress during 2013 include the successful completion of the first test convoy from the port near Marseilles to the ITER site. A test load of 800 tonnes carried by a 352-wheeled transporter travelled the 104 km route over four nights.

In January 2013 the ITER Headquarters building was inaugurated by Günther Oettinger, EU Commissioner for Energy, and Geneviève Fioraso, French Minister of Higher Education and Research who both expressed their strong support for the project. The building now houses all the ITER staff working on the project as well as hosting the regular meetings of the ITER Council and numerous other meetings managing all the various elements of the project.

Europe has budgeted Eur6.6 billion (in 2008 values) for its contribution to ITER until 2020 of which approximately EUR 4 billion is earmarked for the contracts and grants that are required to be placed by F4E with industries, SMEs and research laboratories for ITER construction. I am pleased to note that by the end of 2013 F4E had placed almost 600 such contracts and grants with organisations located in over 20 European countries with a value exceeding Eur2.5 billion.

Recognising the importance of fostering industrial participation, during 2013 the Governing Board of F4E reviewed and strengthened its policy towards industry and intellectual property rights. At the same time, F4E engaged in a dialogue with industry and identified ways to provide a more equitable basis for the collaboration. These measures have been positively received by industry and will help enhance competition and thus constrain costs.

Over the ITER Project as a whole, it is disappointing that progress continues to be fall below expectations. The ITER Council, at which the European Commission represents Europe, met three times in 2013, once at ministerial level, and it underlined the importance that the IO and seven Domestic Agencies (DAs), including F4E, work together to recover delays in the schedule and seek cost savings wherever possible. The Council also considered the outcome of the outcome of a management assessment of the IO.

The collaboration between Europe and Japan known as the "Broader Approach" is proceeding well. One of the main achievements in 2013 was the commencement of the construction of the Satellite Tokamak experiment in Japan which used a number of key components being provided by Europe including the magnets. The "Helios" supercomputer, located in Rokkasho, has been used extensively by European and Japanese scientists to undertake sophisticated simulations of fusion plasmas. Finally, good progress has been made with the manufacture and testing of the injector for the LIPAc accelerator which was shipped to Japan in 2013.

F4E's Governing Board met on two occasions during 2013. Aside from the initiatives in relation to industry mentioned earlier, the Board endorsed an action plan to enhance the collaborations between F4E and the European fusion laboratories. Another major activity of the Board was to approve a package of amendments to F4E's founding statutes. This allowed not only for Croatia to be welcomed as the 30th member of F4E, but also to implement a number of improvements to the governance of the organisation which I hope will be agreed upon by the Council in 2014.

Given the prevailing economic climate in Europe, the Governing Board has continued to pay very close attention to the budget for the European contribution to the project and has encouraged F4E to pursue with vigour all cost containment actions which are under its direct control as well as to refine and update its cost estimates. A number of measures were taken to implement reductions in the scope of F4E's activity without jeopardizing its international commitments under the ITER and Broader Approach agreements.

2013 has been a year of considerable change at F4E and in the New Year I was very pleased to welcome Henrik Bindslev as the third Director of F4E following the retirement of Frank Briscoe. Professor Bindslev brings considerable experience in the management of energy research to F4E, including ten years at JET, the flagship European fusion experiment. He was Vice Dean for Research in the Faculty of Science and Technology at Aarhus University, Denmark and previously had been the Director of Risø DTU, the Danish National Laboratory for Sustainable Energy.

I would like to conclude by thanking the members of the Governing Board for their advice and encouragement throughout the year as well as the members of the subsidiary bodies of the Board: the Bureau, Administration and Finance Committee (AFC), the Executive Committee (ExCo), Technical Advisory Panel (TAP) and Audit Committee (AC). In particular, I would like to thank Lisbeth Grønberg, Cor Katerberg, Joaquín Sánchez and Beatrix Vierkorn-Rudolph for chairing these bodies.

I would also like to acknowledge the collaboration and support that I continue to receive from the European Commission, in particular from the Director-General for Research and Innovation, Robert-Jan Smits, and András Siegler, the Director of Energy responsible for ITER and F4E matters and the staff in their services.

Last but not least, it is clear that none of the achievements set out in this Annual Report would have been possible without the skill, dedication and professionalism of its staff and management. On behalf of the Board, I would like to offer them our warm support and thanks for their continued work on this challenging project.

Mr Stuart Ward
Chair of the F4E Governing Board
25 May 2014

HENRIK BINDSLEV **DIRECTOR OF FUSION FOR ENERGY**

Foreword by the Director of F4E

Over the past year Fusion for Energy (F4E) has made steady progress in delivering Europe's contributions to the international ITER and Broader Approach fusion energy projects as testified by this Annual Report. Important milestones have been achieved in important areas notably the fabrication of ITER magnet prototypes and start of construction of the Satellite Tokamak in Japan. F4E has implemented a new industrial policy, strengthened its collaboration with industries and fusion laboratories and enhanced its internal capacity and efficiency. However, the ITER project as a whole continues to be confronted by many challenges, not least the containment of cost and the minimisation of schedule delays. Measures need to be taken at all levels to improve the efficiency of the project.

At the ITER construction site at Cadarache, though slower than planned, there has been much progress in 2013. Three major tendering procedures, each entailing complex and lengthy negotiations, were brought to successful conclusions during 2013. One of these, with a Franco-German consortium of industries for around EUR 500 million to install the infrastructure services required for the tokamak and other buildings, was the largest contract signed by F4E to date. The major contracts for buildings have now been signed and work may progress apace. During the year around 500 staff worked on the ITER construction site and I am pleased to report that the health and safety indicators remain well within the standards expected for French civil engineering works. More time than anticipated was required to obtaining final requirements and approval of designs for the buildings which delayed the commencement of the civil work for the Tokamak complex of building. I am pleased to report that F4E and the IO are taking steps to improve the situation.

In addition to providing all the 39 buildings required at the ITER site, F4E is developing many of the most important components and systems of ITER. A few examples are given in the following paragraphs with more detail in the body of this report. The activities including development, design, prototyping and industrial fabrication, with the systems needed first being in or near the stage of fabrication.

For ITER's superconducting magnets, significant progress was made last year. Over 80 tons of Nb3Sn superconducting strand was produced and for the toroidal field coils the first full size section (known as a "double pancake") has been successfully produced and testing completed paving the way for series production. For the poloidal field coils a contract was started with an engineering integrator that will define and drive the manufacturing process and will assist F4E in the management of individual contracts.

The contract for the fabrication of seven of the nine sectors of the vacuum vessel was signed in late 2010. It was originally planned that the design of the vacuum vessel would be available before that signature.

The IO made most of the designs available summer 2012 with some design modifications in 2013. With the designs now largely frozen, important progress could be made in 2013, such as in activities to validate the precision forming and deep welding of the 60 mm thick stainless steel shell used for the sectors of the doughnut-shaped vessel.

For the first wall panels, which protect the inside of the vacuum vessel from coming into contact with plasma, the first prototypes were successfully manufactured and several procurement contracts signed, including for the design and construction of a new facility for testing the panels under high heat loads.

The construction of the building for the Neutral Beam Test Facility (NBTF) hosted by Consorzio-RFX in Padova progressed well and is almost ready for equipment. The first experiments were carried out with the ELISE facility in Germany, the world's largest test setup for the negative ion source which is a key component of the neutral beam system.

In relation to diagnostics, F4E made progress in several areas notably for systems which will measure the magnetic fields inside ITER which are needed from day one of ITER's operation. The first design review under F4E's responsibility was also successfully completed. Two framework partnership agreements were signed for systems that measure the temperature of the first wall panels inside ITER and the power radiated from the plasma. Activities in support of the ITER diagnostics are now spread over 14 fusion laboratories in eight EU countries.

For the design and development of the test blanket modules, essential for development of the strategically important technology for breeding tritium, four contracts for engineering services and two grants for R&D were signed.

Many of the ITER components being made in factories around the world are large and heavy. To transport them to ITER, France has adapted a special 104 kilometre-long route (widening roads, roundabouts and reinforcing bridges) from the port at Étang de Berre, and the site near Cadarache. In September 2013 the route was tested for the first time by a 800 tonnes test convoy. The whole operation was successfully completed and paves the way for the first deliveries of real ITER components in 2014.

In total, seven procurement arrangements were signed with the IO in 2013 meaning that agreement was reached on the provision of more than 90 % (by value) of all the components under Europe's responsibility.

To deliver upon its commitments, in 2013 F4E awarded 45 operational contracts and 11 grants to industries, laboratories and other organisations for a total value of almost EUR 850 million bringing the total value of contracts and grants awarded to EUR 2.5 billion out of the approximately EUR 4 billion budgeted. At the same time, 52 new procurement or grant procedures were launched. While the focus of F4E's daily work moves increasingly towards the supervision of running contracts, it is clear the management of procurement and grant award procedures remains an important activity with a significant workload.

Moving to the Broader Approach (BA), the Satellite Tokamak project made good progress in 2013 with the delivery of the first European component to Japan (the cryostat base provided by Spain/CIEMAT), and the start of tokamak construction. A setback occurred due to problems with the properties of the steel plates for the casings of the toroidal field coils and an emergency action was necessary to procure more material. Efforts were made during 2013 to recover other delays which had accumulated with the manufacturing of the toroidal field coils and this is bearing fruit.

For the BA IFMIF/EVEDA project, the main milestone has been the delivery of the components of the LIPAc injector to Japan which is being assembled. Other highlights include the commissioning of the high power RF modules whose performance exceeded expectations. The BA IFERC project progressed well and the Helios supercomputer entered its second year of operation and has allowed for many fusion simulation projects to be completed. R&D work on materials for DEMO and the Remote Experimentation Centre proceeded according to plan.

Cost containment continues to be a major priority for F4E and in the first half of 2013 a thorough revision of the entire cost estimation was conducted by F4E. This exercise showed that F4E is facing a potential budget shortfall by 2020 principally due to increased scope in relation to the ITER buildings. To ensure that the capped budget is respected, F4E continues to develop and implement a broad range of cost containment measures including optimising procurement strategies and contractual conditions to reduce costs, and in cooperation with the IO optimising designs for cost containment.

The schedule for ITER construction, which is now widely considered to be over-optimistic, is being revised at the request of the ITER Council. During 2013 F4E has been working closely with the IO to review and adjust the schedules for work under F4E's responsibility to ensure that they are realistic and commensurate with the available human resources.

During 2013 F4E engaged with its stakeholders in industry and a number of working groups were established and have resulted in valuable improvements in the policies and principles for such cooperation, and improved mutual understanding. In parallel with the adoption by F4E's Governing Board of policies for industry and intellectual property rights, a number of new measures to foster industrial participation in ITER work are being implemented. Similarly, F4E has been pursuing ways to strengthen cooperation with European fusion laboratories and identify more effective ways of working together.

In relation to F4E's internal functioning, there has been further rationalisation in the organizational structure during 2013 and increased levels of delegation and responsibilities to the senior and middle management. In parallel all processes, procedures, templates and model contracts are being described, simplified and standardised, and a paperless workflow is being developed. A monitoring and control strategy has been developed and implemented and integrated project management and reporting systems are now extensively used. Much effort continued to been devoted to respond to the recommendations from internal and external audits.

By the end of 2013 F4E implemented a budget of EUR 1,016.65 million in commitment appropriations and EUR 431.61 million in payment appropriations. While the former was close to that foreseen at the beginning of 2013, the latter was reduced by almost EUR 250 million due to the fact that some contracts were not implemented on the timescale originally envisioned. At the same time F4E has continued to recruit personnel throughout 2013 and by the end of the year there were almost 380 staff in post and the vacancy rate continued to fall.

I have appreciated the effective cooperation between F4E and the European Commission for which I would like to thank the Director-General for Research and Innovation and European Representative at the ITER Council, Mr Robert-Jan Smits and the dedicated staff in his service, in particular, András Siegler, the Director of Energy responsible for ITER and F4E matters.

I would also like thank Mr Stuart Ward, Chair of the F4E Governing Board, the Governing Board members as well as the Chairs and members of the Governing Board's subsidiary bodies for the confidence they have placed in me. I would like to conclude by expressing my appreciation for the F4E managers and staff whose professionalism and dedication has enabled impressive progress to be made in the face of many technical, administrative, organisational and political challenges.

Professor Henrik Bindslev
Director of Fusion for Energy (from 1 January 2013)
8 May 2014

Chapter 1

Introduction

Introduction

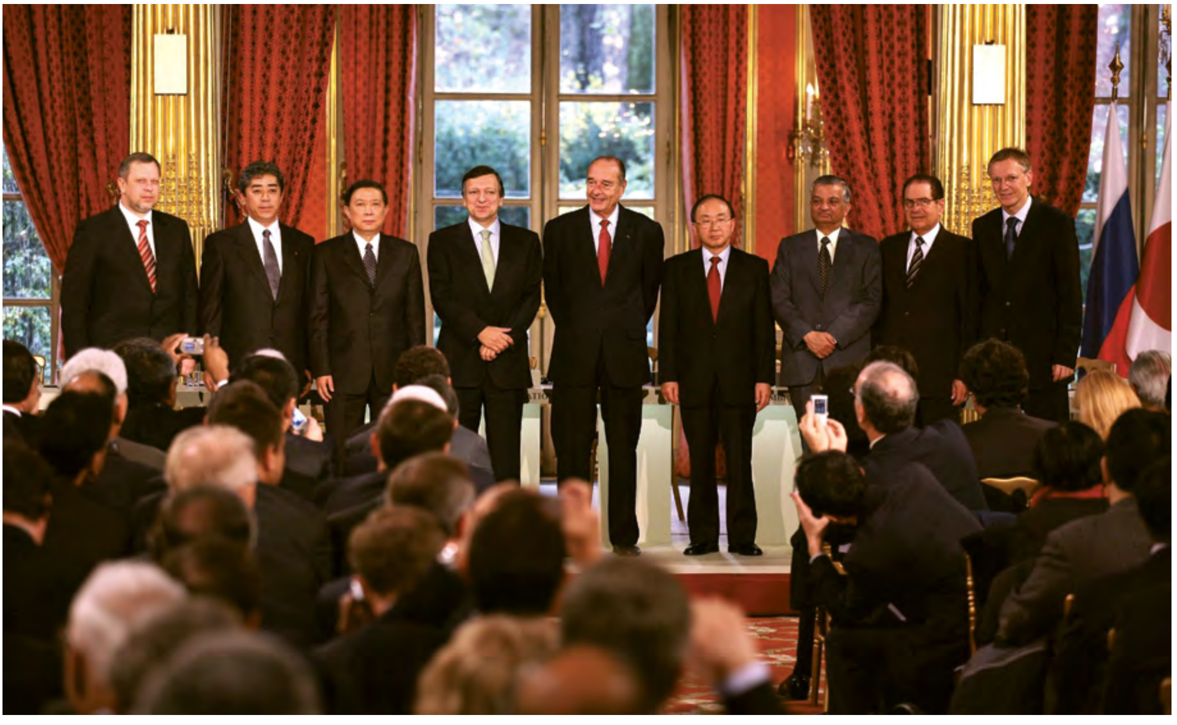
In face of the increasing global demand for energy and the economic, political and environmental risks of using fossil fuels, energy produced by fusion has the potential to make a major contribution to a diverse, sustainable and secure energy supply system in a few decades from now.

To advance fusion energy research close to the point at which the first demonstration commercial reactor could be constructed, Europe has entered into two international agreements:

- Agreement for the Establishment of the ITER International Fusion Energy Organization (the ITER Organization) for the Joint Implementation of the ITER Project (with China, Korea, India, Japan, the Russian Federation and the USA);

- Agreement for the Joint Implementation of the Broader Approach Activities in the Field of Fusion Energy Research (with Japan).

The European Joint Undertaking for ITER and the Development of Fusion Energy or Fusion for Energy (F4E) has been set up to provide Europe's contribution to these two projects and, in the long term, to prepare for the construction of a demonstration fusion reactor and material test facilities.



The signing of the ITER Agreement on 21 November 2006 at the Élysée Palace in Paris. Present are French President Jacques Chirac, European Commission President José Manuel Barroso and some 400 invited guests including high-level representatives from the ITER Parties and European Member States (courtesy of ITER Organization)

What is Fusion?

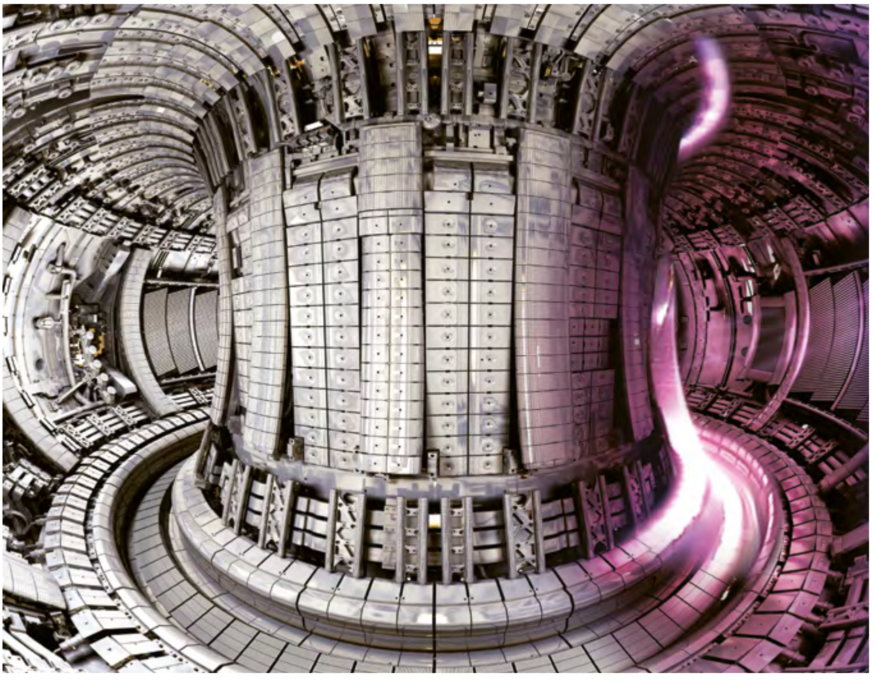
Fusion is the process that powers the sun and other stars and makes life on Earth possible. As the name suggests, the process involves fusing together light atoms to make heavier ones and occurs at the extreme pressures and temperatures caused by the gravity in the sun. During fusion reactions a small amount of mass is converted into energy, in accordance with Einstein's well-known $E = mc^2$ equation.

To make fusion happen on earth, several approaches have been explored. One of these involves heating a gas to very high temperatures (100-150 million degrees centigrade) so that it becomes a plasma which can conduct electricity. Magnetic fields can then be used to contain this plasma long enough for fusion to occur.

In fusion experiments, the magnetic confinement of the hot plasma is achieved using a doughnut-shaped vessel with magnetic coils. Since the 1950s scientists and engineers from all over the world have been carrying out research to assess the most promising approach and the tokamak configuration has emerged as a leading contender.

The merits of fusion include the abundance of the basic fuels (deuterium and lithium), the absence of greenhouse gas emissions, a very low impact on the environment with no long-lasting radioactive waste and finally the inherent safety of fusion reactors, where no meltdown or runaway reactions are possible.

Europe is at the forefront of fusion research, largely due to the integration of national fusion programmes into a single co-ordinated Euratom fusion research programme, including the construction and operation of the Joint European Torus (JET), the world's leading fusion device now under the umbrella of the European Fusion Development Agreement (EFDA).



Inside JET's doughnut shaped vacuum vessel, plasmas (overlaid image) are confined using magnetic fields and heating to enormous temperatures to create fusion reactions (courtesy of EFDA-JET)

What is ITER?

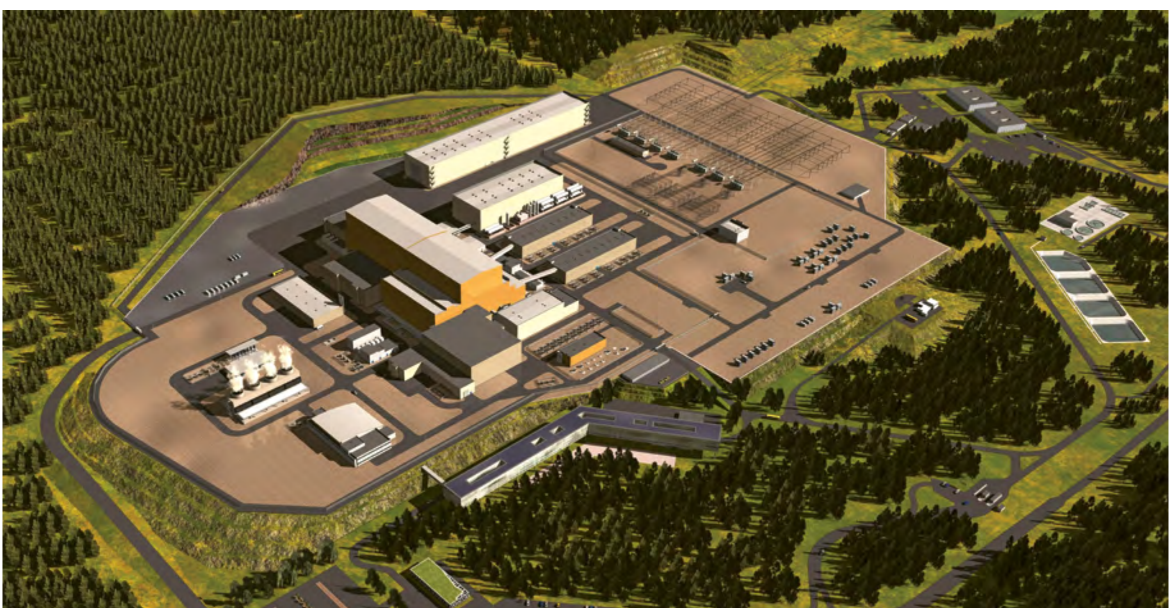
While JET and other tokamak experiments have succeeded in producing significant amounts of fusion power for short periods, none so far are capable of demonstrating fusion on a scale that would be needed for a reactor and a number of technologies that are needed to allow it to generate part of its own fuel and produce power on a more continuous basis.

ITER – “the way” in Latin - is the next major project in tokamak fusion research and is about twice as large as any existing fusion experiment today. Its objective is “to demonstrate the scientific and technological feasibility of fusion energy” and is being constructed at Cadarache in the south of France.

With seven parties participating in the project (the European Union including Switzerland, Japan, China, Korea, the Russian Federation, India, and the USA), ITER is one of the largest international scientific projects of its kind and brings together countries representing over one half of the world’s population.

ITER aims to produce a significant amount of fusion power (500MW) for about seven minutes, or 300MW for 50 minutes. For the first time it will be possible for scientists to study a “burning” plasma – this is when the plasma is mostly heated by fusion reactions rather than by externally applied heating. It will also demonstrate many of the key technologies needed for future fusion reactors.

The IO is responsible for the construction, operation, exploitation and decommissioning of the ITER device. The Director General of the IO is appointed by the ITER Council which also supervises the overall activities of the IO. The European Commission represents Europe (Euratom) on the ITER Council.



An artistic impression of what the 180 hectare ITER site will look like once it is constructed. The yellow building which houses the fusion reactor rises 60m above ground level (courtesy of the ITER Organization)

What is the Broader Approach?

In February 2007, Europe and Japan signed the Broader Approach agreement. This aims to complement the ITER project and to accelerate the realisation of fusion energy by carrying out R&D and developing some advanced technologies for future demonstration fusion power reactors (DEMO). Under the umbrella of the Broader Approach agreement, three projects are being implemented in Japan:

- Producing a preliminary engineering design of the International Fusion Materials Irradiation Facility (IFMIF) with validation of the prototypes for the key subsystems – this facility is needed to test materials under the harsh conditions expected inside fusion power plants. This will allow the materials to be optimised so as to minimise their long term radioactivity and retain their structural properties. This work is being carried out at Rokkasho in Japan.

- Constructing and operating a Satellite Tokamak (also known as JT60-SA) – this is a smaller version of the ITER project which will serve as a test bed to prepare for operating ITER and carry out research for future demonstration reactors. The project is being carried out by upgrading an existing fusion experiment located in Naka, Japan, in particular by using superconducting magnets.

- Establishing the International Fusion Energy Research Centre (IFERC) with the purpose of coordinating a programme of design and R&D activities for future demonstration reactors. Using a new supercomputer it is intended that large-scale simulation experiments on fusion plasmas will be carried out. Activities to develop remote experimentation techniques will also be performed. This work is being carried out at Rokkasho in Japan.

To develop synergy with its activities related to ITER, it was decided that F4E should also be the Implementing Agency of Euratom for the Broader Approach. The resources for the implementation of the Broader Approach will be largely provided by several participating European countries (Belgium, France, Germany, Italy, Spain and Switzerland).

CEA-F4E CSC team standing between a section of the "Helios" supercomputer: from left to right, Jacques David, François Robin, Jacques Noé (CEA) and Susana Clement Lorenzo (F4E).

Fusion for Energy's Role

ITER Procurement Sharing

ITER is being constructed at Cadarache in the south of France. Europe, as the host party, and France, as the host state, have special responsibilities for the success of the project. Europe supports 45% of the construction cost and 34% of the cost of operation, deactivation and decommissioning of the facility as well as preparing the site.

Around 90% of the ITER project is built by in-kind contributions. To this end the components that make up ITER have been divided into 85 procurement "packages" which are distributed among the seven parties to the ITER Agreement to achieve the agreed level of contribution from each of them.

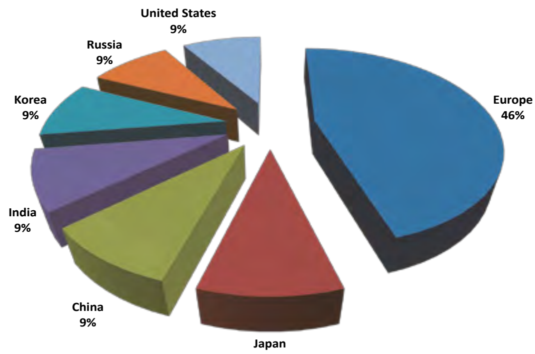
F4E is the European Domestic Agency (DA) for ITER and provides, on behalf of Europe, components to ITER that amount to five-elevenths (see pie chart) of the overall value of the project.

How we operate

F4E provides the EU's direct financial contribution to ITER's own running costs and the in-kind contributions of components. The typical process for providing in-kind contributions to ITER is as follows:

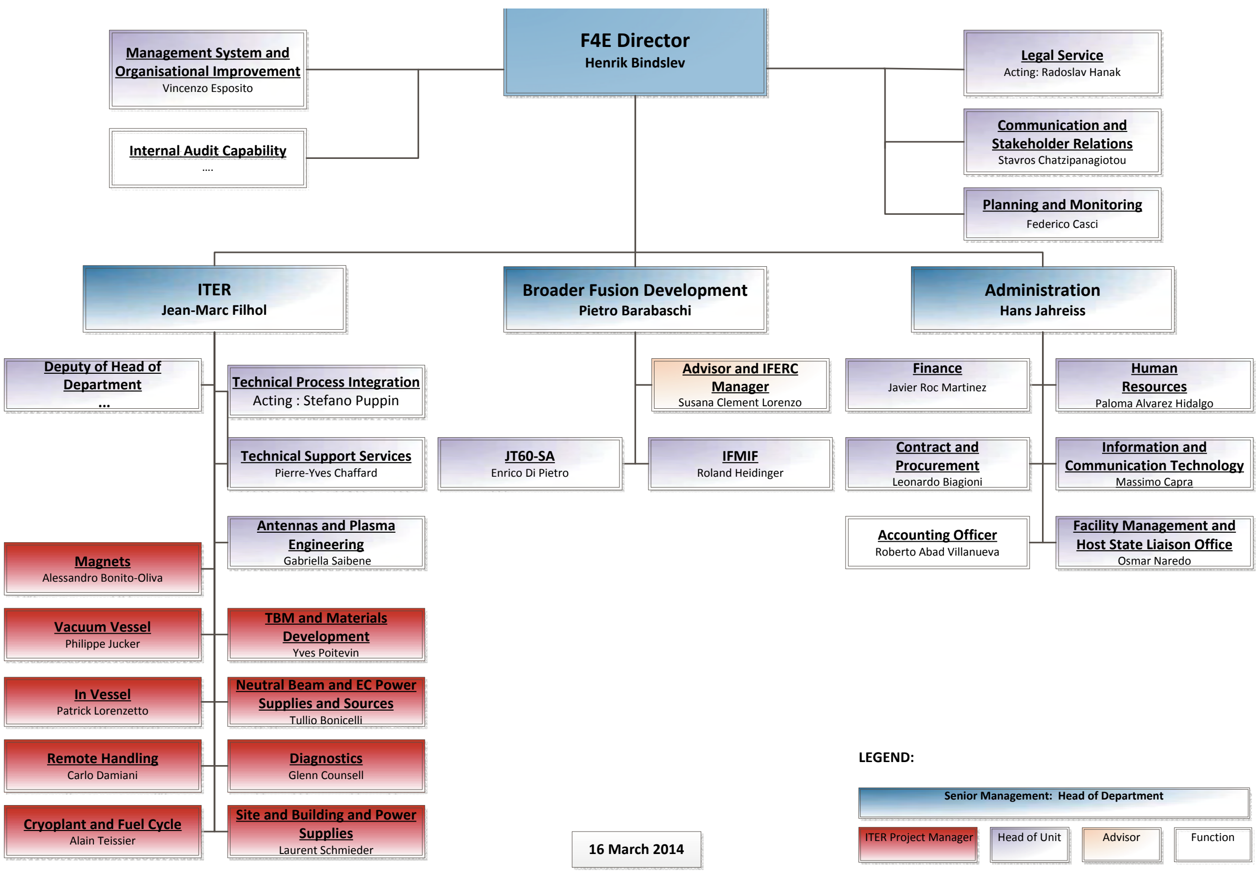
- If there is research, design, prototyping or other preparatory work to be done before an ITER component can be manufactured, ITER may issue a request known as an ITER task agreement (ITA) to DAs (including F4E) to do the work.
- On the basis of the specifications in the ITA, F4E contracts out work (usually to European fusion laboratories) using grants which support a proportion (usually around 40%) of the costs to carry out the work.
- Assuming the work is completed in accordance with the ITA and to the satisfaction of the ITER Organization, F4E will be awarded a certain amount of ITER credit in recognition of the contribution that has been provided.
- Once the design of a component is sufficiently mature, an agreement called a procurement arrangement is usually concluded between F4E and the ITER Organization setting out what has to be provided and by when.
- On the basis of the specifications in the procurement arrangement, F4E starts a procurement procedure for industries in Europe, and sometimes also outside, to competitively bid for the work. F4E contracts with the tenderer that provides the best offer in terms of quality and/or price.
- Assuming the component is fabricated in accordance with the procurement arrangement and to the satisfaction of the ITER Organization, F4E will be awarded a certain amount of ITER credit in recognition of the contribution that has been provided.

In the case of the Broader Approach, the contributions to the projects are mainly provided on a voluntary basis by some EU Member States and Switzerland. Nevertheless, F4E concludes procurement arrangements with Japan and at the same time agreements of collaboration to specify what is to be provided and by when. F4E has also supported design activities, in particular, for the Satellite Tokamak.



Sharing of the contributions to ITER by each of the ITER Parties

Our Organisation



Our Management Team

Henrik Bindslev

Henrik Bindslev, a Danish national, has been Director of F4E since 1 January 2013. A physicist with a DPhil in Plasma Physics, Professor Bindslev has been engaged in energy research for more than 20 years with experience in research management, both in Denmark and internationally. Before taking up the post as Director of F4E, Professor Bindslev was Vice Dean for research at Aarhus University, Faculty of Science and Technology and past Chair of the European Energy Research Alliance (EERA). Previously, he was the Director of Risø DTU, the Danish National Laboratory for Sustainable Energy.

Jean-Marc Filhol

Jean-Marc Filhol, a French national, has been Head of F4E's ITER Department since 1 August 2011. An engineer with a PhD in nuclear instrumentation, Dr Filhol has spent the major part of his career in the field of particle accelerators. He was most recently Director of the Accelerators and Sources Division as well as Deputy Director General at SOLEIL, a third generation synchrotron radiation facility built near Paris, France.

Hans Jahreiss

Hans Jahreiss, a German national, has been Head of F4E's Administration Department since 1 July 2011. With a Doctorate in Law and Assessor Juris, Dr Jahreiss was most recently the Administrative Director of Eurojust, the European Union's judicial cooperation body. Before that, he was the Head of Administration at the European Organisation for Astronomical Research in the Southern Hemisphere (ESO) in Garching and Santiago de Chile.

Pietro Barabaschi

Pietro Barabaschi, an Italian national, has been Head of the Broader Fusion Development Department at Garching since 2008 and European Project Manager for the JT-60SA Project. An electrical engineer, Dr Barabaschi started his career at the JET Project. Later, in 1992, he joined the ITER Joint Central Team, San Diego Joint Work Site and by 2006 he was the Deputy to the Project Leader as well as Head of the Design Integration Division of the ITER International Team at the Garching Joint Work Site.

Chapter 2

Our Achievements

ITER

Introduction

All F4E activities in 2013 were carried out according to the approved work programme 2013 and the amendments adopted by the Governing Board.

In 2013 F4E took into account in its detailed work schedules (DWS) the progress of the work and the delays accumulated during the execution of the contracts. The DWS is submitted on a monthly basis to the ITER Organization (IO) and it is then integrated with the schedules transmitted by the other Domestic Agencies (DA). The progress of the project is measured through agreed milestones and it is reviewed at monthly meetings.

Based on the evolution of the project, negotiations are being carried out with the IO and all DAs to identify both de-scoping and deferrals of in-kind procurements during the operation phase. Cost containment and cost reduction measures are also the topic of on-going discussions inside F4E and with the ITER Project partners.

In 2013 F4E signed a significant number of procurement arrangements (PAs) and contracts (see annexes). A total value of 45 kIUAs (approximately EUR 75 million) was signed in 2013. The integrated value of the PAs signed by the end of the year reached 940 kIUAs, over 90% of the total foreseen for the European in-kind contributions to ITER.

The main contracts for ITER work were as follows:

- Buildings (Tender Batch (TB) 07) – Contract for design and construction of Buildings 67, 68, 69;
- Buildings (TB04) – Contract for completion and installation of HVAC, electrical and fluid network and handling equipment for buildings 11-17,51-53,61;
- Buildings (TB05) – Contract for the design and construction of buildings 32, 33 and 38;
- Contract for the Poloidal Field Magnet Coils engineering integrator;
- Procurement for Fabrication of Divertor Cassette Body prototypes;
- Procurement of Water Detritiation System Tanks including support to the IO for installation;
- Liquid Nitrogen Plant and Auxiliary Systems: Contract for design, manufacturing, on-site delivery and supervision of installation and test;
- Gyrotron HV Power supplies: Contract for design, fabrication, on-site installation and commissioning.

A number of other contracts and grants were launched in 2013, with the aim of signing them in 2014.

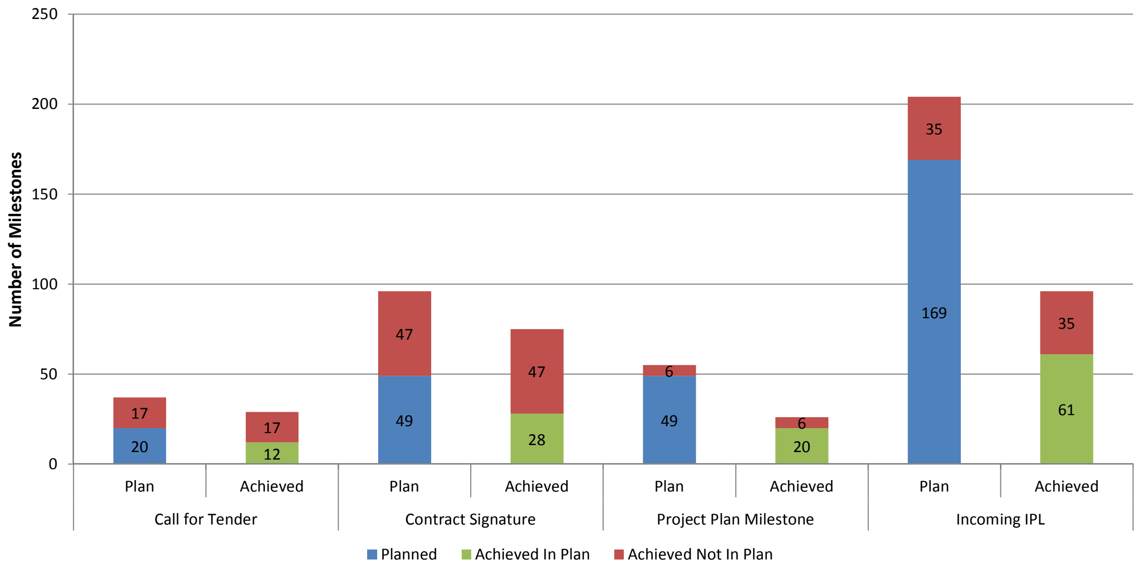
Significant progress was achieved in the on-going contracts for manufacturing the toroidal field coil winding packs and the vacuum vessel as testified in the following sections of this report.

Works on the Tokamak Building progressed well: the foundation of the Assembly Hall was completed in October 2013, and the underground networks and galleries around the Tokamak building complex and the Contractors Area were finished. In addition, the pouring of the first batch of concrete for the Tokamak complex slab began – an important milestone.

The test convoy of 800 tonnes for the validation of the ITER itinerary covered successfully the 104km between Port de la Pointe and Cadarache in four nights, demonstrating that the itinerary is ready to be used for the transportation of the very heavy and large ITER components.

Key Performance Indicators

To quantitatively assess the progress made by F4E, a number of key performance indicators (KPIs) are used: PAs, calls for tender, contract signatures, project plan milestones and incoming inter-project links (IPLs). Note that IPLs are milestones for the receipt by F4E of components, designs or other approvals from the IO or other Domestic Agencies (DAs). A comparison of the planned and achieved milestones by the end of 2013 for the above KPIs is shown below.

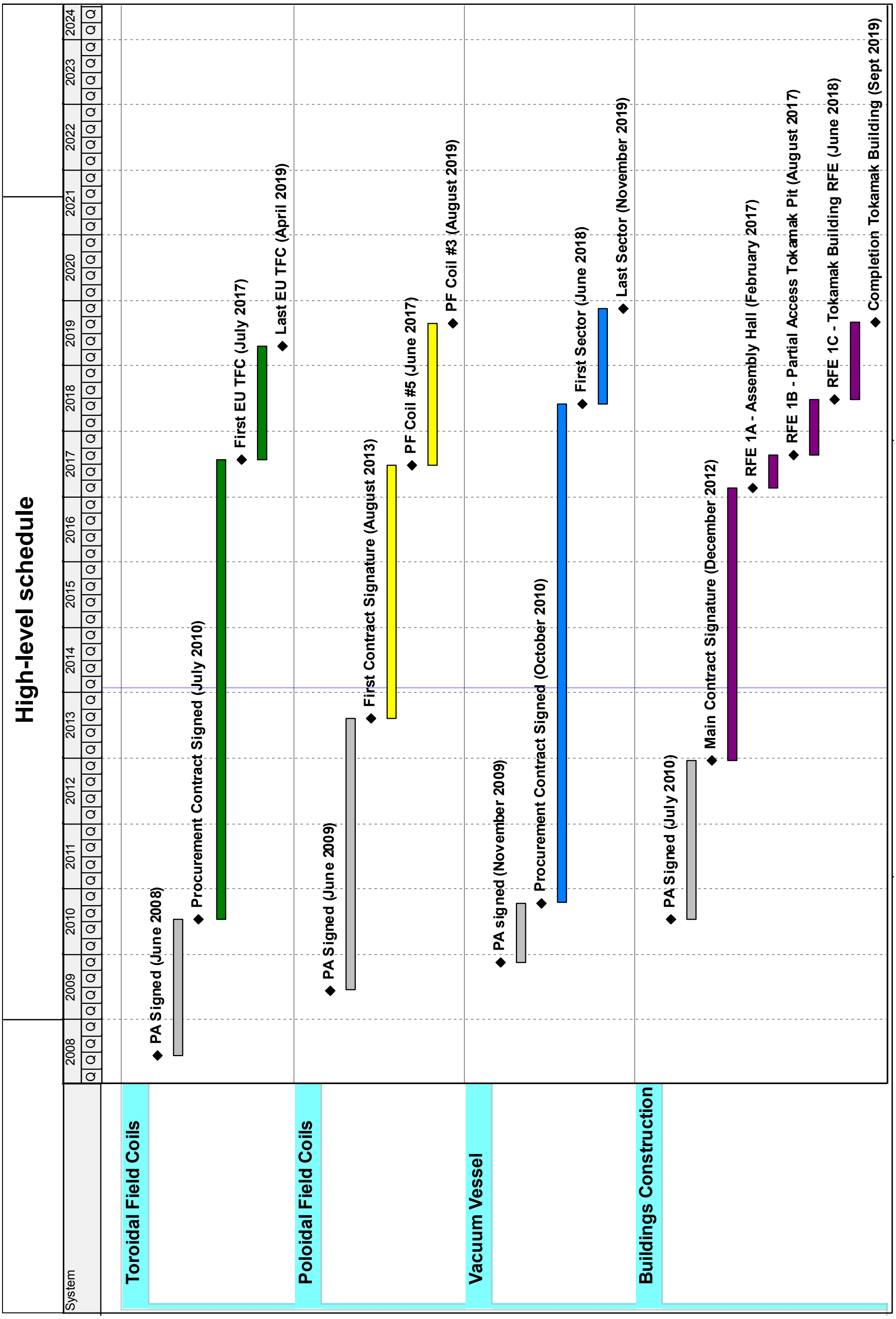


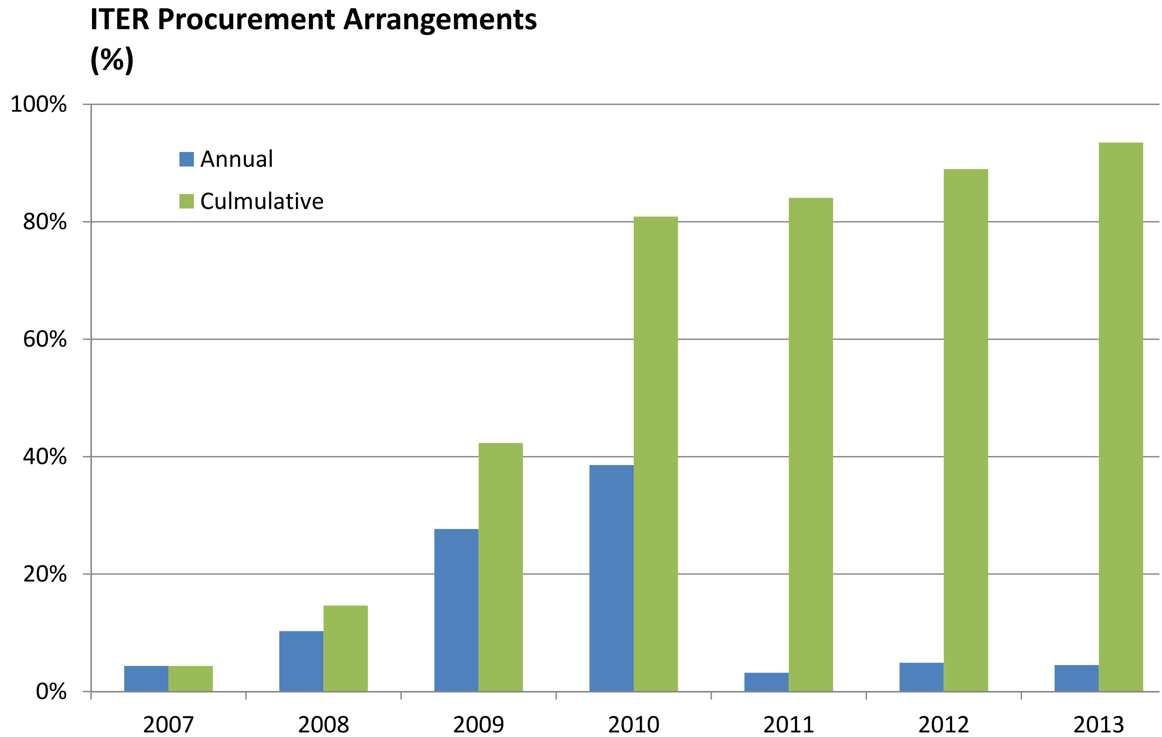
	All Milestones (including unplanned)		
	Planned	**Planned**	**Achieved / Planned**
PA Signature	12	7	58%
Call for Tender	37	29	78%
Contract Signature	96	75	78%
Project Plan Milestone	55	26	47%
Incoming IPL	204	96	47%

Status of KPIs until the end of December 2013 including Milestones not in the Original Plan

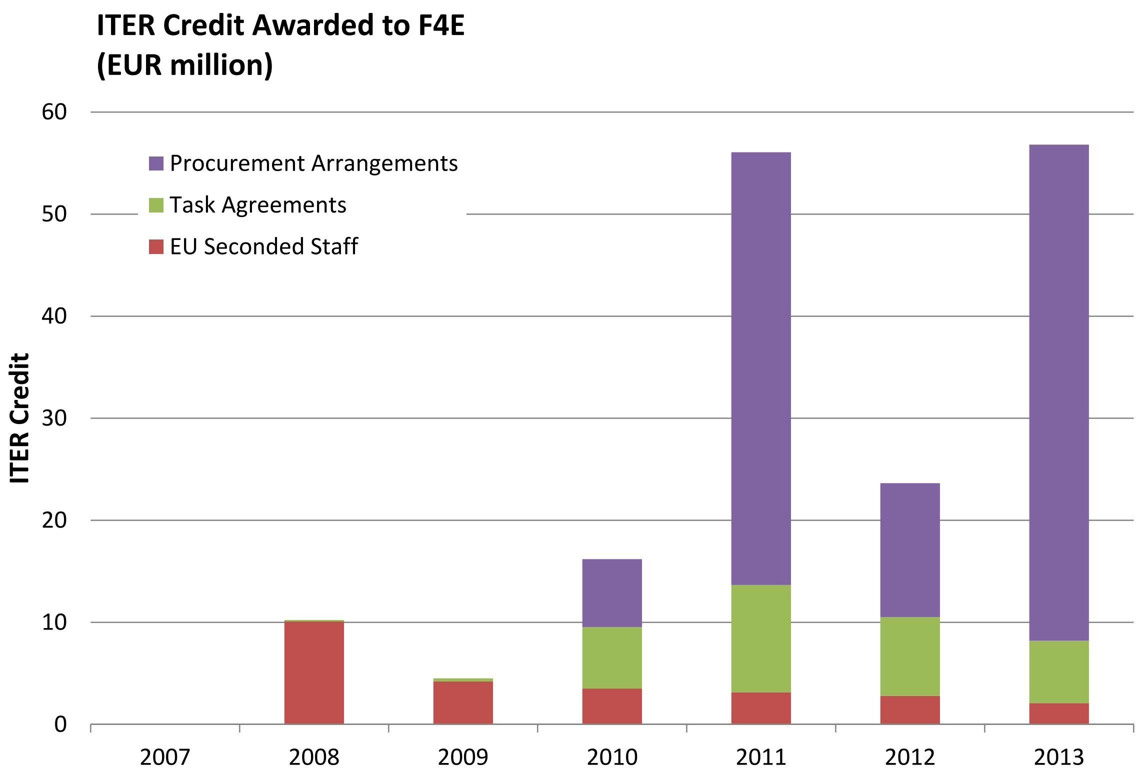
Note that the above analysis includes those milestones that were not originally in the plan at the beginning of 2013 but were introduced by F4E according to the evolving needs of the work and refinement of the procurement strategies (i.e. the number and type of contracts required to perform a task). Excluding unplanned milestones, the performance for the call for tender and contract signature milestones would be around 60%.

The project planning and monitoring systems being used at F4E are being continuously improved and for 2014 a formal change control procedure will be implemented which will allow such unplanned milestones to be taken into account. A system of earned value will also be introduced which will allow the importance of the milestones to be taken into account.

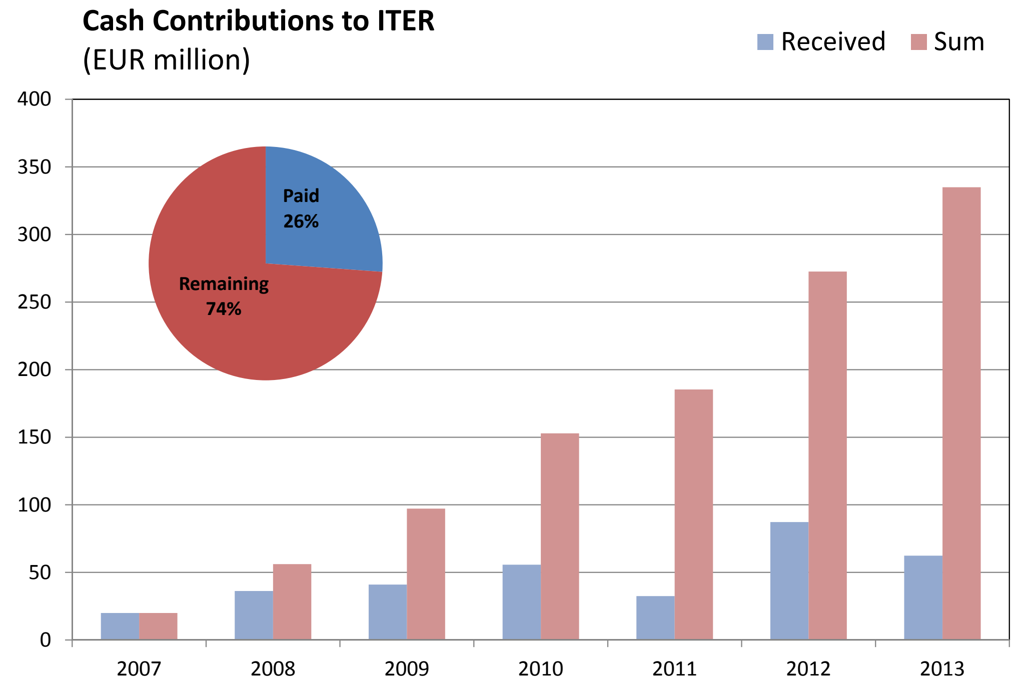

High-level schedule
System
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
Toroidal Field Coils
PA Signed (June 2008)
Procurement Contract Signed (July 2010)
First EU TFC (July 2017)
Last EU TFC (April 2019)
Poloidal Field Coils
PA Signed (June 2009)
First Contract Signature (August 2013)
PF Coil #5 (June 2017)
PF Coil #3 (August 2019)
Vacuum Vessel
PA signed (November 2009)
Procurement Contract Signed (October 2010)
First Sector (June 2018)
Last Sector (November 2019)
Buildings Construction
PA Signed (July 2010)
Main Contract Signature (December 2012)
RFE 1A - Assembly Hall (February 2017)
RFE 1B - Partial Access Tokamak Pit (August 2017)
RFE 1C - Tokamak Building RFE (June 2018)
Completion Tokamak Building (Sept 2019)



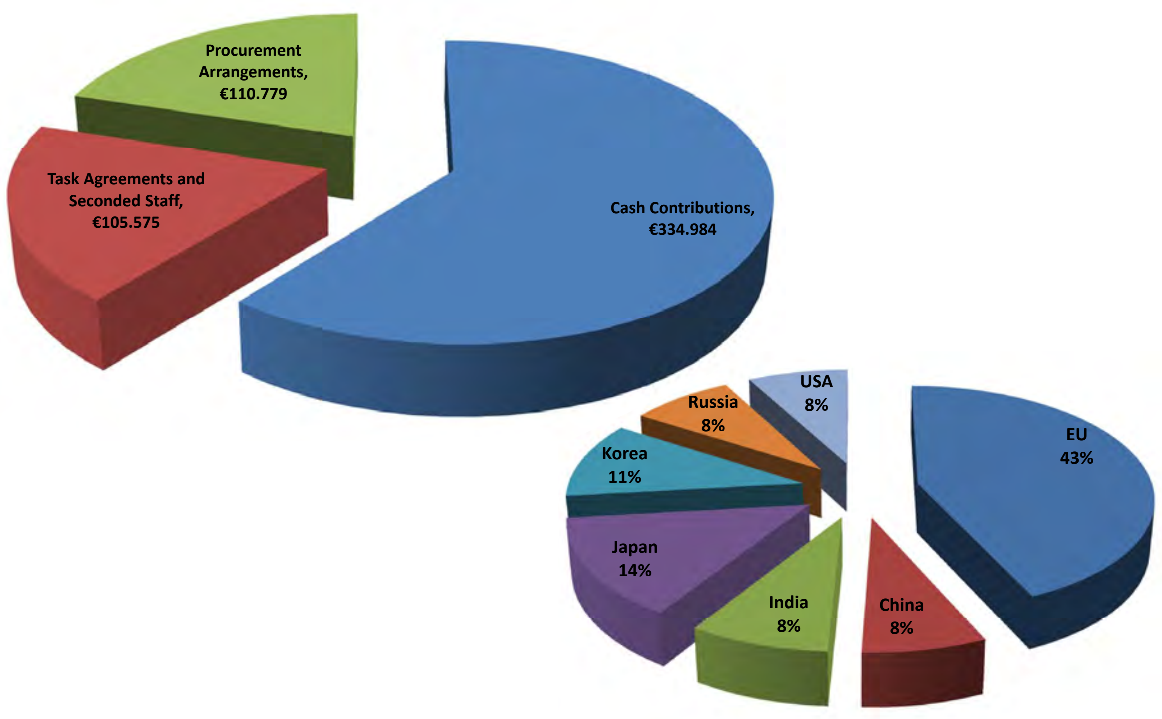
ITER procurement arrangements (% of total concluded in value)



Credit awarded to F4E by ITER



Cash Contributions from F4E to ITER (in EUR millions) – the inset pie chart shows the estimated remaining amount of cash contributions for the ITER construction phase



Pie charts showing (top left) the total contributions made to the ITER Project by F4E/Europe and (bottom right) the division of the total contributions between the different ITER parties

Risk Management

Risk management at F4E currently consists of two different levels: corporate and project level. The project risk management implementation started in 2011 and will continue in the following years, while the corporate risk management was implemented in the second part of 2012, and will be updated and monitored in the following years.

As far as the EU in-kind procurements are concerned, risk analysis has progressed through in-house analysis and feedback from the suppliers (whenever a manufacturing contract was in place). The analysis has concentrated on the components on the critical path. During 2012, 23 procurement arrangements were analysed from a risk point of view, and in 2013 the analysis has been extended to 26, with the aim to extend the analysis to all EU procurement arrangements

Following the F4E risk management process, the following probability/impact matrix (PID matrix) has been used for the risk level ranking in order to define the priorities of the risk events.

PID Matrix		Impact				
		Very Low	Low	Medium	High	Very High
Probability	Very Likely	5	20	45	80	125
	Likely	4	16	36	64	100
	Not Likely	3	12	27	48	75
	Unlikely	2	8	18	32	50
	Not Credible	1	4	9	16	25

Level	Actions
VERY LOW	They are included in the risk file and reviewed by the Technical Project Officer (TPO) concerned. Actions are evaluated in order to reduce the risk.
LOW	They are included in the risk file and reviewed by the TPO concerned. Actions are evaluated in order to reduce the risk.
MEDIUM	An owner is appointed to monitor the risk evolution and report to the TPO concerned. Actions are evaluated in order to reduce the risk.
HIGH	Same as level Medium plus definition of specific mitigation actions. These actions are defined by the TPO concerned with the risk, which identifies also possible trigger events to start them. The owner monitors the risks and these trigger events.
VERY HIGH	Planned mitigation actions are started as scheduled. The risk owner is designated directly by the PM, who closely monitors the effectiveness of the mitigation actions at each project review meeting

In the following sections describing the progress in each of the in-kind procurement packages for ITER, a description of the open risks (number of risks) are provided with a comparison between the current and the residual ones. Most of the events categorised as High and Very High have a mitigation plan that reduces the expected residual risk to an acceptable level.

Site, Buildings and Power Supplies

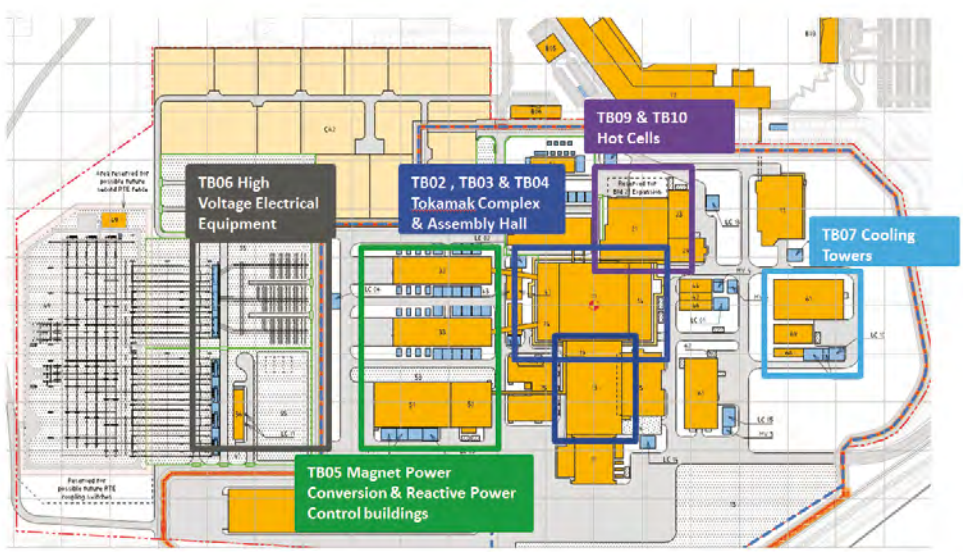
F4E is responsible for the in-kind procurement of the site infrastructure and all concrete and steel frame buildings and Power Supplies by end 2013:

- Poloidal Field Coil Winding Facility (12.8 kIUA);
- Architecture engineering services (55.75430 kIUA);
- Tokamak excavation (31 kIUA);
- Supply of anti-seismic bearings for Tokamak Complex (6.2 kIUA);
- Building construction (343.81281 kIUA);
- Office buildings (13.85 kIUA);
- Power Supplies — pulsed power and steady state power supplies (45.22284 kIUA).

Executive Summary

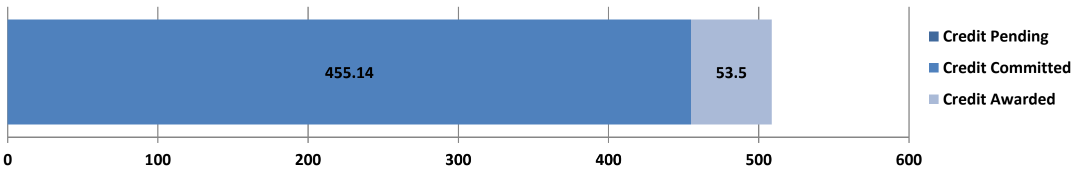
In the area of site, buildings and power supplies, the main highlights during 2013 are as follows:

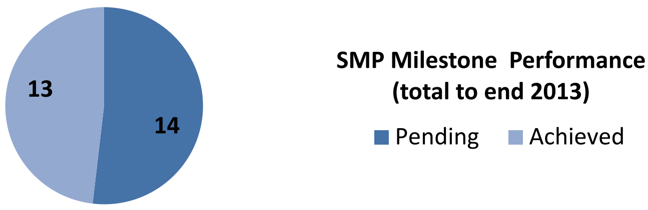
- Completion of Assembly Hall foundation slab;
- Pouring of first concrete for B2 slab of the Tokamak Complex;
- Completion of contractor's area 2 and canteen parking;
- Signing of procurement arrangements for electrical systems with IO;
- Signing of contracts:
  - OPE-301: HVAC, electrical, instrumentation and control, handling items for Tokamak complex and surrounding building;
  - OPE-378: Design and Build of Magnet Power Conversion BLDG (32-33) and Reactive Power Control BLDG (38);
  - OPE-429: Hot Basin and Cooling Towers (B67), Cooling Water Pumping Station (B68 A&B) Chilled Water Pumping Station (B69) and Water Treatment Facility Area (B64);
- OPE-428: Launch of the call for tender for supply of Electrical Power Distribution System.



Overview of ITER Construction site buildings and tender batch (TB) layout

ITER Credit and Milestones





Project Plan and SMP Milestones completed during 2013

Milestone Code	Milestone Name	Actual Start Date	SMP Baseline Date
EU62.03.20375	Start of construction phase of Tokamak Complex foundations	07/01/2013	02/10/2012
EU62.05.17175	Contract Signed for Cargo Lift & Assembly Hall Cranes (TB02)	27/06/2013	22/11/2012
EU41-43.120770	Contract Signed for TB04	08/07/2013	29/03/2013
EU62.05.30020	NPC – Notice to Commence work on TB08	24/07/2013	13/05/2013
EU62.05.10680	NPC – Notice to Commence Work on TB04	29/08/2013	N/A
EU41-43.124297	TB04 Commencement Date	02/09/2013	N/A
EU62.05.15175	Contract Signed for Design & Build Buildings 67, 68, 69 (TB07)	11/10/2013	13/05/2013
EU62.05.15178	TB07 Notice to Commence work	04/11/2013	N/A
EU62.05.14175	Contract Signed for Design & Build Buildings 32, 33, 38 (TB05)	27/11/2013	10/12/2012

Work Progress

In 2013, the F4E Site, Buildings and Power Supplies team of around 20 staff continued the implementation of strategy developed by F4E in 2009.

During the year the following construction works were conducted:

- The assembly hall foundation, a reinforced concrete 60 x 100 m was completed in October 2013 (contract OPE-095).
- On top of the columns in the seismic isolation pit and the in 2012 installed 493 anti-seismic bearings (bearing to mitigate the horizontal seismic effects on the Tokamak Complex) the first concrete for the so called B2 slab was poured. The B2 slab is the floor slab of the Tokamak Complex and will be poured in 15 phases (plots). The first plot was poured in December 2013. (contract OPE-095). Due to difficulties encountered in the complex design of this slab and liaison with the support of the Tokamak and the evolving load cases, the reinforcement installation works on the central area of the B2 slab were suspended. Additional justification on the design calculation of this structure was required to be delivered to the French safety authorities before restarting the installation of reinforcement in this area.

- During the year works on the underground networks continued (OPE-251). This site preparation contract also covers the creation of an area dedicated to contractors, housing their offices and workshops. This contractor area 2 includes, parking, a restaurant and a medical facility. This contractor area was completed by October 2013.
- Progress was made on the in time critical galleries around the Tokamak Complex. These underground structures have to be completed in order to deliver suitable working space to the contractor in charge of the erection of the Tokamak Complex Civil works from the B2 slab onwards (Contract OPE-406).

Tower crane view of the F4E work site: Tokamak Complex Reinforcement, Assembly Hall Foundation slab in the background

Pouring of first concrete to B2 slab of Tokamak complex 11 December 2013 (B74 Diagnostic Building)

Procurement Activities

Despite the unexpected changes in the agreed scope initiated by the IO, during 2013 F4E team co-ordinated the preparation of several packages of tender documentation.

Several procurement procedures were managed in parallel and for three tender batches (TBs) they were completed:

- TB04 – on 8 July 2013 a contract for completion of HVAC, electrical, instrumentation and control systems, handling items for Tokamak Complex and surrounding building (OPE-301) with duration of 6 years and a value around EUR 500 million was signed;
- TB05 – on 27 November 2013 a contract for Design and Build of the Magnet Power Conversion Buildings (32-33) and Reactive Power Control Building (38) was signed (OPE-378) with a duration of 4 years and a value around EUR 25 million was signed;
- TB07 – on 11 October 2013 a contract for Design and Build of the Hot Basin & Cooling Towers (B67), Cooling Water Pumping Station (B68 A&B), Chilled Water Pumping Station (B69) and Water Treatment Facility Area (B64) (OPE-429) with a duration of two years and a value of around EUR 15 million was signed.

The following documentation packages were completed in 2013 and calls for tender were launched:

- Tender to supply the Electrical Power Distribution System.

In 2013 the construction design for the Assembly Hall building (B13) and the Site Services Building (B61) were delivered and approved. Construction design of the first level of the Tokamak Complex was delivered by the architect engineer as well, although it was delayed by 8 months due to the availability/ immaturity/integration difficulties and changes of the IO input data.

All the mentioned activities were supported by F4E contractors:

- Architect engineer (ENGAGE ~ 220 staff) - scope: studies, design, scheduling, evaluation of contractors, technical monitoring of construction contracts.
- Support to the owner (ENERGHIA ~ 25 staff) – scope: daily support to F4E in monitoring contracts (including the review of the design).
- Health, safety and legal inspection services (APAVE ~ 10 staff) – scope: compliance to health and safety requirements, to French and European construction norms, access to the site.

Development of construction design and construction supervision of works by the architect engineer is on-going. In 2013 around 422,400 working hours, the architect engineer issued 1,836 drawings, 488 calculation notes, 74 procedures and 390 other documents.

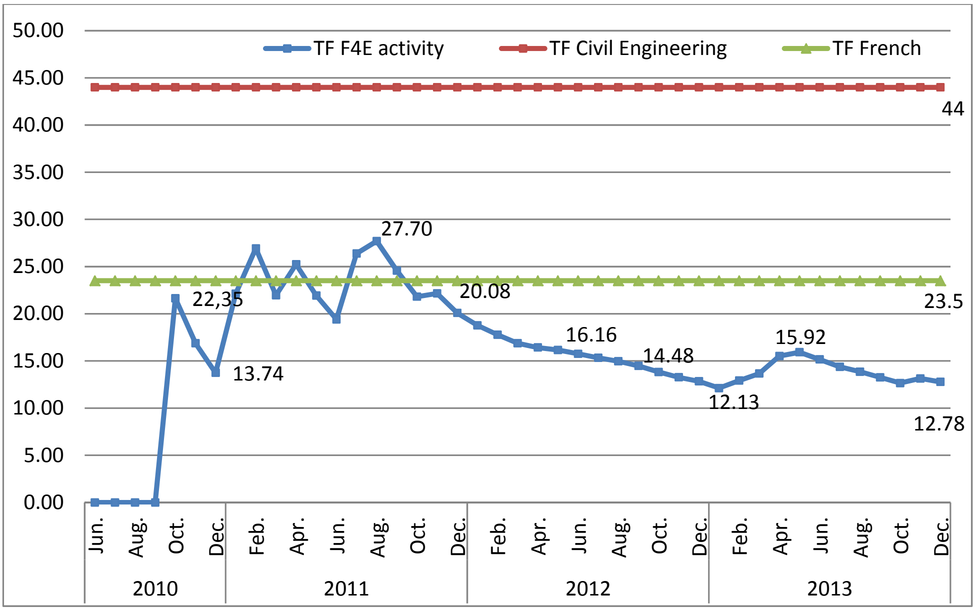
Health and Safety on the ITER Site

Health and safety management of the on-site activities at the ITER site is of paramount importance. During the year, around 500 were employed in the construction activities. Health and safety indicators are evaluated on a monthly basis. The following graphs represent the results for mentioned indicators at ITER worksite in comparison with the data for French companies and civil engineering in general for the same period.

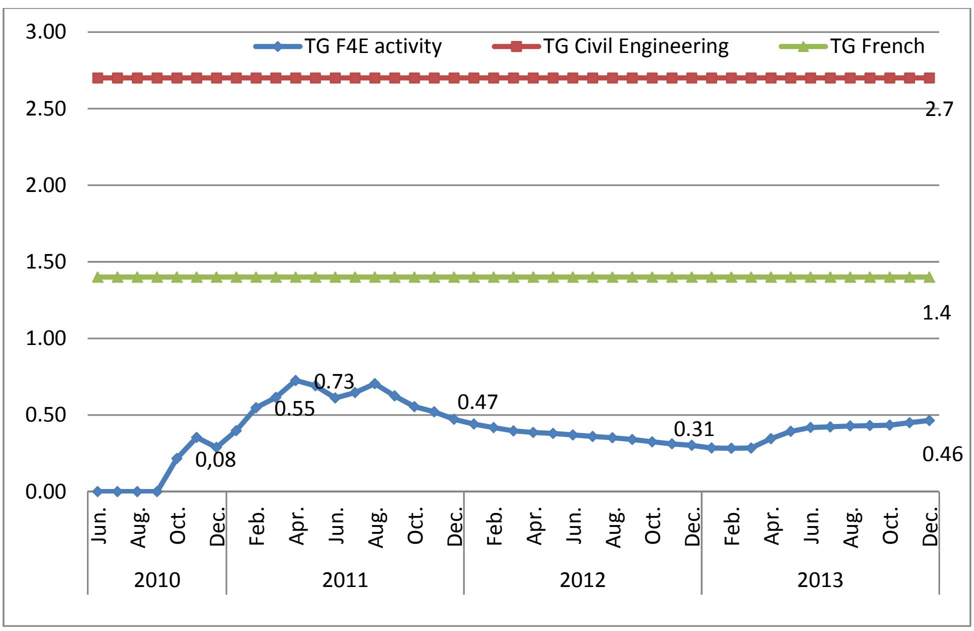
Power Supplies

In 2013, the activities focused mainly on the preparation for the procurement and the start of the implementation contracts for the Pulsed Power Electrical Network and the Steady State Electrical Network, in particular:

- Progress on the tendering process of main tender batches involving power supply activities (finalisation of tender documentation, launch of call for tender and award of one important contract for the power supply). In fact TB04 contract has been awarded in July 2013 and the KOM has been held in September 2013. TB06 call for tender has been launched in December 2013 and the definition of a new tender batch (TB13) was decided to implement the anticipation of the Safety Emergency Power Supply by decoupling it to form TB09 and TB10 package.



Graph frequency rate (number of accidents with lost working days / total working hours x 1,000,000)



Graph severity rate (number of lost working days / total working hours x 1,000)

- Finalisation of the negotiation phase with the IO for the recognition of the additional credits deriving from the huge evolution of the IO electrical loads In fact after two years of negotiations on the cost impact due to the increase of the electrical load list and after the implementation of some technical optimisations, an agreement has been found with the IO and the project change request (PCR) 476 has been finally approved at the end of December 2013.
- Finalisation and signature of all the remaining

procurement arrangements for all the electrical power supply all have been signed the 5 December 2013.

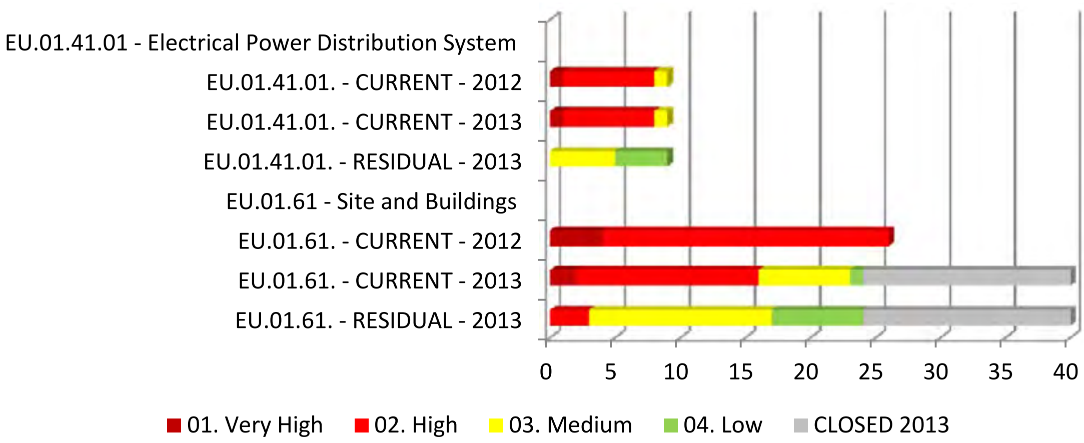
Overall, the site, buildings and power supplies activities were implemented as foreseen in the 2013 work programme and in accordance with the project plan and ensuring the requested quality of works delivered on the construction site. Nevertheless due to long process of negotiation between F4E and IO on the cost impact of the changes in the electrical load list, some tasks foreseen for the 2012 have been postponed to 2013 (i.e. TB06 call for tender completion).

Risk Management

In the following an overview of the number of risk events, their levels and the evolution from 2012-2013 per procurement arrangement is provided.

- EU.01.41.01 – Electrical Power Distribution System → no relevant changes from risk point of view;

- EU.01.61 – Site and Buildings → for buildings the signature of TB04 and TB03 have closed some of the risks and decreased the risk level analysed last year. The move to a realistic schedule has decreased the current risk level. The late, incomplete and changing input date from IO for buildings remains a major risk for the SBPS project in terms of schedule and cost.



Magnet Systems

In terms of the scope of the supply for which F4E is responsible:

- Ten toroidal field coils and 20% of the Nb3Sn conductor to be used in the toroidal field coils (89.74 kIUA);
- Five poloidal field coils and 11% of NbTi conductor for the poloidal field coils (40.86 kIUA);
- Nine fibreglass composite pre-compression rings (0.6 kIUA);
- Toroidal field conductor and poloidal field conductor (54.6188 kIUA).

Executive Summary

In the area of magnets significant progress has been made during 2013 of which the highlights include:

Conductors

- Achieved cumulative production of 86.3 tons of toroidal field Nb3Sn strand;
- Testing of TFEU09 at the SULTAN test facility;
- Fabrication of six 760 m unit lengths and two 415 m unit lengths of toroidal field conductors;
- Fabrication of three 720 m unit lengths of poloidal field coil number 6 (PF6) cables;
- Fabrication of the following poloidal field conductors: two 400 m PF1 copper dummy, two 720 m PF6 copper dummy and one 100 m PF6 superconducting dummy;
- Qualification activities for poloidal field conductor jacket weld;

Toroidal Field Coils

- Started series production of the 70 radial plates and of the 70 Double Pancakes;
- Installation of three portal milling machines for the supply contract of 70 radial plates and of the main tooling for the double pancakes production;
- Procurement of raw material 316LN/C2 for radial plate segments and cover plates;
- Successful completion of qualification activities: manufacture and test of six helium inlet mock-ups, manufacture and test of one electrical termination joint sample, laser welding and impregnation of one 3m long double pancake mock-up;
- Successful winding, reacting and first stage of transfer of the double pancake prototype (first TF coil full size double pancake ever manufactured);
- Several runs of negotiation with the bidders for the cold test and assembly of the winding pack into coil cases;

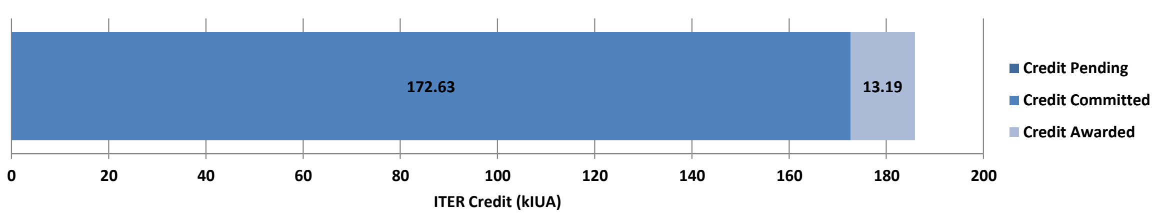
Poloidal Field Coils

- Start of engineering integrator contract;
- Signing of the cooperation agreement for the manufacturing of the PF6 coil in China;
- Launched final run of the call for tender for the procurement of the winding tooling.

Pre-Compression Rings

- Started the qualification of the composite material and the manufacturing processes for the pre-compression rings.

ITER Credit and Milestones



Project Plan and SMP Milestones completed during 2013

Milestone Code	Milestone Name	Actual Start Date	SMP Baseline Date
EU11.3B.22230	Contract Signed for PF Coil Engineering & Integration (EI)	13/08/2013	29/05/2013
EU11.1A.12385	Summary - Radial Plate + Covers: manufacturing & delivery (DP2 / TFWP11)	14/10/2013	N/A
EU11.1A.13500	Phase II - TF Coils - Joints and Helium Inlets Mock Ups Complete (CAS Milestone)	19/11/2013	25/07/2012

Progress Report on the Conductors

For the conductor, the industrial production phase is underway, in particular:

- The supply of 59.7 tons of Nb_3Sn strand for the toroidal field conductor (F4E-OPE-005-01) is almost completed with 59.2 tons delivered and approved so far. The contract will be completed in the first half of 2014.
- A second contract (F4E-OPE-005-02) for 37.7 tons of Nb_3Sn strand for the toroidal field conductor is progressing with 27.1 tons delivered and approved so far. In 2013, 10 tons have been produced by the supplier and approved by F4E. The contract will be completed in 2014.
- The contract for strand characterisation of toroidal field Nb_3Sn strand samples (F4E-OPE-145) is progressing very well and has already provided the verification tests needed for the ATPP clearance of 95% and 70%

Fabrication of the first poloidal field copper dummy length at Criotec (compaction and spooling)


The 100m superconducting poloidal field qualification conductor length on its transportation jig

of the total amount of billets foreseen respectively for F4E-OPE-005-01 and F4E-OPE-005-02.

- The SULTAN test of the Phases III/IV F4E toroidal field conductor lengths (TFEU9) was successfully completed at CRPP, thus confirming the adequate performance of the F4E toroidal field conductor lengths made with the F4E-OPE-005-01 superconducting strand.

- The contract for cabling and jacketing of the toroidal field and poloidal field conductors, as well as the JT-60SA conductor is proceeding well with already around 20 km of conductor fabricated for the three conductor types. In particular in 2013, almost 8 km of JT-60SA conductor and more than 5 km of toroidal field conductor have been manufactured by the supplier. For the poloidal field conductor, the two copper dummy lengths (720 m each) and the superconducting qualification length (100 m) were fabricated.

Progress Report on the Toroidal Field Coils

Related to the production of the toroidal field coils in 2013, the sub-project team completed the follow-up of major milestones along with managing the main contracts and providing support to the industry. The following progress is highlighted:

- Follow up of the contract for manufacturing of 70 radial plates (signed in December 2012, F4E-OPE-355) and related activities. This included:
    - o Procurement contracts were signed for the supply of around 2,000 tons of raw material 316LN/C2 stainless steel. After a qualification process, deliveries of material for the series production have started. So far accepted 260 tons of forged material for the radial plate sectors and 2 tons for the cover plates;
    - o Three portal milling machines have been installed for the final machining of the radial plates. A fourth machine, which belongs to F4E and which has been previously used for the machining of the regular radial plate prototype, has been re-commissioned;

- Follow up of the contract for manufacturing of ten toroidal field winding packs (signed in July 2010, F4E-OPE-053) and related activities. This included:
    - o Manufacturing, installation and commissioning of double pancake main tooling, including transfer and insertion line, conductor insulation wrapping machine and others;
    - o Winding and heat treatment trials on conductors from different types and manufacturers;
    - o Successful completion of qualification activities: preparation of six helium inlet mock-ups and subsequent fatigue tests at 4K; preparation of

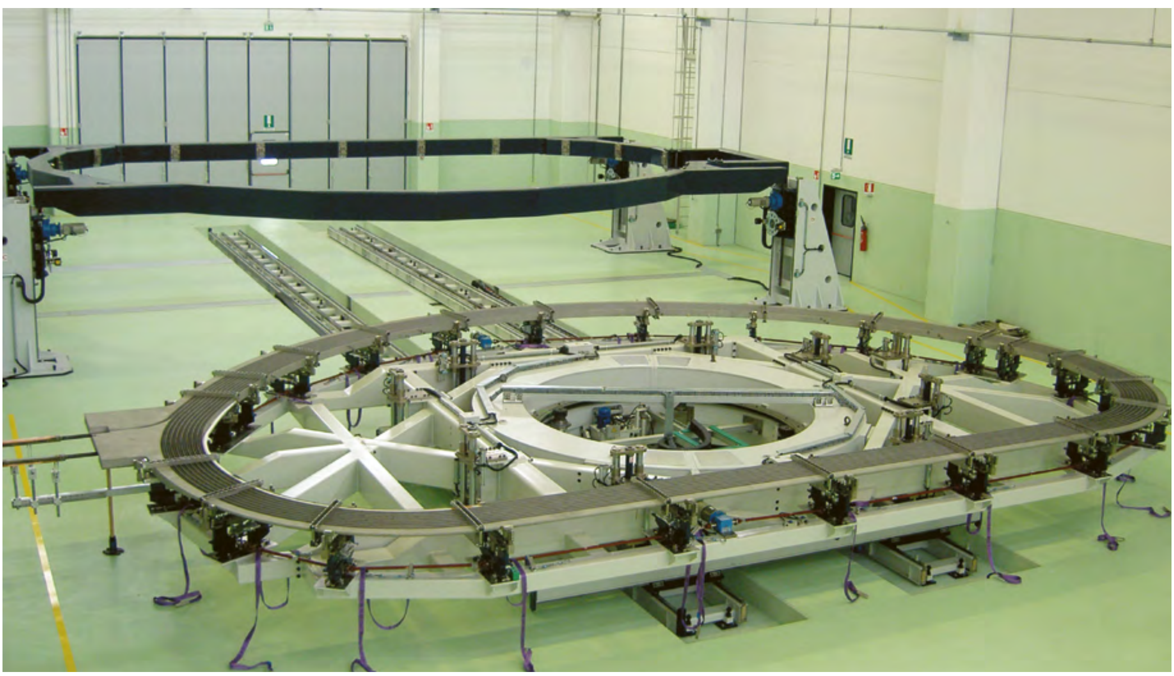
The first two series production radial plates being assembled (courtesy of CSC)

Portal milling machines for the production of 70 radial plates (courtesy of CSC)

a full-size mock-up of the electrical connection of double pancake termination and subsequent electrical test cycles; assembly of a 3m long double pancake mock-up, including cover plate laser welding activity and subsequent impregnation;

- o Successful completion of the first manufacturing stages of a double pancake prototype: winding and subsequent heat treatment of superconductor. Dimensional measurement at this stage showed a geometrical accuracy of 30ppm with respect to the objective. Transfer and insertion activity of the reacted conductor in the radial plate started in December 2013;

Cover plate laser welding station (courtesy of ASG)



Double pancake prototype during transfer into the radial plate grooves (courtesy of ASG)

- Tender for the cold test and the winding packs insertion into the coil cases (F4E-OPE-414): the call for tender was launched in 2012 with a negotiated procedure. Since then two rounds of negotiation followed by a new quotation from the bidders have been carried out. In December, because the quotation were still much higher than budget, a new intense and promising round of negotiation has started. It is planned to comwplete it by February 2014 and to place the contract by April 2014.

Progress Report on the Poloidal Field Coils

Regarding PF6, the cooperation agreement for the manufacturing of the PF6 Coil by ASIPP in China has been signed. Regarding PF2-PF5 coils, the achievements are reported below.

The engineering integrator contract (F4E-OPE-344) has started in August 2013. Since then a number of activities related to the definition of technical specification and manufacture procedures are being carried out.

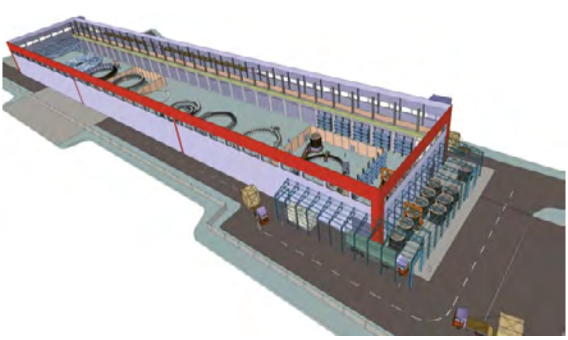
The negotiation phase of the winding tooling tender (F4E-OPE-463) has been completed. All the documentation for the preparation of the final offers has been submitted to the bidders. It is planned to place the contract in April 2014.

Regarding the additional tooling and impregnation tooling, the preparation for the market survey for the procurement is on-going (expected to be launched in January 2014).

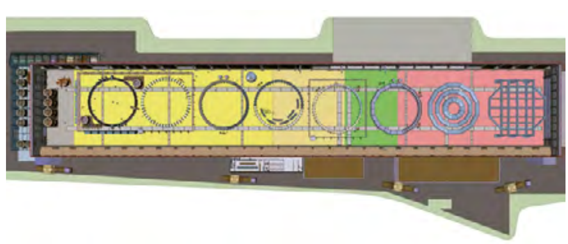
Regarding the procurements for the "Site & Infrastructure" and for the "Manufacturer" preparation of the market surveys is on-going (expected to be launched in February 2014).

The first dummy conductor spools to be used for the qualification phase have arrived at the PF Building in Cadarache.

External view of the poloidal field coils building



Poloidal field coils building lay-out (courtesy of ASG)



Poloidal field coils building lay-out (courtesy of ASG)

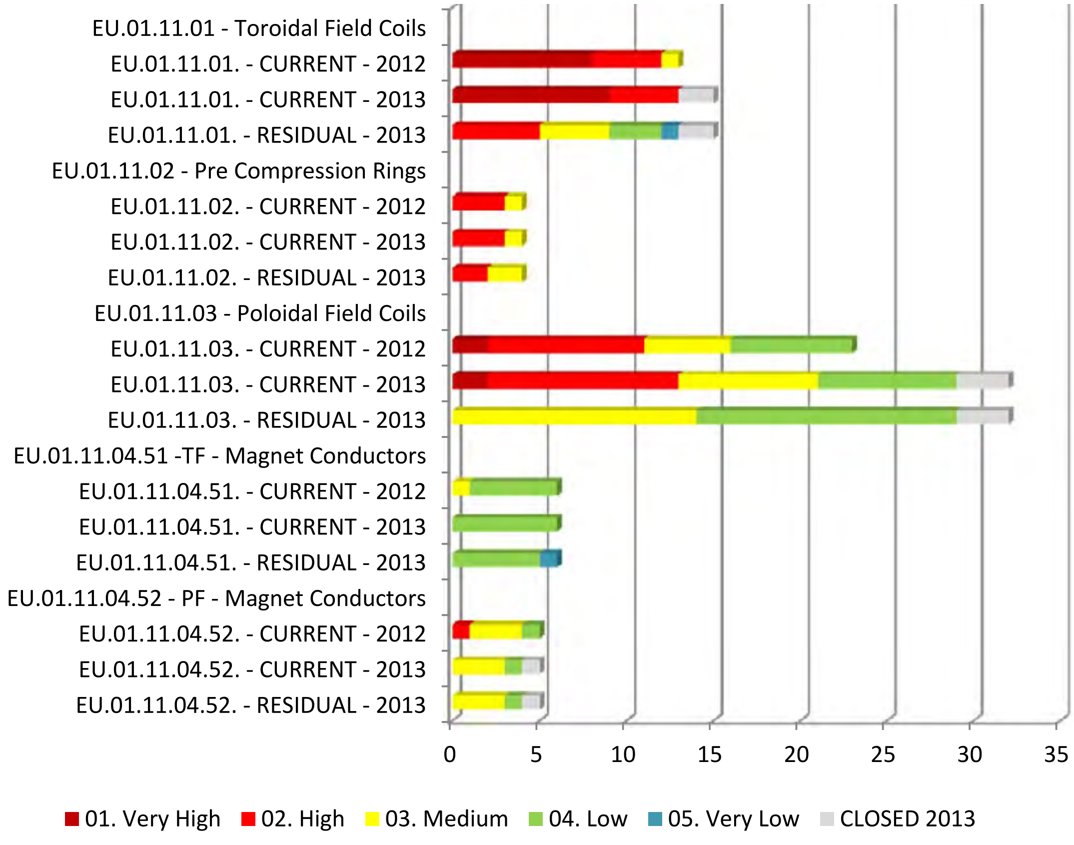
Progress Report on the Pre-Compression Rings

The ring manufacturing design, the tooling design and manufacturing, as well as the qualification of the material and the processes have been carried out for the pre-compression ring contract (F4E-OPE-345), which was signed in October 2012. The work has progressed as planned. The first qualification test with the sub-scale ring was carried out in December 2013. The result was not satisfactory and the reasons are under examination. A second ring will be tested in February 2014.

Risk Management

In the following an overview of the number of risk events, their levels and the evolution from 2012-2013 per PA is provided.

- EU.01.11.01 - Toroidal Field Coils → Following the signature of the procurement contract for the radial plates, the relevant risks for the lack of competition of the contract have been closed without impact. Interfaces with other DA's are key in this package. Regular updates with new technical risks have been carried out as the project detail was increasing.
- EU.01.11.02 - Pre Compression Rings → the contract was signed with no relevant changes from the risk point of view
- EU.01.11.03 - Poloidal Field Coils → in this case, the new procurement strategy has been analysed in detail regarding the implication of splitting the scope within several contractors. The risks on the management of the interfaces have been increased while those on a monopoly situation have been decreased. Some risks were rejected as not relevant to the new strategy. The decision of the manufacturing of the PF6 out of Europe also identified more risks(transportation and bureaucracy issues) and the opportunity to improve the schedule
- EU.01.11.04.51 TF - Magnet Conductors → the risk level has been decreased as some activities have been finished and the risk probability and exposure have been reduced.
- EU.01.11.04.52 PF - Magnet Conductors → the risk level has been decreased as some activities have been finished and the risk probability and exposure have been reduced.



Vacuum Vessel

The total credit of the vacuum vessel is 92.19 kIUA. F4E is responsible for the in-kind procurement of seven sectors of the vacuum vessel.

Following the signature of a contract for the first stages of the fabrication of the seven sectors of the vacuum vessel (F4E-OPE-068) in late 2010, progress was made by AMW, the consortium of suppliers. Although some minor input design changes from the IO have been requested, inducing later rework of detailed manufacturing design, the overall progress has been in accordance with the work programme 2013 and Project Plan.

Executive Summary

Progress and major achievements for 2013 were:

- The continuation of mock-ups manufacturing to provide input on the manufacturing procedures, the welding, assembly and inspection issues, model calibration and control of distortions.

- Simulations are on-going on welding distortions for the welding sequence optimisation and achievement of the tolerances. Analyses by finite-element modelling of welding distortions are a very important work to define the welding sequence, to forecast distortions and to allocate the proper tolerances in the manufacturing drawings, tolerance control being the major issue of the vacuum vessel sector manufacturing.

- Several stress analyses related to the structural assessment of the vacuum vessel have been carried out, including an update of the vacuum vessel regular sector to study the effect of the approved deviation requests (DR) in terms of structural margins. Besides, a complete campaign of analyses related to the vacuum vessel irregular sectors #2 and #3 has been successfully carried out. Different design and manufacturing optimisations were proposed and analysed using the finite-element method. Results have shown a significant improvement in stresses and manufacturing optimisation.

- Multi-body to multi-part (MB-MP) conversion of the vacuum vessel sectors #2, 3, 4, 7, 8 & 9 into ENOVIA. The task was successfully performed within the planned schedule and with satisfactory results, since the models have been accepted by the IO and AMW. During this task not only the MB-MP conversion was executed but also the PCRs and DRs were implemented in sectors models.

- About In-Wall Shielding (IWS) blocks for the sector 5, the full checking of housing ribs has been made, but 3D and drawings for IWS blocks are not all commented by AMW.

- The UT Qualification Committee continues to define the main UT inspection procedures acceptable by the Nuclear Safety Authority, and the final test to validate them.

- The finalisation of vacuum studies to list of the products to be used during manufacturing.

- A first review of the IO design for vacuum vessel instrumentation has been completed in collaboration with CCFE UK, the final design review being scheduled by the end of 2014.

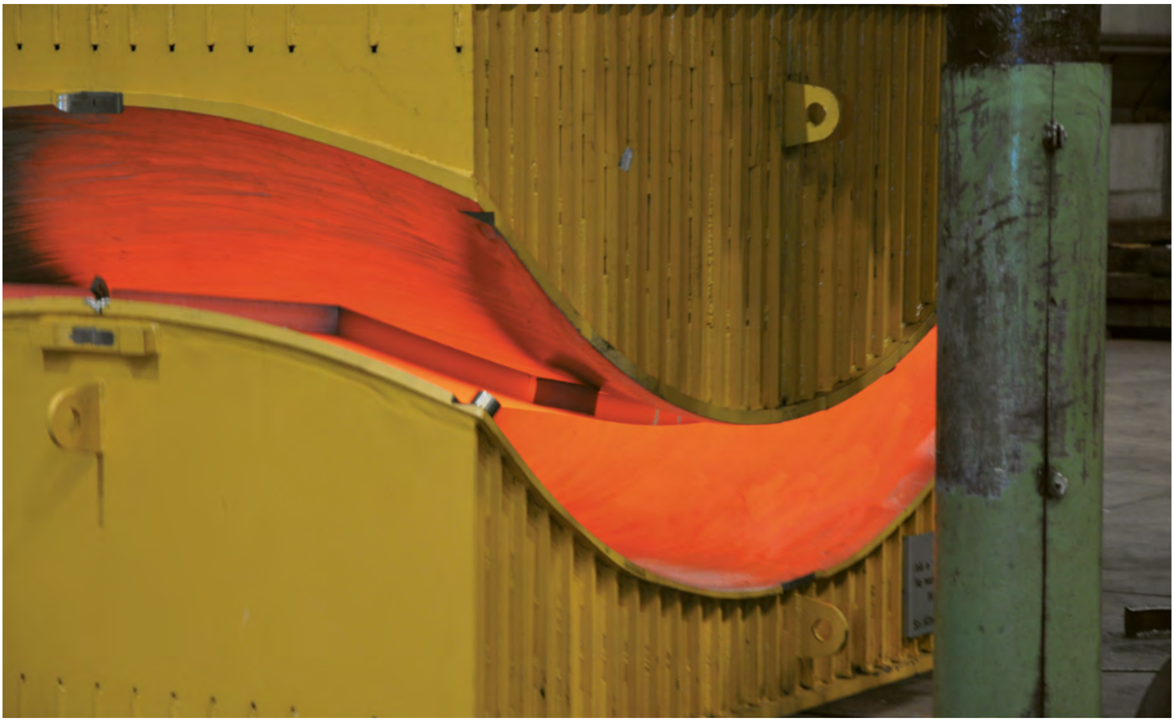
- The design and assessment of a transportation frame have started. A preliminary design has been presented to the IO in an effort to fix the interfaces with the upending tool (whose final design review will take place in 2014).

- The strong collaboration between the IO and the DAs concerned by the vacuum vessel has been sustained, allowing to tackle together issues and to share experiences between European and Korean DAs.

- The raw material procurement (plates and forgings) according to RCC-MR code requirements is on-going: three out of four forging material suppliers have been qualified. 300 tons of plates have been produced, forging material production has started with one of the suppliers, and filler materials have also been qualified and produced.

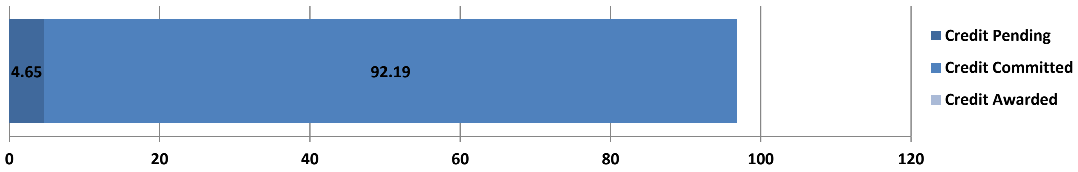
- Welding qualifications for the different welding techniques and profiles are progressing in both supplier workshops, Walter Tosto and Mangiarotti.

- Plates hot forming qualification process was performed in the supplier's premises (Walter Tosto).



Steel plate being removed from the furnace (above) and being formed between dies (below).

ITER Credit and Milestones



Two SMP milestones were foreseen to be completed and until the end of 2013 neither of them had been completed. No project plan milestones were completed.

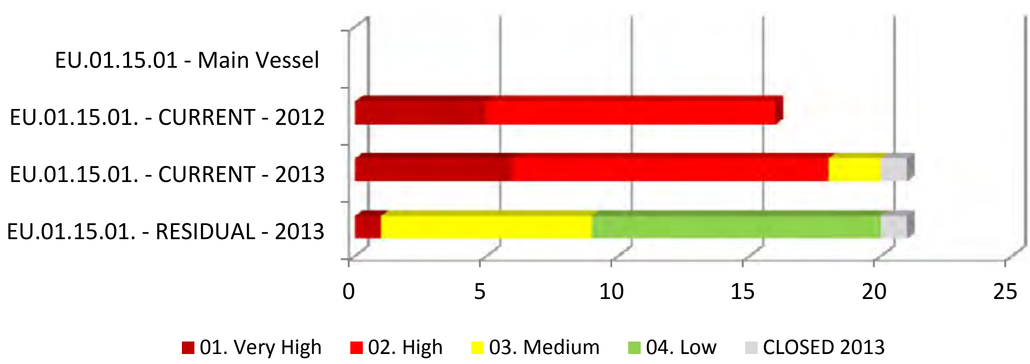
Progress Report

- Follow-up of the manufacturing contract for the vacuum vessel, the largest component of the ITER device;
- Definition of design, CAD activities and stress analysis to support design changes from the ITER IO and from F4E;
- Defining the manufacturing strategy through distortion simulations and tolerance control during production activities in workshops;
- Start of the activities for the procurement of material for the first three vacuum vessel sectors.

Risk Management

In the following an overview of the number of risk events, their levels and the evolution from 2012-2013 per procurement arrangement is provided.

- EU.01.15.01 – Main Vessel → for this component, the contract is on-going and there are some recurrent risks that have been closed and reopened as they are still valid (i.e. delayed product and shop qualification of Plates materials and delayed finalisation of the concept design. More details have been included due to a review carried out with the new project information and input provided by the supplier.



In-Vessel Components

F4E is responsible for the in-kind procurement of the following:

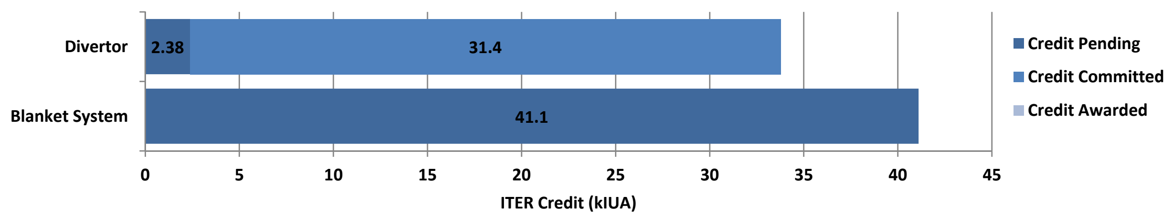
- Blanket first wall: 48.4% of the first wall panels corresponding to the normal heat flux first wall (41.52 kIUA);
- Blanket cooling manifold (4.652 kIUA);
- Divertor inner vertical target (20.20 kIUA);
- Divertor cassette bodies and integration of plasma-facing components (11.20 kIUA);
- Divertor rails (2.38 kIUA).

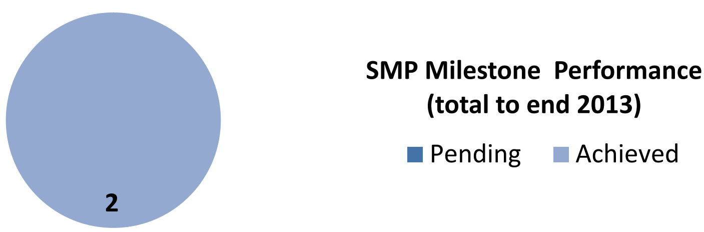
Executive Summary

In the area of the in-vessel components, the main highlights of the achievements during 2013 are as follows:

- Signature of the contract OPE-431 for the manufacture of a partial full-scale blanket cooling manifold prototype;
- Completion of the first blanket first wall qualification prototype manufactured in the frame of the contract OPE-284;
- Signature of the contract OPE-319 for the construction of a test facility for high heat flux testing in-vessel components;
- Signature of the contract OPE-422 for the high heat flux testing of first wall components;
- Award of three framework contracts (OMF-444 lots 1, 2 and 3) for the procurement of divertor cassette bodies and signature of the contract OMF-444-03 lot 3.

ITER Credit and Milestones





Project Plan and SMP Milestones completed during 2013

Milestone Code	Milestone Name	Actual Start Date	SMP Baseline Date
EU17.01.00790	Contract Signed for Prototype + Series CB	27/11/2013	26/11/2013
EU17.01.15080	Contract Signed for Prototype + Series CB	17/12/2013	N/A

Progress Report on In-Vessel Components

During 2013, progress in the development of in-vessel components was achieved for the following systems: the blanket cooling manifold, the blanket first wall, the divertor cassette body and integration of plasma facing components and the divertor inner vertical target.

Progress Report on the Blanket Cooling Manifold

The design of the blanket cooling manifold is now practically frozen. The design for the standard sectors remains based on 20-pipe bundles (eight for the inboard and 12 for the outboard). In the neutral beam injection sectors, the lack of space in the upper port requires the routing of some pipes through the lower ports to feed the additional blanket modules. In order to reduce the electro-magnetic loads which were practically impossible to withstand in some areas, it was decided to electrically insulate the pipes from the supports and one from each other. The first analysis iteration after this modification has shown that the pipe stresses and support loads – as expected – were drastically reduced.

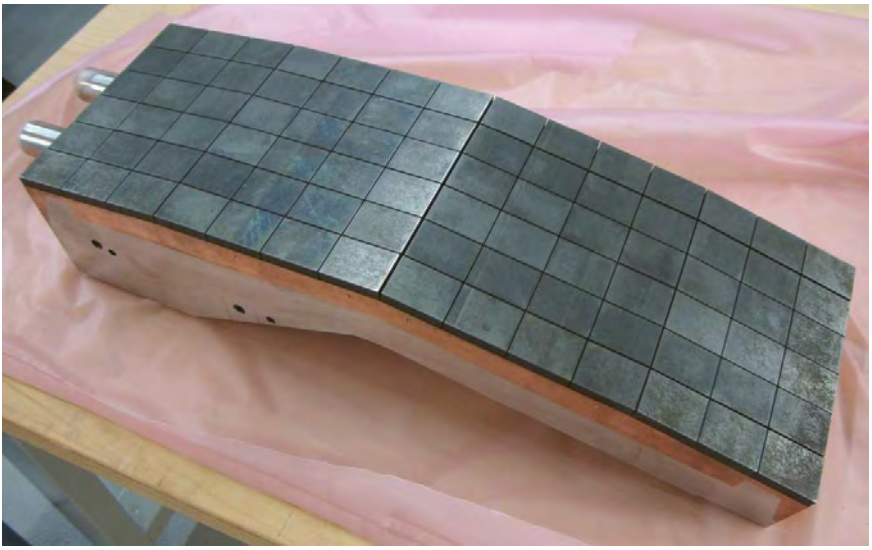
The contract OPE-431 for the manufacture of a partial full-scale blanket cooling manifold prototype was signed in June 2013. This contract aims at demonstrating the manufacturing feasibility of the blanket cooling pipes with the required accuracy. This program is in progress and is expected to be completed in summer 2014 in time for the final design review (FDR).

The design of the pipe supports is still at a conceptual level and will be the next priority before the FDR scheduled for fall 2014.

Progress Report on the Blanket First Wall

Achievements in the area of the blanket first wall may be grouped as follows:

- R&D in support of the first wall procurement: additional activities on the development of the copper-chromium-zirconium (CuCrZr) alloy for the hot isostatic pressing manufacturing route (OPE-461) of the first wall panels and continuation of activities on irradiation and post-irradiation thermal creep of 316L stainless steel/CuCrZr joints (GRT-291) and on irradiation and post-irradiation mechanical characterisation of the CuCrZr alloy (GRT-043).
- Component design and analyses in support of the ITER IO done in the frame of the Blanket Integrated Product Team Task Agreement as follows:
    - o Development by F4E of the detailed 3-dimensional computer-aided-design models and associated 2-dimensional drawings of four first wall panels till FDR in April 2013 and then refinement and finalisation of this set of main variants from June to December 2013, in preparation of the procurement arrangement signature;
    - o Completion of design and analyses activities (OPE-437, OPE-031.01.03, OPE-07-02-01-08, OPE-07-02-01-09, OPE-07-02-02-10, OPE-07-02-03-11) of the following first wall (FW) panels to be procured later by F4E: FW6, FW2, FW18 and FW12 until April 2013 (FDR); new analyses launched from June to December 2013 of several detailed topics related to design optimisation for the previously studied main variants of first wall panels, in preparation of PA signature;
    - o Presentation of four main variants of the normal heat flux design of the ITER first wall panels at the blanket FDR meeting of 10-12 April 2013 at Cadarache. No category 1 chit was raised on the EU first wall design. The formal FDR approval (all category 1 chits closed) was obtained in August 2013.
- Signature in November 2013 of the contract OPE-319 for the design, fabrication and commissioning of a new test facility for in-vessel components following a competitive dialogue with three candidates. This new Electron-Beam Test facility is mainly devoted to the high heat flux testing of first wall panels for ITER, as there are no other such test facilities in Europe having the capability in terms of dimensions and power while accepting beryllium components.
- Second phase of the ITER first wall qualification programme to prepare for the procurement of the first wall panels: follow-up of the three procurement contracts for the fabrication of normal heat flux first wall mock-ups and qualification semi-prototypes (OPE-097, OPE-284 and OPE-394). In particular, the first semi-prototype was completed under OPE-284 and passed all fabrication acceptance tests. It was sent to the electron-beam test facility JUDITH2 at the Forschungszentrum Juelich (D) for high heat flux (HHF) testing activities. Other HHF tests, as specified in the grant GRT-154 and the contract OPE-362, were performed to check the performance of small-scale first wall mock-ups.



First Wall semi-prototype showing 6 full-scale fingers (Courtesy by AREVA)

The work programme 2013 was implemented as originally planned with the exception of GRT-446, which had to be cancelled as no tender was received; this activity was replaced by a task order under the framework contract OFC-167 on material characterization. The overall F4E blanket programme was fully reassessed to elaborate a draft realistic schedule, up to the delivery of the FW panels to IO. In particular, this meant to move forward all the SMP milestones going from 2014 to 2017; in this respect, IO has implemented in the fourth quarter of 2013 a PCR to realign their milestones to the ones proposed by F4E.

Progress Report on the Divertor Components

An important event affecting the procurement of the divertor inner vertical target was the approval by the ITER Council on 20-21 November 2013 to start ITER operations with a full-tungsten (W) divertor. During 2013 the full-W divertor design was completed by IO with a final design review held on 26-28 June 2013. F4E successfully passed the complementary pre-qualification programme, a pre-requisite for the full-W divertor procurement, consisting in the manufacture of divertor mock-ups by F4E and high heat flux tests organised by IO at the Efremov Institute of St Petersburg (RF).

The main achievements associated with the procurement arrangement on the inner vertical target can be summarised as follows:

- The activities aiming at manufacturing the inner vertical target full-size prototypes have continued (OPE-138 lots 1 and 2). The latest requirements for the full-W divertor design have been integrated in the technical specifications and implemented in the initial documentation by the two concerned companies. The manufacturing of armour tiles and plasma facing units has started.

- The high heat flux thermal fatigue testing of mock-ups and prototypes for the qualification of alternative tungsten material grades has continued (OPE-423).

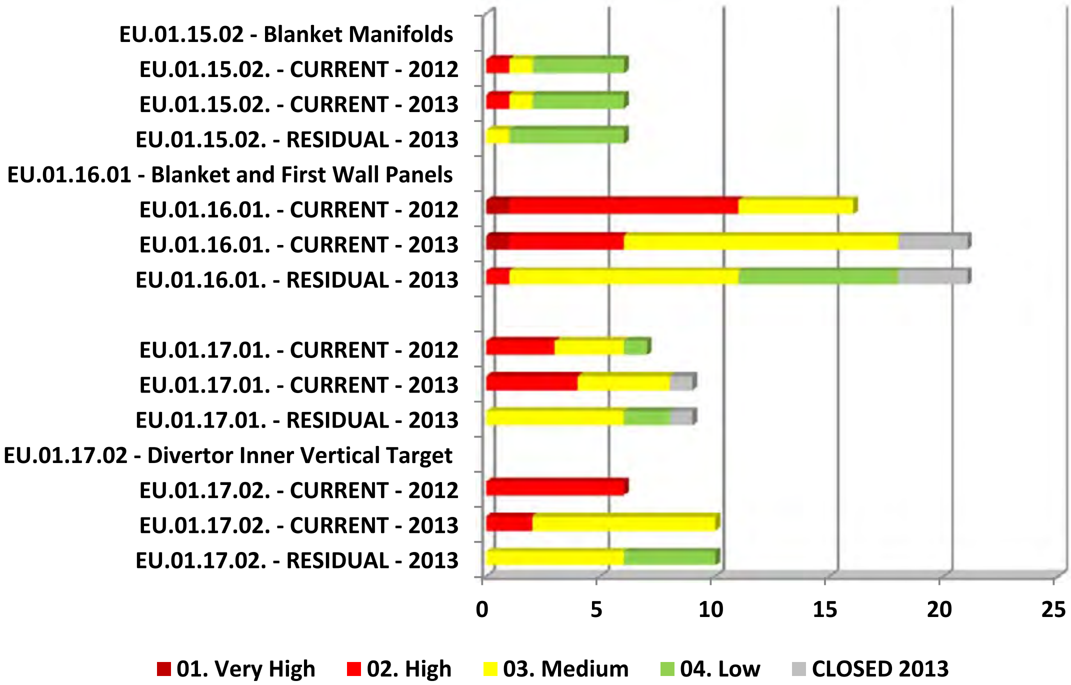
A significant achievement during 2013 was the award of three multiple framework contracts for the procurement of the divertor cassette bodies (OMF-444 Lots 1, 2 and 3) following an open procedure. The baseline consists of the manufacture of one full-scale cassette body prototype and in a second stage competition will be re-opened to enable contractors to compete for the series production. The contracts OMF-444 Lots 1 and 3 were signed in December 2013 and November 2013 respectively.

The conceptual design of a support frame for the transportation of the ITER divertor cassette body prototypes has been completed (Task Order 24 of OPE-017-01-01).

The work programme 2013 for the divertor area was implemented according to plan.

Risk Management

In the following an overview of the number of risk events, their levels and the evolution from 2012-2013 per PA is provided.



- EU.01.15.02 – Blanket Manifolds → no relevant changes from risk point of view
- EU.01.16.01 – Blanket and First Wall Panels → a deep review has been performed introducing a few new lines. The level of some risks has been decreased due to completion of mitigation actions.
- EU.01.17.01 – Divertor Cassette Body and Assembly → one risk, concerning the expected price of the material, has been closed due to the performance of a market survey. New risks concerning the new schedule and the integration with other components have been identified.
- EU.01.17.02 – Divertor Inner Vertical Target → more details have been introduced and the level of some risks has been decreased as the mitigation actions have been completed.

Remote Handling

F4E is responsible for the in-kind procurement of the following:

- Divertor Remote Handling System (9.62 kIUA);
- Cask and Plug Remote Handling System (17.31337 kIUA);
- In-Vessel Viewing System (6.8 kIUA);
- Neutral Beam Remote Handling System (6.0 kIUA).

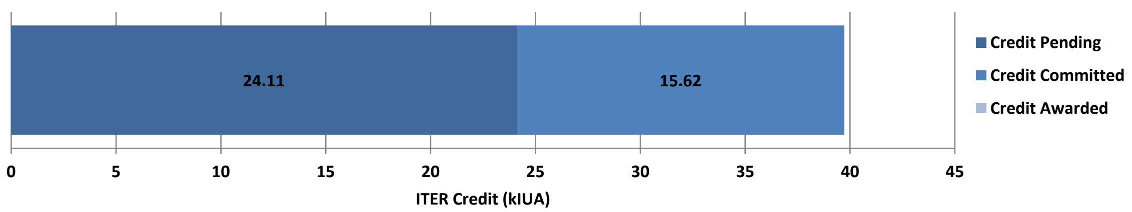
In 2013, important achievements have been the signature of the procurement arrangement for neutral beam remote handling system; the execution of the dialogue and tendering phase for the divertor remote handling system with the significant involvement of European industries as bidders; the conceptual design review of the cask and plug remote handling system; and the completion of the activities in support to the in-vessel viewing system conceptual design review (foreseen during early 2014).

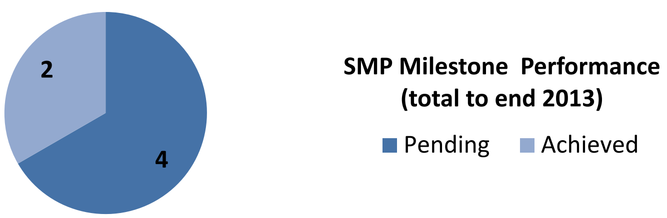
Executive Summary

In the area of remote handling, the main highlights of the achievements during 2013 are as follows:

- Execution of the dialogue and tendering phase for the divertor remote handling system, and completion of most of the tender evaluation;
- Publication of the call for expression of interest for in-vessel viewing system;
- Signature of the procurement arrangement for the neutral beam remote handling system;
- Start of the dialogue and tendering phase for the neutral beam remote handling system with pre-selected European industries;
- Placement of task order in support of:
    - o Evaluation of tender for divertor remote handling system;
    - o Neutral beam remote handling procurement and tendering (risk and cost analysis, business case analysis, respectively);
    - o Development of rad-hard electronics;
- Conceptual design review for cask and plug remote handling system.

ITER Credit and Milestones



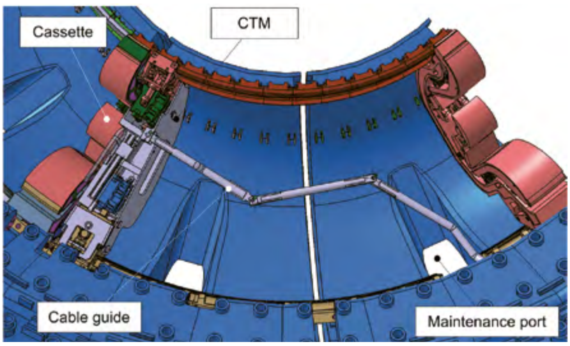


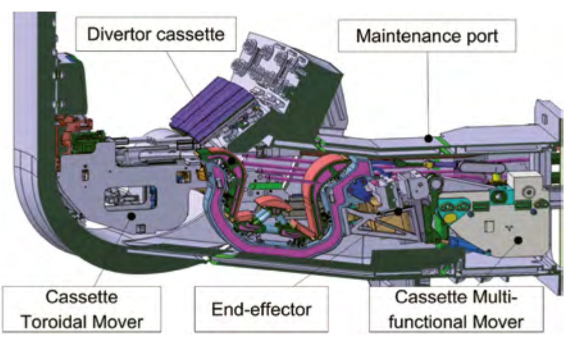
Project Plan and SMP Milestones completed during 2013

Milestone Code	Milestone Name	Actual Start Date	SMP Baseline Date
EU23.05.01550	Inter-Project Link PA 2.3.P5.EU.01 Neutral Beam RH System Signed	19/06/2013	30/01/2013

Progress Report on Divertor Remote Handling

The competitive dialogue and subsequent tender phase of the divertor remote handling procurement procedure (F4E-OMF-340-01) started in December 2012 and was concluded in August 2013 with the receipt of the bids, followed until the end of the year by an extensive evaluation phase focused on the business cases performed by each of the four tenderers. The business case is a comprehensive engineering study where the tenderers have the opportunity to demonstrate that they master all the necessary skills that they will need in the execution of the framework contract. At the same time, design validation support activities were been still on-going and full scale demonstrations were conducted at the divertor test platform (DTP2) facility (located in Tampere, Finland): two contracts have been implemented throughout 2013 to verify the remote exchange of the ITER divertor (F4E-GRT-143 closed in June, and F4E-GRT-401 to be completed in mid-2014).



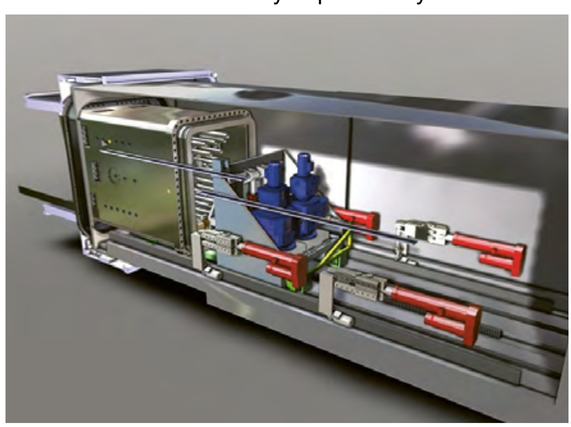


Concept design of the ITER divertor remote handling system for the radial (down) and toroidal transportation of divertor cassettes (up)

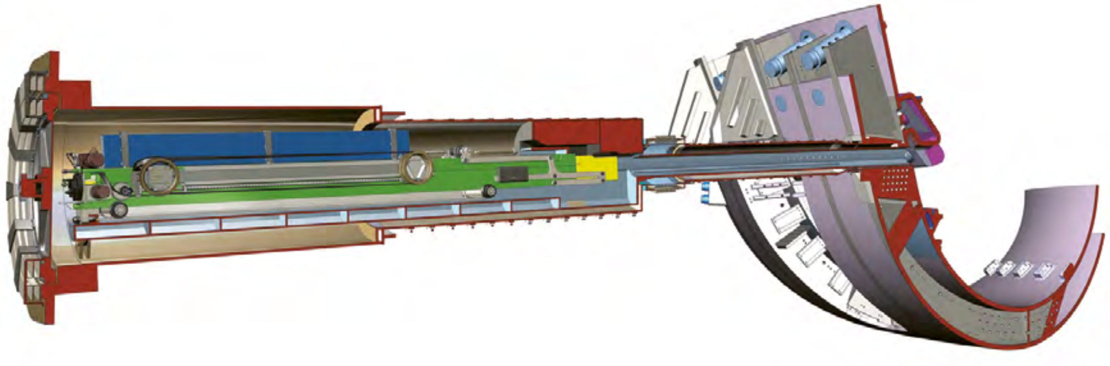
Remote Handling trials being conducted at DTP2 test facility

Progress on the Cask and Plug Remote Handling System (also known as the Transfer Cask System)

The main achievement for the cask and plug remote handling system was the completion of the conceptual design review (CDR). This is a formal project milestone which leads to the subsequent signature of the procurement arrangement between F4E and the IO which will take place in 2014. F4E implemented two specific contracts in support of the CDR namely; Preparation of the cask and plug remote handling system CDR documentation (F4E-OMF-272-01-05) and finalisation of the conceptual design of the cask and plug remote handling system (F4E-OMF-272-01-08). In parallel work started in preparation of the invitation to tender for the main cask and plug remote handling system procurement which will follow (F4E-OMF-340-02). A central part of this process has been the definition of a business case which the tenderers will undertake to demonstrate their competence against a representative set of tasks related to the design and manufacture of this safety important system.



Equatorial port plug handling using the cask and plug remote handling system



Section view of the port extension including the in-vessel viewing system plug

Progress on the In-Vessel Viewing and Metrology System

The conceptual design review planned in mid-2013 was delayed due to the implementation of the IO project change request PCR-515 that re-assigned the in-vessel viewing system responsibilities in IO to the diagnostics group. Meanwhile, the concept design validation program went on, with the finalisation of the activities related to the in-vessel viewing system probe layout refinement, compatibility check of its key components under vacuum and during prolonged exposure to gamma rays and neutrons (F4E-GRT-282). Also the activities associated with the in-vessel viewing system neutronic analysis (F4E-2008-OPE-02-01-06) were completed and different configurations of the shielding blocks being analysed. The procurement procedure was started with the publication of the call for expression of interest and the receipt the applications (F4E-OMF-383).

Progress on Neutral Beam Remote Handling

The procurement arrangement for the neutral beam remote handling system was signed in June between the IO and F4E. In parallel, following the call for expression of interest launched in November 2011, five selected companies have been invited to the competitive dialogue that started in November 2013 as part of the neutral beam remote handling procurement procedure (F4E-OMF-340-03) which covers design, manufacturing and installation of the whole package. Meanwhile, an option study for the possible inclusion of commercial off-the-shelf components in an embarked control unit on the monorail crane was performed (F4E-OMF-272-01-06, see ITER compatibility assessment of remote handling equipment programme section below), and a call for proposals for a grant related to ‘Remote pipe and lip seal maintenance R&D’ was launched (GRT-0514).

View of NB calorimeter during transportation by the neutral beam remote handling system monorail crane

Progress on cross cutting technologies

Control System

In 2013, various activities in the remote handling control system area were performed in support to IO to prepare for the procurement phase of related hardware and software:

- R&D, design and prototyping activities in the area of remote handling networks, communication protocols and structured language, to progress on the definition of standard interfaces for a better remote handling systems integration;

- Analysis of the ITER remote handling control system design handbook and its annexes, and formalisation of their content in the F4E requirement management system tool in order to ensure requirements traceability during the upcoming procurement activities with industrial suppliers;

- Identification of a standardisation strategy of the remote handling control system aiming at reducing development and maintenance costs (it will be further developed in year 2014).

The ITER Compatibility Assessment of Remote Handling Equipment (ICARHE) Programme

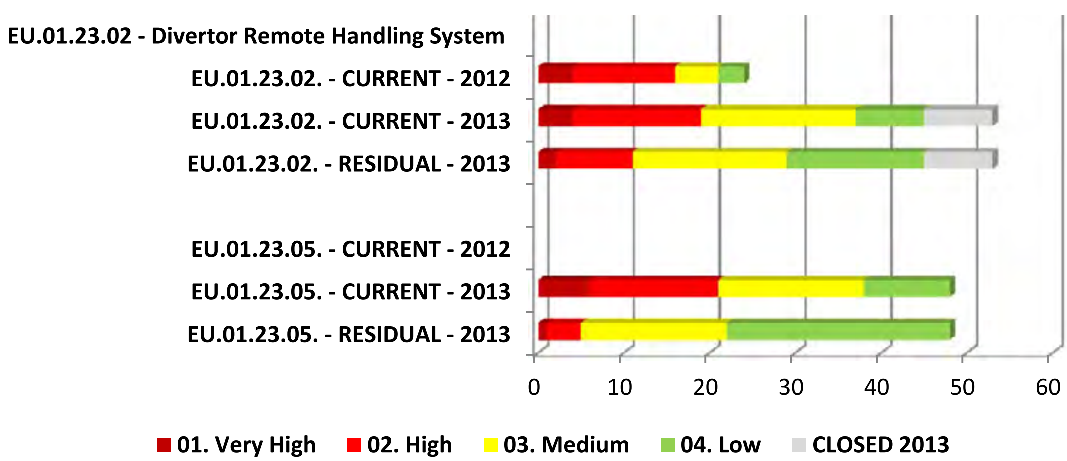
In support to the four RH procurement packages described above, a specific study was performed, to identify COTS components suitable for control units that would be embarked on the monorail crane of the neutral beam remote handling system, the cask and plug remote handling system and for the deployment system of the in-vessel viewing system (OMF-272-01-06), whilst identifying remaining technology gaps. In preparation of the framework contract with industry for the NB RHS procurement (F4E-OMF-340-01), a detailed study of all the required radiation tolerant components was performed (F4E-OMF-272-01-07). Besides, in order to improve umbilical harness management and communication between remotely operated field equipment and the control room, front-end electronics for read-out and multiplexing of embarked sensors of the divertor remote handling system is being designed for its future assessment under radiation (F4E-OMF-272-01-10), with support from an external expert. In parallel, a study of the viewing needs to support all remote handling operations was prepared, in order to identify available solutions and assess the potential need for further developments (OMF-272-01-13 to be launched in 2014). Meanwhile, a possible collaboration with CERN on radiation damage studies has being explored.

Risk Management

In the following an overview of the number of risk events, their levels and the evolution from 2012-2013 per PA is provided.

- EU.01.23.02 – Divertor Remote Handling System → the risk analysis of this PA was completed during this year and more details were added. During the year some risks regarding pre PA activities have been closed without any impact. Some scope issues have been clarified with ITER IO (i.e. agreed in the PA) and the absence of competitors for the contract was also closed.

- EU.01.23.05 – Neutral Beam Remote Handling System (NEW) → As this is a new analysis, a comparison with the previous one is not possible.



Cryoplant and Fuel Cycle Systems

F4E is responsible for the in-kind procurement of the following:

- Liquid nitrogen (LN_2) plant and auxiliary systems, approximately one-half of the cryoplant (30.677 kIUA);
- Warm regeneration lines front-end cryodistribution with cold valve boxes, torus and cryostat cryopumps, cryopumps for the neutral beam system and leak detection and localisation system (12.966 kIUA);
- Tritium plant consisting of the water detritiation system (WDS) and the hydrogen isotope separation system (ISS) (6.3391 kIUA);
- Waste Management System (10.1 kIUA);
- Radiological and Environmental Monitoring Systems (4.2 kIUA).

Executive Summary

In the area of Cryoplant and Fuel Cycle, the main highlights during 2013 are the following:

Cryoplant

- The OPE-376 (LN_2 Plant and Auxiliary Systems) tender receipt was closed on the 4 March 2013;
- The tender negotiation, led in close and constructive cooperation with IO, resulted in an optimisation of the technical configuration and a very significant reduction of the tender amount;
- The award decision for the adjudication of the procurement procedure F4E-OPE-376 was taken on the 26 November 2013 and the contract signed with Air Liquide Engineering on the 16 December 2013;
- The definition of the interfaces and the safety analysis made great progress, especially in the second half of 2013.

Cryopumps and Cryodistribution Lines (Vacuum Pumping, Leak Detection and Localisation)

- The manufacture of cryopanels and thermal shields for the pre-production cryopump together with their documentation package in relation to quality and safety requirements were completed;
- The manufacture of the other components of the pre-production cryopumps progressed significantly;
- The design for the cold valve boxes and the warm regeneration system reached a level close to completion, despite the stringent demands by geometry limitations, from load conditions, especially for components with safety functions, and by extreme temperature ranges for the necessary insulation;
- F4E has contributed to the final design review of a modified design for the IO neutral beams and MITICA cryopumps to minimise manufacturing and operational risks;
- An updated leak detection and localisation strategy was agreed with IO to reflect the progress of the conceptual design of the systems for the cryostat and the rest of the ITER machine;
- The PA for the warm regeneration lines was signed by F4E and IO in September 2013.

Tritium Plant

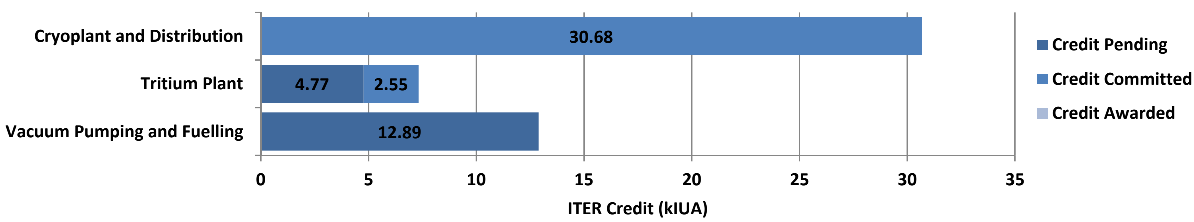
- The call for tender for the final design and procurement of WDS large tanks (volume $\geq$ 20 m^3) was published in April 2013 and the contract signed with Equipos Nucleares S.A. in September 2013;
- The contractor of the WDS large tanks submitted the first drafts of tank design documentation for a final design review scheduled in February 2014;
- The call for tender for the preliminary design for WDS (excluding tanks) was published in January 2013 and the contract awarded to Kraftanlagen Heidelberg GmbH in August 2013;
- First tasks to develop the Preliminary design of the WDS (excluding tanks) were initiated;
- Grant agreement for R&D in support of the Isotope Separation System conceptual design was implemented. The experimental facility is being commissioned in order to start the experimental campaigns to characterise the packing types used in

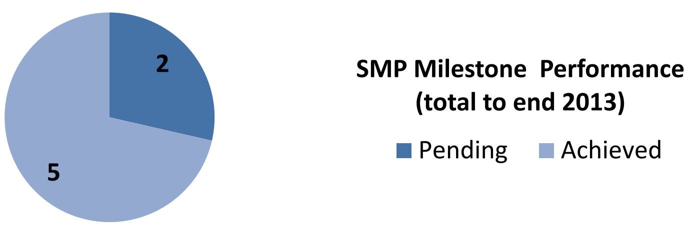
the cryo-distillation columns in the first half of 2014.

Waste Management System (WMS) and Radiological and Environmental Monitoring Systems (REMS)

- The ITA FCIPT-11-30-EU01 "Support for Radiological and Environmental Monitoring during Conceptual Design, phase II" was closed and results delivered to IO;
- The Procurement Arrangement "ITER Radiological and Environmental Monitoring Systems" was negotiated and signed in September 2013;
- The Task Order F4E-OMF-298-02-01-01, partially implementing the REMS Design PA was drafted and negotiated with AMEC and accepted by IO;
- The ITA C66TD01FE "Radwaste process optimisation" was amended and a new task added to the scope;
- The new Task of the ITA C66TD01FE, "Conceptual Design of the Tritium Outgassing Rate Measurement System", was timely executed and information provided for the Type-A Conceptual Design Review Meeting;
- The Conceptual design review meeting of the Type-A Radwaste System was carried out by IO;
- In support to the Hot Cell Complex Task Force, the task "Study of the Operation and Maintenance of Doors, Cranes, Trolleys and Mast on Cranes, in ITER Nuclear Environment" was positively undertaken through the Framework Contract F4E-OMF-298-01-01. Results obtained were timely provided to the Task Force for the Hot Cell Complex Safety Review.

ITER Credit and Milestones





Project Plan and SMP Milestones completed during 2013

Milestone Code	Milestone Name	Actual Start Date	SMP Baseline Date
EU31.01.11550	Inter Project Link.P1.EU.01 Front End Cryo-Distribution: Warm Regeneration Lines Signed	26/09/2013	10/09/2012
EU32.05.13365	Contract Signed for Procurement of WDS Tanks including Inst'n	19/09/2013	03/06/2013
EU34.01.10480	Contract Signature for Design, Procurement & Technical Assistance of LN_2 Plant and Auxiliary Systems	16/12/2013	16/10/2013
EU64.01.10560	Inter Project Link PA 6.4.P1.EU.01 for Design of ITER REMS Signed	26/09/2013	18/10/2012

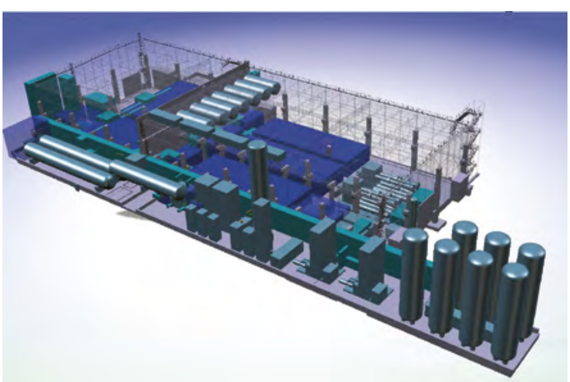
Progress Report on the Cryoplant

In 2013, a major landmark was achieved with the signature of the contract for the procurement of the LN_2 Plant and Auxiliary Systems. The tender and award process for that large amount and complex contract spread over the whole of 2013. Within the allocated timescale and in close cooperation with IO, the negotiations allowed to get a final offer fully acceptable for F4E and optimised in terms of price, technical compliance, contractual conditions, implementation strategy and distribution of risk. Variants were assessed in order to reduce costs, optimise the performance and implement industrial standards. In some cases, proposed variants led to deviations from the PA. To ensure acceptance of the deviations by IO, IO experts were extensively involved in the negotiations. Examples of variants are:

- LN_2 plant refrigerators sized on average loads rather than maximum load;
- Use of standard equipment for the GAN (Gaseous Nitrogen) generator, external purifier and the recovery compressor;
- Reduction in the number of storage tanks.

The contract was signed with Air Liquide Engineering in December 2013.

Additionally, an extensive safety analysis was performed resulting in some adjustments of the specifications, in particular regarding the seismic requirements. The implementation of the quality and project management rules was fully defined. The interfaces of the cryoplant with the other systems kept being updated and refined as required so as to ensure a smooth integration within the overall ITER project.



Layout of the cryoplant showing, among others, the components provided by F4E: compressors, cold boxes, tanks, gasbags, heaters, dryers

A 2014 realistic schedule with monitoring milestones was defined. For the next years, a first draft of a realistic schedule was initiated, which will be finalised later on by refining the assumptions, the strategy, performing a risk analysis and especially integrating it within the overall ITER schedule.

Progress Report on the Cryopumps and Cryodistribution Lines

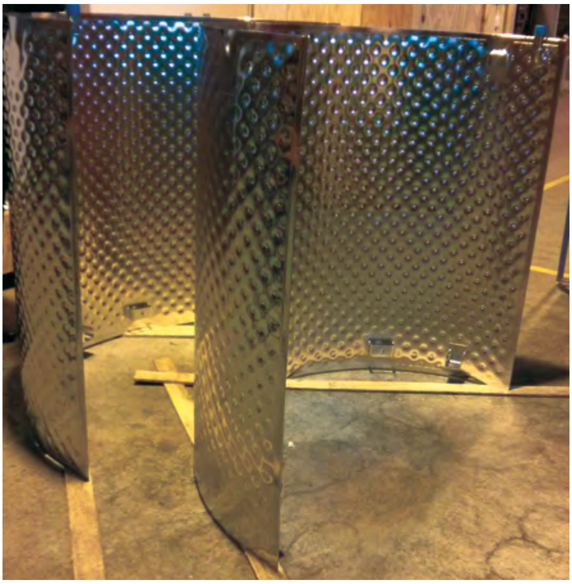
The manufacture of the cryopanels and thermal shields for the pre-production cryopump were completed. In addition, the documentation package for these components with the highest demands for quality and safety was also finished. Significant effort has also been spent to optimise aspects of the design to minimise manufacturing and operational risks for this pump, while production of its other components is in progress. An intellectual property agreement was signed between IO and KIT to safeguard the KIT know-how on the charcoal spray of the cryopanels which is necessary for the helium and hydrogen isotope pumping. It is reminded that the pre-production cryopump manufacture, under the task agreement C32TD31FE, is a major pre-procurement arrangement activity for the built-to-print definition of the torus and cryostat cryopumps and that the pre-production cryopump is also intended as a spare cryopump.

The PA for the warm regeneration lines was signed in September 2013. The detailed design for these components guaranteed maximum competition during the subsequent tender phase.

A modified design of the ITER and MITICA neutral beam cryopumps was presented by IO in a FDR in November 2013. F4E supported the proposed design modifications which aimed to minimise manufacturing and operational risks.

The leak detection and localisation package for the cryostat has been separated from the rest of the ITER machine to reflect progress in the related R&D as well as in the conceptual definitions of the design.

Similarly to the cryoplant, a lot of efforts were dedicated to planning and scheduling.

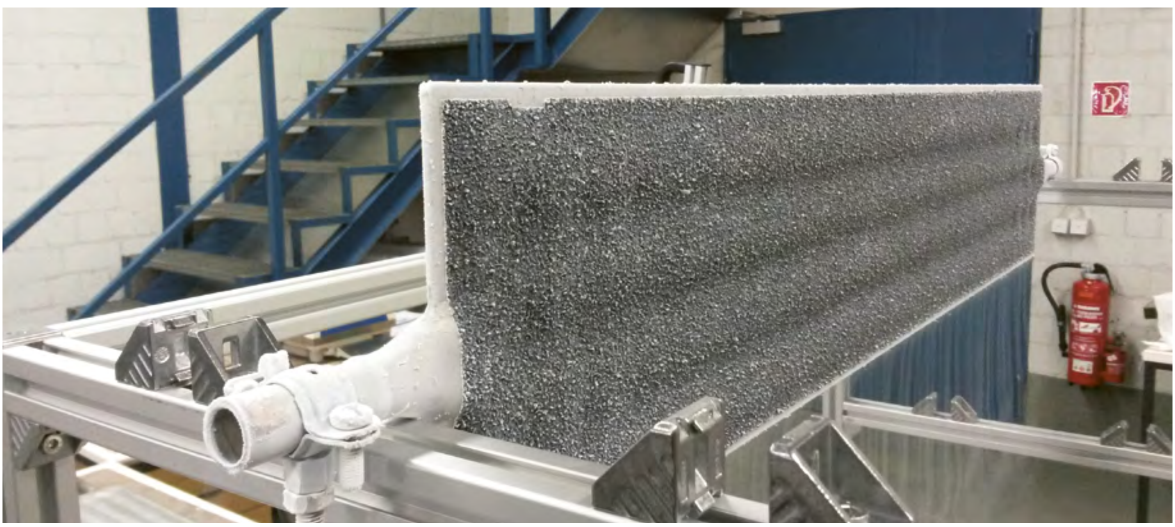


Manufactured thermal shields for the pre-production cryo-pumps (courtesy of SDMS/Ziemex)

to be assessed in February 2014 in a dedicated design review meeting to be organised by F4E. The safety requirements provided by IO in line with the PA specifications were spelled out and a nuclear safety control plan was established accordingly. The design methodology was accepted by F4E. The quality plan was approved. Main issues relative to design and manufacturing were addressed in advance and solved.

The contract F4E-OPE-421 was awarded to the German Company Kraftanlagen Heidelberg GmbH to develop the Preliminary Design of the Water Detritiation System. The Supplier has initiated the review of the input documentation. This activity is covered by ITA and is expected to be completed by the end of 2015. A draft of the safety requirements was issued by IO.

In the frame of the grant F4E-GRT-045, the activities were completed to qualify a catalyst/



A pre-production cryopump cryopanel after charcoal spraying and a cold test at 77K (courtesy of KIT)

Progress on the Tritium Plant

Water Detritiation System (WDS)

Following signature in December 2012 of the Procurement Arrangement for the Water Detritiation System large tritiated water tanks (four 20m^3 holding tanks and two 100m^3 emergency tanks), the contract F4E-OPE-500 was signed with the Spanish company Equipos Nucleares S.A. The Contractor has started preparing the final design

packing mixture type that is candidate to be used in the water detritiation system liquid phase catalytic exchange columns. Experimental campaign was completed. The results confirm the expected negative impact on the separation performance derived from the deuterium concentration increase in the fed tritiated water. The outcome of the R&D will be used to optimise the design parameters of the catalytic exchange column (e.g. hydrogen gas/liquid water ratio, length of the column) in order to achieve ITER's required detritiation performance.

Isotope Separation System (ISS)

R&D has been initiated in the area of the Hydrogen Isotope Separation System in the frame of a grant agreement (F4E-GRT-440) placed in 2013. The beneficiary in this case is the Karlsruhe Institute of Technology that will carry out experiments to characterise the performance of few defined packing types to be used in the cryo-distillation columns to separate the hydrogen isotopes (protium, deuterium and tritium) by exploiting the differences in their vaporisation temperature. This grant is covered by an ITER task agreement (ITA).

More generally, the strategy for the procurement of the ISS was redefined with IO as the need for an additional configuration study was identified by IO.

Similarly to the other packages, a lot of efforts were dedicated to planning and scheduling.

Progress Report on the Waste Management System and Radiological and Environmental Monitoring Systems

Waste Management System (WMS)

At the beginning of 2013, the scope of the ITER Task Agreement (ITA) C66TD01FE "Radwaste Process Optimization" was amended to include an additional task: "Conceptual Design of the Tritium Outgassing Rate measurement System".

The task order F4E-OMF-298-01-01-02 "Conceptual design of the tritium outgassing rate measurement system" was successfully executed, in time for the Type-A Radwaste Conceptual Design Review Meeting, held at Cadarache in December 2013.

In addition, during the first half of 2013 support to the Hot Cell Complex Task Force was provided by means of participating to relevant meetings with the Task Force Team, in order to agree issues affecting the Radwaste building which needed to be solved, and by running on behalf of the Hot Cell Complex Task Force, a task order, F4E-OMF-298-01-01-03 with the F4E Radwaste services Supplier, on Hot Cell doors, cranes, trolleys and mast on cranes. The task order was successfully executed and preliminary results were provided in time for the Hot Cell Complex Safety Review Meeting, which was initially scheduled at the beginning of December.

Radiological and Environmental Monitoring Systems (REMS)

As far as concerning the Radiological and Environmental Monitoring Systems (REMS) project, the first part of 2013 was mainly devoted to agree both the scope of the PA, which, in order to optimise the configuration, was limited to preliminary design activities, and the requirements to be applied during the REMS design. On the last subject, a workshop was successfully held in Barcelona, and at the end of the three day meeting a complete set of requirements was agreed with IO. The workshop outcomes were also included in the drafting of the Annex B of the REMS PA, which was finally signed in September.

Once the PA was signed, most of the time was dedicated to draft both the necessary procurement documentation as to have the contract with industry in place by February 2014, as well as REMS project related documentation included in the PA and its annexes and indispensable to IO to monitor and control the correct development of the system design.

Similarly to the other packages, a lot of efforts were dedicated to planning and scheduling.

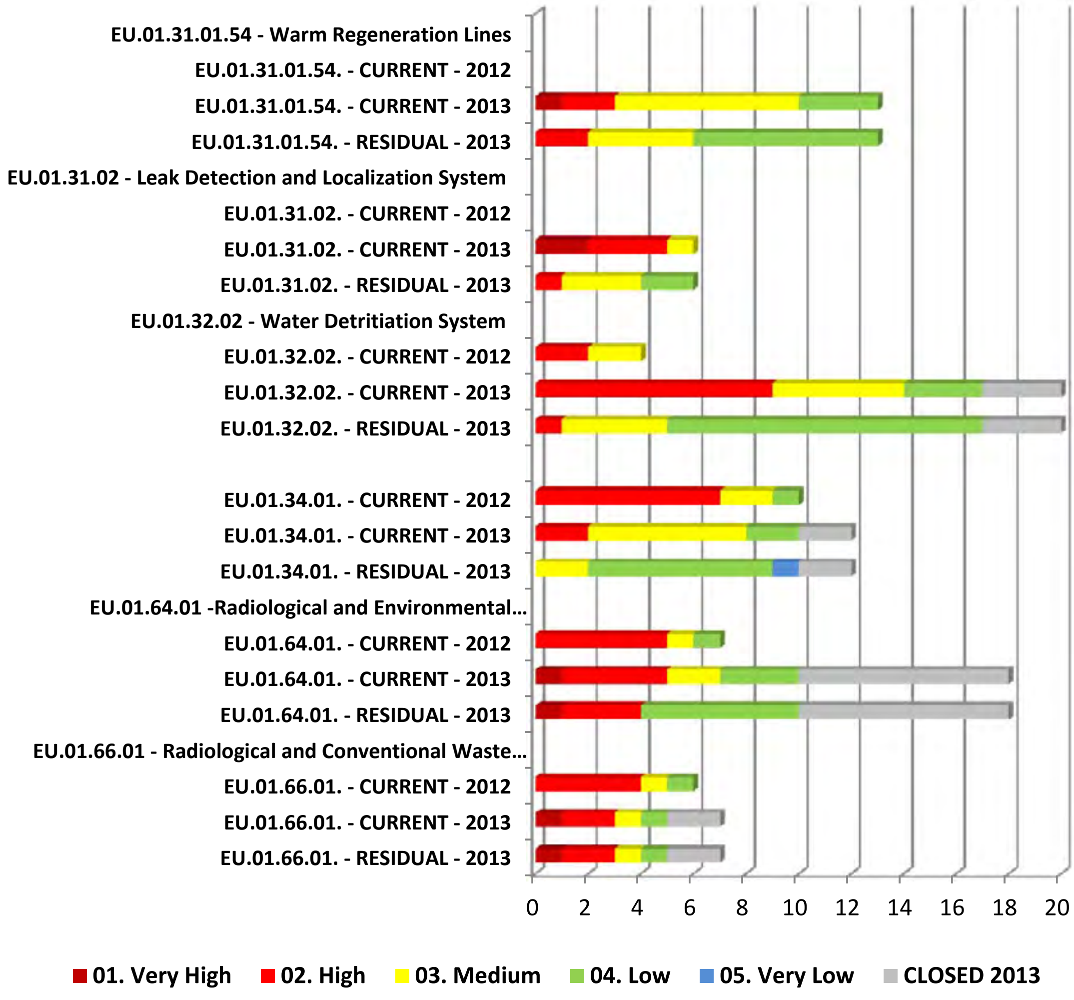
Risk Management

In the following an overview of the number of risk events, their levels and the evolution from 2012-2013 per PA is provided.

- EU.01.31.01.54 – Warm Regeneration Lines (NEW) → As this is a new analysis, a comparison with the previous one is not possible.
- EU.01.31.02 – Leak Detection and Localization System (NEW) As this is a new analysis, a comparison with the previous one is not possible.
- EU.01.32.02 – Water Detritation System → More details have been added after the signature of the preliminary design of WDS.
- EU.01.34.01 – Liquid Nitrogen Plant and Auxiliary Systems → with the implementation of many of the planned mitigation actions, the risk level for most of the critical risk events has been decreased.
- EU.01.64.01 – Radiological and Environmental Monitoring System → in this case all the closed

risks have impacted the project, thus increasing mainly the expected cost and the scope of the PA. An analysis of the new situation for the signature was done with the identification of many new risks that may affect from the signature.

- EU.01.66.01 – Radiological and Conventional Waste Treatment and Storage → since last year there is one risk that has increased the risk level. This moved to Very High after the negotiations carried out with ITER IO with a Very High impact on cost.



Radio and Microwave Heating Systems

F4E is responsible for the in-kind procurement of the following:

- Ion cyclotron resonance heating system (equatorial port plug incorporating one ion cyclotron antenna) (3.96 kIUA).
- Electron cyclotron resonance heating system (four upper port plugs incorporating launchers as Primary Confinement System (10.8320) kIUA), 32% of the gyrotron sources and 67% of the power supplies (8.010kIUA and 11.628 kIUA respectively).

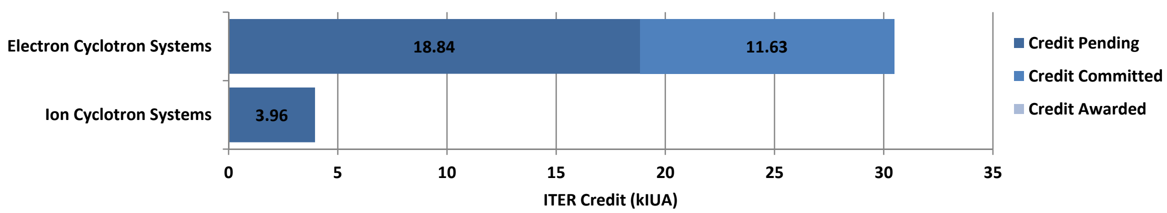
Executive Summary

In the area of the radio and microwave heating systems, the main highlights during 2013 are as follows:

- The manufacturing of the Faraday Screen mock-ups is complete and the mock-ups are ready to be tested. The framework contract for the final design of the ICH antenna is ready to be signed in early 2014.
- Electron cyclotron upper launcher design is in the final design phase. High priority has been given to the design and analysis of the SIC1 components (ex-vessel).
- The implementation of the activities for the development of the 1MW gyrotron for ITER has started.
- The contract for the procurement of the European power supplies for the ITER electron cyclotron system has been signed.

ITER Credit and Milestones

No SMP milestones were foreseen to be completed until the end of 2013.



Project Plan and SMP Milestones completed during 2013

Milestone Code	Milestone Name	Actual Start Date	SMP Baseline Date
EU51.01.103260	Preliminary Design for the IC Antenna approved by IO	01/07/2013	N/A

Progress on the Electron Cyclotron Upper Launcher

The design of the electron cyclotron launchers has entered the final design phase.

The launcher design and analysis work in 2013 has continued under the umbrella of GRT-161, an agreement between F4E and the electron cyclotron upper launcher consortium of associations (KIT, CRPP, DIFFER, ENEA-CNR and IPP). Prototype work for some high-priority component has also started in 2013, namely for mock-up support for waveguide coupling design (OPE-528) and for the qualification of the electron cyclotron launcher diamond window (OPE-467).

The priority of the technical work has continued to be on the launcher components that are classified as SIC1 (that is providing primary confinement for the ITER Tokamak). These components include all the ex-vessel components (waveguides and waveguide components, isolation valves and high-power diamond windows), as well as the rear part of the port plug (providing the seal between the port plug and the vacuum vessel) and feed-throughs. Tender preparation for an industrial contract for the design of the cooling of the launchers has also started in 2013.

FEM analyses of the ex-vessel waveguide couplings (design provided by IO, based on industrially available couplings) showed that these components are not suitable for the ITER environment (show cope with large displacements during baking and seismic events). The development of new waveguide couplings is now ongoing in GRT-161 and OPE-528.

The interface definition of the upper launcher has changed in 2013, due to unstable allocation of space reservation in the port extension (where the port plug has to fit) as well as modifications of sealing method (increased size). Imposed gaps between the port plug and the port wall have increased significantly (driven by requirements associate with poor tolerance of the port extension and the chosen installation method). F4E (in agreement with its suppliers and IO EC) has decided a freeze of some design activities and a re-direction of the resources for performing an impact assessment of all the changes. A first consequence of the interface change is the reduction of the ex-vessel waveguide diameter from 60.5 to 50mm, requiring re-design of the ex-vessel mm-wave system. The diamond window is not affected by these changes. The impact of these delays on final design review dates will be determined after the full impact assessment has been completed, during the first half of 2014 (completion pending stabilisation of input data).

F4E has also increased its efforts in the system engineering of the EC launcher, in particular exploiting the internal development of the DOORS system for collection, tracking and verification of requirements.

In the area of Code and Standards, work has continued and ASME is now adopted as main code for the mechanical design (in agreement with the IO EC). In collaboration with F4E Safety and IO EC, a technical case for exemption of the EC Upper Launcher from pressure code directive (PED) has been carried out. Nuclear FMEA studies (OFM 298) for the launchers have been also carried out in 2013, and will continue on 2014, again in collaboration with F4E.

Progress on the Ion Cyclotron Heating

The work for GRT-026 (CYCLE consortium: CCFE, CEA, ERM, IPP and Politecnico di Torino) for the detailed design of the ITER ICH antenna was completed in the summer of 2013. As a result of one of the category one chits of the ICH antenna preliminary design review, the faraday screen design was subject to a separate PDR in May 2013. The PDR of the antenna was closed in June 2013.

Work has progressed in 2013 to complete the electromagnetic analysis and seismic analysis of the antenna (under F4E analysis framework contracts), and the thermo-mechanical analysis (performed by CYCLE) under a set of load conditions. Neutronics

Mock-ups of ICH antenna Faraday screen bars

analysis (under F4E analysis framework contract) of the antenna has progressed in 2013. The preparation for the next phase of the antenna design has involved the launch of the call for tender, negotiation evaluation and adjudication of the framework contract for the final design of the antenna, which is foreseen to be signed in 2014. A new ITA to cover this phase of the design has also been prepared by IO in collaboration with F4E. The new contract will cover the completion of the design, the preparation of the built to print drawings and of the technical specifications for procurement and general support to procurement preparation. This contract is expected to be signed in January 2014.

The fabrication of small scale mock-ups for the qualification of the Faraday screen Be/Copper/stainless steel bonds (HIP) was completed in 2013. High heat flux testing of the mock-ups is planned for 2014.This work is being carried out under OPE-097 Lot 2 for the manufacturing, and OPE-400 for the testing, and is profiting from the synergies in scope with the blanket

Small scale mock-up of the ion cyclotron resonance Faraday shield (courtesy of Atmostat)

project. The option of OPE-097 for the manufacturing of the prototypes has not been released because it was judged that the Faraday screen bar design was not mature enough; a new manufacturing contract is planned for 2014.

A call for tender has been launched in 2013 for the first part of the qualification of the Radio Frequency window ceramics with pre- and post-irradiation measurements of relevant material properties. The aim is to choose one alumina grade out of six for full qualification (second part of the material property measurements) and manufacturing of the window. To support this choice, a second activity for the study of the brazing of Alumina grades and titanium joints has been launched (preparation of specifications to signature) in 2013 under an F4E technical support services framework contract. In 2013 IO made a major change of strategy of the window R&D and qualification programme, with the decision that the window prototype for functional tests will be built by IO.

Finally, F4E has continued to provide support to the IO for design reviews and technical meetings related to the ICH antenna and to the ICH system in ITER.

Progress on the Electron Cyclotron Radio Frequency Sources and Power Supplies

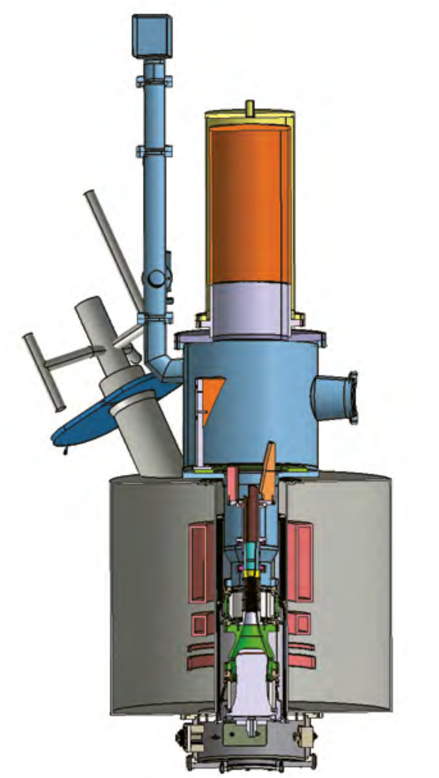
In 2013 the activities for the validation of the design of the 1MW CW gyrotron have been launched. The contract for the procurement of a 1MW short pulse gyrotron has been signed. The short pulse gyrotron has the same scientific design as the industrial tube, and is the main risk mitigation measure in place for the development of the EU 1MW gyrotron. The manufacturing design is completed and the first subassemblies have been manufactured. The call for tenders for the 1MW CW gyrotron prototype and critical mock-ups and for the cryogen-free superconducting magnet, have been issued and the evaluations has been completed.

The grant for the design and development activities is continuing. Good progress achieved in the modelling of electron gun phenomena. Improvements have been implemented in the design of the cathode and anode structure to enhance the quality of the electron beam parameters at the cavity. The new design version of the electron gun will be implemented in the short pulse gyrotron and CW gyrotron prototype. The conceptual design of a test bed for control of the electron beam quality and homogeneity before installation and operation has been completed. The numerical method for the modelling and design of the mirror line launcher has been optimised.

In the frame of a thermo-hydraulic framework contract a task has been launched for the optimisation of the hypervapotron cooling concept used in the gyrotron collector. A full 2D model of the complete axial length of the collector have been successfully run in two phase flow and allowed to understand the liquid flow pattern and local boiling phenomena taking place in the reference geometry used in the 1MW CW gyrotron collector.

An ITER Task Agreement for the integration of the EU gyrotron in the ITER environment and for the preliminary design of the auxiliary systems has been signed with IO. The experimental validation of the EU spherical load for long pulses and high power operation, is Included in the task, as well as the qualification of gyrotron diamond disks.

The call for tender for the procurement of the European contribution to the electron cyclotron power supplies was issued, the award was signed, and the contract signature occurred in December 2013. Under this contract, eight high voltage power supplies (55kV/100A), 16 body power supplies (35kV/100mA) and the dummy loads will be procure. The power supplies system will be designed to shut down in less than 10 micro-seconds.



3D assembly drawing of the 1MW short pulse gyrotron (F4E-OPE-458)

Copper rings for the gyrotron beam tunnel and body ceramic insulator for the 1MW short pulse gyrotron (F4E-OPE-458)

Neutral Beam Heating

F4E is responsible for the in-kind procurement of the neutral beam heating system (100% assembly and testing, 100% beam line components, 100% of compensation and active correction coils, around 50% of the remaining components broken down into:

- Neutral beam assembly and testing (3.8 kIUA);
- Beam source and high voltage bushings (3.893 kIUA);
- Beamline components (3.9 kIUA);
- Pressure vessel and magnetic shielding (9.025 kIUA);
- Active corrections and compensation coils (4.4 kIUA);
- Neutral beam power supplies and related systems (31.382 kIUA);
- Neutral Beam Test Facility (27.0 kIUA).

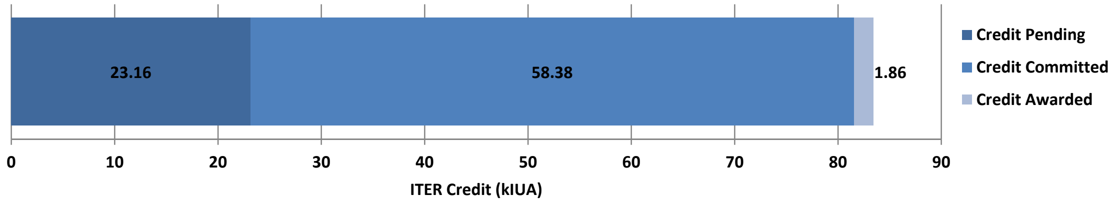
F4E is in charge of the in-kind contributions related to six neutral beam procurement packages, which include beam sources, beam line components, confinement and shielding, coils, power supplies and assembly. A seventh major procurement arrangement covers the European procurements for the establishment of the Neutral Beam Test Facility in Padova, Italy.

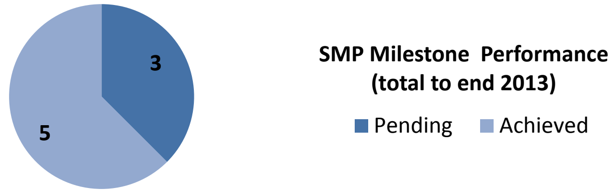
Executive Summary

In the area of the neutral beam heating systems, the main highlights during 2013 are as follows:

- Many major procurement contracts for the Neutral Beam Test Facility were signed in 2013 and the tendering procedures for many others were launched and progressed;
- The contracts signed in 2013 progressed through the final design phases and the manufacturing of critical components have progressed;
- The construction of the Neutral Beam Test Facility buildings at the Consorzio-RFX site in Padova has progressed well;
- Design work on towards the build-to-print specifications of the Heating Neutral Beam core components and front end progressed and the design were submitted to the different reviews stages;
- The ELISE test facility in IPP has performed experiments obtaining very good results.

ITER Credit and Milestones





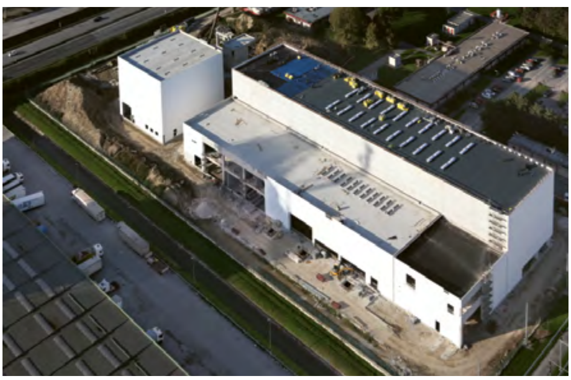
Project Plan and SMP Milestones completed during 2013

Milestone Code	Milestone Name	Actual Start Date	SMP Baseline Date
EU52.04.10160	NP – Contract Signed for BPS & MHVPS (main contract)	17/12/2013	31/07/2013

Progress Report

The Neutral Beam Test Facility entered the construction phase in 2012, with the start of the works for the erection of the buildings in Padova, and progressed well in 2013 with the erection of all the prefabricated building, to be completed in 2014. The buildings, managed by Consorzio RFX are part of the Italian contribution to the establishment of the Neutral Beam Test Facility.

In 2013, F4E continued to provide support to the IO to prepare the Neutral Beam technical specifications at the required level of detail. This support included most of the design and R&D activities related to the Heating Neutral Beam system and the design and the establishment of the Neutral Beam Test Facility. In particular:



PRIMA building erection at Padova site (Consorzio RFX premises)

- The ITER preliminary design review for the Beam Line and Beam Source vessels, the Passive magnetic shield and active correction and compensation coils has been held in April 2013. This completes the preliminary design phase of all the front components as for the the others components (drift duct, vvpss box, exit scraper and fast shutter), the preliminary design review was approved successfully in 2012. An amendment of the existing ITA/grant has been signed end 2013 to bring the design up to the final design review.

- The design of the megavolt ITER injector and concept advancement (MITICA) components has advanced: in March the preliminary design reviews of the neutral beam line components (neutraliser, electrostatic residual ion dump and calorimeter) were performed and all the components were accepted for the subsequent final design phase. The final design review and the preparation of the detailed technical specifications for MITICA vacuum vessel were completed.

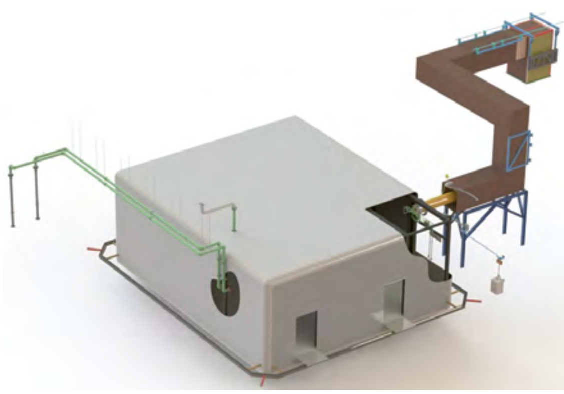
- R&D activities were performed to verify the manufacturing procedures of special parts to be used in order to fulfil the stringent requirements of the high heat flux components.

- The test facility for ultra-high voltage tests for vacuum insulation was fully commissioned and several experimental campaigns have been performed to verify electrostatic configuration of the beam source accelerator also in the presence of transversal magnetic field.

- The main manufacturing activities for the Ion source and extractor power supplies (ISEPS, F4E-OPE-046) supplied by OCEM s.p.a progressed well throughout the year and were completed by end December. Factory tests of several major components were successfully performed, of which in particular the large transformers for the RF and extraction grid power pupplies hosted on the high voltage deck, which were tested at SEA premises in May, and the first RF generator, tested at Himmelwerk premises in September. Overall factory acceptance testing at OCEM premises will follow in spring 2014.

RF Power Supplies for ISEPS of SPIDER at OCEM Energy Technology premises

- The procurement contract for the HV deck and transmission line for SPIDER was signed with COELME in July 2013 (F4E-OPE-396). Design activities progressed through the remaining of the year, including in particular the detailed definition of the interfaces between the HV deck and the hosted ISEPS equipment, and between the transmission line and the SPIDER vessel. Detailed design is scheduled for completion early 2014.



3D Model of the SPIDER HVD & TL

- The major contract for the procurement of the SPIDER beam source and vacuum vessel signed in 2012, is under manufacturing. Vacuum vessel to be finished mid 2014.

SPIDER vacuum vessel manufacturing at Zanon premises.

- The start of the procurement of the 1MV deck and bushing of MITICA and ITER injectors has been hindered by slow contractual negotiations within the competitive dialog. Negotiations were still ongoing by the end of the year. The procurement is planned to start next summer.

- The manufacturing activities for the PRIMA Cooling Plant (F4E-OPE-351) supplied by Delta-Ti Impianti s.p.a. progressed well throughout the year with the F4E Hydraulic Detailed Design review successfully held in June 2013.

- The activities in 2013 in relation to the supply contract for the SPIDER beam source and vessel have been the completion of the main hardware of the vacuum vessel including NDT, the finalisation of the first manufacturing design of the beam source together with the start of manufacturing of the main parts and the completion of the production of the prototypes.

Spider Vacuum Vessel lid at Zanon premises.

- The contract for the procurement of the gas storage and distribution, vacuum and gas injection systems for the Neutral Beam Test Facility progressed up to the detailed design being approved by F4E at the end of the year.

- A framework contract for the procurement of the I&C for the NBTF have been successfully negotiated, and will be implemented in 2014.

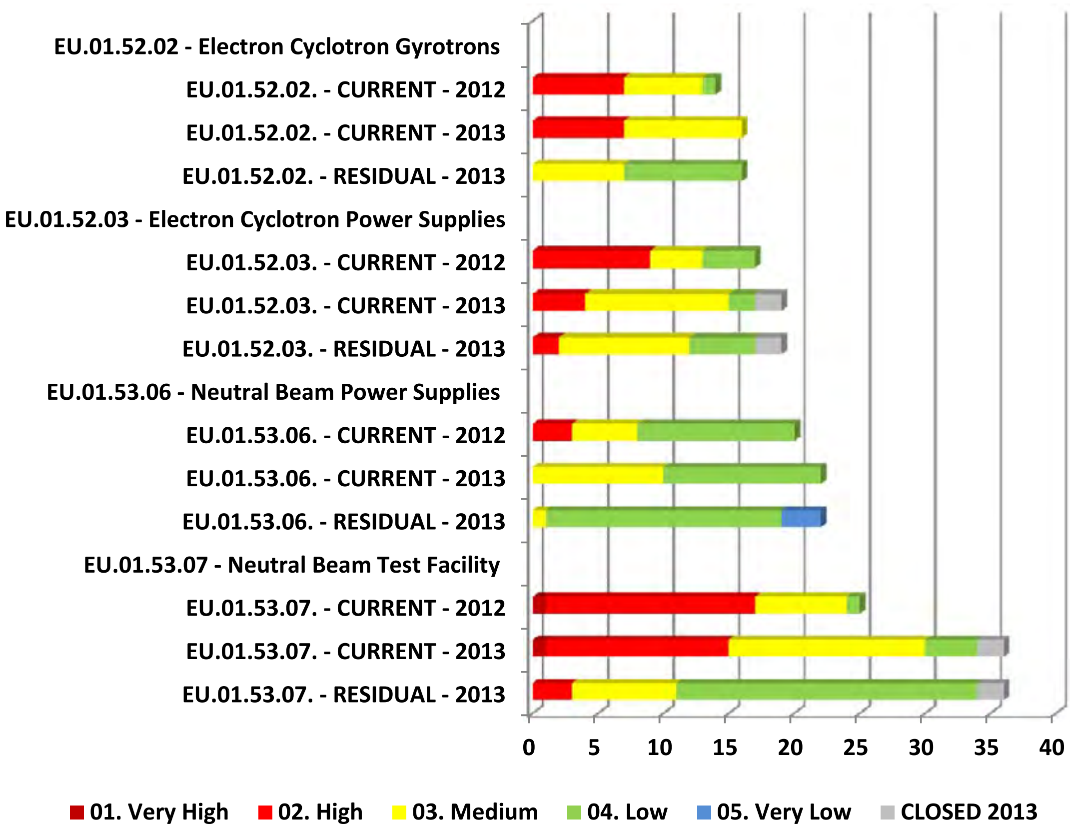
First experiment of the ELISE test facility at the Institute of Plasma Physics (IPP) in Garching started at the beginning of 2013, when integrated commissioning was completed. After initial troubleshooting and low power operation in volume, i.e. w/o caesium, the experiments were mainly concentrated in control the plasma and beam homogeneity. In the second half of the year the installation of the diagnostic calorimeter was completed, and Cs operation started in October with very good progress of the results. Ion current densities of up to 130 A/m^2 have been achieved in low-perveance conditions, i.e.

9 kV extraction voltage and low RF power (20 kW per driver). In optimum-perveance conditions (4.5 kV extraction voltage), ion current densities of up to 95 A/m^2 in hydrogen have been achieved with an electron/ion ratio of 0.5 at the required source filling pressure of 0.3 Pa and for more than 400s. The next steps foreseen in 2014 are deuterium operation and an increase of the RF power.

Risk Management

In the following an overview of the number of risk events, their levels and the evolution from 2012-2013 per PA is provided.

- EU.01.52.02 – Electron Cyclotron Gyrotrons → A new Risk identified regarding the general policies (IPR).
- EU.01.52.03 – Electron Cyclotron Power Supplies → with the implementation of many of the planned mitigation actions, the risk level for most of the critical risk events has been decreased.
- EU.01.53.06 – Neutral Beam Power Supplies → with the implementation of many of the planned mitigation actions, the risk level for most of the critical risk events has been decreased.
- EU.01.53.07 – Neutral Beam Test Facility → New additional risks have been included



Diagnostics

F4E is responsible for the in-kind procurement of the following:

- 13 distinct diagnostics systems; tokamak services (cables, feed-throughs and connectors on the ITER vessel); and integration of diagnostics into seven ports housing 22 diagnostics systems from Europe, IO and five other Domestic Agencies;

- F4E is responsible of about one quarter of the ITER Diagnostics.

A planned amendment to the existing PBS.55 Diagnostics PA was implemented in March 2013 to include technical specifications for the continuous external rogowski (CER) coils, part of the magnetics diagnostic, bringing the total credit to 1.1396 kIUA. This PA will be further amended in the future to include technical specifications, and associated credit, for all the diagnostics forming part of the EU obligations.

Significant progress has been made during 2013 with design of the magnetics diagnostic under several grants and through signature of framework partnership agreements (FPA) for the development and design phase of several other diagnostics systems.

An FPA establishes a long-term collaboration (for up to four years) with a beneficiary or consortium by defining a set of rules (i.e. a framework) for conduct of the work; with the work itself performed under separate specific grants agreements. FPAs have been chosen as providing the best tool for these diagnostics, which are typically 'first-of-a-kind', require a large specialised design base and need long continuity of the design team.

Executive Summary

In the area of diagnostics, the main highlights during 2013 are as follows:

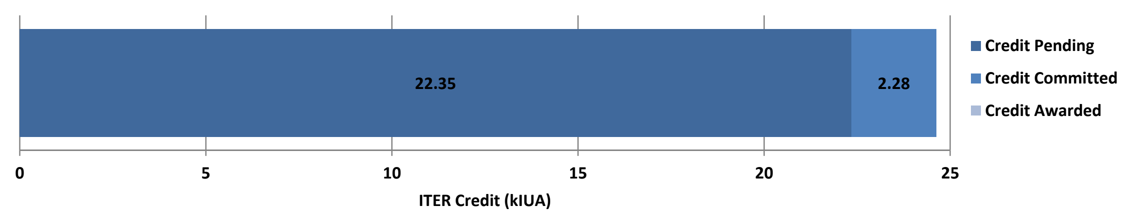
- Final design review held for the Continuous External Rogowski coils;

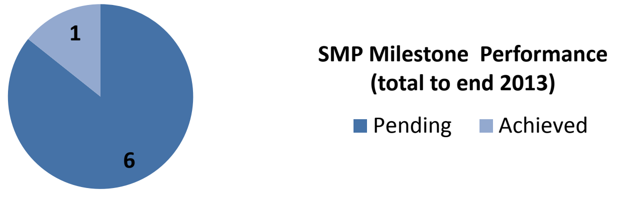
- FPA signed for Equatorial Visible/IR Wide-Angle Viewing System;

- FPA signed for Bolometer Diagnostic;

- Framework contract signed for neutron and gamma ray radiation testing services.

ITER Credit and Milestones





No project plan or SMP milestones were completed during the reporting period.

Progress Report

In July 2013 F4E held the first-ever final design review (FDR) under its responsibility, for the ITER continuous external rogowski (CER) coils. Whilst most of the components to be delivered by F4E are based on final designs provided by IO; in some cases, such as with the CER coils, F4E is responsible for finalising the design and so for conducting an FDR.

The meeting, which paves the way for the start of manufacturing, was held to assess the final design of the CER coils. These coils are to be located outside the vacuum vessel, within the cases of three toroidal field (TF) coils. Their purpose is to measure the toroidal current flowing within the contour of the TF coils, which approximates to the plasma current under steady conditions, a key measurement with relevance for safety and plasma control.

Participants in the final design review for the ITER continuous external rogowski coils

The meeting was led by an official review panel, appointed by F4E and chaired by Dr Edward Strait from General Atomics (USA). It comprised international technical experts as well as F4E and IO representatives in areas such as quality control, safety and interfacing components. Representatives from the F4E supplier, led by CEA, in addition to relevant F4E and IO staff also attended. Presentations and discussions focused on checking that the selected design solution met the system requirements in terms of performance, integration in ITER and documentation. Factory and site acceptance test procedures were also presented, as well as those for assembly, installation and commissioning.

In their report, the panel noted their appreciation for the large amount of work that had gone into the design, the supporting analysis and testing of prototypes and confirmed their satisfaction with the maturity of the design. A call for tender for manufacture of the CER coils will be launched in early 2014, with manufacturing itself commencing later in the year.

Equatorial Visible/Infra-Red Wide-Angle Viewing System

The ITER equatorial visible/infra-red wide angle viewing system is intended to provide spatially and time-resolved measurements at visible and infra-red wavelengths and will be installed in four equatorial ports on ITER (with 15 lines of sight in total, enabling views of the upper-part of the machine, the main wall and the divertor). Analysis of the measurements provided will contribute to protection of the ITER machine, control of the ITER plasma and to its evaluation/optimisation. The visible light measurements will provide the operator with an invaluable image of the inside of the machine during the plasma as well as spatially resolved information related to recycling and impurity fluxes at the plasma edge. The infra-red measurements will allow the temperature of, and power deposition onto, plasma-facing components to be mapped; helping to identify any exceeding their normal operating temperature, as well as contributing to the characterisation of run-away electrons. In August 2013, F4E signed FPA-407 for the development and design of the equatorial visible/ infra-red wide angle viewing system with a consortium consisting of CEA, CIEMAT and Bertin Technologies SAS

Schematic composite of the four different views of the ITER plasma facing components provided by the equatorial visible/infra-red wide angle viewing system from one of the equatorial port plugs

Bolometer Diagnostic

The ITER bolometer diagnostic provides scalar and profile-resolved measurement of the total radiated power from the plasma in the spectral range infrared to soft x-rays. To achieve this goal, about one hundred collimated 5-channel bolometer cameras will be distributed around the plasma and are envisaged to be mounted in port plugs, on divertor cassettes and on the inside of the vacuum vessel, providing good coverage of the poloidal cross-section. The bolometer cameras consist of support structures, imaging openings, and bolometer sensors. The bolometer diagnostic comprises the bolometer cameras, mounting platforms, electronics with provisions for calibration, control software and data-analysis software. In December 2013, F4E signed FPA-384 for the development and design of the ITER bolometer diagnostic with a consortium consisting of IPP, Garching, Institut für Mikrotechnik Mainz GmbH, Wigner RCP and MTA-EK, supported in the work by one third party.

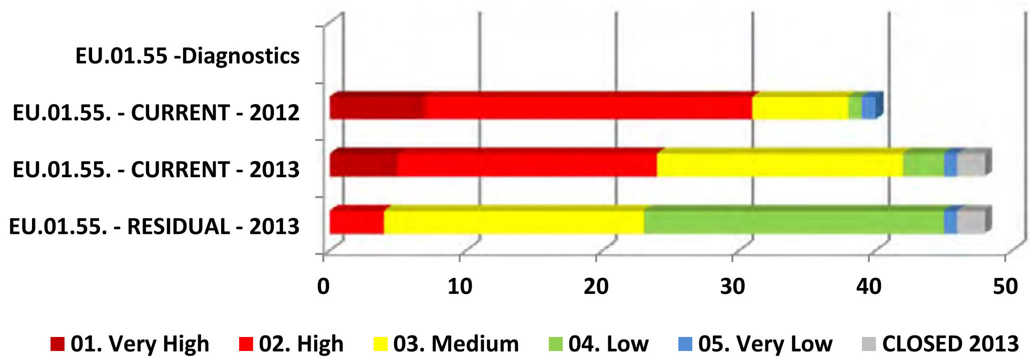
Neutron and Gamma Ray Radiation Testing Services

Irradiation by neutrons and gamma-rays in ITER could reduce, either gradually or abruptly, the performances of radiation-sensitive diagnostic devices, possibly leading to temporary or even irrecoverable failure. To demonstrate that the devices concerned meet the ITER reliability and availability requirements, radiation testing of radiation-sensitive components may be needed during design and development. Since today's fusion devices are unable to deliver sufficiently intense radiation, material testing fission reactors and strong gamma-ray irradiation sources remain the only possibility to perform, quickly and cost-effectively, such tests. In July 2013, F4E signed two framework contracts OFC-358 Lot 1 and OFC-358 Lot 2 to secure access to, respectively, fission reactors and gamma-rays sources. Contractors of Lot 1 are (in cascade) SCKCEN, Studsvik Nuclear AB and a consortium formed by NRG and CVR, whilst for Lot 2 the contractors are (in cascade) a consortium formed by SCK-CEN and CIEMAT, Synergy Health PLC and UJV.

Risk Management

In the following an overview of the number of risk events, their levels and the evolution from 2012-2013 per PA is provided.

- Diagnostics (General Risk Log) → additional risks were identified with the increase of the project information. Threat closed concerning the agreement with IO on the responsibilities on the area of port plugs and the standardisation



Test Blanket Modules and Materials Development

It is widely recognised that ITER plays a critical role in the fusion roadmap by demonstrating the scientific feasibility of fusion. Less well known is the essential role that ITER will play by providing a unique opportunity to obtain relevant feedback from the operation of a tritium breeding blanket of future fusion reactors, as planned in the Test Blanket Module (TBM) programme. This feedback includes the essential information on the tritium breeding and extraction capabilities as well as the performance of an integrated system consisting of a breeding blanket mock-up (TBM) and its auxiliaries. This information is needed before a DEMO reactor can be designed, constructed and operated with confidence.

Since the late 1990s Europe has been developing two concepts of TBM for ITER: the Helium-Cooled Pebble-Bed concept (HCPB) and the Helium-Cooled Lead-Lithium (HCLL). Both concepts, being developed keeping in mind relevancy with a future DEMO, share similarities in terms of design, structural material and technologies. However, the key difference lies in the type of tritium breeder material used: for the HCPB, lithium is present in ceramic pebbles, whereas for the HCLL, it is implemented under the form of liquid Lead-Lithium eutectic. Consequently, the set of ancillary systems deployed to extract and recover the tritium out of each TBM is specific for each concept. Each TBM System is operated independently.

Executive Summary

In 2013 the main achievements in the area of the TBM systems are as follows:

- Signature of four engineering service contracts (F4E-OMF-331-1/3/4/5-01) for (i) design of TBM sets and analyses including neutronics, shielding, dose rate and waste; (ii) nuclear maintenance studies and design of associated equipment; (iii) TBS transient and accidental analyses and safety studies; (iv) development and characterisation of preliminary welding procedure specifications for the TBM box assembly by welding and fabrication of feasibility/demonstration mock-ups. In addition, a service contract (F4E-OMF-331-2-01) for the design of TBM ancillary systems and integration in ITER was pursued.

- Signature of of two R&D specific grants (F4E-FPA-372-01, FPA-380-2-SG01) and preparation of two others (F4E-FPA-380-1/3-01) for (i) experimental activities in support of the design of HCLL and HCPB-TBS using the TBM-CA experimental facilities; (ii) experimental activities in support of the design of HCLL and HCPBTBS using other facilities; (iii) test blanket system instrumentation development; (iv) qualification of functional materials for TBM applications.

- Completion of two service contracts for the electromagnetic and seismic analysis of the TBM set installed in an equatorial port of ITER.

- Other contracts (F4E-OPE-305-1/2/3/4, F4E-GRT-410, F4E-OPE-412) allowed progressing significantly in the area of standardisation of fabrication procedures for the TBM box and development/maintenance of a database for the EUROFER-97 steel.

Progress Report

Design of the TBM Systems

The development of the European TBM systems design has progressed in 2013 with engineering contracts (F4E-OMF-331-1/2) for the design of TBMs, radiation shield and their ancillary systems. Activities have focused on the preparation of the conceptual design review to be carried out in 2014:

- The design of HCLL and HCPB TBMs has been updated in 2013 to adjust to the new dimensions of their supporting frame recently redesigned by the IO. Also, the steel structure of both TBMs has been optimised to enhanced design similarities and improve fabrication and maintenance operations.

- The design of the radiation shield located behind the TBMs, as well as its attachment system to the TBM, has been developed, supported by nuclear and simplified structural analyses. A first shield design was proposed based on scoping nuclear calculations. The complete nuclear analyses (neutron transport, photon transport, activation inventory and dose rates) using ITER b-lite model are underway to confirm the shield design and identify any possible further improvements.

- A specialised support contract (OPE-06-06-12-L1-

TO12) has focused on the development of a detailed finite element electro-magnetic model of the TBMs, which includes all other ITER components present in the toroidal sector of the ITER port. It allowed for the first time the precise calculation of the loads applied on the TBM structure and its attachment resulting from most of the foreseen ITER operational scenarios. The model fully accounts for the ferromagnetic properties of the TBM structural material (EUROFER), including the nonlinear magnetisation curve and the dependence of its electrical resistivity upon temperature. These results are inputs for structural analysis of the TBM set.

- For the ancillary systems of TBMs, 2013 activities have focused on technologies selection in each system; updated process flow diagrams; load and functional analysis for each system; analysis of the main safety and investment protection functions; preliminary sizing of the most complex components, e.g. tritium extractor in PbLi loop, getter beds and adsorption column in tritium extraction system, helium economiser in helium cooling systems, catalytic oxidation reactor and Pressure Temperature Swing Adsorption (PTSA) in Coolant Purification System; and integration in Equatorial Port Cell, ITER CVCS area and Tritium Process Room.

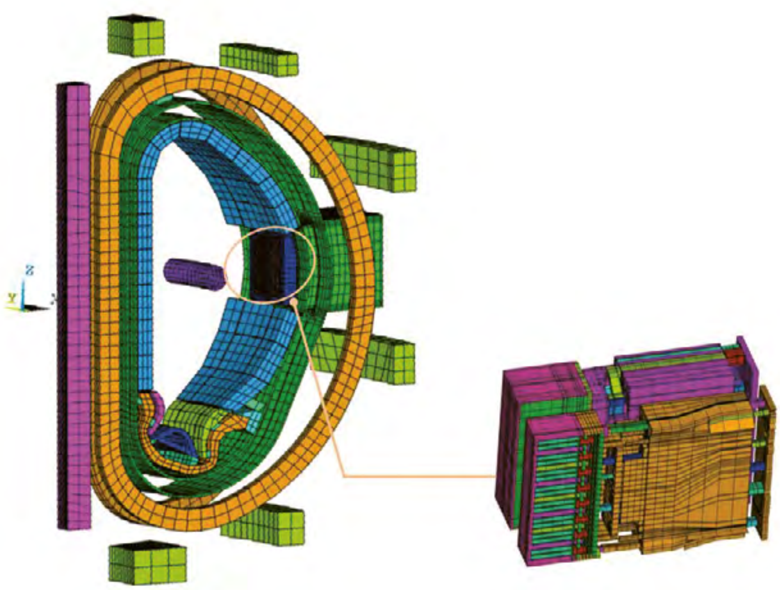
- In support of the development of ancillary systems, experimental R&D activities aimed at validating the most critical technologies started in the last part of 2013 (F4E-FPA-372-SG01). They are run in dedicated facilities like HELOKA (KIT, Germany), TLK (KIT, Germany), Meliloo (CV-Rez, Czech Republic), EBBTF (ENEA, Italy).

- A first sizing of the Plant Safety and Plant Interlock Systems was carried out in collaboration with the F4E I&C team. This important assessment required the evaluation of the needed sensors and signals in the different locations of the two TBS that allow triggering different safety and interlock functions. The number of I&C cubicles, their configuration in case of actuators/sensors sharing interlock and safety functions and their location in the Tokamak Complex were preliminarily identified and results shared with IO.

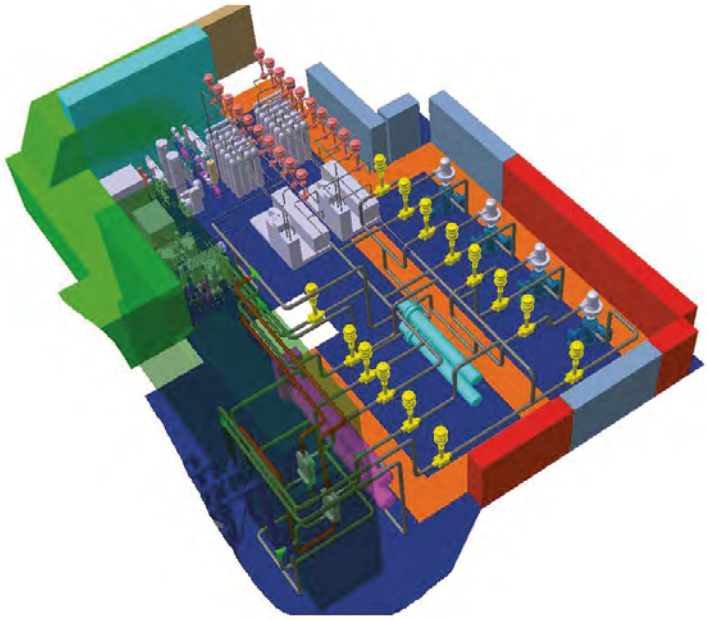
Qualification of EUROFER-97 structural material; Standardisation of TBMs box fabrication procedures

After the partial introduction of the EUROFER-97 steel in the RCC-MRx Edition 2012 under probationary phase, the main effort (F4E-GRT-410) was focused in 2013 on the extension of the EUROFER database and update of the supporting document to be submitted to AFCEN in view of the 2015 Edition of the RCC-MRx.

The development and standardisation of TBM fabrication procedures has made significant progresses in 2013:



Electromagnetic models of the TBMs installed in ITER Equatorial Port



Integration of the European TBM Helium Cooling Systems and Coolant Purification Systems in the ITER Tokamak Building

- Four service contracts (F4E-OPE-305-1/2/3/4) focused on the development of preliminary Welding Procedure Specification (pWPS) for sub-components; first pWPS have been delivered, others will be achieved in 2014, along with industrial feasibility mock-ups.

- Another service contract (F4E-OMF-331-5-01) focused on the assembly of subcomponents by welding: A welding assembly assessment report has been issued, which is an intermediate step for selection of the welding scenarios whose corresponding Welding Procedure Specifications (WPS) shall be developed and eventually qualified.

Tritium transport modeling in TBM Systems

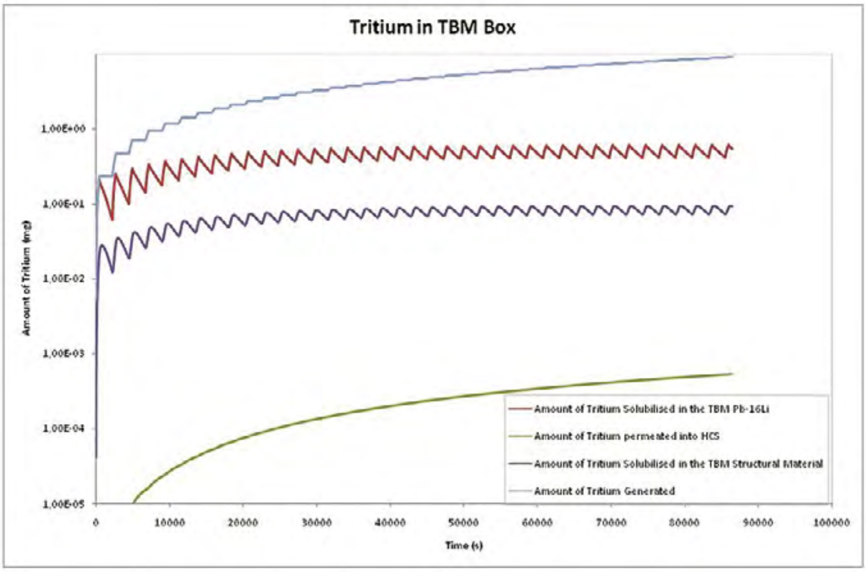
A tritium transport simulation tool, based on EcosimPRO object-oriented modelling platform, was successfully developed in the frame of a grant action (F4E-GRT-254) with CIEMAT and EAS (Empresarios Agrupados, Madrid, Spain).

The mathematical model implemented by the code is dynamic and 1D, while the tritium transport physics, which doesn't include any multi-physics coupled effect, exhaustively describes the phenomena of tritium transport at the gas-metal interface and at the liquid metal boundary layer. On the other side, the tool strongly simplifies the physics of the main components of the ancillary systems, like Tritium extractor from Pb-16Li, getter beds, PTSA, etc.

As output this tool gives, under different ITER irradiation scenarios, the amount of tritium permeated from the breeding region into the main coolant, the amount of tritium solubilized in the functional and structural materials of the TBM and ancillary systems, the tritium permeation rate through the piping of the ancillary systems into the Port Cell and Port Interspace and, then, the percentage of tritium reaching the TBS tritium accountancy system over the tritium generated in the TBM per unit time.

Instrumentation/sensors development

In 2013 the development of HCLL and HCPB TBS instrumentation was integrated in F4E activities. Through the review of previous design studies, which included a preliminary analysis of the requirements, and the assessment of relevant technological solution commercially available F4E identified a development strategy and integrated it with TBM set and ancillary systems design activities. Results of such integration are already reflected for example in design solutions adopted for instrumentation penetrations in the TBM box structure (hollow stiffening rods) and the feasibility analysis of the inclusion of an additional TBS sub-system dedicated to the measurement of neutron parameters (neutron activation system). Initial results from the two Framework Partnership Agreements launched for TBS instrumentation (F4E-FPA-380-A2



Time evolution of tritium inventory in various sub-systems of the HCLL TBM System (back to back inductive plasma pulses)

for all sensors types and F4E-FPA-395 specific to neutron measurements) include the development of the structure of the TBS instrumentation database, which will become the key tool for data management, and the selection of four types of neutron sensors for integration in the TBMs.

The commissioning test of a bench-scale multipurpose facility to carry out R&D activities related to Pb-16Li technology (F4E-GRT-41) was successfully completed in 2013 at ENEA Brasimone. It is intended to complement the larger scale loops already operating in the same laboratory, providing a flexible test environment with controlled operating conditions. The first foreseen test campaign is related to the development of permeation sensors to measure the hydrogen isotopes concentration in Pb-16Li.

Safety and accidental analyses

HCLL and HCPB TBS Preliminary Safety Reports (PrSR) were deeply revised to include, in particular, the following items:

- Updated TBS design description;
- Updated ancillary systems PFDs with safety features like isolation valves, rupture disk, coolant dump tanks, etc. needed for the TBS accident management;
- Detailed TBM Systems (TBS) activation inventory, dose rates with detailed list of the contributing nuclides both for the biological hazard assessment and radwaste categorization;
- Detailed TBS components safety, seismic and quality classifications;
- Main TBS components Pressure Equipment and Nuclear Pressure Equipment classifications;
- Main TBS components Tritium classifications;
- TBS short and long term maintenance operation list;
- Updated safety principles and approach: application of ALARA and implementation of defence-in-depth;
- Revised potential hazards and adopted safety measures;
- Updated selection of the reference accidental scenarios;
- Consolidated accident analyses reports based on available so far results;
- Updated TBS ORE assessment;
- Updated TBS radwaste management with detailed radwaste information and categorisation;
- TBS Plant Interlock and Plant Safety Systems Flow charts of main incident/accident prevention and

management that triggers the ITER Interlock and Safety systems actions.

A specific contract (F4E-OMF-331-4-01) has been started on the “HCLL and HCPB TBS Models Development and Qualification, execution of the first set of Accident Analyses”. The HCLL and HCPB TBS Accident Analyses Specification has been released. Qualified MELCOR and RELAP5 codes’ models and execution of up to six accident analyses per TBM Systems are ongoing.

Radioactive Waste management

In the frame of the TBM-PC, F4E has participated to a special working group on TBS radwaste management and prepared detailed activation inventory, dose rates and decay heat data. These data were delivered to Agence ITER France (AIF) and CEA for analysis and classification of TBS radwaste. It triggered also an international collaboration by all IO members developing a TBM programme for the establishment of a common methodology for Tritium-inventory and outgassing assessment.

Technical Support Activities

Introduction

In carrying out its tasks, F4E also carries out a number of technical support activities which support the above-mentioned activities and cover the following areas:

- Safety and Licensing;
- Analysis and Codes;
- Materials and Fabrication;
- Instrumentation and Control;
- Plasma Engineering;
- Project Management, Risk and Scheduling Activities;
- Metrology.

Safety and Licensing

F4E safety officers have been employed assessing PA's input documentation, F4E management and Technical specifications and design documents to ensure that the nuclear safety requirements are incorporated into the designs and that the evidence to demonstrate those safety requirements is also identified. A Nuclear Safety review has been carried out on all deviation requests and non-conformities of Protection Important Components (PIC).

F4E safety officers have directly participated in the following IO / F4E Study Groups: Cryogenic Tanks Design Optimisation, Hot Cell Complex Preliminary Design, Port Cell Design Optimisation. F4E Safety officers have also directly supported the design phase of the Neutral Beam Test Facilities which will be constructed at Padua, Italy.

Throughout 2013 a contract has been signed for the procurement of Nuclear Safety Analysis Support on F4E PAs. The first task was performed in 2013 including a detailed FMEA assessment on the ECRH antenna, performed by NIER Ingegneria S.P.A.

On a more specific level the French Safety Authorities, ASN, performed several in-situ inspections on the construction of the Tokamak Building at Cadarache (France) and on the vacuum vessel supplier Mangiarotti (part of the Consortium AMW) at Monfalcone (Italy).

Based on the outcome of the inspections F4E has improved the processes in order to better follow up the safety requirements and the non-conformity requests from the supplier.

A training course on quality assurance, nuclear safety culture has been given to around 100 F4E colleagues, and 40 technical and management staff of our suppliers involved in the construction of the ITER vacuum vessel. Over 100 managers and workers involved in the construction of the buildings and support systems with nuclear safety requirements have received nuclear safety awareness training by ENGAGE on behalf of F4E during 2013.

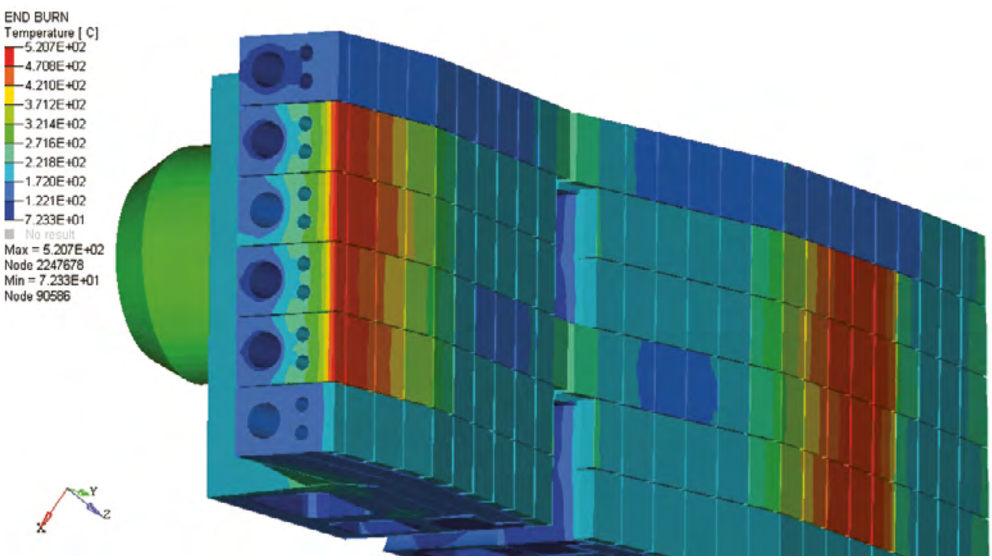
F4E Safety participated to Nuclear Safety related consultancy meetings/workshops organised by IAEA and OECD/NEA.

Analysis and Codes

The activities in this area have been focusing on two main lines, namely to provide support to the development of the ITER design (through, for example, task agreements), as well as to the F4E procurement contracts.

As far as the analysis work is concerned, this is mostly implemented via the placement of service contracts to qualified companies. Within the context of the existing framework contracts (covering both analysis and engineering support) approximately 20 task orders were placed and followed-up in 2013.

Regarding mechanical analysis, several studies were ordered to European industries. Among those, there are activities to support the manufacturing of the vacuum vessel, which is in the critical path in terms of schedule. In particular, these analyses allowed F4E to justify the conceptual manufacturing design from the manufacturer in front of the IO. Additionally, the work performed to assess the structural behaviour of the first wall panels was of a key importance for the final design review approval in October 2013. Several systems (such as the ICRH Antenna) were analysed to take into account the seismic and dynamic loads in their design, in order to ease the on-going design processes pursued by the IO and related F4E Project Teams.



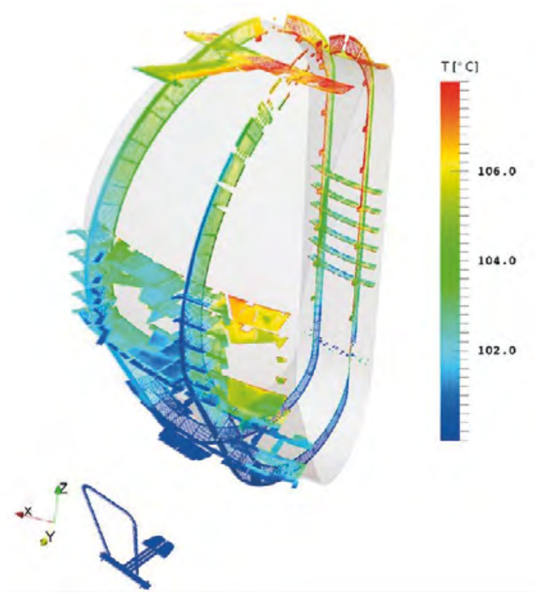
Temperature distribution of the First Wall panel #18 detail section under 2 MW/m² heat peak load

In the area of the fluid dynamic analyses several contracts have been launched. Among them it is worth to mention a task on the thermo-hydraulic optimisation of the gyrotron collector, the analysis of the vacuum vessel irregular sector and field joints, and the calculations on overpressures generated by potential blast of cryogenic tanks. The ITA for the update of the MELCOR calculations for the validation of the cryostat design was signed and it being implemented.

The activity in the area of electromagnetic analysis during 2013 has continued in the wake of the analysis of ITER components which are under design reviews and in the critical path in terms of the time schedule for manufacturing, such as blanket modules first walls, the vacuum vessel, ICRH antenna, TBMs, TF coils. In this context, apart the activity performed in house, seven task orders with qualified European companies were managed and the call for tender for a new framework service contract in the area of electromagnetic analysis was launched.

In the area of nuclear analyses, important shielding and dose rate assessments have been performed in support of ECRH and diagnostic equatorial port plugs. Both studies have gained valuable insight in radiation cross talk issues and respective needs for coordinated design processes. The study of tritium transients in the Tritium Plant and the thermal hydraulic performance of the vacuum vessel and first wall were the most remarkable CFD activities.

Moreover, support to the architect engineer and, closely linked to it, to the IO building team, was provided through several detailed structural analysis studies simulating, in particular, the seismic behaviour of the buildings consistently coupled to the ITER device. Support has been provided to insure a more stringent control of the design of Protection Important Components such as the reinforced concrete supporting the tokamak machine.



Temperature magnitude in the fluid domain of the VV Irregular Sector #02

In addition, some resources were also devoted to follow-up the installation and commissioning at CRPP of the EDIPO magnet whose aim is to provide a new, more powerful test facility alternative to the existing 11 T SULTAN test facility. The EDIPO main coil was successfully commissioned in March 2013, reaching the design point of 12.35 T with comfortable margin.

Within the nuclear data project, aiming at the improvement and validation of the nuclear data base for ITER, DEMO and IFMIF, grant activities on nuclear data validation experiments and nuclear instrumentation for TBM have been started. In this respect, TBM design integration issues have been particularly addressed in support of the TBM CDR. Comprehensive thermal scattering data and displacement cross section libraries have been processed for standard use in Monte Carlo transport simulations. New evaluations of neutron induced cross section data for manganese, copper and tantalum isotopes will be ready in early 2014.

Materials and Fabrication

The 2013 activities in this area included characterisation and assessment of materials data under ITER operating conditions via irradiation campaigns, testing at cryogenic, room and elevated temperatures, thermal fatigue testing, assessment of corrosion parameters and development of welding technologies. Assessments of materials data were performed by non-destructive testing, mechanical and physical characterisation of materials and joints. The activities were linked with R&D, qualification and validation of series production stages of various EU-ITER and JT-60SA subsystems.

A task to qualify the ITER TF Conductor Jacket was concluded and another supporting task to qualify raw material JT-60SA TF coil casings was initiated under the framework contract on cryogenic material testing F4E-OPE-084. A task to qualify materials for ITER first wall panels and ITER pre-compression rings was initiated under the framework contract on room and elevated temperature material testing F4E-OFC-167. The collaboration in the framework of The Welding Institute membership intensified significantly due to an increase in the welding related activities within the ITER and BA departments and resulted in a total number of 40 tasks during 2013. Two intensive training courses on welding and NDT technologies were organised by the materials group for 30 ITER department technical officers.

A contract F4E-OPE-360 to fabricate powder-solid HIP 316L (N)-IG mock-ups for ITER blanket was concluded. A tender process for a framework contract F4E-OFC-413 on material irradiation and PIE was concluded during 2013 aiming at contract signature in Q1 2014.

Corrosion assessment of vacuum vessel and in-vessel coolant water interfaces were concluded in the contracts F4E-GRT-243 and F4E-GRT-268. The results paved way to get approval from the nuclear authorities to go on with various welded and bolted solutions. Additionally, important materials data was submitted to ITER to support the final design of the coolant water cleaning system. During 2013 there was an increase of requests to review corrosion related issues for material qualification purposes.

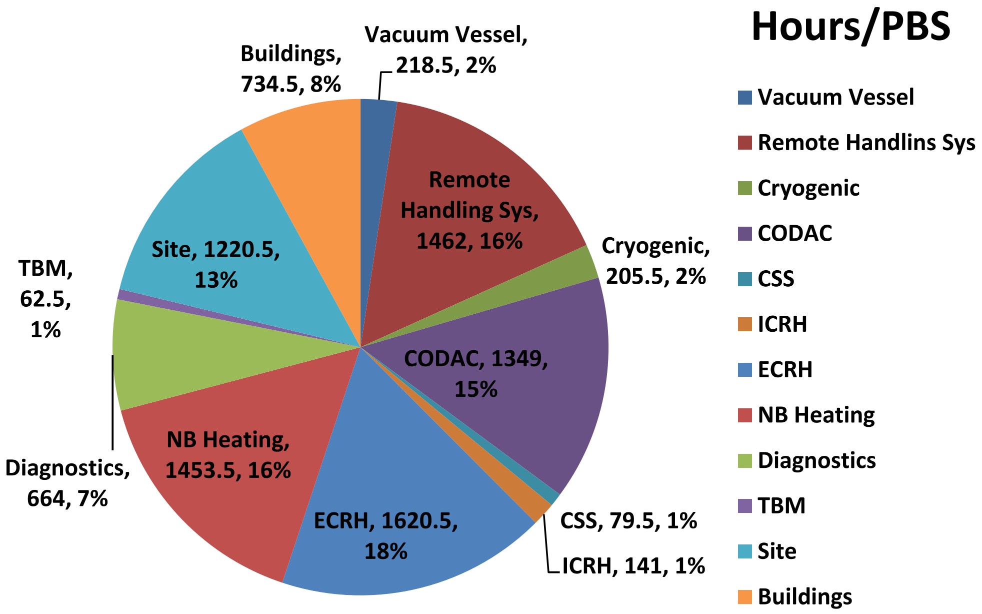
The on-demand support to the F4E-ITER department on material and fabrication related issues increased with various technical topics. In particular the support to project teams approaching industrial manufacturing of large series and final components increased. In particular for the In-Vessel and Magnets teams the materials group assisted launching and implementation of their contracts by providing support on materials and fabrication aspects.

Instrumentation and Control - CODAC

In 2013, F4E CODAC group has continued working along the lines of the established strategy:

1) The main focus has remained on helping F4E Project Teams managing I&C requirements and implement their procurement strategy. In particular the group has provided a strong contribution towards the TB04 tendering action with active participation in the preparation and selection phases. Similar contribution has been provided to the Remote Handling team in the preparation, tendering and evaluation of the divertor remote handling framework.

2) The in-sourcing contract, implemented by INDRA has been used to provide I&C specialised system and electronic engineering to F4E project teams. This is the distribution of effort that has been provided by INDRA Task Order 2:



Distribution of effort by INDRA Task Order 2

3) 2013 has been the first year of the system integrator framework contract, awarded to GTD systems at the end of 2012. During 2013 the CODAC team, has worked at the preparation of the first 3 task orders: magnetic diagnostic control system engineering, building alarm survey monitoring system and Integration of the F4E Cryo-Plant systems I&C to ITER CODAC.

1. Preparation of a DOORS database for the Magnetic Diagnostics

Tokamak diagnostics are complex devices that need to be designed to cope with a variety of often conflicting requirements. The need of better understanding the physics occurring in a working Tokamak, together with the limited ability to forecast the actual operating conditions that ITER will experience, all tend to drive towards a large set of requirements where in addition the performance needs tend to exceed the current technical abilities.

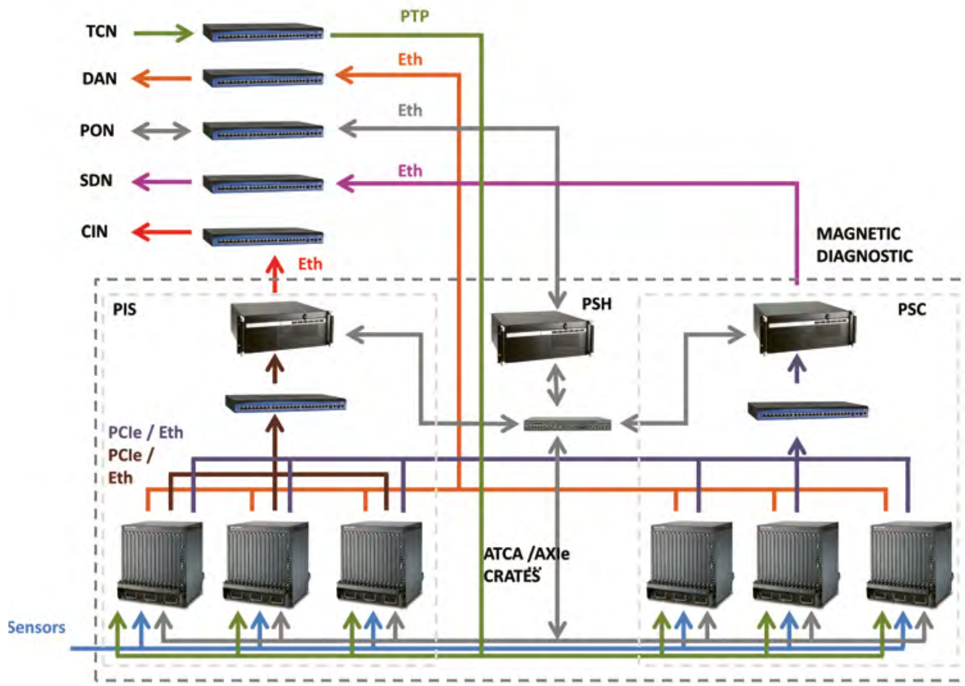
To be able to start developing a diagnostic system one need to firm up requirements, to list them exhaustively and to translate them in a form that can be understood by industry. The next step is to identify which of these requirements are not achievable, which are contradictory and which are not yet fully understandable.

This work has been the subject of task order one of GTD, where first the magnetic diagnostic requirements have been clarified and then coded into DOORS together with their derivation from the various baseline documents. In addition GTD has produced a proposal implementation plan with proposed reference implementation architecture.

2. Work on a critical component: The Magnetic Integrator

To implement the magnetic diagnostic, the most critical I&C component is the signal integrator. This component needs to continually track the magnetic field variation in the machine using only signals associated with the variation of the field. As if blindfolded, one need a very good sense of orientation to keep the direction, this component need a very high precision to still be able to produce a good magnetic field measurement after one hour after the operation of ITER.

During 2013 F4E has awarded to Instituto Superior Técnico (IST), the developer of the W7X integrator, the task of testing their product against the ITER magnetics diagnostic requirements. As part of this task IST has been requested to propose a number of tests aimed at identifying the strength and weaknesses of the current design.



Magnetics diagnostics: possible functional interfaces

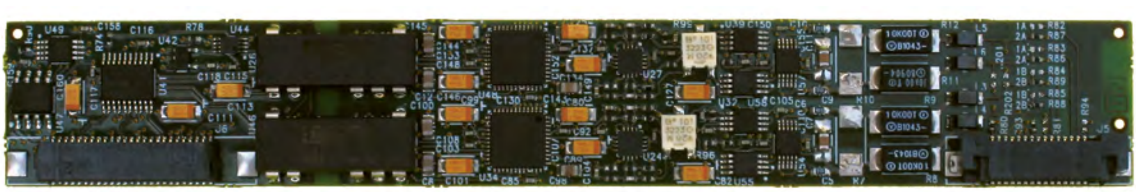
3. Bring JET experience to the ITER CODAC (ITA C45TD12FE)

The Joint European Torus (JET) is the largest Tokamak currently in operation in the world. One of the greatest challenges of JET is the integrated commissioning of all its major plants. This is driven, partially, by the size and complexity of its operational infrastructure and also by the fact that, being an international environment, it has to address the issues of integrating, commissioning and maintaining plant systems developed by third parties.

With the scope of leveraging and contributing with some of the history and experience of JET into the ITER project, F4E has worked together with the Culham Centre for Fusion Energy (CCFE), the host and operator of JET, for the provision of user experiences related to the integrated commissioning of the Tokamak. Since the collection of commissioning experience from a Tokamak is a very broad subject, the first stage of the work has focused mostly on the commissioning of the plant systems' hardware and software and its impact on the control and data acquisition system infrastructure, in particular, the real-time framework. Specifically, F4E was interested in collecting requirements and experiences that had progressively arisen during the history of all the JET integrated commissioning activities. In particular, F4E has collected, processed and structured details about design choices that have proven successful, technical mistakes and lessons learned, risk assessment, changes to the design, and conflicts between plant system commissioning requirements and how these were addressed.

4. CA2 Alarm System Survey - GTD Task Order #2

The contract area 2 (CA2) is part of the infrastructures provided by F4E to the IO site contractors. The Alarm



The two-channel version of the magnetic integrator under test in IST

Survey System is one of the services of the CA2.

The main objective of this Task Order is to provide the programming and configuration of the CA2 Alarm Survey System PLCs (Programmable Logic Controllers) and to develop the respective Human Machine Interface (HMI) based on ITER CODAC tools. For that it has been prepared in the Contractor's facilities, GTD-Barcelona, a specific set-up with the scope to develop and test the software for the Siemens PLCs to be installed later at ITER site.

5. Support to the CDR for the Vacuum Vessel Instrumentation

The vacuum vessel instrumentation is part of a sub-system which has functional and physical interfaces with the vacuum vessel overall monitoring system. In addition the vacuum vessel instrumentation has a strong interface with the CODAC.

The support to IO in the preparation of a comprehensive design review consisted in the study and identification of the sensors type and displacement both in-vessel and ex-vessel for each individual vessel sector.

Plasma Engineering

Part of F4E PE activities are carried out in support to EU procurements and part on the basis of ITER task agreements (ITAs), awarded, as the result of competition between domestic agencies or on the basis of specific competence.

In 2013, F4E was awarded one ITA: ITA C52TD49FE: providing support in terms of engineering and physics analysis to the electron cyclotron (EC) system final design.

The work related to ITA C19TD43FE (SOLPS development for ITER design), ITA C19TD45FE (plasma evolution and performance during plasma regimes with controlled ELMs in ITER), ITA C19TD46FE (evaluation of edge MHD stability and uncontrolled ELM energy losses for ITER H-mode plasmas in non-active, DD and DT operational scenarios), ITA C19TD47FE (Simulations of ITER first wall energy loading during mitigated disruptions and runaway electrons), ITA C19TD49FE (Analysis of plasma magnetic control) was completed in 2013, the results transmitted to IO and therefore the ITAs were closed in 2013.

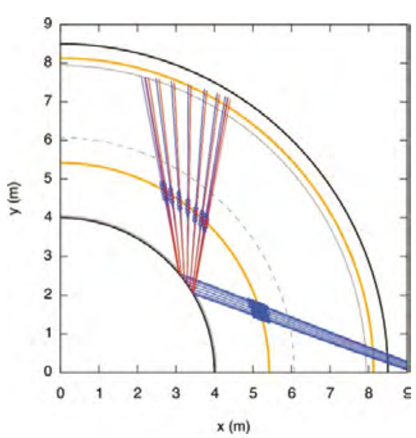
To implement existing and new ITAs, F4E awarded in 2013: two new grants (GRT-502, GRT-519) on ITER scenarios and fuelling and on plasma control and two contracts (OPE-501, OPE-505) on the collection of requirements for the EC plant and for the plasma control system.

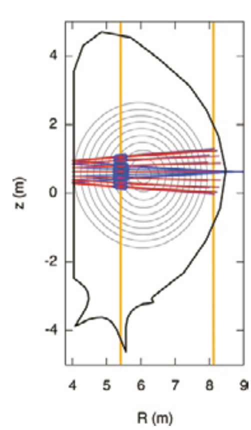
In addition to the new activities, a substantial part of work consisted in the follow up of a large number of grants and contracts issued before 2013:

F4E-GRT-265, F4E-GRT-267, F4E-GRT-315, F4E-GRT-334, F4E-GRT-346, GRT-379, F4E-GRT-397, F4E-GRT-418, F4E-OPE-06-06-11, F4E-OPE-06-06-16.

The implementation of the above grants and contracts involves several european fusion laboratories (Aalto Uni, CEA, ENEA, CCFE, CNR, FZJ, KIT, Austrian Association, CRPP and IPP).

The contracts and grants in place cover the following





Analysis of EC breakdown assists: Toroidal (left) and poloidal (right) view of the EC beam-tracing computed by the Gray code in case of reflection at the wall with oblique injection (20°, XM2). Red rays are the fraction converted to OM2, B0 = 2.65 T.

main topics: plasma control; plasma boundary reconstruction; ITER scenarios development including breakdown; assessment of loads on plasma-facing components; assessment of disruption loads and disruption mitigation techniques.

Progress Report on the Plasma Engineering.

An important activity in 2013 was the conceptual design of the EC plant control system (ECCS), carried out in collaboration between the Antenna and Plasma Engineering Unit and the CODAC group in the Technical Services Unit.

The ITER Electron Cyclotron plant is a complex system, essential for plasma operation. The system is being designed to supply up to 20MW of power at 170 GHz; it consists of 24 RF sources connected by switchable transmission lines to 4 upper and one equatorial launcher.

The complexity of the EC plant requires the presence of a plant controller, providing the functional and operational interface with CODAC and the plasma control system and coordinating the various subsystem control units, i.e. the local controllers of power supplies, gyrotrons, transmission lines and launchers.

A very successful conceptual design review for the EC plant control system was run by ITER based on the work performed by F4E. F4E contribution includes collection and consolidation of user requirements; functional analysis; plant I&C architecture proposal; risk analysis and cost estimation; staged development Plan.

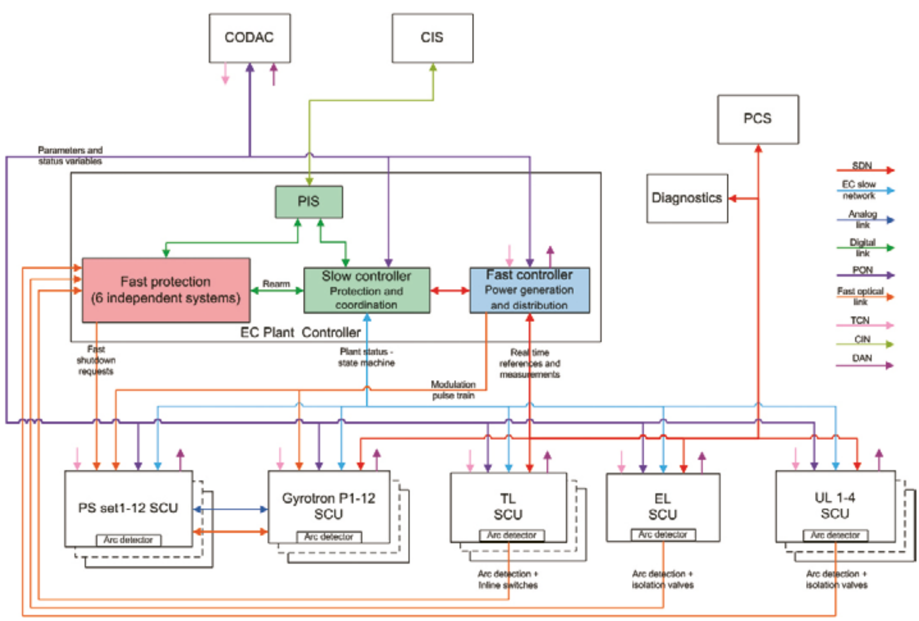
Other activities in the area of plasma engineering in 2013 included support to the EU members of the ITER Science and Technology Advisory Committee (STAC) and to the Technical Advisory Panel of F4E.

Some activities foreseen in 2013 work programme were cancelled because the related ITAs were not issued by the IO and other activities were postponed due budget constraints of the IO.

Project Management, Components Transportation, and Scheduling Activities

In 2013 the F4E Project Office and Control Unit has kept on providing an extensive transversal support to the Project Teams and, more generally, to the ITER department. The areas involved with this work were: scheduling, configuration control, system engineering, quality assurance, activities on transportation of components and project management, including risk and monitoring tasks.

As far as planning activities are concerned, F4E has maintained and further developed its schedules



The proposed architecture for the EC plant control system.

based on both project development and input from its suppliers. Detailed WBS Schedules (DWS) updates are regularly provided to IO at the beginning of each month to allow IO to carry out an overall integration with the schedules from all parties and to cross check with the DAs their achievement of milestones compared with the agreed baseline (Strategic Management Plan - SMP). The result of the integration carried out by IO is transmitted back to the DAs for their analysis and the necessary actions. Progress at project level is regularly reviewed every month at meetings involving IO and all seven DAs.

In the area of configuration control, Project Change Requests (PCRs), deviation requests and non-conformities have been managed on a daily basis both internally and in liaison with suppliers and IO according to F4E QA procedures. The Technical Configuration and Integration Board (TCIB) has been created to gather the knowledge of different parts of the ITER department (i.e. planning, safety, QA, costing, etc.) to have a more thorough analysis of the PCRs proposed by IO and to recommend the subsequent actions to be taken by the F4E management.

As far as system engineering is concerned, special emphasis has been given to the propagation of the requirements down to the contractual level and the criteria for their verification. The number of users of IBM Rational DOORS (the tool to manage ITER requirements) has rapidly increased and specific training sessions have been provided to the project teams. Collaboration with IO has been strengthened and a common strategy has been developed in order to progress rapidly on this important topic.

In the area of quality assurance, quality officers have supported the Project Teams in their activities devoted to their in-kind procurements and R&D activities. Monitoring of the work carried out by the suppliers has also been performed in order to grant the right level of quality. Quality documents have been updated, where necessary, in order to take into account the developments of the project. External inspectors have been used through an external F4E service contract to support F4E in its manufacturing activities. Quality assurance audits have been carried out in both laboratories and industries.

As far as the activities on the transportation of the ITER components are concerned, the "ad-hoc" ITER itinerary has been validated through a test convoy. A special modular self-propelled trailer has transported a dummy load of about 600 tonnes for 104km from Port de la Pointe to Cadarache in four nights. On this occasion all

The ITER Test Convoy: 800 tonnes on 352 tyres crossing the South of France technical aspects of the structural parts of the itinerary (i.e. bridges, temporary crossings, etc.) have been carefully checked with a successful result. Progress has been achieved on the conventions with all involved entities to allow the future real convoys to be performed, starting in 2015.

Work on export control has progressed. Support was provided to the Project Teams to identify and to deal with dual use items. Regular contacts have taken place with the Spanish authorities on this topic.

Project management support was provided on several topics linked to the day-by-day activities, such as the preparation of the PAs and the management of the task agreements with IO. Programmatic documents have been prepared to be presented to the supervising committees as well as regular reports to show the progress in the implementation of the work. Cash contributions to both IO and Japan have been managed together with the Budget and Finance team.

The use of the F4E Integrated Reporting System has increased. More standard reports were created and the data quality was further improved. Data are regularly extracted to feed reports both for internal and external use.

The contract management tool was further improved through a familiarisation phase internal to F4E and by starting its use for specific contracts in view of its global adoption in the first half of 2014.

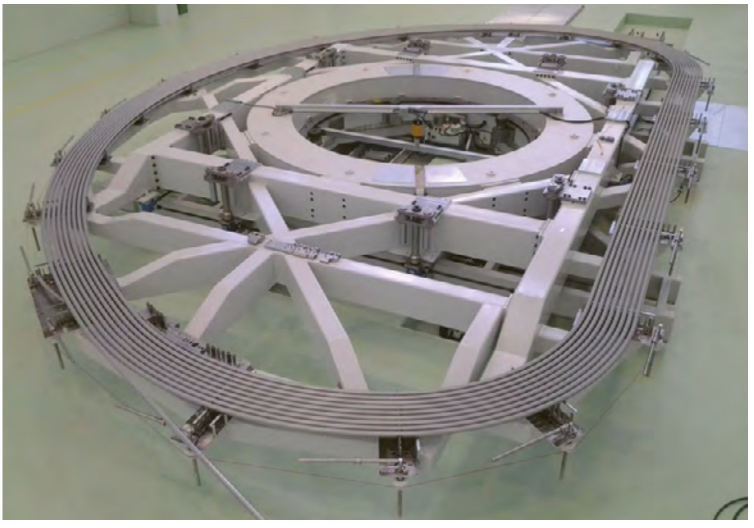
Metrology

Factory acceptance test as well as intermediate process geometry assessment is a key phase in the development of components that have to be delivered to the ITER site. In particular the check of mechanical interfaces between adjacent components is very important to allow a smooth assembly process into the ITER machine. In this frame the metrology team gives transversal support to all F4E project teams in the field of metrology, geometrical survey and procedure development. Among the others it is worth to mention the work done into 2013 to assess the cable insertion process of the toroidal field coils.

Following process development, trials and qualification a procedure has been set up to monitor the manufacture of TF coils double pancakes geometry.

Cable length and shape have been assessed. Laser tracker and scanner based systems have been used under F4E supervision during winding, before and after heat treatment. Survey data confirmed that the transfer in the as-built prototype radial plate can be done with an average accuracy of +/- 0.1 mm on length per turn as expected.

Laser Tracker during winding



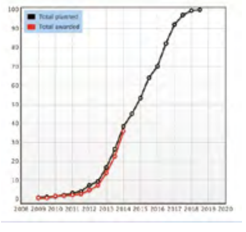
Wound prototype Double Pancake (pDP)

Broader Approach

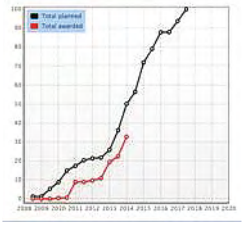
Satellite Tokamak Programme

The table below shows the key performance indicators for the three BA projects, based on deliverables considered by the projects as having been made during the period, and comparing the accumulated credit awarded versus that planned.

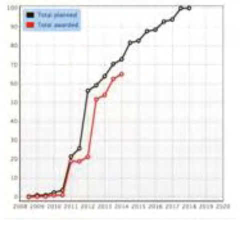
	JT-60SA (STP)	IFMIF/ EVEDA	IFERC	BA
End December 2012 Earned /planned credit	82.0%	69.4%	96.8%	88.9%
End December 2013[1] Earned /planned credit	91.3%	63.9%	98.2%	86.1%



JT-60SA(STP)



IFMIF



IFERC

Status of earned value (European plus Japanese percentage of total committed credit awarded) for the three BA projects at the start of the indicated years

Main Achievements

Project Governance

On 25 March, a “Celebration of the delivery of the first component from EU and start of assembly of the JT-60SA tokamak” was held at the conference hall in the JAEA Naka site. About 100 guests attended from the relevant organisations of the EU and Japan and from local government. This ceremony was reported with high visibility by Japanese media. The project reached, on 28 January 2013, the milestone of the start of tokamak assembly. Moreover 90% of PAs are now signed.

Toroidal Field Coils

Europe is committed to provide the full toroidal field (TF) magnet system. For this purpose, F4E is procuring 27km of TF conductor, a cable-in-conduit type conductor with 486 strands (2/3 NbTi - 1/3 copper) embedded in a rectangular stainless steel jacket.

Toroidal Field Superconducting Strand and Conductor (F4E)

The procurement is split into two main contracts, one for the production of the NbTi strand and one for the strand processing into the TF conductor by cabling and jacketing operations.

In January Furukawa Electric Industries submitted the remaining part of the quality assurance documentation and quality control records for the original scope of the contract BA-002 (10,200km of JT-60SA TF coils NbTi strand). By April F4E had verified these and the full payment of the original scope of supply was released. The fabrication of strand was completed in April with the shipments #8 and #9, and delivered to ICAS (TF conductor manufacturer). The fabrication of the additional strand for the TF spare coil (Amendment 2 to BA-002) was finished on schedule at the end of May 2013. The contract for the strand procurement with Furukawa Electric Industries was completed, on schedule, with the issue of the final report in July.

TF conductor production at ICAS (part of Contract OPE-018) progressed regularly. In March and April the production of cables reached unit length (UL) #55 (about 50% of production scope) and conductor production reached UL #33. Conductors from JTF015 to JTF021 were produced, leak, pressure and flow-tested and were delivered to ALSTOM in March 2013. The conductor production rate exceeds the capacity of the TF coil manufacturer to accept, store and use them in TF coil manufacturing. In order to ease this problem, a small contract for storage of 24 conductor ULs was signed with ALSTOM (one UL consists of 240m of conductor sufficient for one of the six double pancakes forming a TF coil). Moreover an amendment of the ICAS contract has been negotiated including the possibility to store 18 additional ULs and to distribute the production over the period until July 2014. By October 2013, 100 cable lengths and 55 complete conductors (about 50% of final scope) have been produced.

Toroidal Field Coils Manufacturing

The responsibility to provide the JT-60SA TF coils is an in-kind obligation of France (CEA) and Italy (ENEA), which placed two contracts, respectively, with ALSTOM (in July 2011) and ASG (September 2011).

The winding of TF coil pancakes was originally due to start at the beginning of October 2012 (ASG) and December 2012 (ALSTOM). By September 2013 the activities of the contracts were proceeding with a considerable delay, mainly due to late deliveries of the winding machine to both firms from the same supplier, followed by technical difficulties in the final set-up of the winding machines, both at ASG and ALSTOM. On the positive side, the problems were understood and solutions were being developed. F4E, CEA and ENEA continued exercising strong monitoring and management pressure to ensure that the delays were recovered. In early October, ASG completed the first dummy double pancake. On this basis the fabrication of the Prototype/First-of-the Series DP was immediately started, this time using the production conductor. The result respected all quality requirements and this marked the achievement of the Production Readiness Review for the ASG part of the production. With the introduction of double-shift working ASG confirmed the delivery date of the first TF coil to the TF Coil Test Facility in July 2014. Also at Alstom the situation made considerable progress: the fabrication premises and auxiliaries are fully ready and fabrication trials started, at relevant scale. The achievement of the Production Readiness review at Alstom was obtained in November. Also ALSTOM expressed its confidence to match the schedule of the second TF coil (TF Coil 10), due for the fourth quarter of 2014 at the TF Coil Test Facility.

Outer Intercoil Structures and Gravity Supports

The contract for the manufacturing of the outer intercoil structures (OISs) for JT-60SA was awarded to the SDMS Company, France, in March. The 18 OISs are welded structures of large dimensions: 7m long, 1.8m wide, for a unit weight of 5t, to be

The DP wound from JTF-002 (background) and JTF-006 (foreground) at ASG

Winding line with the first wound single pancake at Alstom manufactured with sub-millimetre accuracies. They are designed to withstand intense forces exerted on the TF coils and are linked together by insulating bolted junctions. CEA completed the detailed design studies and the associated technical qualifications starting from the conceptual design developed by F4E. The first batch of raw material was delivered at the end of October. The first OIS will be delivered ready for shipment to F4E in March 2014.

The contract for the gravity supports (an inverted V-shaped strut pair) was awarded to ALSYOM, France, in April. The procurement of raw material is underway, a mockup is under construction, qualification of the welds is ongoing, and the manufacturing drawings are almost completed.

Toroidal Field Coil Casings

The contract for the toroidal field coil casings was placed by ENEA with the Walter Tosto Company in June 2012. The contract progressed well, with all raw materials ordered and most of them available for the commencement of manufacture in December 2012. By March all stainless steel plates and the majority of the forgings had been received and the delivery of the first casing was foreseen to take place in August 2013, with further production continuing at the typical pace of one casing per month.

In September problems began to show up with mechanical properties at 4 K of some forged blocks in tests performed at KIT. Following expert assessment and considering risks to the project, it was decided to repurchase all the casing forged material in order to avoid issues in the highly stressed regions of the magnet jeopardising machine operation. F4E strategy to proceed with an urgent procurement of the material was endorsed by the F4E Governing Board in December. The call for tender was launched immediately. In spite of this recovery action a knock-on effect in the casing delivery dates is unavoidable (first casings were to be delivered at ASG and Alstom in November 2013), and its impact on the TF coil manufacturing and testing schedule will depend critically on the recovery plans to be put in place by the ENEA (Walter Tosto). F4E is closely working with ENEA and CEA to address this issue.

Toroidal Field Coil Cold Test Facility

The TF coils will be tested at cryogenic temperature and their nominal current of 25.7kA, prior to their shipment to Japan. For this purpose the creation of a specific facility (the Toroidal Field Coil Cold Test Facility) is underway at CEA Saclay, to which France and Belgium are contributing.

In January the leak test of the cryostat and test frames was completed. By April the He-refrigerator was commissioned. Prototypes of the high temperature superconductor current leads were successfully tested at CRPP in Switzerland. By September the test cryostat and the valve box were assembled together, the pumping system installed at its final position and the whole system pumped down to 5.10-4 mbar at 300K and leak tested. Several components of the magnet safety system have now been received and tested. Remaining services and components (modification of power supplies, control and instrumentation equipment) have been ordered.

High Temperature Superconducting – Current Leads

The 26 high temperature superconducting current leads (HTS CLs) which connect the superconducting feeders with the power supply busses are provided by Germany through its designated voluntary contributor KIT. A dedicated test facility, CuLTKa, is being installed at KIT, which allows testing two current leads at a time.

The early part of the year was concerned with manufacturing drawings preparation, manufacturing of subcomponents (both at KIT and its sub-suppliers), qualification of welding processes, and preparation of auxiliary testing equipment. Japanese regulatory issues related to the use of a specific type of copper as part of the pressurised boundary were also resolved. The first two jumpers for the test of the TF current leads were manufactured by JAEA and were delivered to KIT in May. By the end of the year the manufacture of the six TF current leads was progressing well. The first two heat exchangers using a special brazing technology were completed. Pressure tests on them were performed with third party inspection and witnessed by a JAEA representative. Set-up of the current lead test facility was proceeding well and is expected to be finished by January 2014.

JT-60SA Power Supply Systems

The European contribution for the JT-60SA power supply (PS) systems includes the PS System for the toroidal field magnet, the central solenoid (CS) and equilibrium field (EF) coils and the fast plasma position control coils (collectively named Superconducting Magnet Power Supplies - SCMPS), the switching network units (SNUs) for CS modules 1-4 to provide the requested voltage for plasma breakdown, the quench protection circuits (QPCs) for all superconducting coils, and the PS system for the in-vessel sector coils for resistive wall mode (RWM) control.

Quench Protection Circuit

The QPCs are being provided by CNR through Consorzio-RFX and their supplier Nidec ASI S.p.A. By the beginning of the year series production of the QPC had begun, based on optimisations identified during the type test. In April he first two series units have been completed and the relevant routine tests were completed in June, allowing the order to go ahead for all the components for the remaining 11 units and their delivery to RFX by the end of 2013. Following testing and packing of all systems, these will be delivered to Japan in Q4 2014.

The qualification process of a new explosive system (as an alternative to the one developed by the Efremov Institute, St. Petersburg) for the backup protection pyrobreakers has been successfully completed, allowing the risk of delivery delay to be reduced by removing a time-demanding procurement of explosives from Russia.

Switching Network Units

The SNU procurement has been entrusted by ENEA to Energy Technology – OCEM. The First Design Report was approval in June. The first type tests on the SNU resistor modules were also successfully performed in June. The first unit of the SNU is being manufactured, and the related type tests are expected in the first half of 2014.

Superconducting Magnets Power Supplies

The SCMPS procurement is shared by CEA and ENEA, by means of two separate contracts. The contract for the procurement of the JT-60SA SCMPS to be procured by CEA was awarded to the industrial supplier JEMA Energy SA in March. ENEA placed a contract to suppliers POSEICO – JEMA in a joint venture in August. The first design report of each supplier was expected by the end of 2013. Drafts were delivered and discussed, but further technical details need to be resolved, so the reports are now expected to be approved by June 2014. This is not expected to cause problems with the delivery in Japan.

Resistive Wall Mode Power Supplies

The RWMPS is due to be supplied by CNR through Consorzio RFX. Following changes in the original physics specification it was considered necessary to manufacture a prototype power supply before proceeding to series manufacture. In early 2013 the detailed specification for the prototype was developed, leading to a contract for the development, manufacturing, and testing of the prototype placed in May. Preliminary factory tests are now foreseen in April 2014, followed by finalisation of the PA covering the production.

Cryostat

The European contribution to the procurement of the cryostat for JT-60SA consists of the cryostat base) and the cryostat vessel body, both provided by Spain through CIEMAT. Japan has contributed the material for the cryostat vessel body.

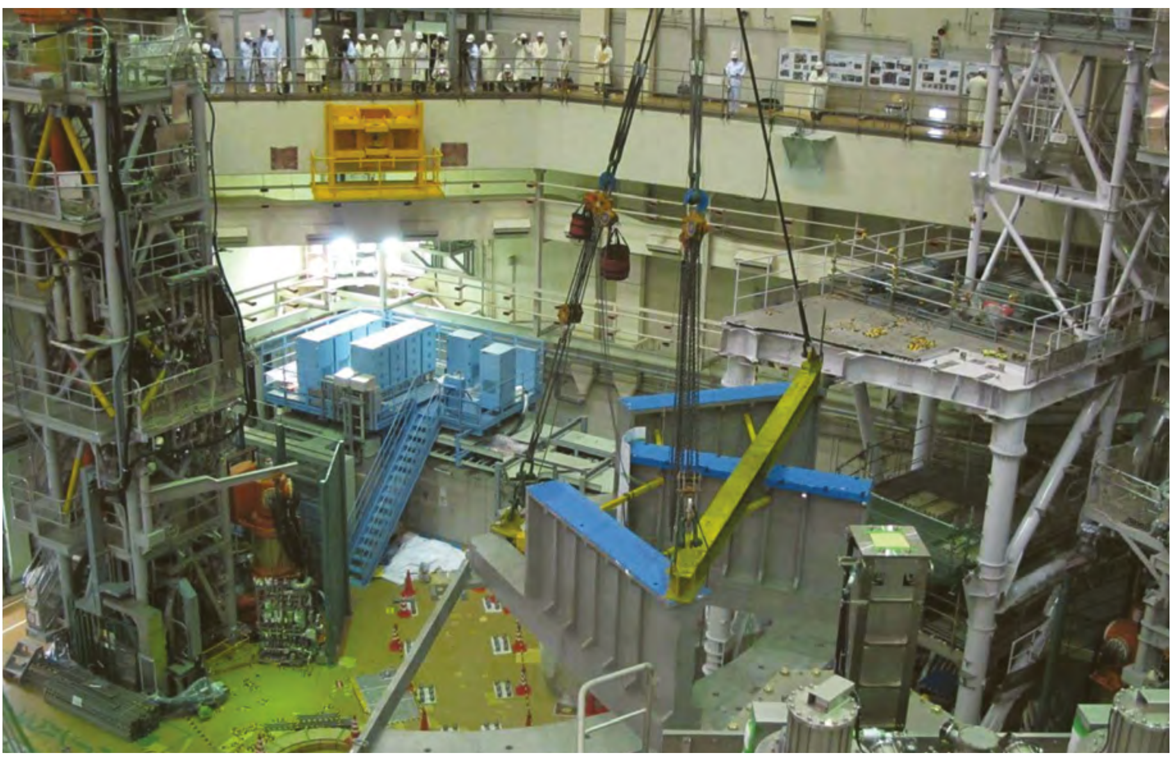
Cryostat Base

CIEMAT realised this activity through contracts for manufacture with IDESA, with final machining by ASTURFEITO, in Aviles, Spain. The cryostat base left Europe in November 2012, reached Hitachi port via the Panama Canal in mid-January 2013, and was promptly transported to the JAEA Naka Fusion Institute. The note of acceptance and transfer of ownership was signed in late February 2013, and assembly of the parts by the JAEA contractor in the final location began immediately. The arrival of the first EU contribution, respecting the scheduled dates, was appreciated by the JAEA management (a written certificate of appreciation issued by the JAEA Director General was bestowed on Dr Jose Botija, representing CIEMAT (Spain) on 23 January 2013). Japanese national media gave considerable attention to the event. The assembly of the cryostat base, subsequently completed by the end of March 2013, marked the beginning of JT-60SA Assembly. Final measurement on-site confirmed the achievement of all dimensional tolerances.

Cryostat Vessel Body

At the very end of December 2012 the Spanish government allocated to CIEMAT part of the funds for IFMIF and JT-60SA. Those funds would allow

TCM16 attendees in front of the cryostat base lower structure components in JT-60SA hall (24 January 2013).



Start of CB assembly (28 January 2013).

for the financing of, among others, the 2013 and (probably) 2014 payments for the cryostat vessel body cylindrical section (CVBCS). This put CIEMAT in a favourable position for the immediate launch of the call for tender for which the technical documentation (drawings and specification) were already prepared. CIEMAT launched the tender in June 2013 and the bids were received by the end of August 2013. CIEMAT signed the contract for the manufacturing of the CVBCS to ASTURFIETO in November 2013, and the kick-off meeting took place in December.

Cryogenic System

The superconducting coils, thermal shields, HTSCLs and divertor cryopumps of JT-60SA require refrigeration at 3.7K to 100K provided by a cryoplant with an equivalent refrigeration capacity of about 8kW at 4.5K provided in-kind by France (CEA). CEA signed a contract with Air Liquide Advanced Technology (ALAT) in November 2012.

In January, based on technical information already contained in the offer from ALAT, the most urgent interfaces were defined: those with the buildings that will host the cryogenic system, and the utility requirements. Several technical meetings were held with ALAT to discuss details of the process and the installation of the components on the Naka site. In a dedicated meeting at Mito/Japan, Ibaraki Prefecture approved the design, manufacture and testing concept of ALAT.

By September, the detailed design had been finished on schedule and agreed between ALAT, CEA, F4E and JAEA. The interfaces between the cryogenic system and the buildings that will host them have been agreed, allowing JAEA to design the new Compressor Hall and fix the modifications of the existing Cryogenic Hall.

IFMIF/EVEDA Programme

Project Team

To execute the commitments agreed for the Japanese and European PAs AF10-JA and –EU, an Integrated LIPAc (Linear IFMIF Prototype Accelerator) Installation and Commissioning (ILIC) Unit was established formed by PT members seconded from F4E and JAEA and by staff assigned on the basis of the PAs.

In order to integrate specific skills in the ILIC Unit, which currently are not present, additional resources are intended to be added at IA and PT level to enhance efficiency and to form a critical mass by attracting accelerator experts from Europe and Japan. A specific proposal for the organisation of the ILIC Unit was supported by the BA Steering Committee in December 2013.

Main Technical Achievements

In January the injector (tested in Europe in November 2012) was disassembled, and the packaging completed, in preparation for shipping to Rokkasho. Due to the extra preparation time needed for clearance of export documentation, it was decided to ship the core components (magnetron, ion source, accelerator column, and alignment system) by air, and the bulky subcomponents by sea. The core components arrived at the end of March and were presented in early April to a delegation of Japanese stakeholders (see picture). The containers with the other packages arrived at the Japanese port of entry, Hachinohe, in late May. The pre-installation work of the LIPAc injector at the Rokkasho BA site was completed by mid-December executed by the ILIC unit. The installation phase of the LIPAc injector will start in March and extend until end of April 2014. It will be followed by another phase of injector check-out.

At the end of 2012 the prototype P02 for the Half-Wave Resonator (HWR) for the SRF (superconducting) linac reached 8MV/m (above the specification of 4.5MV/m) during tests at 4.2K, with a Q_o at low field ($2x10^9$) over specified values. Thus the RF design of the HWR was qualified. The design of a new tuning method, based on elastic deformation of the HWR cavity, and the revised design of the cavity (in particular lower thickness of the niobium walls to make the tuning by compression easier while keeping the inner geometry of the cavity) was completed in January. The finite element stress analysis was checked in February by an external certified company, the raw materials (Nb and NbTi) were ordered, and the call for tender of the series cavities was launched at the end of March. Bids for the pre-series and series HWRs were received and analysed. In April, supported by the report received by CEA from their subcontract to an industrial assessment company, the input for the licensing file to be submitted by JAEA to their national licensing authority was completed. The documents for the manufacturing contract can therefore be issued as soon as the progress in the present pre-application exercise with the Japanese licensing authority allows. Following a detailed design review in July for the SRF linac of the LIPAc accelerator, the technical specification for the vacuum vessel and cryomodule was fixed and approved in November.

The prototype High Power RF Module was completed as the first of the modules subcontracted by CIEMAT to industry, including equipment in the racks, power amplifiers, and circulators. Both required tetrodes which were successfully conditioned at the beginning of January. Due to troubles in the water cooling system, later fixed, the acceptance tests were delayed. In May, a joint performance test was performed by CIEMAT with the two industrial partners, before releasing the manufacturing of the remaining set of 18 amplifier stages: INDRA (subcontracted by CIEMAT to set up the full radio-frequency power system) and IBA (subcontracted by SCK-CEN to deliver the final power amplifier stage). After only three days of commissioning, the target of 230kW CW output power at 175MHz was reached. The results exceeded expectations, as the efficiency, given in terms of driver and lower grid/screen current, is higher than expected. The prototype module of the RF power system is now dedicated to conditioning the prototypes of the SRF linac couplers.

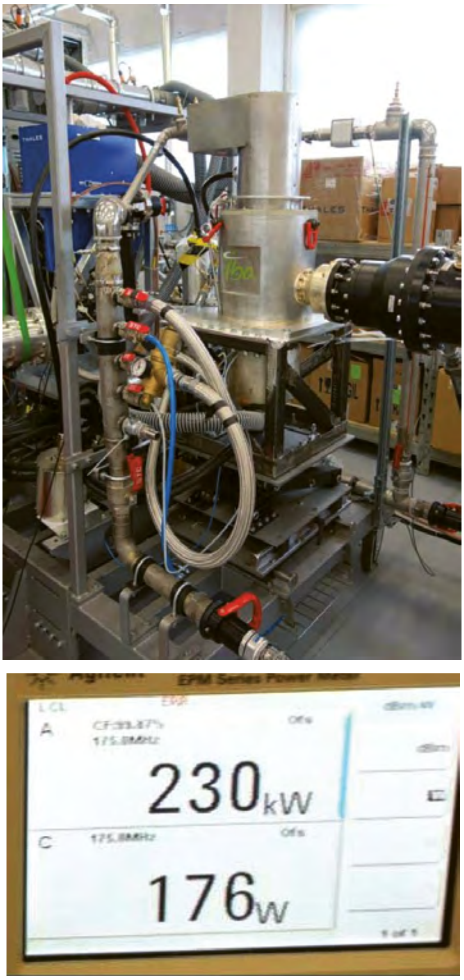
The Visit of representatives of the MEXT Fusion Directorate, Japanese Diet, Aomori Prefecture and JAEA high level management to welcome the core components on the Linear IFMIF Particle Accelerator (LIPAc) injector.

In September the fabrication of the bunchers of the Medium Energy Beam Transport line was started by CIEMAT. At INFN Legnaro, the radio-frequency test module was prepared to receive the couplers for the radio-frequency quadrupole (RFQ) provided by JAEA for functional testing. RFQ powering tests started in September but have so far nor been successful. A specific expert group was set-up to assist the JAEA responsible officer in his risk mitigation actions which are ongoing still in 2014 Preparatory work for high power tests at LNL of the most critical sections of the RFQ (RF quadrupole) has been completed. The related four RFQ modules are ready as well as the High Power Test Stand and infrastructure at LNL. The production of the 18 RFQ modules is divided into three supermodule sets, high energy (Italian industry Cinel), intermediate energy (INFN workshops), and low energy (German industry RI). Manufacturing at all three companies is progressing according to schedule and will be completed by October 2014.

In June all European PAs related to the Li target validation tasks were amended to extend the completion date till June 2014 with the exception of the PA for Remote Handling Design and Validation of the target assembly. Following the achievement of the target flow rate of the liquid lithium jet (20m/s) at the EVEDA Lithium Test Loop (ELTL) at JAEA Oarai, the options for an experimental test programme including the monitoring elements provided by ENEA were investigated in December. Whereas the long term studies on cavitation using the ENEA sensor were clearly identified, the possibility of performing a long term test of the nitrogen impurity level using the ENEA resistivity meter is still uncertain and under debate.

All the elements of the LIFUS 6 loop (dedicated medium-size liquid lithium loop) were installed at ENEA Brasimone, completing the air coolers, the connecting pipe between the storage tanks and the hot trap, and the samplers for the hot trap. The completion of this commissioning early in 2014 will be followed by an experimental campaign with reduced-activation ferritic-martensitic steels to quantify the corrosion/erosion effects under flowing liquid lithium with a controlled low N content.

The work committed in the PA for the Design, Construction of IFMIF Target Assembly (TA) Mockup and Testing of the RH Refurbishment Operations was successfully completed by remote handling of the lithium target assembly mock-up. These results confirm that there will be enough time to complete all

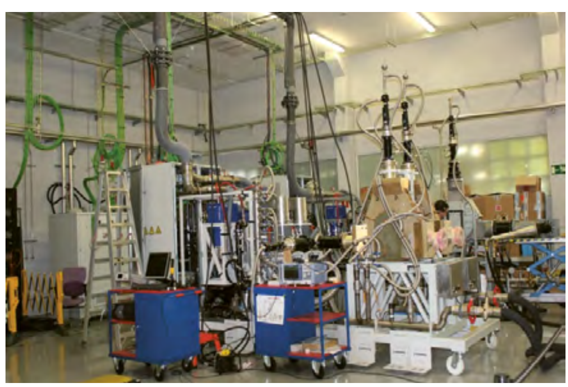


Experimental arrangement in the joint performance tests for the final power amplification stages of the RF power system provided by CIEMAT and observation of target output power level of 230 kW.

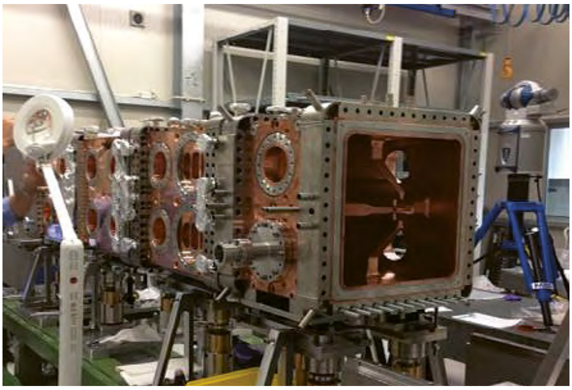
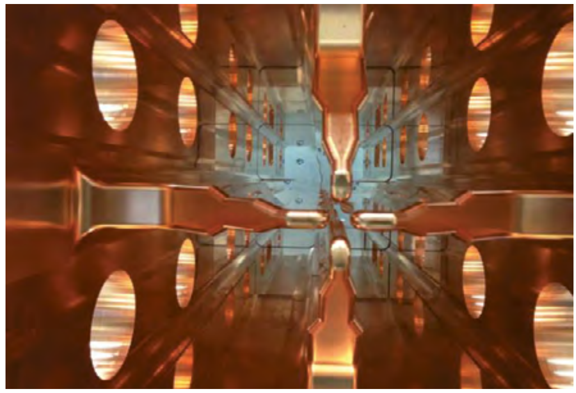
the maintenance tasks to be performed for the TA while staying within the 7 days allowed by the maintenance plan.

After having revised the capsule preparation methodology for BR2 irradiation tests of essential elements of the High Flux Test Modules (HFTM), new irradiation capsules (K1, K2, K3) were prepared to the level of subassemblies (bodies with heaters and top plugs with thermocouples) which allow the filling of specimens in a next step. The Reduced Activation Ferritic Martensitic (RAFM) steel specimens were retrieved from the previously filled capsules (B1, B2, B3) with which the uncertainty about the NaK filling level had occurred. During the specimen retrieval, it was discovered that the NaK sufficiently wets the narrow gaps. However, difficulties occur when filling the large volumes which are distant from the filling ports. Therefore, it was decided to fabricate and apply additional pieces of RAFM which will close as far as possible the large gaps between the specimens. The filling procedure was tested using ethanol in order to quantify the precision of liquid volume measurements in an RAFM-loaded capsule made of a transparent polymer giving direct evidence of the results of the filling height measuring technique. Two capsules were ready for filling with the NaK heat transfer medium, when a brazing defect in the third capsule held up the expected start of the irradiation in August. KIT and SCK-CEN subsequently overcame the problems with the preparation of the capsules in September. The HFTM (high flux test module) capsules were successfully filled with NaK. The results indicate good wetting of the specimens and good realisation of the targeted NaK volumes. This has unblocked the validation activities associated with the irradiation in BR2, which can now start with the April 2014 reactor cycle.

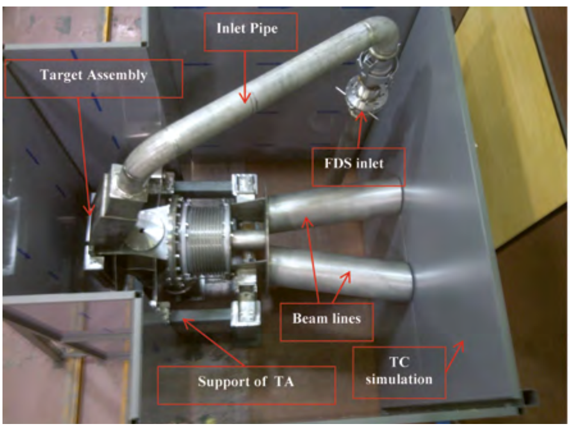
Pre-installation of the injector components at the LIPAc hall by members of the LIC unit formed by PT, JA-HT and EU-HT members



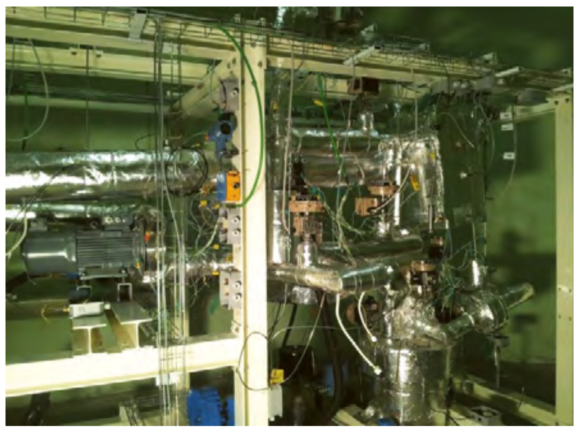
The prototype module of the RF power system for the LIPAc accelerator at the Spanish supplier facilities.

Four RFQ modules aligned for the high power test (outer and inner view)



The Li Target Assembly prototype set up and used for the RH studies



Final appearance of LIFUS 6 plant, after the completion of the thermal insulation

The Li Target Assembly prototype set up and used for the RH studies

The Engineering Design Activities for the IFMIF plant

In the final phase of producing the Detailed Design Description documents and the accomplishment of major Plant Requirement Definitions, an Editors Working Group was formed to revise the input documents to the IFMIF Intermediate Engineering Design Report and prepare for a comprehensive integration meeting held at Garching in April. As a result of the meeting, the input documents were assigned to be finalised by the Responsible Officers by integrating the comments received and adjusting the files to a common formatting framework. All EU PAs dedicated to the IFMIF Engineering Design Activities were completed on schedule by June. This contributed significantly to the issuing of the IFMIF Intermediate Engineering Design Report (IIEDR) on schedule in June, The IIEDR does not supply a detailed engineering design but provides the basis for configuring and deciding on the next step design activities, i.e. the IFMIF/CODA phase.

IFERC Programme

In 2013, the IFERC project

- continued the successful operation of the Computational Simulation Centre (CSC);
- continued the activities in DEMO R&D in materials and DEMO Design, increasing the interaction between the two areas;
- entered a more detailed planning phase for the implementation of the REC.

Computational Simulation Centre

At the start of 2013 Helios (the supercomputer provided by CEA under a contract with Bull as part of France's voluntary contribution) entered its second year of exploitation, and completed its second cycle of computational projects. Bull continued to fulfil its contractual commitments for availability and performance of the system.

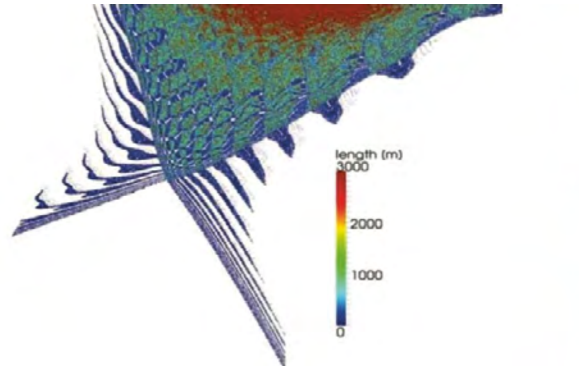
The first annual CSC security audit took place in February, looking at the security procedures in place at CSC, to check compliance with the security policy. The auditor's report provided a positive outcome, and made useful observations, advice, and recommendations.

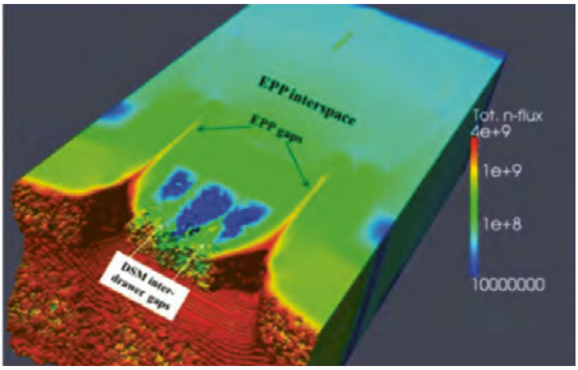
The network line between Rokkasho and Hirosaki was upgraded in April to a dedicated line of 10Gbps, as was the line between Japan and Europe, which started operation in March. As a consequence the connection between Hirosaki and Sendai is now the bottleneck for communications and will be monitored carefully to request an upgrade to SINET (the Japanese network Agency) if necessary.

Typically during the year the usage of Helios was between 85 and 95%, and the availability of the machine remained above 98%. A PA for enhancement to the supercomputer was signed in November with a view to providing additional computation resources to the supercomputer based on a "many-cores" architecture, in order to prepare the community of fusion users for future supercomputers. This enhancement will be provided in January 2014.

The third cycle of projects started in mid-November 2013 and will continue until mid-November 2014. The total number of proposed simulation projects in the third cycle is 122 (87 for EU and 35 for JA) with around 370 users. The large number of EU proposals is due to the closure of the HPC in Julich.

Results of simulation projects carried out on Helios in the first and second cycles have been published in many scientific journals and presented at various conferences and meetings. The total number of papers published or accepted for publication is 175: 113 in scientific journals, 61 in conference proceedings, and one review article. In addition, 28 papers have been submitted to scientific journals. The total number of 404 presentations includes 204 in conferences, 72 in meetings, 29 in symposiums, 83 in workshops, and 16 in seminars.





Results of simulation projects in support of ITER construction.
Left: Ergodisation of edge magnetic field during an ELM in ITER 15MA/5.3T scenario (JOREK, Marina Becoulet). Supported by F4E-GRT-2656 (and ITA C19TD46FE).
Right: Neutron flux 3D-map at Diagnostic Shield Module (DSM) in ITER Equatorial Port (MCHIFI, Dieter Leichtle).

DEMO Materials R&D Programme

DEMO R&D activities on material research continued in 2013 as planned in the PAs. The 12th Workshop on DEMO R&D, held in February 2013 in Rokkasho jointly with the 4th DEMO Design Activities Technical Coordination Meeting, reviewed design activities and plans and the impact of the EU DEMO roadmap. PAs were subsequently placed for a series of new proposals by JA (implemented using the excess credit originally planned for electricity charges in Rokkasho).

Regarding the activities on DEMO Design Coordination, a broad scope programme was maintained in 2013 with very modest R&D investment. The work included: (i) the analysis of the design requirements and technical prerequisites of a DEMO reactor, (ii) the preliminary assessment of the foreseeable technical solutions and (iii) the prioritization of R&D activities to be launched as part of the new EU fusion roadmap. As in the previous year, the work carried out in 2013 consisted of a number of technical activities (e.g. improvement and validation of fusion reactor system codes, safety, etc.) and common studies on outstanding technical problems that are recognised to have an impact on the design of a future fusion reactor (e.g., divertor physics, in-vessel components integration remote maintenance, etc.).

The outcome of stage one of the PA on the safety research in DEMO Design Activities was satisfactory and has resulted in a detailed proposal for stage two for work on safety codes. There is an increasingly strong interaction between the DEMO R&D and DEMO design activities. A new collaboration to analyse JET tiles in the Rokkasho materials laboratory is being defined and will be the subject of a new PA.

The progress of work in 2013 and R&D plans for 2014 were presented at the first DEMO Joint Technical Coordination Meeting (JTCM-1) and 13th Workshop on DEMO R&D held in September in Garching and Barcelona.

In the framework of DEMO R&D activities on SiC/SiC Composites, there has been progress on the task examining the erosion-corrosion of SiC materials in liquid metals (Li-Pb). This activity included the completion of construction by ENEA of an experimental apparatus for performing high temperature tests by rotating SiC materials into the liquid metal. The apparatus, comprising an oven capable of reaching 1000°C, and a rotating crucible, was undergoing preliminary acceptance tests at the end of 2013 prior to shipping to Rokkasho and installation in the DEMO R&D materials laboratory, with experiments starting in autumn 2014.

Remote Experimentation Centre

In the initial IFERC project plan, the Remote Experimentation Centre (REC) should have been demonstrated by proving remote experimentation from Rokkasho of the JT60-SA machine. In view of the delay of the start-up of JT60-SA, the scope and schedule of REC were re-examined in 2012 by a joint group of the two Implementing Agencies and EU experts. The group recommended that every effort should be made to optimise the usage of resources and to benefit the CSC and JT-60SA projects, and to explore the possibility of demonstrating REC in an existing experimental facility in operation.

The first REC Technical Meeting was held in Rokkasho and Naka in April 2013, and agreed the content of the PA for the definition of the requirements of the REC. Both JA and EU presented their ideas for the work organisation, the system engineering approach, and proposals for network tests and data transfer experiments, with emphasis is on the definition of the urgent activities connected with the preparation of the remote exploitation of JT60-SA. In the second TCM meeting, priority was given to the urgent tasks: the remote experiment system (RES) and the experimental data analysis software (EDAS) in JT60-SA. The EU contribution will concentrate on the development of software for remote participation and the data access. Three PAs were signed by October 2013 on these topics.

Equipment to measure erosion/corrosion in SiC/SiC with liquid metals

Contracts and Procurement

Introduction

The year 2013 was a transitional year for the Contracts and Procurement Unit, due to a reorganisation and redefinition of its mandate and scope. As a consequence of this reorganisation, as of May 2013 the Unit was organised with three separate sub-structures: the Project Procurement Group (comprising procurement staff fully dedicated to serve F4E's project teams), the General Procurement Group (comprising procurement staff in charge of administrative and operational procurements supporting transversally all of F4E's services) and the Market Policies, Analysis and Reporting Group (comprising staff dedicated to pre-competitive and post-competitive activities in preparation and support of F4E's procurements). The unit mandate was consequently reformulated to cover "procurement procedures and contractual issues, in relation to all administrative and operational procurement contracts, grant agreements and expert contracts", the coordination of "all administrative and operational procurement actions on behalf and in agreement with operational and administrative units" and the support needed during the whole procurement lifecycle in relation to "Policy Implementation, Intellectual Property, Export Control, Logistics and Transportation, Business Intelligence and Economic Analysis".

During 2013 the unit performed its main duty as engine of the procurement (and in particular tendering) operations of F4E; furthermore it deployed substantial resources to address a large number of cross-service issues and to support the development of organisational systems and capabilities. Among these, of particular relevance were:

- The definition of standardised tender specifications, complementing the parallel definition of standard model contracts;
- The continuous support to the development of internal processes, procedures and manuals;
- The follow-up of important action plans in response to external and internal audits (among which the conclusion of the action plans about experts' contracts and grants).

Finally, during 2013 the unit was one of the driving services for the definition of the Industrial Policy Implementation plan. This document defines a set of tools and strategies (which on-field application started during the year) which will be instrumental for F4E in the coming years to achieve its industrial policy objectives.

Procurement Activities

Project Procurement Group (PPG) and General Procurement Group (GPG) are in charge of all procurement procedures for both operational expenditure (i.e. those procurements and grants which are associated with F4E's objectives) and administrative expenditure (i.e. those procurements supporting the internal working of F4E). In addition, GPG manages contracts with external experts and supports European participation in calls for nomination issued by the ITER IO.

As anticipated at the end of 2012, the start-up phase for F4E's procurement activities is complete and during 2013 a balance distribution of workload was achieved between the signature of new contracts and the implementation of those signed during previous years.

During 2013, a total of 46 operational procurement procedures were launched and 45 procurement contracts were signed for a value of about EUR 831 million. Major operational procurements were awarded and signed in the area of Buildings and Cryoplant, but significant procurements were also signed in relation to Magnets, Neutral Beam and In-Vessel.

In particular in 2013 F4E signed the contract for the systems to be installed in the main portion of the ITER buildings (Tokamak Complex and surrounding buildings) including the heating, ventilation and air conditioning (HVAC), Electrical and Fluids Networks and Handling. This was the largest procurement milestone for Buildings as well as the largest single contract ever released by F4E. The procurement contract was signed at the conclusion of a long and extremely complex competitive dialogue, which tested the capability of the various services involved to cope with technical, commercial and planning challenges.

A second significant procurement milestone during 2013 was the signature of the contract for the supply of the Liquid Nitrogen (LN_2) Plant and Auxiliary Systems. This was the main procurement milestone for the cryoplant systems. The procurement contract was signed after a complex negotiated procedure, in a market which proved to be extremely limited due to the unusual large size of the plant.

Many of the systems and components belonging to the EU in-kind obligation (such as the ICH antenna and the EC gyrotrons) are now moving out of the R&D phase and into the design and prototype manufacturing phases of their lifecycle, therefore being contracted by means of procurements. Nevertheless, in spite of the slightly reduced number, implementation of grants for R&D activities continues to have a high strategic importance for Europe's capability to deliver the full contribution to the ITER and Broader Approach projects and to positively exploit their scientific and technological results. During 2013, a total of six grant procedures were launched and 11 grant agreements (or framework partnership agreement) were signed. This corresponds to a grant budget of over EUR 16 million.

In relation to grant developments at the end of 2013 F4E also finalised the statistical work in support of the adoption during 2014 of lump sum grants. The results were presented to the governing bodies and are in the process of being implemented through a new set of guidelines for lump sum grants.

The average time to contract for procurements above EUR 1 million decreased during 2013 with respect to year 2012, from 165 days to 143 days. At the same time the average time to contract for procurements below 1 million EUR and grants increased, mostly due to a large number of competitive negotiations for the former, and the increase of Framework Partnership Agreements for the latter.

During 2013 a total of three administrative procurement procedures were launched and 22 procurement contracts were signed, with a budget of EUR 16 million. Within these, two service framework contracts for bank services were signed following an inter-institutional procurement procedure managed by F4E together with other two participating agencies: European Fisheries Control Agency (EFCA) and European Agency for Safety and Health at Work (OSHA).

On 10 September 2013, the new call for expression of interest for external experts was published with the aim of attracting external expertise in different specified areas relevant to the ITER and JT-60SA projects.

In comparison with the previous call, the new procedure was designed to ensure an even higher level of transparency and equal treatment during the evaluation process by aligning it as far as possible to the other F4E procurement rules in force and by introducing the principle of rotation for the expert selection process.

Since its publication nearly 100 applicants covering several areas of expertise have registered in the new database allowing F4E to swiftly answer to any technical need that may arise within the different F4E departments and projects.

Market Policies, Analysis and Reporting

The **Market Policies, Analysis and Reporting Group (MPG)** is in charge for market surveys, commercial risks analysis, Intellectual Property and reporting.

Intellectual Property Rights

As regards the activities of the group in relation to **Intellectual Property** it is worth mentioning that the new IP policy was approved and signed by the relevant Commissioner on 17 May. This new approach is crucial in promoting European industry through the commercial exploitation of the results of F4E's activities.

Business Intelligence

As regards **Business Intelligence** related activities, during 2013 F4E has further developed its pre-procurement activities and tools. F4E has enriched its interactions with European industries and associations in view of enhancing the efficiency of its procurement actions.

Both directly, through the F4E Industry Portal and the Industry Liaison Officers (ILO) network, F4E has various channels of communications with European industry.

Industry outreach activities during 2013 included:

- In August 2013 F4E adopted, as an important Business Intelligence tool, a comprehensive Market Survey Policy covering the different methods which can be used to gain a better understanding of the market structure

- F4E has kicked-off the Supplier Improvement follow-up exercise (+30 suppliers monitored so far) and has also initiated a benchmark on Supplier Assessment best practices with other industry and public bodies.

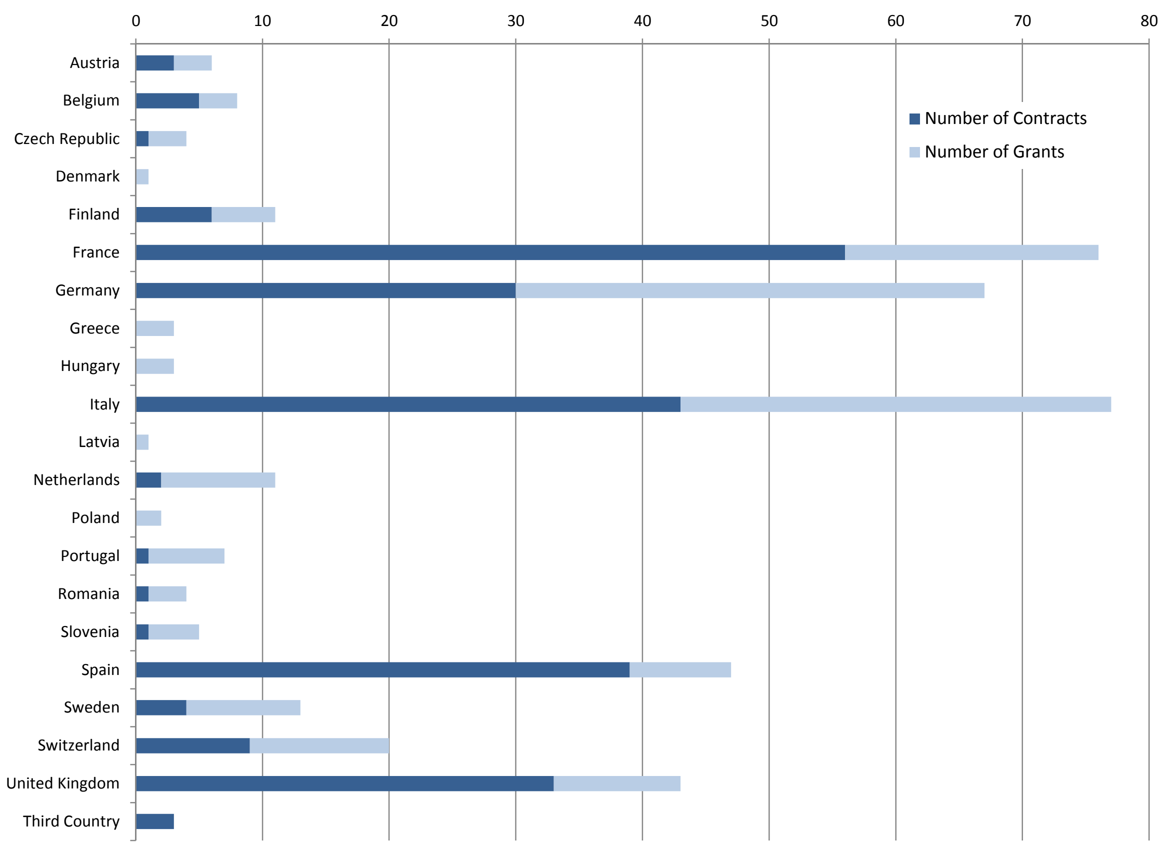
- Working groups with ILOs were organised during spring 2013 to identify possible ways to improve the participation of industry in F4E activities: the exercise helped in reducing the actual and perceived gap between industries' and F4E's needs and positions.

- Four ILO meetings took place, one of which was held during the ITER Business Forum of Toulon. These meetings have supported wide dissemination of information on past, on-going and future procurement activities and related needs for the fulfilment of European contribution to ITER.

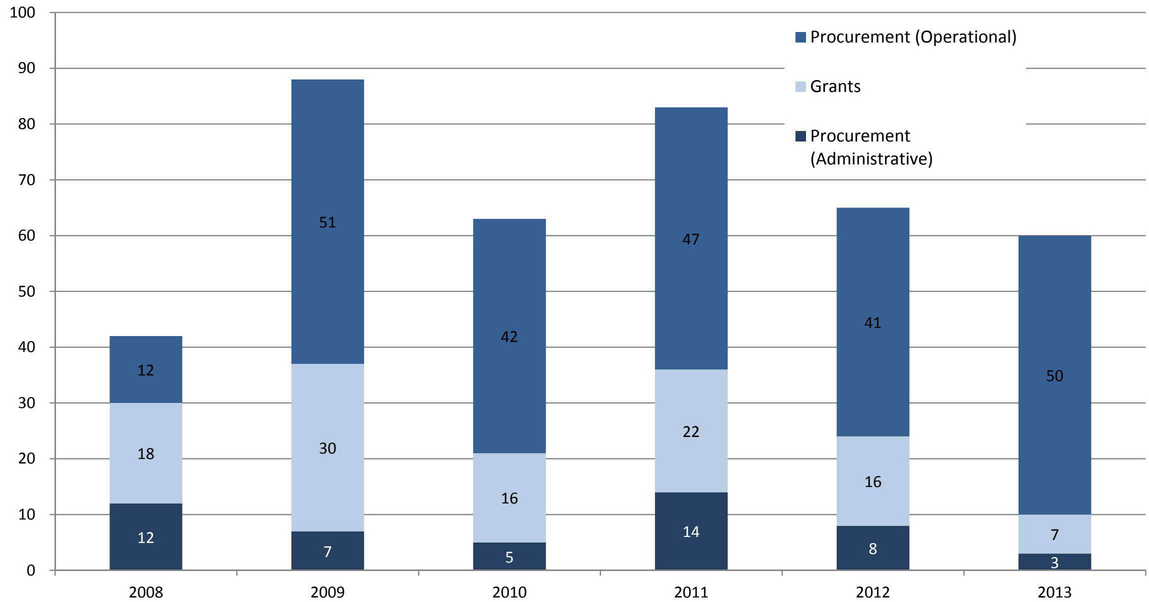
- F4E organised six information days in relation to specific procurement actions or general information meetings for industry. F4E representatives also attended many meetings, seminars and conferences organised in the Member States (including, for the first time, Poland, Malta and Croatia), mainly as part of the preparation of procurement activities in various technical areas.

- For more precise identification of capabilities, 13 market surveys have been published through the F4E Industry Portal. Most of the market surveys launched in 2013 have been targeted to assess the market in the view of forthcoming procurement procedures, while some have been used to identify potential commercial and technical risks in relation with the signature of specific procurement arrangements with ITER.

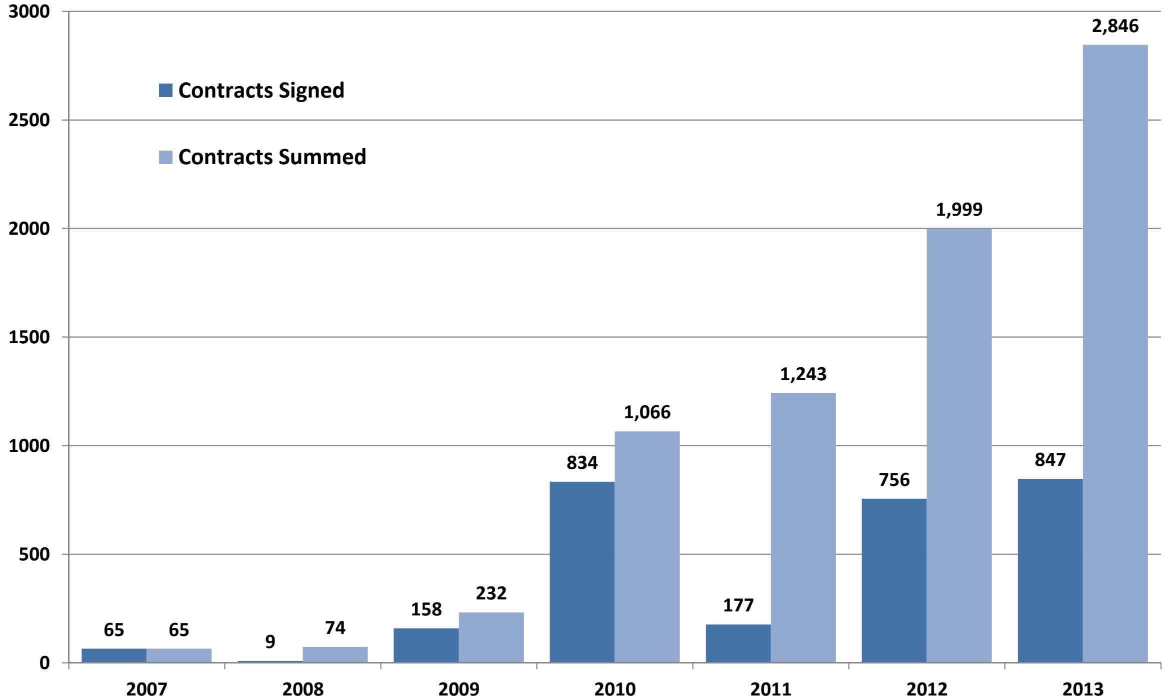
- In 2013, F4E Industry & Associations Portal (https://industryportal.f4e.europa.eu) continues to be the main contact point with F4E for companies. The supplier database reached about 1,500 registered users, of which more than half have initiated a generic pre-qualification process. The publication of announcements on the portal aiming at delivering dynamic information and updated on F4E procurement and pre-procurement activities has also significantly increased.



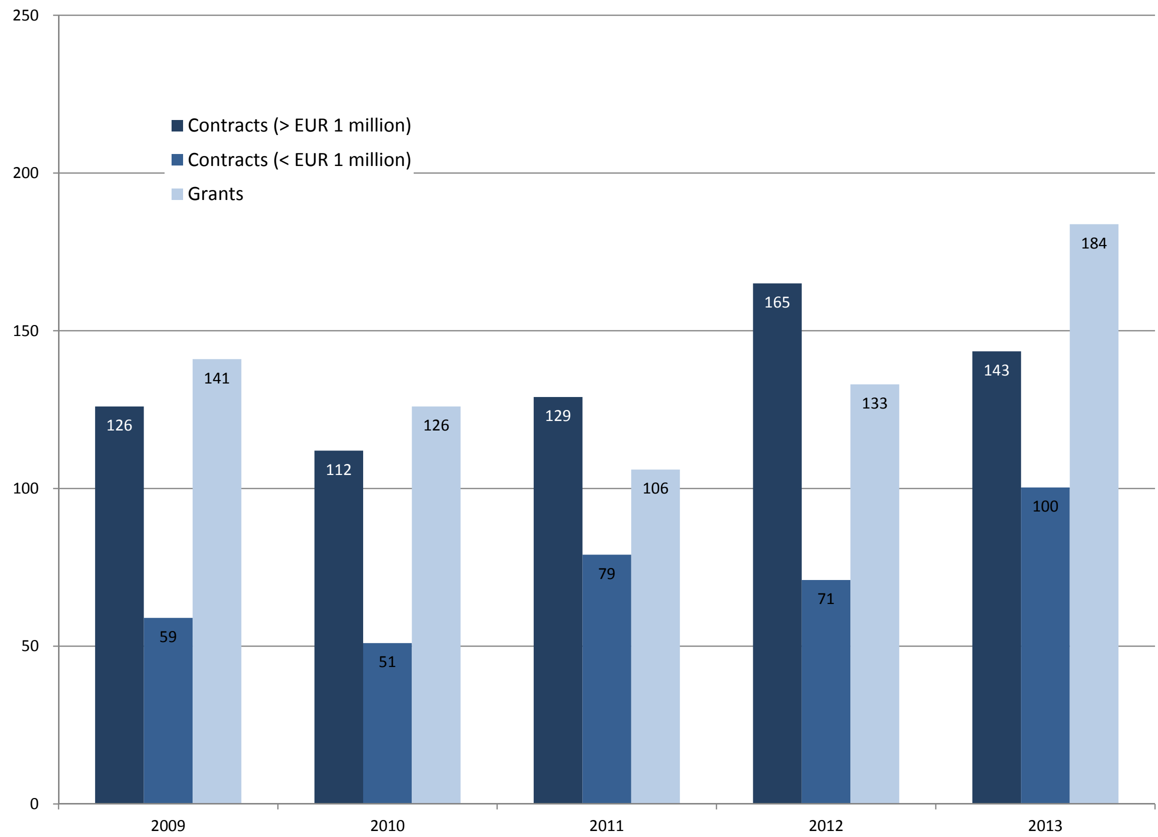
Geographical distribution of awarded contracts and grants (Number in the period 2008-2013)



Procurement and grant procedures launched (number – excluding Task Orders)



Annual and summed value of contracts and grants awarded by F4E to award)



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

Budget, Finance and Accounting

The 2013 financial statements, the 2013 budget implementation and reporting on the budgetary and financial management in 2013 are detailed in the 2013 Annual Accounts which are published separately.

Budget Establishment

F4E's budget for 2013 was initially adopted for the global amount of EUR 1,016.65 million in commitment appropriations and EUR 677.23 million in payment appropriations.

Following budget amendments approved by the Governing Board, the final authorised F4E budget for 2013 was EUR 1,016.78 million in commitment appropriations and EUR 431.61 million in payment appropriations.

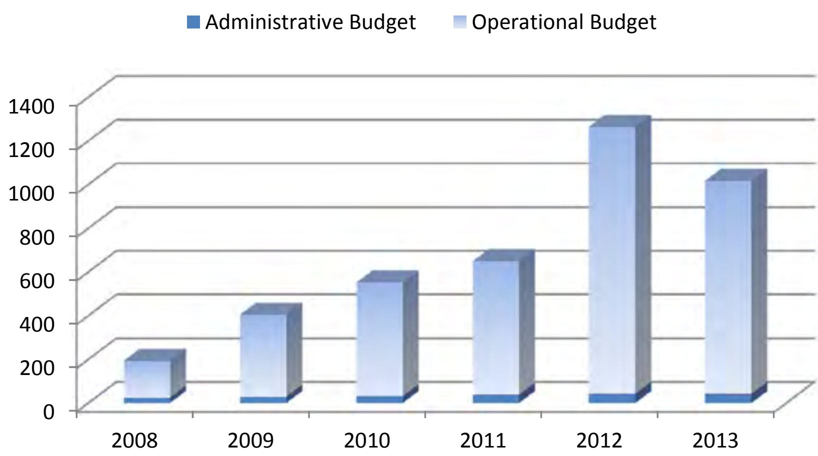
Implementation of the Authorised 2013 Budget

Revenue	• **100.0%** of the foreseen revenue was collected.
Commitments	• **100.0% of Implementation** • **99.9%** of the administrative budget • **100.0%** of the operational budget Of which **61.7%** of individual commitments
Payments	• **89.8% of implementation** • **57.3%** of implementation compared to the original budget • **83.1%** of the final administrative budget • **90.6%** of the final operational budget.

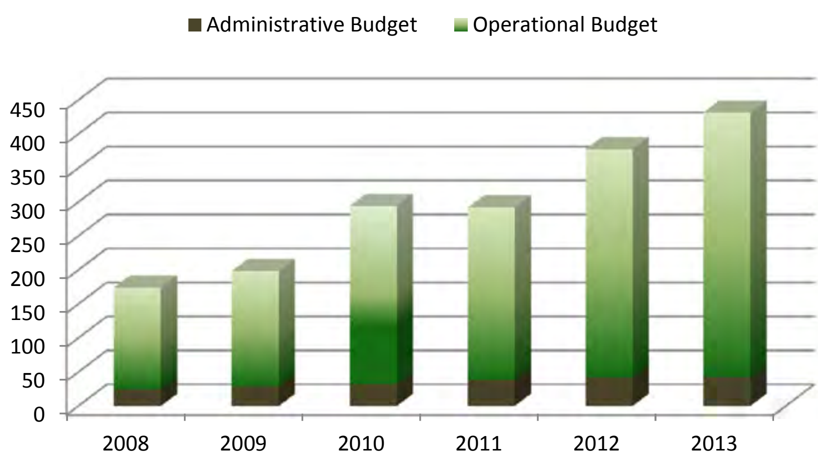
Revenue

The repartition of revenue for 2013 ensures/corrects the balance between contributors is in line with their relative share for the overall period of ITER construction:

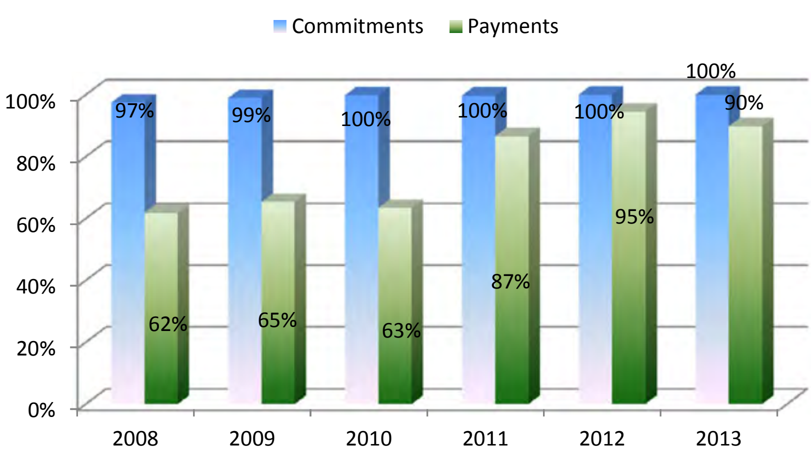
- Contributions from the EURATOM 69%
- Contributions from the ITER Hoste State 30%
- Annual Membership Contributions 1%



Commitments and Payments



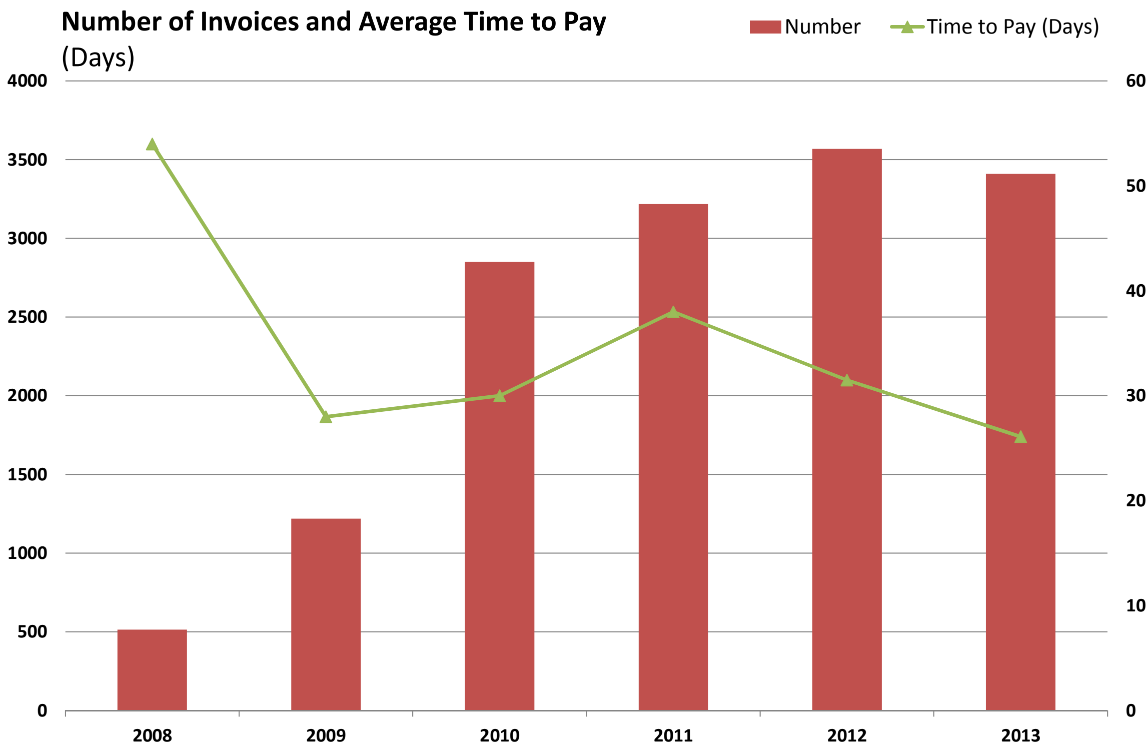
F4E available budgets in commitment appropriations (EUR million) since 2008:



F4E available budgets in payment appropriations (EUR million) since 2008:

Implementation of the budgets (%) since 2008

Moving to statistics on payments, the previous graph shows that the number of transactions carried out is 3,410 (excluding individual salary payments) and the average time to pay was 26 days, which is well within the maximum



45-day period foreseen in the Implementing Rules of the Financial Regulation. This significant improvement over the previous years was achieved through a cross-departmental exercise to re-define the circuits for approval of a deliverable and its payment and to render them more efficient.

Legal Framework – Accrual Accounting Standards in F4E

According to its statutes, the annual accounts of F4E are fully consolidated with those of the European Union. The 2013 financial statement was established by using the consolidation package provided by the European Commission.

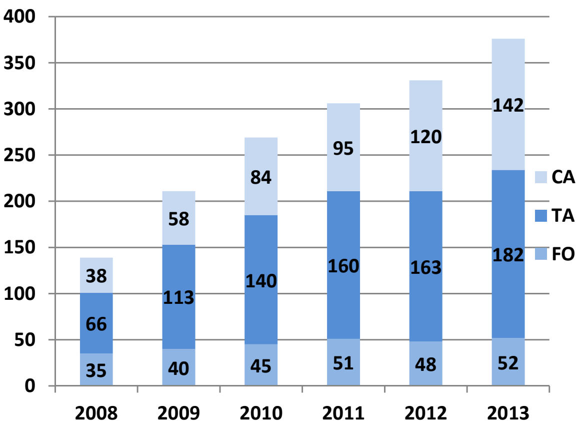
The accounting rules and regulations used in the annual accounts are also laid down by the European Commission. In addition they are on an accrual basis and are compliant with the International Public Sector Accounting Standards (IPSAS).

F4E uses the ABAC system (Accrual Based Accounting) owned by the European Commission and used by many EU bodies.

Human Resources

Personnel Selection and Recruitment

As of 31 December 2013, the total number of occupied posts at F4E was 234 Officials and Temporary Agents, and 142 Contract Agents. In addition, as of 31 December 2013, F4E counted on



Evolution of the staff complement from 2008 to 2013 where FO stands for Officials, TA for Temporary Agents and CA for Contract Agents

the support of 17 interims (16 in Barcelona and one in Cadarache) and 3 Seconded National Experts (SNE). In this context neither the interim staff nor the SNEs are considered to be F4E staff.

During 2013, 36 vacancy notices were published (15 for established EU Officials, 12 for Temporary Agents, eight for Contract Agents and one internal call for expression of interest). Overall, 34 selection procedures were completed: 21 from the positions published in 2013 and 13 selections from the positions published end of 2012. A total of four Officials, 16 Temporary Agents and 17 Contract Agents took up duties as per the following table (distributed by type of contract, category and department):

Department	FO	TA	CA
Units/Teams reporting to the Director	2 AD	3 AD	1 FGII
ITER	2 AD	5 AD 3 AST	9 FGIV 1 FGIII
Broader Fusion Development			1 FGII
Administration		3 AD 2 AD	2 FGIV 3 FGII

Following the call for expression of interest addressed to candidates who had already passed a selection procedure (CAST) managed by the EU's Personnel Selection Office (EPSO) which F4E launched in 2011 in order to better target the selection procedures for support, two CAST procedures were successfully launched and candidates were recruited.

The average time to select in 2013 was 4.5 months. This slight increase is mainly due to the longer notice period given by candidates, which might represent significant delays depending on the contract of employment.

Following the last part of the reorganisation, concerning mainly the unit/teams reporting to the Director and the BFD Department, three new units were created to enhance efficiency and effectiveness and clarify responsibilities. As a result, 5 Acting Heads of Unit (2 in Broader Fusion Development Department, 1 in Administration Department, 1 for the Management System and Organisational Improvement Unit and 1 for the Legal Services Unit) were appointed in 2013. In addition to this, 1 Acting Project Team Manager was appointed for the Magnets Project Team within the ITER Department.

Personnel Policy

F4E implemented new and simplified provisions on appraisal and promotion/reclassification of its staff, aiming at ensuring that appraisal and promotion decisions can be taken faster. For the first time, a certification and attestation exercises were launched, with the view to offer additional career perspectives and mobility. The internal guidelines to deal with complaints and appeals were also finalised and implemented. The last quarter of the year was finally significantly dedicated to the preparation of the reform of the Staff Regulations (effective on 1 January 2014) and its impact on F4E. This includes notably the implementation of specific transitory measures, endorsed by the Governing Board, so as to ensure that the proper legal framework is in place, in due time.

Several other provisions were submitted to the Commission for approval but unfortunately the Commission's feedback has not yet been received.

The area of data protection represented a very significant workload in 2013, following the request from the European Data Protection Supervisor to receive a series of notifications by the end of the first semester of the year. For the Human Resources Unit, this implied that around 15 notifications, with their privacy notices, were drafted, on top of the usual follow up required by the notifications already in place.

The unit also dealt with an increase of its legal activity, in particular in the field of internal appeals.

In addition to the actions mentioned above, F4E also:

- Undertook an important revision of the decision on SNEs (updating the 2008 decision), adapting it to the needs of the organisation;

- Contributed to the document presented to the Governing Board on the staffing needs up to 2020;

- Conducted in-depth discussions and reinforced the works to provide the organisation with a fully-fledged career management and development.

Studentships schemes

In March 2013, F4E launched its summer studentship scheme for the fourth year running. The scheme aims at providing short-period training (2 to 3 months) to university students as well as to promote awareness, knowledge and understanding of F4E's role in the ITER project and within the European context. In total, 10 studentships were awarded and the students were assigned to the ITER Department (8) and General Affairs Unit(2).

Also, in May 2013 F4E signed an agreement with the Carlos III University in Madrid. This scheme is addressed to students of Masters in European Law, for a period of 6 months. The main objective is also to promote knowledge and understanding on F4E's role, objectives and policies.

In September 2013, three students were assigned to different services in Fusion for Energy.

Training

F4E proposed new tools to reach the perfect match between F4E needs and learning actions proposed: from the Learning and Development Framework to a training catalogue set upon consultation of the Heads of Department to clearly identify and prioritise objectives.

F4E also introduced four learning paths linked to four different profiles to provide staff with an overview of the training required or recommended for specifics tasks. One of those learning paths is the one addressing the managers, as one of the key priorities during the year and beyond.

In 2013 F4E also had to select the new language courses provider via a call for tenders, after the old framework contract expired after four years.

Some figures related to the training activities in 2013 are shown below, as well as the comparison with the previous year:

	2013	2012
Number of training courses at the European Commission	68	64
Number of collective training organised at F4E	59	36
Number of external training courses	98	83
Number of seminars/ conferences	143	43
Number of people following language courses in F4E	221	219
Average number of training days per staff member	4.9	4.6

Working Conditions/Social Policy

Some of the main achievements in 2013 related to this sector included:

- Two new administrative agreements were signed with international schools in Barcelona and the surrounding area bringing the total number of agreements to 19, which covers the needs of staff members from a variety of backgrounds. As of 31 December 2013, 123 children made use of this option and are currently enrolled in the international schools with which F4E has concluded administrative agreements.

- Since the conclusion of an agreement with a complementary health insurance company in 2012, F4E is managing the contract with 667 affiliates mainly F4E staff members and their families.

- 17 newcomers were provided with support for relocation services.

The F4E Medical Service completed a second year of activities. During 2013, the service performed the following actions:

- Medical visits / screenings
  - 33 visits of pre recruitment
  - 108 annual check-up
  - 17 health screening programmes
  - 375 medical consultations
- Vaccinations
  - Flu campaign
- Internal communication / prevention
  - Sun protection campaign
  - Neck pain workshop

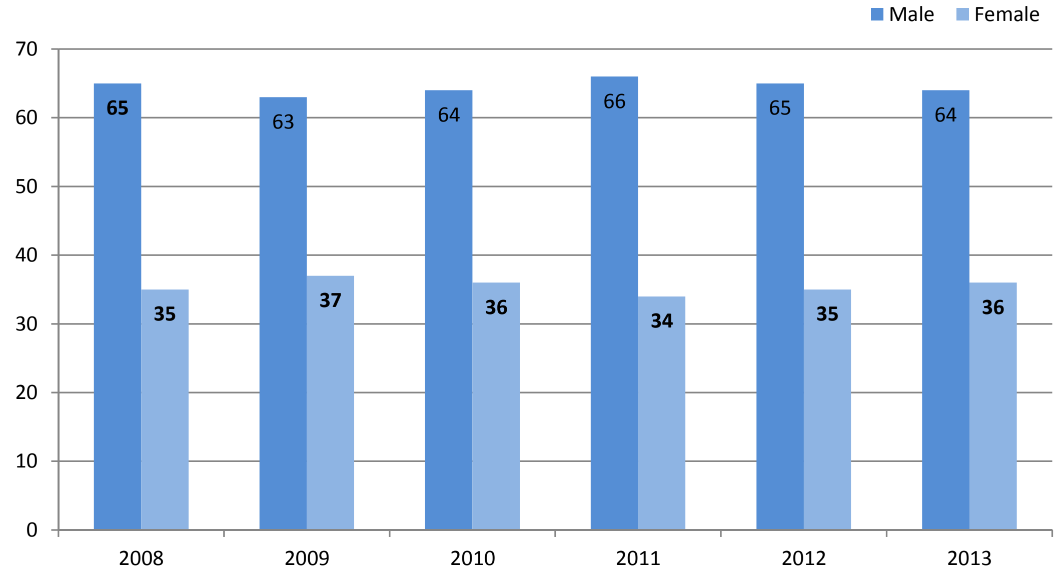
Some additional specific projects were conducted in the course of 2013:

- Prevention of harassment: contribution to the revision of the Manual of Procedures for the implementation of F4E Policy protecting the dignity of the person and preventing psychological and sexual harassment, update of the intranet, presentation to staff

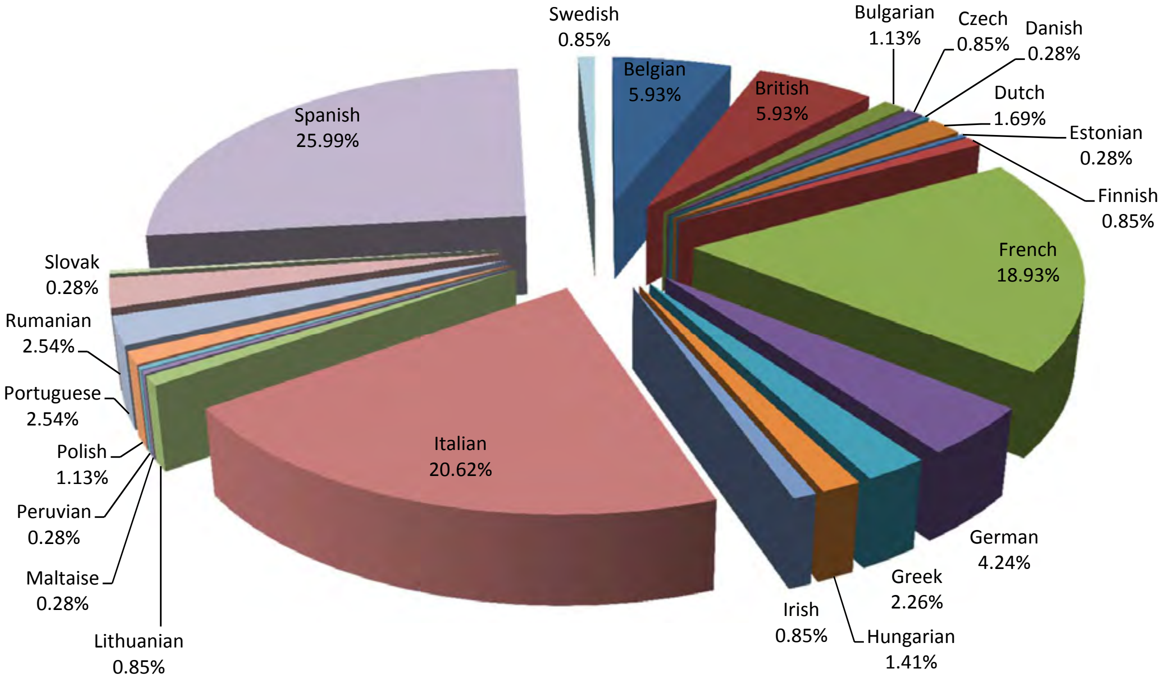
- Draft revised decision on the gifts policy

Staffing Statistics

In the following graphs statistics on the gender and nationality of F4E staff is provided.



Gender distribution for all staff (%)



Breakdown of staff nationality (%)

Legal and Control Environment

Legal Matters

Creation of new Legal Service Unit

In June 2013 an important reorganisation took place by creating a new Legal Service Unit (LSU) with the aim to increase efficiency and additional assurances for the legality in F4E's activities by gathering all legal activities within one unit.

The scope of the LSU covers on one hand provision of horizontal legal activities on corporate matters, human resources, data protection, legal knowledge sharing and compliance issues on the other hand provision of legal support to the project teams from the tender phase all along the life of the contract.

Regulatory framework

In 2013 important modifications to the existent F4E regulatory framework have been approved by the F4E Governing Board.

At first place F4E Governing Board approved an amendment to grant provisions embodied in the Title VI of the F4E Implementing rules to the F4E Financial Regulation. The amendment introduces in particular:

1) Abolition of the limitation of the duration of framework partnership agreements to four years (Article 147(2) IR) as this limitation is not conducive for establishment of the durable collaboration between F4E and economic operators which is a pre-requisite for a long-term project such as ITER.

2) Increase of the current upper funding limit of a maximum of 40% of the total eligible costs (Article 153(1) IR) for research, technological development and demonstration activities up to a new maximum ceiling of 70% of eligible costs for the purchase of durable equipment or assets and of ancillary services approved by F4E as necessary to carry out the research, technological development and demonstration activities under the grant. The current limit has proven too low to attract beneficiaries, requiring F4E to organise a number of small procurements further burdening F4E's limited human resources and entailing inefficiencies arising from the integration of the procurements in the grant activities.

3) In order to optimise applicants' workload in the proposal preparation a new provision was inserted in Article 167 IR allowing F4E to recur to a two-stage grant evaluation procedure, whereby applicants first submit an outline proposal and only those applicants whose proposals satisfy the evaluation criteria for the first stage shall be requested to submit a complete proposal in the second stage.

4) With a view to affording F4E with the same flexibility in the area of grants as is the case for procurements, a new provision was inserted in Article 167 IR providing for the possibility that F4E may negotiate with an applicant in order to adapt the application to the requirements of the Joint Undertaking. In order to prevent distortions of competition, this shall be limited to situations when only a single admissible application has been submitted in response to call for proposals and provided that the content of the activities of the call for proposals will not be substantially affected by the negotiation.

F4E's Governing Board also approved an amendment to the current rules on the secondment to F4E of Seconded National Experts (SNEs) in force since October 2007. The revision takes into account the experience gained in F4E since 2007 and a revision of the Commission rules on SNEs adopted in 2009. Under the amendment SNEs can be seconded from a public authority or from the private sector however "cost-free" SNEs can only be seconded from public authorities. The minimum period of secondment is now 6 months and maximum standard one up to 4 years. The period of secondment can exceptionally be extended up to a total of six years. The SNE and his employer must declare that there is no existing conflict of interest in relation to the SNE's tasks. The subsistence allowances shall be subject to the weighting coefficient set by the Council and allowances shall be granted under the same conditions as the expatriation allowance for EU officials. The removal expanses were replaced by a monthly allowance and travel expenses shall be only reimbursed when the secondment is within the EU territory. To continue to attract highly specialised experts, the possibility of reimbursing the net remuneration to the SNE's employer was maintained.

The Governing Board finally approved a revision of the F4E rules on confidentiality, independence prevention and management of conflicts of interests originally adopted in 2007. The revised draft is more prescriptive with detailed procedures for managing conflicts of interest. It covers all participants in the F4E bodies, i.e. not only the Governing Board and all its sub-committees established under the Statutes but as well all the bodies newly created by the decision of the Governing Board. It uses definitions common to EU institutions and OECD. The revision retains the existing declarations on commitment, independence and confidentiality composed of general declaration of interests, a specific declaration of interest and spontaneous declaration however it improves the timing of its issuance and its content.

Contribution to the Annual Corporate Objectives

LSU contributed significantly to achievement of the F4E 2013 corporate objectives in particular by:

- Implementation of the adjudication system under the buildings contracts.

- Promotion of knowledge sharing and standardisation by the development of standardised model contracts for supply and service for contract value below EUR 10 million and creation of model for lump sum agreements for grants.

Internal Audit

Two audit engagements were closed (final report issued) during 2013; they covered respectively staff selection and recruitment (Internal Audit Capability (IAC)), and the competitive dialogue procedure for a specific procurement (limited review by the Internal Audit Service (IAS)). From the other IAC audits planned for 2013, one has been transformed into a consulting engagement, and the reporting phase of another large engagement has been carried over to 2014. In addition, the IAS facilitated an IT risk assessment in the first half of 2013, which gave also rise to an action plan.

On the consulting side, the IAC provided advice to management to design instruments in a view to strengthen financial control during contract implementation (operational procurement) and inter alia, on further steps of decentralisation. Finally, it helped clustering open audit recommendations around management standards in support of corporate objectives-setting.

Since the creation of the internal audit function in 2009, 178 internal audit recommendations (31/12/2012: 160) have been issued, of which at year-end 94% (31/12/2012: 96%) were accepted by the management. In response to these recommendations, 345 remedial actions were identified.

The overall implementation of action plans in response to internal audits remained beyond schedule although in progress (self-assessed: approximately 71% in average at year-end 2013).

In 2013 64% (2012: 66%) of the available IAC resources were directly dedicated to assurance engagements.

Internal Control

In 2013 F4E has significantly progressed in the implementation and further development of its internal control systems. An internal control system is an on-going process which can never be considered as finalised as it is used to improve on a continuous manner the organisation and the systems in place.

Overall Control and Monitoring Strategy

The "overall control and monitoring strategy" adopted in 2012 aims at strengthening the F4E's control environment and it has been further implemented during 2013. The aim of the strategy is to ensure that the operational and financial transactions are implemented according to the highest standards expected for such a project as ITER and to contribute to the “assurance chain” providing to the F4E Director and external stakeholders reasonable assurance on the state of Internal Control in F4E. The strategy has been enlarged in order to include a new supervisory function.

The 2013 Control and Monitoring report provides an update of the evolution in the resolution of the issues detected and presents a summary of the progress made in each of the areas of improvement identified for the year as well as identifies the challenges ahead in 2014, and which will be addressed through the 2014 corporate objectives.

A corporate supervision function has been set up and will coordinate the following functions:

- the financial supervision function;
- the Internal Review Panel which assesses the contractual and procedural aspects before awarding a contract;
- specific ad-hoc controls as requested by management on the basis of specific needs or weaknesses detected.

The results of these assessments will be used to feed the continuous F4E improvement plan and to strengthen the F4E internal control and its procedures.

Control Strategy on Grants and Procurement Contracts

This Multi-Annual Ex-Post Control Strategy, which was adopted in 2012, aims at reducing and controlling risk by performing on-the-spot checks in order to assure that contractual obligations are met.

During 2013 a function in charge of ex-post audit on grants was set up, and the pilot phase for the implementation of such strategy was successfully completed. Towards the end of the year, F4E started the preparation and launch of the first batch of ex-post audit on grants which will yield its results during 2014.

As for the financial verification for contracts, and taking into account the completion of the pilot phase carried out in 2013, it was concluded at the Audit Committee meeting in November 2013 that the internal audit capability would be better placed to ensure this verification through their audits, providing the organisation with the overall assurance needed on the monitoring and management of contract implementation.

Corporate Risk Management

The risk log was updated in accordance with the Corporate Objectives 2013 to monitor the mitigation actions and the current status of the risk identified; on that basis the risks have been reassessed regarding the effect of the action plans in place.

The process to monitor the corporate risks is evolving in accordance with the new requirements from the Corporate Objectives 2013. The risks categorised as ‘Very High’ were reported to the Governing Board and other committees with their mitigation actions and the evolution.

Tools and Instruments

F4E has implemented an Integrated Management System which is a single integrated system to manage the totality of the F4E’s processes in order to meet the organisation’s mission and objectives. It combines the two control environments which F4E operates within - the ITER-wide quality system which is intended to ensure the performance of ITER and the compliance with the nuclear safety requirements, and the EU Internal Control Standards to manage the organisation.

The backbone of this system is the Integrated Management System Standards (IMSS). A set of standards specifically developed by F4E, integrating the ISO-9001 quality requirements, the F4E EU Internal Control Standards and the ITER Project quality and safety requirements. During 2013, while implementing the IMSS, F4E performed a preliminary assessment of its efficiency and status of implementation concluding on the need to review and streamline the Standards in order to improve its application and effectiveness.

All observations and recommendations stemming from internal as well as external audits, controls and assessments are being registered in a central follow-up database. In addition, they have been linked to the F4E Integrated Management Standards thereby defining the key areas of improvement developed in the Annual Control and Monitoring Report which supports the declaration of assurance of the Director.

F4E has also further developed during 2013 the **"F4E Manual"** to provide a centralised access to all practical information required to consistently perform all F4E activities (rules, policies, processes, procedures, checklists, routing sheets, templates, etc.). The F4E Manual is a living undertaking, which needs to be further developed in line with the standardisation of processes being set up as well as new processes, guidelines, rules, etc. to be adopted in the near future.

The **Integrated Reporting System** of F4E which combines various information sources such as financial data, project management information and control environment has been further developed during 2013, in view to increase the monitoring and reporting and have a better control of operations.

External Audit

In the following table the status of the follow-up to observations raised by the Court of Auditors in their reports on the annual accounts of F4E for the period 2008-2013 is summarised:

Area	Completed	In Progress	No Action	Total
Annual Activity Report	2		1	3
Audit Committee of the Joint Undertaking	1			1
Commission Internal Audit Service	3		1	4
Financial Regulation and Implementing Rules	4		2	6
Grants and procurement	5	2	8	15
Host State agreement		1*		1*
Implementation of the Budget	1		4	5
Intellectual Property Rights and Industrial Policy	3			3
Internal Control Systems	12	2		14
IT systems	1			1
Late payment of membership contributions	6		1	7
Presentation of the accounts	1	1	2	4
Reorganisation of the Joint Undertaking	2		1	3
Status of the financing of the ITER project		2	11	13
Quality assurance audits and ex post controls on procurement and grants	2			2
Rules implementing Staff Regulations		1		1
Total	**43**	**9**	**31**	**83**

**The observation related to the permanent premises not yet provided by the Host State has been raised 3 times already: in the years 2010, 2011 and 2012.*

Quality Management System

In 2013, F4E continued the implementation and development of the Quality Management System through five main activity areas:

- Implementation of an integrated management system;
- Establishment and continual improvement of the system;
- Process development and reviewing;
- Quality audits (internal and external);
- Quality Assurance in the operational projects.

F4E Quality System

The development and establishment of a Quality System is part of the F4E overall management strategy included in obligations as ITER Project items provider (ITER IO and Host Country Authority Regulations requirements) and to assist the internal management in the Internal Control Standards compliance.

Integrated Management System

The Integrated Management System is a single integrated system to manage the totality of the F4E's processes in order to meet the organisation's mission and objectives.

It combines the two control environments which F4E operates within - the ITER-wide quality system which is intended to ensure the performance of ITER and the compliance with the nuclear safety requirements, and the EU Internal Control Standards to manage the organisation.

The backbone of this system is the Integrated Management System Standards. A set of standards specifically developed by F4E, integrating the ISO-9001 quality requirements, the F4E EU Internal Control Standards and the ITER Project quality and safety requirements.

Establishment and Continual Improvement

The continual improvement work is an on-going process in accordance of the Standard 22 which requires F4E to continually improve the effectiveness of the Internal Management System standards through the use of the quality management policy, the integrated management system policy, quality objectives, audit results, analysis of data, corrective, preventive and improvement actions and management review.

The integrated management system standards implementation is assessed once a year. The assessment is reported and used for improvement of the Integrated Management System.

In response to the conclusions of the European Competitiveness Council of 9 July 2010, the F4E Governing Board adopted in October 2010 a set of Improvement Plans in relation to cost containment, organisational structure and project management system processes. The progress on these Improvement Plans is reported periodically to the Governing Board and annually to the Council in the F4E Progress Reports since 2011.

Since 2012, F4E has developed and implemented the "overall control and monitoring strategy" to strengthen F4E's Control Environment ensuring that the organisation would be able to meet its strategic and operational objectives. This strategy contributes to the "assurance chain" providing to the F4E Director and external stakeholders reasonable assurance on the state of Internal Control in F4E. In order to support this strategy, F4E has undertaken the following key actions:

(i) All observations and recommendations issued by all sources of assessment (including the IAC, IAS, ECA and External Assessments, but also Risks, Ex-Posts and management assessments) have been consolidated within a central database and each recommendation or observation has been linked to the F4E Integrated Management System Standards allowing us to assess in an integrated way the detected weaknesses and to prioritise logical key areas of improvement leading to coherent action plans aiming at consistently solve groups of weaknesses in a structured way.

(ii) F4E has developed an "F4E Manual" to provide a centralised access to all practical information required to consistently perform all F4E activities (rules, policies, processes, procedures, checklists, routing sheets, templates, etc.).

(iii) The annual Control and Monitoring also report on the findings identified via the control mechanisms in place (Corporate Risks, Record of Exception, Deviations, Surveillance Campaigns, etc.)

Organisational improvement is an on-going process and shall remain a corporate priority in line with the Strategic Objectives. It provides inputs for the definition of the actions related to the annual corporate objectives.

Process Development and Reviewing

According to 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.

This process approach is also a requirement of the IAEA Safety Requirements No. GS-R-3, that together with ISO-9001 are the standards adopted 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:

(i) the requirement definitions;

(ii) the stakeholder feedback;

(iii) F4E compliance with the requirements

Any system will be more efficient as its capacity to meet these requirements grows. This way the comprehension of the activities to carry can be shared by all stakeholders in a transparent way. Efficiency of the system is continually assessed and measured through the monitoring indicators of processes and the fulfilment of the specified objectives.

In this logic F4E has developed a Process Map to organise al its processes showing the links between all activities to carry across the organisation, including:

(i) Definition of the overall F4E process (F4E Process Map);

(ii) Details of the macro process to provide the information on the core activities of F4E;

(iii) The list of processes needed for achieving the intended F4E outputs;

(iv) Areas to further document or to further improve in each macro process.

(v) As part of the Integrated Management System an F4E Manual describing all operational and administrative activities has been developed to indicate for each activity the key documents of reference to conduct tasks consistently.

In 2013, with the aim to improve and simplify, F4E has reviewed its overall process map and the key activities macro processes, ensuring also that the processes are being defined for all the identified processes needed for achieving the intended organization outputs, including:

(i) Update and improvement of all operational procurement processes;

(ii) Issue and update the existing contract implementation processes;

(iii) Issue of all financial processes related to operational expenditure;

(iv) Issue of core Administration processes (HR, Administrative Procurement and ICT).

In 2013 the statistics of the process development are shown in the table below:

(i) An additional 48 processes where identified (120 to 168);

(ii) 63 new processes were approved (41 to 104);

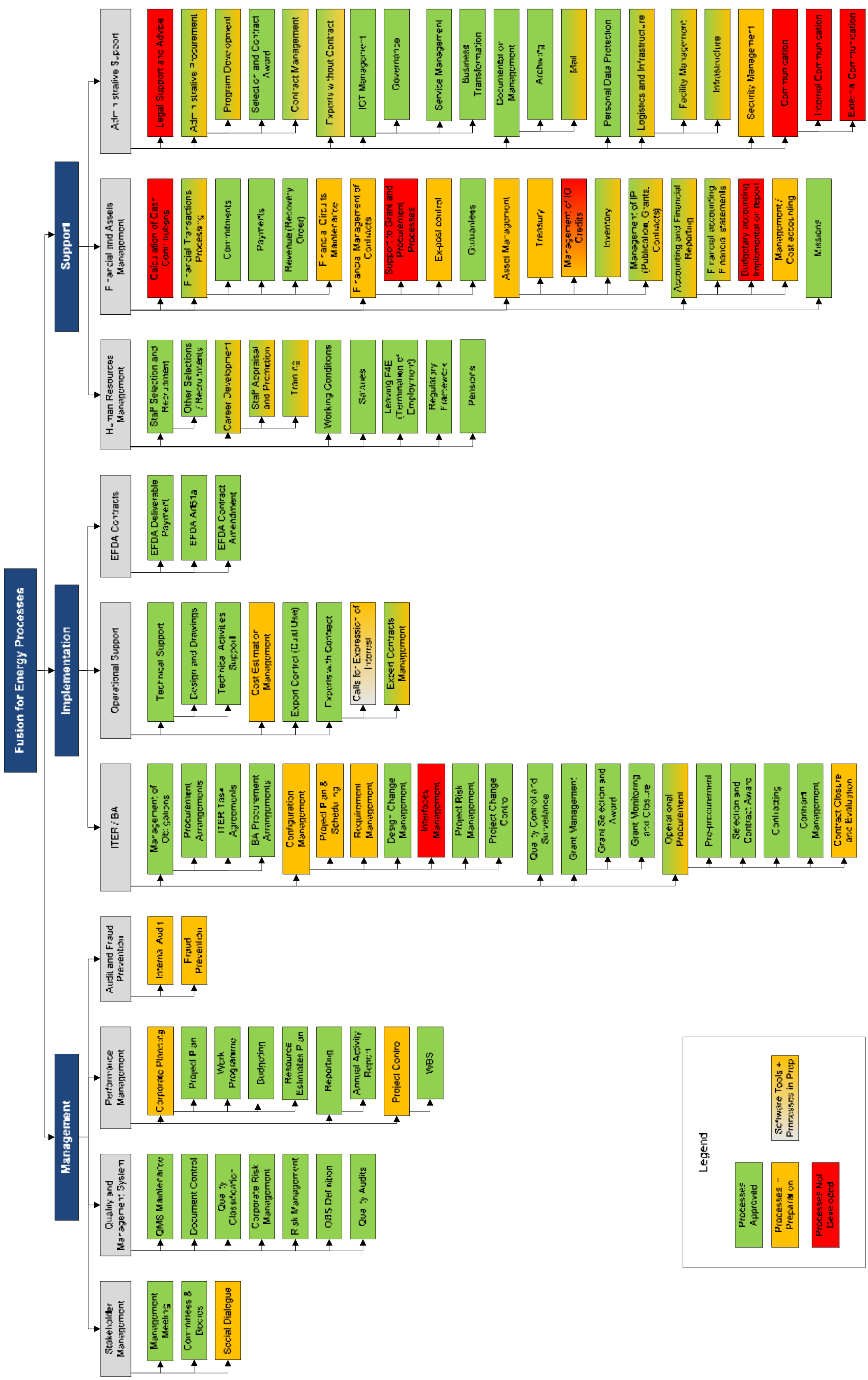
(iii) On average 11 already approved processes were being updated each month (continual improvement);

(iv) On average 14 new processes were in review each month (assessment, analysis and formal review);

(v) On average 17 new processes were in preparation (preparation, drafting and proposing new solutions.

The evolution of the process tree is the following:

Processes Status (out of 168)	**Approved**			**In Development**			**Software tool based**
	Process	Procedure/ Policy	Updating	Review	Mapped	Preparation	
	104	9	5	14	4	19	3



Fusion for Energy Processes
Management
Implementation
Support
Stakeholder Management
Management Meetings
Committees & Bodies
Social Dialogue
Quality and Management System
QMS Maintenance
Document Control
Quality Classification
Corporate Risk Management
Risk Management
OBS Definition
Quality Audits
Performance Management
Corporate Planning
Project Plan
Work Programme
Budgeting
Resource Estimates Plan
Reporting
Annual Activity Report
Project Control
WBS
Audit and Fraud Prevention
Internal Audit
Fraud Prevention
ITER / BA
Management of Obligations
Procurement Arrangements
ITER Task Agreements
BA Procurement Arrangements
Configuration Management
Project Plan & Scheduling
Requirement Management
Design Change Management
Interfaces Management
Project Risk Management
Project Change Control
Quality Control and Surveillance
Grant Management
Grant Selection and Award
Grant Monitoring and Closure
Operational Procurement
Pre-procurement
Selection and Contract Award
Contracting
Contract Management
Contract Closure and Evaluation
Operational Support
Technical Support
Design and Drawings
Technical Activities Support
Cost Estimation Management
Export Control (Dual Use)
Experts with Contract
Calls for Expression of Interest
Expert Contracts Management
EFDA Contracts
EFDA Deliverable Payment
EFDA Art51a
EFDA Contract Amendment
Human Resources Management
Staff Selection and Recruitment
Other Selections / Recruitments
Career Development
Staff Appraisal and Promotion
Training
Working Conditions
Statutes
Leaving F4E (Termination of Employment)
Regulatory Frameworks
Pensions
Financial and Assets Management
Calculation of Cash Contributions
Financial Transactions Processing
Commitments
Payments
Revenue (Recovery Order)
Financial Circuits Maintenance
Financial Management of Contracts
Support to Grant and Procurement Processes
Ex-post control
Guarantees
Asset Management
Treasury
Management of IO Credits
Inventory
Management of IP (Publication, Grants, Contracts)
Accounting and Financial Reporting
Financial accounting Financial statements
Budgetary accounting implementation report
Management / Cost accounting
Missions
Administrative Support
Legal Support and Advice
Administrative Procurement
Program Development
Selection and Contract Award
Contract Management
Experts without Contract
ICT Management
Governance
Service Management
Business Transformation
Document Management
Archiving
Mail
Personal Data Protection
Logistics and Infrastructure
Facility Management
Infrastructure
Security Management
Communication
Internal Communication
External Communication
Legend
Processes Approved
Processes in Preparation
Processes Not Developed
Software Tools + Processes in Prep

Quality Audits

F4E has an established a quality audit framework that provides F4E and its stakeholders (e.g. the IO) with the assurance that our suppliers are being monitored and that quality is adequately being implemented:

- Each audit result is recorded in an audit report, which includes the identification of any strong areas, improvement areas and nonconformities;
- Where improvements or nonconformities are identified the report is followed by an action plan from the auditee;
- In 2013, out of the 26 quality audits planned:

Audits	Cases	%
Operational Contracts performed and reported	18	69%
Grant Agreements performed and reported	4	15%
International Agreement performed and reported	1	4%
Internal on quality implementation performed and reported	1	4%
Cancelled (due to external causes)	0	0%
Internal – date postponed to 2014	2	8%
Total	26	-

- Two internal quality audits were postponed to 2014, (will be performed out of the 2014 plan) due to the internal work load of the auditors.
- In the end of the year the Annual Quality Plan for 2014 was developed and approved for implementation. The F4E Quality Audit Guideline was also updated improved.
- The global results of the audits are detailed in the table below:

Audit Result	Cases	%
with an Acceptable Result	23	96%
with an non-Acceptable Result	1	4%

Audit Finding	Cases	%
Strong Areas	45	16%
Improvement Areas	201	72%
Nonconformities	35	12%
Total	281	-

- An additional audit was performed by the IO to the F4E QA Programme: that resulted in the identification of nine minor corrective actions and seven improvement actions – addressed by F4E through an action plan already implemented.

Quality Assurance in the Operational Projects

One of the major QA activities is the support to the operational projects to ensure the correct implementation of the quality programme. These activities can be divided in:

- Support and review of the procurement arrangements and ITER task agreements to ensure conformance with the F4E QA Programme, the IO-Domestic Agency coordination meetings in quality and safety and issue of the implementation templates;
- Guidance training on QA to all the operational officers;
- Full support to the technical departments on quality issues of Contracts and Grants, verification of the calls documentation (including full review of the management specifications) for compliance with the F4E QA Programme and issue of the follow-up documentation templates;
- Training on QA (and nuclear safety) to suppliers providing Safety Important Class items and/or services;
- Verification of the suppliers' quality plans and all the contract implementation quality documentation;
- Supplier quality audits and full support on QA to the kick-off, progress meetings and control point quality related visits.
- Deviations and nonconformities in 2013

- In 2013 the main types of Nonconformities and Deviations are represented below:

Nonconformities (F4E Classification)	Cases	%
Major (impact on customer critical requirements)	62	31%
Minor (impact on customer non-critical requirements)	46	23%
Relevant (impact on F4E contract, but not on customer requirements)	91	45%
Technical Exception (no impact on F4E contract or customer requirements)	02	1%
Total	201	-

Deviations (F4E Classification)	Cases	%
Level A (no impact on F4E contract or customer requirements)	5	1%
Level B (impact on F4E contract, but not on customer requirements)	168	38%
Level C (impact on customer requirements)	145	32%
Still to be defined (in the process of assessment)	128	29%
Total	446	-

Deviations (by initiator)	Cases	%
F4E DR (deviation request by F4E, internally or to ITER IO)	87	20%
Supplier DR (deviation request by the Supplier to F4E)	162	36%
ITER IO DR (deviation request by ITER IO towards F4E)	11	2%
Deviation Notice/Order (deviation by F4E towards the supplier)	186	42%
Total	446	-

In relation to the major nonconformities reported in the first table, over 90% are attributed to work associated with the ITER site buildings. As reported earlier in this report, F4E has several major on-going building contracts (representing a large part of the on-going production/manufacturing contracts of F4E), some of them classed as Protection Important Components (PIC). Any nonconformity on an activity important for protection (of a PIC) is automatically classified as major. Nonetheless all Major nonconformities have been technically addressed together with IO and solved. Furthermore, the root causes were assessed and corrective actions implemented in a collaborative “lessons learned” approach with IO.

Information and Communication Technology

During 2013 the main achievements in the area of Information and Communication Technology (ICT) were the following:

- The launch of the **F4E Mission Management** platform saw the elimination of paper from the mission order process, a substantial reduction in approval time and an associated reduction in traveling costs. The platform facilitates the mission order, cost declaration and reimbursement process.

- The deployment of the **eHR** solution has provided not only the HR team with a tailored tool to manage their work but also a transparent way for members of staff to access and update their personal data. The eHR solution is the central repository for staff data, organisational structure and personal files. The platform provides a solution for the operational needs of the HR Team as well as a source for the Reporting System to generate analysis and forecast on staff-related data.

- A first pilot of the **eSignataire** between the ICT and Finance Unit has shown the enormous gains that can be achieved by deploying such a solution at F4E. The pilot focused exclusively on Payments and Commitments creation for the ICT Team. Traceability of signataires, reduction in the processing times, consistent information all in one place, reduction of print-outs are only the main benefits of such a system.

- The **Integrated Reporting System** is in active use with the addition of new data sources and (Supplier Schedules, Contract Management Data, Human Resources Data) and new project related performance measurement reports which compare F4E planned cost and schedule information to actual financial data.

- To support the F4E “Call for Expression of Interest for the establishment of a list of prospective External Experts” the ICT Unit developed and released the **External Experts Management platform**. The platform facilitates both the submission process for applicants as well as the internal F4E search, review and evaluation process for submitted applications. Over 130 applications have been submitted to-date.

- **AET** is a simple yet critical application set-up for tracking Administrative Expenditure against provisional commitments. This platform allows the owners of provisional commitments and the budget team to keep track of the consumption of their commitments before invoices are received and paid. Users of the AET platform have access to up-to-date information reducing the risk of overspending generating financial exceptions.

- The roll out of the **ICT Service Desk portal**, which is a tool aimed to improve the interface between users and the Service Desk, being the entry point for F4E users to register Incidents, Requests for help and service Requests.

- The **Unified Communications** solution by Microsoft (Lync) was adopted and rolled-out. Deployment to all F4E staff took place in March-April and it included training sessions for all F4E staff.

- A **monitoring tool (SCOM)** was implemented to monitor all of the core services of the ICT infrastructure. The information provided will be used to calculate and monitor Service Levels.

- The F4E **EDB/PLM Smarteam solution** was deployed and made available to the TSS users for testing and validation. The solution will be finally rolled-out in Production during the first half of 2014.

- Signature of **Contracts**:

    - o the new FWC for ICT Development Services was signed in May,
    - o the new FWC for ICT Projects was signed in August,
    - o the FWC for ICT Service Support was renewed and signed in June,
    - o the new contract for Telephony services (fixed and mobile) was signed in December.

- F4E users have been integrated in the **EC Authentication system (ECAS)**, the EC Authentication System, required now to have access to the EC applications.

- **ICT Service Desk**: on-going support for all F4E users has been regularly provided with a high degree of customer satisfaction. **During 2013 around 3,423 requests (2,351 Incidents, 1,072 service requests) were submitted** and as many were resolved. The overall backlog at the end of the year was 33 open requests (16 incidents, 17 service requests).

- In the area of **ICT governance** the ICT Unit progressed in the definition and adoption of policies and processes. Within the ISO 20000 framework, adopted by the ICT Unit in 2012, the following actions were carried out and the following processes were developed:

    - o Service Level Management
    - o Financial Management
    - o Business Relationship Management
    - o Supplier Management
    - o In addition, enhancements in the ITSM tool were carried out to improve support of ISO 20000 processes (incident management, service requests management, problem management, change management, asset management, reporting)

- Deployment of a **new ICT infrastructure** (servers, load balancers) that will reduce the physical hardware and the energy footprint of F4E datacenters without compromising performance and availability.

- Implementation of a **new WiFi infrastructure** to go live during January 2014, allowing staff to access their ICT resources regardless of their location in the F4E building.

None of the F4E IT services suffered any severe discontinuity during 2013.

Facility Management and Host state Liaison Office Unit

Offices and other Support Services

Activities in this area aim to ensure a functional and safe workplace for all people working within the F4E premises.

The Spanish Authorities sent F4E two proposals for F4E's new permanent office premises which were studied and analysed. A technical report was drawn up comparing both proposals taking into account the information of the "Guide to the Commission´s Architectural policy" and the Manual of standard building specifications (2011) issued by the Office for Infrastructure and Logistics in Brussels (OIB).

F4E's report identified the preferred proposal taking into account F4E's needs, centre of interest, accessibility and mobility of staff members.

In order to enhance F4E's security, a new access control system was installed. This new system is now owned and managed exclusively by F4E and replaces the old one which was managed by the building management.

A total of 34 new staff members were installed and 113 internal moves were organised including the associated support arrangements.

F4E received 258 call for tenders which were dispatched to the responsible departments. F4E also registered in ABAC workflow a total of 1,613 invoices from external providers.

External Visits and Meetings

In 2013 almost 4,117 internal and external meetings took place in F4E premises. Each meeting drew upon the necessary logistical support of F4E, including the preparation of the layout of the rooms and the checking of the audio-visual equipment.

As an indicator for the substantial growth of activities in the logistics area and F4E in general, it should be noted that 4,551 visitors were accredited for access to F4E's offices in 2013 representing around 10% more in relation to the previous year.

Safety

In the area of health and safety, 26 First Aiders were trained on how to react in case an emergency care is needed and on the use of the AED (Automated External Defibrillator). 32 Fire Pickets were trained and in order to ensure the good evacuation of employees in case of a fire emergency.

In 2013, F4E monitored the analysis of air and water quality but also of the Wi-Fi connections in F4E premises in order to prevent any consequence on F4E staff's health.

Social Actions

In 2013, several social actions were carried out, including an F4E staff blood donation, food campaign for the Banc dels Aliments and a Christmas toys collection which were donated to underprivileged children living in Barcelona.

Implementing the Host Agreement

Following the recognition of the official presence of F4E in France, the French authorities started accrediting the F4E staff in Cadarache and provided a special identity card to non-French F4E staff.

F4E managed the import (without customs taxes) of merchandise for F4E official use: two tokamak scale models coming from Seoul, Korea and three small-scale mock ups coming from St Petersburg, Russia. This implied contact and coordination with the Spanish ministry, customs office and transport companies to obtain the authorisations and delivery schedule to F4E's premises.

54 new staff were accredited to Spanish and French Ministry of Foreign Affairs. F4E provided assistance for visa procedures contacting the Spanish Ministry of Foreign Affairs in order to ensure the attendance of non-European experts (from China and India) to F4E meetings in Barcelona.

F4E requested and managed 72 procurements resulting in 697 invoices by implementing the annex A of the Host Agreement with Spain.

Information, Communication and External Relations

In the area of information and communication, F4E developed a multi-level strategy in order to:

- Capitalise on corporate achievements like the signature of major contracts, manufacturing progress of components and its new F4E industrial policy through various online, print and social media;
- Participate in key events so as to ensure an institutional presence, reach out to new parties and report on future business opportunities;
- Explain the progress of the ITER construction and components by means of articles, interviews, short films and awareness days;
- Establish a series of listening platforms for key stakeholders in order to take stock of their recommendations;
- Highlight the role of industry and SMEs through short films that illustrate the tangible benefits of their contribution to ITER.

In terms of media coverage, F4E's presence tripled compared to the previous year with reports from 328 media sources. F4E's YouTube channel viewings grew six-fold reaching 87,300 viewings thanks to eight new clips which constitute a real improvement in terms of narrative, quality, creativity and photography. The number of followers of F4E's Twitter account doubled to over 1,100 allowing F4E to engage more dynamically with companies, fusion laboratories, science reporters and fusion enthusiasts. During 2013, F4E launched its Flickr and LinkedIn pages. The F4E Flickr account served as a platform for good quality pictures from the ITER construction site and manufacturing. The account became a popular source for journalists, companies and other ITER DAs in terms of photographic material. Similarly, the F4E LinkedIn account boosted the organisation's professional profile and networking capacity constructing a virtual professional community between F4E staff, suppliers and fusion laboratories.

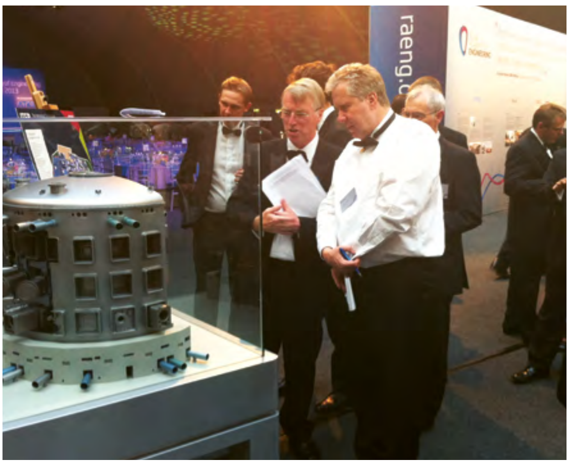
F4E participated in 21 key events in order to promote different aspects of its work. For example, at the Industry Business Forum (Toulon, France) information on upcoming calls was disseminated, during the 11th International Symposium on Fusion Nuclear Technology (Barcelona, Spain) updates on key ITER technologies were offered, at the 22nd World Energy Congress (Daegu, Korea) the ITER project was presented for the first time, during the British Royal Academy of Engineers awards (London, UK) the Chair of the Governing Board had the opportunity to present Europe's contribution to ITER to key policy makers, at the EU ICT Conference (Vilnius, Lithuania) Helios, the Broader Approach supercomputer was showcased. F4E also maintained information activities with younger audiences through our participation to the Europe Campus and the Catalan Science week. Last but not least, F4E hosted the Eigth Neutronics conference and collaborated with the French authorities for the communication support actions of the ITER test convoy exercise.

In terms of stakeholders' engagement, F4E involved the network of Industry Liaison Officers more actively in its communication activities through systematic updates regarding communication actions, frequent distribution of material (clips, images, press releases) in order to capitalise on their networks and offered support to information day events hosted in different countries.

In the spirit of good collaboration and efficiency, F4E, the European Commission and ITER IO, agreed on a set of priorities in the fields of audiovisual production and annual objectives. F4E participated to the ITER IO Communications and EFDA Public Information Network meetings in order to share information and establish joint activities.

In an attempt to improve the way F4E engages with industry and SMEs, a series of listening platforms were established, giving F4E the opportunity to take stock of recommendations that would shape the implementation of F4E's new industrial policy and its communication. A campaign consisting of a new brochure, a fresh section on the F4E website and 14 interviews of senior ITER policy makers, Industry Liaison Officers, representatives from industry, SMEs and fusion laboratories, was rolled out in order to communicate this initiative.

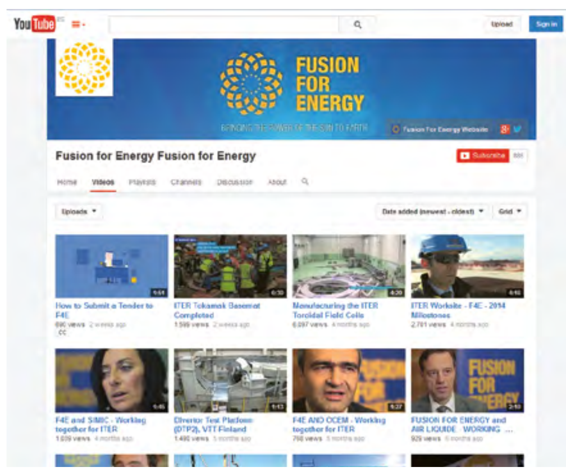
With respect to publications, F4E continued with the online and print version of its flagship publication, F4E News, covering a broad number of themes. New fact sheets and two new brochures (Broader Approach, F4E's industrial policy) were produced. In the field of internal communications, F4E talks were successfully launched giving the opportunity to members of staff to present their field of expertise and raise awareness about key ITER technologies.



Mr Stuart Ward, Chair of F4E's Governing Board with Jeremy Webb, Editor of New Scientist magazine

(left to right): Jean Pascal de Peretti de la Rocca, CEO Cofely Axima, Guy Lacroix, Managing Director GDF SUEZ Energy Services and Henrik Bindslev, Director of Fusion for Energy

Professor Osamu Motojima, ITER IO Director General with Jean-Marc Filhol, F4E Head of ITER Department, at the 11th International Symposium on Fusion Nuclear Technology



F4E YouTube grew six-fold reaching 87,300 viewings thanks to eight new clips on construction and manufacturing

Staff Committee

The Staff Committee, appointed on 30 March 2012 for a period of 3 years, comprised the following F4E staff members on 31 December 2013 (left to right), Estelle Defois (Alternate), Victor Saez (Full Member), Alfredo Portone (Chair), Aris Apollonatos (Full member), Pilar Rosado (Co-Chair, Full member), Cristina Ortiz (Alternate), Audrey Verpont (Vice-Chair, Full member), Vassilis Stamos (Alternate), Muriel Simon (Alternate) and Max Maglienti (Full member).

During 2013 the Staff Committee (SC) addressed the majority of its work-programme goals while coping with several other events, counting on the cooperation of all the F4E Departments. involved.

The SC actively contributed to the revision of the F4E staff selections procedure following the introduction of the written tests for all recruitments, and some audit findings related to the F4E recruitment process.

The SC also organised two different training sessions to support the staff for their preparation to participate for competitions for permanent EU staff.

Effort has been devoted to improving the internal communication on the SC's tasks and activities with the staff members, via a substantial update of the SC intranet section.

The SC has been very active organising activities and events related to sports, culture, solidarity, and team-building, all actions aimed to foster wellbeing within F4E.

The number of F4E Clubs has been doubled: from three Clubs in 2012 to six in 2013. In order to promote integration amongst F4E families the SC also organises activities involving kids and their families.

Annexes

ITER PROCUREMENT ARRANGEMENTS

Title	Credit (kIUA)	Signature Date
Installation and Commissioning of the Steady-State Electrical Network (SSEN) and Pulsed Power Electrical Network (PPEN) and SSEN cables	27.52284	December 2013
Material procurement for SSEN	5.00000	December 2013
Material procurement for SSEN Emergency Power Supply	5.70000	December 2013
Neutral Beam Remote Handling System	6.00000	June 2013
Front-end Cryodistribution Warm Regeneration Lines	0.20000	September 2013
Radiological Protection and Environmental Monitors Sys design	0.600	September 2013
Diagnostics-CER	0.02768	May 2013

BROADER APPROACH PROCUREMENT ARRANGEMENTS

Reference	Title	Date signed	Value (kBAUA)
IFMIF-PA-ED01 -EU	Procurement Arrangement for the Supply of the Engineering Design of the IFMIF Plant for the IFMIF/EVEDA Project	28/03/2013	2.61
IFMIF-PA-ED02 -EU	Procurement Arrangement for the Supply of the Engineering Design of the IFMIF Accelerator Facility for the IFMIF/EVEDA Project	29/03/2013	6.36
IFMIF-PA-ED03 -EU	Procurement Arrangement for the Supply of the Engineering Design of the IFMIF Lithium Target Facility for the IFMIF/EVEDA Project	18/03/2013	0.8
IFMIF-PA-ED04 -EU	Procurement Arrangement for the Supply of the Engineering Design of the Test Facility	28/03/2013	4.27
IFERC-CSCPA02-EU.CEA	Procurement Arrangement for the Enhancement of the Computational Simulation Centre in the International Fusion Energy Research Centre	01/11/2013	6.32
IFERC-RECPA01	Procurement Arrangement for the Outline of the Requirements for the ITER Remote Experimentation Centre for the IFERC Project	26/08/2013	0.1

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BROADER APPROACH AGREEMENTS OF COLLABORATION

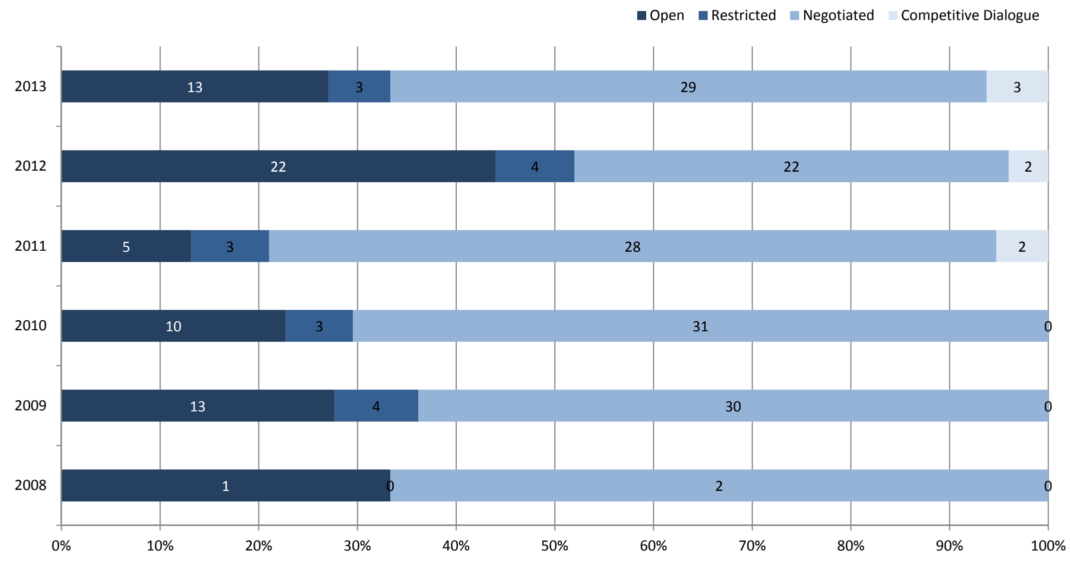
Reference	Title	Date signed	Value (kBAUA)
BA-IFMIF-EU-AoC-ED01-CIEMAT	Agreement of Collaboration F4E-CIEMAT for the Joint Implementation of the CIEMAT Part of the PA for the Supply of the Engineering Design of the IFMIF Plant (“Plant Design”)	13/03/2013	0.74
BA-IFMIF-EU-AoC-ED01-SCK.CEN	Agreement of Collaboration F4E-SCK.CEN for the Joint Implementation of the SCK.CEN Part of the PA for the Supply of the Engineering Design of the IFMIF Plant (“Plant Design”)	18/03/2013	1.87
BA-IFMIF-EU-AoC-ED02-CEA	Agreement of Collaboration F4E-CEA for the Joint Implementation of the CEA Part of the PA for the Supply of the Engineering Design of the IFMIF Accelerator Facility (“Accelerator Facility Design”)	29/04/2013	3.69
BA-IFMIF-EU-AoC-ED02-CIEMAT	Agreement of Collaboration F4E-CIEMAT for the Joint Implementation of the CIEMAT Part of the PA for the Supply of the Engineering Design of the IFMIF Accelerator Facility (“Accelerator Facility Design”)	13/03/2013	1.23
BA-IFMIF-EU-AoC-ED02-INFN	Agreement of Collaboration F4E-INFN for the Joint Implementation of the INFN Part of the PA for the Supply of the Engineering Design of the IFMIF Accelerator Facility (“Accelerator Facility Design”)	24/05/2013	1.44
BA-IFMIF-EU-AoC-ED03-ENEA	Agreement of Collaboration F4E-ENEA for the Joint Implementation of the ENEA Part of the PA for the Provision of the Engineering Design (F4E Part) of the IFMIF Lithium Target Facility (“Li Target Facility Design – F4E Part”)	18/02/2013	0.58
BA-IFMIF-EU-AoC-ED03-SCK.CEN	Agreement of Collaboration F4E-SCK.CEN for the Joint Implementation of the SCK.CEN Part of the PA for the Provision of the Engineering Design (F4E Part) of the IFMIF Lithium Target Facility (“Li Target Facility Design – F4E Part”)	14/01/2013	0.22
BA-IFMIF-EU-AoC-ED04-CIEMAT	Agreement of Collaboration F4E-CIEMAT for the Joint Implementation of the CIEMAT Part of the PA for the Supply of the Engineering Design of the IFMIF Test Facility (“Test Facility Design”)	25/02/2013	1.26
BA-IFMIF-EU-AoC-ED04-KIT	Agreement of Collaboration F4E-KIT for the Joint Implementation of the KIT Part of the PA for the Supply of the Engineering Design of the IFMIF Test Facility (“Test Facility Design”)	01/02/2013	3.01
BA-IFERC-EU-AoC-CSCPA02.CEA	Agreement of Collaboration F4E-CEA for the Joint Implementation of the Procurement Arrangement for the Enhancement of the Computational Simulation Centre for the IFERC project (CSC activity)	29/09/2013	6.32

CONTRACTS AND GRANTS

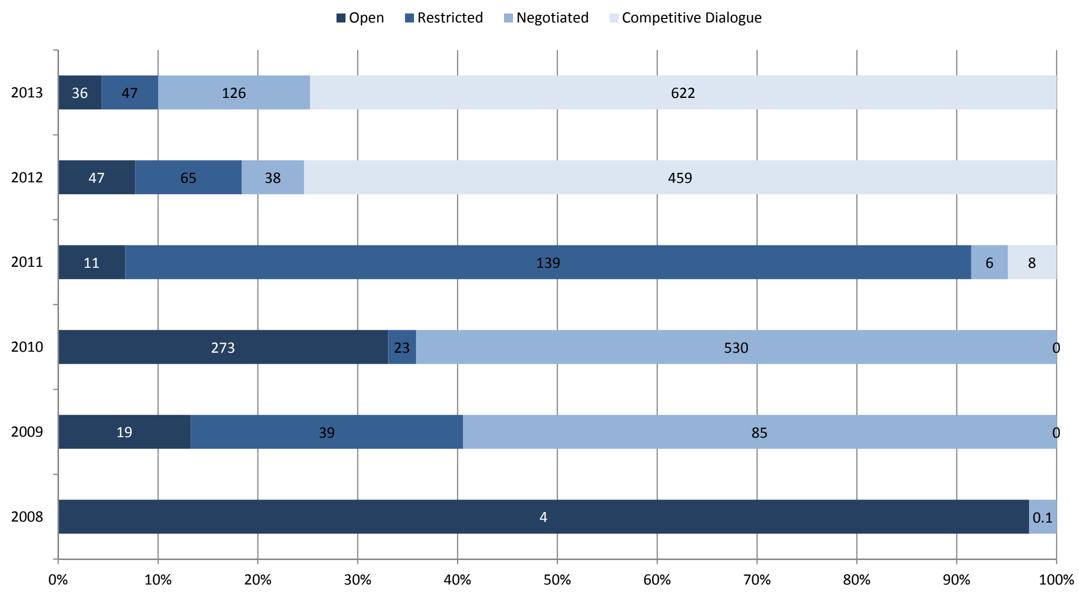
Operational Procurement Contracts

Summary by Type of Procedure

Contracts awarded by procurement procedure (Number)



Contracts awarded by procurement procedure (EUR million)



Negotiated procedures (above EUR 250,000)

	Number
Negotiated above threshold	7

Awarded Contracts (* Negotiated Procedures)

Reference	Title	Contractor
F4E-OFC-0484 *	Final Design of ICH Antenna	Consortium CYCLE (UKAEA, CEA, ERM, IPP, POLITECNICO DI TORINO)
F4E-OFC-358 LOT 1	Radiation testing of prototype, components and assemblies	Studiecentrum voor Kernenergie/ Centre d'Etude de l'Energie Nucléaire (SCK-CEN)
F4E-OFC-358 LOT 2	Radiation testing of prototype, components and assemblies	CONSORTIUM - SCK-CEN AND CIEMAT
F4E-OMF-0457	Mechanical Analysis for ITER components	IDOM INGENIERIA Y CONSULTORIA with Frazer-Nash Consultancy Ltd (United Kingdom) as subcontractor
F4E-OMF-0505 *	Functional description and commissioning use cases for the ITER real time framework.	Culham Science Centre (CCFE)
F4E-OMF-436 LOT 2	Configuration Management and System Engineering Support	SPACE SYSTEMS FINLAND OY
F4E-OMF-436 LOT 3	Project Management Systems Support	BCF Solutions France
F4E-OMF-436 LOT 5	CE Marking Support	ALTER TECHNOLOGY TUV NORD S.A.U.
F4E-OMF-444 Contractor 1	Manufacturing of the ITER Divertor Cassette Body	CNIM/SIMIC
F4E-OMF-444 Contractor 2	Manufacturing of the ITER Divertor Cassette Body	Pori Works
F4E-OMF-444 Contractor 3	Manufacturing of the ITER Divertor Cassette Body	Walter Tosto
F4E-OPE-0157 *	Second iteration of FW #18 analyses for the final design review.	S.R.S. ENGINEERING DESIGN
F4E-OPE-0465 *	Independent review of vacuum vessel re analysis.	EMPRESARIOS AGRUPADOS INTERNACIONAL S.A
F4E-OPE-0485 *	Provision of Short-Term Support on Project Management Tools	TESSELLA Ltd
F4E-OPE-0487 *	Eddy Current and Halo Current analysis for the ITER IC Antenna	NATEC
F4E-OPE-0511 *	Shielding Study to reduce Neutron Cross-Talk from Lower to Equatorial Ports	UNED - UNIVERSIDAD NACIONAL DE EDUCACION A DISTANCIA
F4E-OPE-0535 *	Cryostat Counter Model on Civil Works	Numerical Engineering Consulting Seices - NECS

F4E-OPE-285	Design, Certification, Manufacturing, Testing, Installation and Commissioning of the Tokamak Cargo Lift and Tokamak and Assembly Hall Cranes (TB02)	Grouping NKM Noell SC GmbH and REEL S.A.S.
F4E-OPE-301	HVAC, Electrical and Fluids Networks and Handling (Tokamak complex and surrounding buildings)- TB04	OMEGA CONSORTIUM
F4E-OPE-319	FRAMEWORK CONTRACT - HHF test facility for in-vessel components (design and commissioning)	CENTRUM VÝZKUMU REŽ S.R.O.
F4E-OPE-344 *	ITER PF Coils. Engineering Integrator.	A.S.G . SUPERCONDUCTORS SPA
F4E-OPE-376 *	LN2 Plant & Auxiliary Systems	AIR LIQUIDE ENGINEERING
F4E-OPE-378	Magnet Power Conversion Buildings (32-33) and Reactive Power Control Building (38) (TB05)	FERROVIAL AGROMAN S.A.
F4E-OPE-396 *	Supply of the High Voltage Deck and Transmission line for the SPIDER experiment	COELME
F4E-OPE-421	Preliminary Design for Main Water Destritiation System	KRAFTANLAGEN HEIDELBERG GmbH
F4E-OPE-422 *	HHF test for 3rd Semi-prototype	FZJ
F4E-OPE-426 (DG) *	Continuous External Rogowski (CER) Sensor Prototypes	AXON' CABLE SAS
F4E-OPE-429 (SB-PS)	Cold & Hot Basin & Cooling Towers (67), Pumping Station (68), Heat Exchangers Building (69) and Water Treatment Building (64) (TB07)	FERROVIAL AGROMAN S.A.
F4E-OPE-431 (IV-PT)	Manufacture of Blanket Cooling Manifold Prototypes	DOCKWEILER AG
F4E-OPE-442 *	Design and Performance Assessment of Integral and Proportional Data Acquisition Electronics for Real-Time Applications	INSTITUTO SUPERIOR TÉCNICO (IST)
F4E-OPE-448 *	Manufacturing and primary tests on reduced size samples of DLC pads	DIARC-TECHNOLOGY OY
F4E-OPE-449 (DG) *	Manufacturing of magnetic sensors prototypes based on LTCC technology	VIA ELECTRONIC GMBH
F4E-OPE-454	ELECTRON CYCLOTRON HIGH VOLTAGE POWER SUPPLY	AMPEGON AG
F4E-OPE-456 *	Temporary Storage of the JT-60SA Conductor	ALSTOM Magnets and Superconductors
F4E-OPE-458	Short-pulse 1MW gyrotron for the development of the European RF Sources for ITER	Karlsruhe Institute of Technology (KIT)
F4E-OPE-467 *	The support to the prototype window work	Karlsruhe Institute of Technology (KIT)
F4E-OPE-500	Procurement of WDS Tanks including supervision of installation	ENSA
F4E-OPE-501 *	ECH control system requirements specifications	Instituto di Fisica del Plasma (IFP) & Consiglio Nazionale delle Ricerche (CNR)

F4E-OPE-509 *	Amendment 1 to F4E-OPE-485	TESSELLA Ltd
F4E-OPE-512 *	Accelerated SULTAN test of IO-DAs samples	Centre de Recherches en Physiques des plasmas (CRPP)
F4E-OPE-513 *	Expert support NBTF	SIACI SAINT HONORE
F4E-OPE-518 *	H&S CONSULTANT	URS ITALIA S.P.A
F4E-OPE-527 *	"Amendment 8 to OPE-058: Additional services provided by the Architect Engineer"	Consortium Engage (Assystem France SAS, WS Atkins International LTD, IOSIS Industries, Empresarios Agrupados Internacional)
F4E-OPE-528 *	Definition, execution and documentation of functional tests and verifications to support the design development of EC UL ex-vessel waveguide components	EPFL & Centre de Recherches en Physiques des plasmas (CRPP)
F4E-OPE-530 *	Provision of a 3rd Party Liability Insurance to F4E	LIBERTY MUTUAL

Administrative Procurement Contracts

Summary by type of procedure

Type of Procedure	Number	Value (kEUR)
Open	16	9,500,000
Restricted	0	0
Negotiated	5	5,995,000
Re-Opened competition implementing a Framework	0	0
Joint Procurements*	13	27,085,324
Total	**34**	**42,580,324**

Negotiated Procedures above EUR 60,000

Reference	Title	Contractor	Type
F4E-ADM-419 (FWC)	Travel agency	ATLANTA Agencia de Viajes S.A.	Framework Service Contract
F4E-ADM-420 (FWC)	Language Courses	LINGUARAMA Ibérica S.A.	Framework Service Contract

Awarded Contracts

Reference	Relocation Services	Type
F4E-ADM-156-01 (FWC cascade) F4E-ADM-156-03 (FWC cascade)	Bank Services	Framework Service Contract in cascade with 2 Contractors
F4E-ADM-161-01 (FWC cascade) F4E-ADM-161-02 (FWC cascade) F4E-ADM-161-03 (FWC cascade)	ICT Support Systems	Framework Service Contract in cascade with 3 Contractors
F4E-ADM-419 (FWC)	Travel agency	Framework Service Contract
F4E-ADM-420 (FWC)	Language Courses	Framework Service Contract
F4E-ADM-430-01-01 (FWC cascade) F4E-ADM-430-01-02 (FWC cascade) F4E-ADM-430-01-03 (FWC cascade) F4E-ADM-430-01-04 (FWC cascade) F4E-ADM-430-01-05 (FWC cascade) F4E-ADM-430-01-06 (FWC cascade) F4E-ADM-430-01-07 (FWC cascade)	Information and Communications Technology (ICT) Development Services for F4E	Framework Service Contract in cascade with 3 Lots

F4E-ADM-464-01 (FWC cascade) F4E-ADM-464-02 (FWC cascade) F4E-ADM-464-03 (FWC cascade)	Provision of ICT Projects to F4E (fixed-price projects)	Framework Service Contract in cascade with 3 Contractors
F4E-ADM-481-01 (FWC cascade) F4E-ADM-481-02 (FWC cascade) F4E-ADM-481-03 (FWC cascade)	Provision of Interim Support Staff Services	Framework Service Contract in cascade with 3 Contractors
F4E-ADM-529-01	Provision of Legal Services to represent F4E in litigation related to the award of the Call for Tender F4E-ADM-0464 in Court Case T-553-13	Direct Service Contract

Grants

Grants (* Unique Beneficiaries)

Procedure Reference	Agreement Description	Beneficiary
F4E-FPA-384 (DG)	Bolometers	Consortium: IPP, Wigner RCP, IMM, MTA-EK
F4E-FPA-393 (DG)	LFS Collective Thomson Scattering	CONSORTIUM - TECHNICAL UNIVERSITY OF DENMARK (DTU) AND IST
F4E-FPA-407 (DG)	Equatorial Visible/Infrared Wide Angle Viewing System	Commissariat à l'énergie atomique et aux énergies alternatives (CEA) - Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT) - Bertin Technologies SAS
F4E-FPA-408 (DG)	Core Plasma CXRS System	CONSORTIUM (FZJ, KIT, BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS (BME), STICHTING VOOR FUNDAMENTEEL ONDERZOEK DER MATERIE (STICHTING FOM), TECHNISCHE UNIVERSITEIT EINDHOVEN (TU/E),CCFE)
F4E-GRT-440	R&D in Support of Conceptual Design of Hydrogen Isotope Separation System	KIT+ICIT
F4E-GRT-502 *	Evaluation of fuelling requirements and transient density behaviour in ITER reference operational scenarios	CONSORTIUM - CCFE, CREATE, TUV Wien
F4E-GRT-515 *	Assessment of erosion corrosion parameters of CuCrZr & CuCrZr/316L(N)-IG joints at nominal (off-plasma) operational conditions	Studsvik Nuclear AB
F4E-GRT-516 *	Feasibility Survey of Electron Beam and Laser Sintering for the Manufacturing of the First Wall Beam Structure	Stockholm University
F4E-GRT-519 *	ITER Plasma Magnetic Control	Consorzio di Ricerca per l'Energia e le Applicazioni Technologiche dell'Elettromagnetismo (CREATE)

ITER TASK AGREEMENTS CLOSED IN 2013

In the following a list of ITER Task Agreement which have been closed (i.e. the final report accepted by the IO) is given. Note that the closing date is the date reflected on the closure letter send by the IO and PPY shows the effort in person per year. These ITAs are voluntary contributions.

Reference	Title	Amount	Status	Closing Date
C11TD179FE	Analysis of the error fields induced in the magnet system of ITER	100	Complete	13/03/2013
C16TD150FE	Assessment of Corrosion in Water Coolant loops in Vacuum Vessel, Divertor and Blanket	160	Complete	11/12/2013
C19TD41FE	Task on the study of power and particle fluxes to plasma-facing components during ELM Control by in-vessel coils in ITER and evaluation of plasma response effects	16/(131)(1)	Complete	05/02/2013
C19TD43FE	Task on SOLPS Development for ITER Design Work: Upgrading from SOLPS4.3 to SOLPS5.3	100/(200)(2)	Complete	11/12/2013
C19TD44FE	Model validation of 3D MHD code and construction of ITER model for simulation of asymmetric VDEs and associated electro-magnetic load	40	Complete	27/03/2013
C19TD45FE	Plasma evolution and performance during plasma regimes with controlled ELMs in ITER	100	Complete	17/12/2013
C19TD46FE	Task on the evaluation of edge MHD stability and uncontrolled ELM energy losses for ITER H-mode plasmas in non-active, DD and DT scenarios	100	Complete	25/09/2013
C19TD47FE	Simulation of ITER First Wall Energy Loading during mitigated disruptions and runaway electrons	65	Complete	09/12/2013
C19TD49FE	Analysis of plasma magnetic control	96	Complete	13/12/2013
C23TD59FE	Prototype for RH networks, communication protocols, structured language	65	Complete	08/10/2013
C51TD39FE	ITER IC Antenna R&D programme: Exploitation of Antenna Low Power Mock-Ups	72.7 IUA (112.5k€ + 72.7 IUA) (3)	Complete	03/04/2013
C53TD64FE	ITER Vacuum System: Support for the Cryopump design of the ITER Neutral Beam Injectors	99	Complete	31/10/2013
C53TD66FE	Design of the NBTF Components-Part IV	787.26	Complete	09/09/2013
C62TD01FE	The analysis activity of ITER Tokamak support structure integrated with the floor B2	122.866	Complete	12/12/2013
C76TD08FE	Deuterium desorption from Be layer	73.7	Complete	18/09/2013
TA - RHIPT-10-EU/2	EU-DA support to Remote Handling IPT (2010) – work package 2	135	Complete	05/02/2013
TA-FCIPT-10-13-EU9	Leak Detection/Leak Localisation - Analysis of TCWS PHTS for leak localisation strategies	84	Complete	03/04/2013
TA-FCIPT-11-30 EU1	Support for Radiological and Environmental Monitoring during CDR Phase (Part II)	100	Complete	29/07/2013

[1] Out of the total 131 IUAs of the ITA C19TD41FE, the amount credited for in 2013 was 16 IUAs.
[2] Out of the total 200 IUAs of the ITA C19TD43FE, the amount credited for in 2013 was 100 IUAs.
[3] Out of the total EUR 112.5k paid in cash in 2008 + 72.7 IUA of the ITA C51TD39FE, the amount credited for in 2013 was 72.7 IUAs.
Note: Some ITAs which were not yet completed were partially credited by IO in Year 2013. This means that IO issued part of the corresponding credit before completion due to budgetary planning reasons. The total amount for this partial credit for the year 2013 is 1362.87 IUAs.

Declaration of Assurance

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

- Declare that the information contained in this report gives a true and fair view;

- State that I have reasonable assurance that 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. This reasonable assurance is based on my own judgment and on the information at my disposal;

- Note that the organisation has significantly developed its overall control environment in 2013 although some parts have still to reach full maturity;

- Confirm that I am not aware of anything not reported here which could harm the interests of F4E and the European institutions in general.

Professor Henrik Bindslev
Director of Fusion for Energy
29 May 2014

Analysis and Assessment by the Governing Board

INTRODUCTION

Article 43 of the Financial Regulation states that

1. The authorising officer shall report to the Governing Board on the performance of his/her duties in the form of an annual activity report, together with financial and management information confirming that the information contained in the report presents a true and fair view except as otherwise specified in any reservations related to defined areas of revenue and expenditure.

The annual activity report shall indicate the results of his/her operations by reference to the objectives set, the risks associated with these operations, the use made of the resources provided and the efficiency and effectiveness of the internal control system. The internal auditor referred to in Article 75 shall take note of the annual activity report and any other pieces of information identified.

2. By no later than 15 June each year, the Governing Board shall send the Council, the European Parliament and the Court of Auditors an analysis and an assessment of the authorising officer's annual report on the previous financial year. This analysis and assessment shall be included in the annual report of the Joint Undertaking, in accordance with the provisions of the Statutes.

In light of the above, the Governing Board Vice-Chairs conducted an analysis and assessment of the 2013 Annual report on the basis of the comments made by the committees (AFC, TAP, ExCo and AC) and came to the following conclusions.

ANALYSIS AND ASSESSMENT

THE GOVERNING BOARD:

1. Notes that the Authorising Officer of Fusion for Energy (F4E) fulfilled the tasks given to him in Article 43 of the Financial Regulation.

2. Welcomes the overall achievements presented in the 2013 Annual Report and its improved presentation, in particular analysis of the risks and their evolution/mitigation.

3. Notes that although fewer milestones were achieved than planned, significant progress was made in a number of areas in particular:

   a. Commencement of the construction of the foundations of the main building housing the experiment;

   b. Successful completion of the full sized prototype of the Toroidal Field magnet “double pancake”, one of ITER key components;

   c. Progress with the vacuum vessel, in-vessel systems, fuel cycle systems, plasma heating systems, diagnostics and test blanket modules.

4. Underlines the importance of having a realistic planning of activities in the future against which progress can be measured.

5. In relation to the participation of the European Fusion Laboratories (EFLs) in the development of systems for ITER:

   a. Welcomes the measures being taken by F4E to implement the recommendations of the Governing Board’s Ad-Hoc Group on the partnership between F4E and the EFLs;

   b. Notes their increased involvement through the signature of several framework partnership agreements and the advanced preparation of additional ones.

6. Notes that cost containment and the rebuilding of the contingency remains challenging, that further steps are needed and that both items should remain a priority for both F4E and the Governing Board.

7. Recalls the conclusions of report ‘Potential for Reorganization within the ITER project’[1] from 2013, carried out by Ernst & Young upon request of the European Parliament, in which it is stated that *“F4E is a sui generis organisation operating in a complex environment, which constrains the possibilities for cost-efficiency.”*

8. Welcomes the continued progress made in the Broader Approach projects JT60-SA and IFMIF-EVEDA as well as the excellent performance of the Helios supercomputer, in full exploitation during 2013. In particular it is worth highlighting the start of JT60-SA assembly, the delivery to Japan of the IFMIF EVEDA accelerator injector and the finalization of the IFMIF engineering design report.

Mr Stuart Ward
Chair of the F4E Governing Board
11 June 2014

[1] http://www.europarl.europa.eu/meetdocs/2009_2014/documents/cont/dv/study_geier/study_geieren.pdf

List of Acronyms

ABAC	Accrual Based Accounting
AC	Audit Committee
AFC	Administration and Finance Committee
BA	Broader Approach
BASC	Broader Approach Steering Committee
BAUA	Broader Approach Units of Account
CA	Contract Agent
CAD	Computer Aided Design
CB	Cryostat Base
CCFE	Culham Centre for Fusion Energy
CEA	Le Commissariat à l’Énergie Atomique et aux Énergies Alternatives
CIEMAT	Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas
CPRHS	Cask and Plug Remote Handling System
CREATE	Consorzio di Ricerca per l'Energia e le Applicazioni Tecnologiche dell Elettromagnetismo
CRPP	Centre de Recherches en Physique des Plasmas
CS	Central Solenoid
CVB	Cold Valve Boxes
CVBCS	Cryostat Vessel Body Cylindrical Section
CW	Continuous Wave
DA	Domestic Agency
DEMO	Demonstration Fusion Reactors
DR	Deviation Request
DTP	Divertor Test Platform
EBBTF	European Breeding Blanket Test Facilities
EC	Electron Cyclotron
ECA	European Court of Auditors
ECRH	Electron Cyclotron Resonance Heating
EFDA	European Fusion Development Agreement
ELM	Edge Localised Mode

ENEA	Italian National Agency for New Technologies, Energy and Sustainable Economic Development
EU	European Union
EUROFER	A reduced activation ferritic-martensitic steel
ExCo	Executive Committee
FO	Official
FW	First Wall
FWC	Framework Contract
GB	Governing Board
GPG	General Procurement Group
HCLL	Helium-Cooled Lithium-Lead
HCPB	Helium-Cooled Pebble Bed
HFTM	High Flux Test Module
HHF	High Heat Flux
HIP	Hot Isostatic Pressing
HNB	Heating Neutral Beam
HTS CL	High Temperature Superconducting Current Leads
HV	High Voltage
HVAC	Heating, Ventilation and Air Conditioning
HVPS	High Voltage Power Supply
HWR	Half Wave Resonator
I&C	Instrumentation and Control
IAC	Internal Audit Capability
IAS	Internal Audit Service
IC	Ion Cyclotron
ICH	Ion Cyclotron Heating
ICRH	Ion Cyclotron Resonance Heating
IFERC	International Fusion Energy Research Centre
IFMIF	International Fusion Materials Irradiation Facility
ILO	Industrial Liaison Officer
IMSS	Integrated Management System Standards
IO	ITER International Fusion Energy Organization
IP	Intellectual Property
IPP	Max-Planck Institut fuer Plasmaphysik
IPSAS	International Public Sector Accounting Standards
IR	Implementing Rules
ISEPS	Ion Source and Extraction Power Supplies
ISS	Isotope Separation System

ITA	ITER Task Agreement
IUA	ITER Units of Account
IVT	Inner Vertical Target
IVVS	In-Vessel Viewing System
IWS	In-Wall Shielding
JAEA	JA Implementing Agency
KIT	Karlsruhe Institute of Technology
LIPAc	Linear IFMIF Prototype Accelerator
LN2	Liquid Nitrogen
LPCE	Liquid Phase Catalytic Exchange
LSU	Legal Services Unit
MB-MP	Multi-Body Multi-Part
MPG	Market Policies, Analysis and Reporting Group
NB	Neutral Beam
NBTF	Neutral Beam Test Facility
NbTi	Niobium Titanium
NHF	Normal Heat Flux
OIS	Outer Intercoil Structure
PA	Procurement Arrangement
PCR	Project Change Request
PF	Poloidal Field
PIC	Protection Important Components
PID	Probability / Impact Matrix
PIE	Post Irradiation Examination
PPC	Pre-Production Cryopump
PrSR	Preliminary Safety Report
PPG	Project Procurement Group
PS	Power Supply
PTM	Project Team Manager
Q1/2/3/4	Quarter
QA	Quality Assurance
QMS	Quality Management System
QPC	Quench Protection Circuit
R&D	Research and Development
RAFM	Reduced Activation Ferritic Martensitic
RCC-MR	Règles de Conception et de Construction des Matériels Mécaniques des Îlots Nucléaires RNR
REMS	Radiological and Environmental Monitoring Systems
RF	Radio Frequency

RFQ	Radio Frequency Quadrupole
RH	Remote Handling
RWM	Resistive Wall Mode Control
RWMPS	Resistive Wall Modes (Coils) Power Supplies
SCMPS	Superconducting Magnet Power Supplies
SNE	Seconded National Expert
SNU	Switching Network Unit
STAC	ITER Science and Technology Advisory Committee
STP	Satellite Tokamak Programme
TA	Temporary Agent
TAP	Technical Advisory Panel
TB	Tender Batch
TBM	Test Blanket Modules
TBS	Test Blanket Systems
TF	Toroidal Field
TPO	Technical Project Officer
TÜV	Technischer Überwachungs - Verein
UT	Ultrasound Testing
VV	Vacuum Vessel
WBS	Work Breakdown Structure
WDS	Water Detritiation System
WMS	Waste Management System
WP	Work Programme
WRS	Warm Regeneration System