



# F4E NEWS

Fusion for Energy Quarterly Newsletter

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## F4E READY TO SIGN OVER 300 MILLION EUR IN 2011

The Governing Board of F4E has adopted the 2011 work programme and budget which provide over 300 million EUR to European industries and research organisations to contribute towards the realisation of ITER.

The 18<sup>th</sup> meeting of the F4E Governing Board opened with a presentation from the Director General of ITER Organization, Prof. Osamu Motojima, who paid his first official visit to F4E and took the opportunity to present the status of the ITER project.

In his opening words he explained that “the top priority is to deliver on time - we must respect the agreed schedule and conduct an exercise for more savings”. He further explained that “establishing a good relationship between F4E and the ITER Organization is of fundamental importance”.

Following the adoption of the 2011 work programme and budget, F4E will publish calls for tender and proposals in 2011 with a value of over 300 million EUR.

The Governing Board also decided on the next steps to continue the improvement of the governance of F4E, discussed F4E’s draft industrial policy and extended the mandate of the F4E Director, Dr Frank Briscoe, until August 2012.



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01 F4E Director, Frank Briscoe, ITER Organization Director General, Osamu Motojima, and F4E Governing Board Chairman Carlos Varandas

02 Governing Board Meeting

## FOUNDATION STONE FOR EUROPE-FINANCED ITER HEADQUARTERS UNVEILED

The foundation stone for the ITER Headquarters was unveiled in Cadarache, France, on 17 November.



Artist's impression of the future ITER Headquarters building © Agence Rudy Ricciotti

Financed by F4E and Agence ITER France (as host country), the works consist of the construction of three buildings which will amount to approximately 40 million EUR. Agence ITER France is also responsible for overseeing the contract and construction.

The first building will be used to receive the public and will include a conference room seating 50. The building facade will consist of a highly resistant smooth concrete, shaped to produce striking asymmetrical designs. The building will have a green roof to help regulate the temperature inside the building.

With a surface area of approximately 20,500m<sup>2</sup>, the second building will house offices of 460 people, a canteen catering for 1,000 people, a boardroom seating 200 people and an amphitheatre for 500. Planned to measure 160 metres long, 21 metres wide and around 20 metres high, its north-west facade will be shaped like a bird's wing and will have a shading system composed of 7 centimetre-thick fibre-reinforced concrete slats positioned vertically which will form a protective veil against the wind and will change shape depending on the angle of the viewer, the light or the seasons.

The third building will consist of a medical unit and access control.

It will take two years to construct these buildings. The foundation work started in September 2010 and the first walls were erected in late October 2010. Construction of the super-structure (floors, pillars, walls, etc.) will continue before the facades and exterior fittings are installed in April 2011. The specialty trades (floor covering, ceilings, walls, locks, etc.) will then follow. Installation of electricity, heating and the lifts should start in November 2011.

### Technical details

**Contracting authority:** Agence ITER France

**Contracting authority support:** Altran

**Prime contractor:** A group of architects from the Var Department including Rudy Ricciotti and Laurent Bonhomme, working in partnership with the technical design offices CAP-Ingelec & SNC-Lavalin.

**Grouping of public works companies:** Léon Grosse and Axima. Léon Grosse built the Pavillon Noir auditorium, the TGV train station in Aix-en-Provence, and both the Museum of Natural History and the Orangerie Museum in Paris. Founded in 1881 by Léon Grosse in Aix-les-Bains, it is now one of the most reputed public works companies in France.

**Workforce:** 200 people during the peak expected in spring 2011.

**Cost of works:** The works, amounting to about 40 million EUR, are financed by F4E and France (as host country).

## FIRST F4E DIAGNOSTIC PROTOTYPE PRODUCED

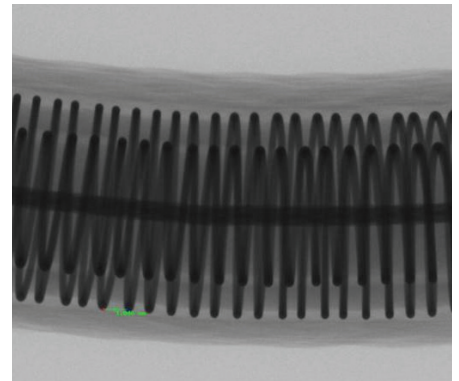
Manufacturing of a prototype for the first diagnostic component to be supplied by F4E to ITER, the Continuous External Rogowski (CER) coils, was completed in December 2010.

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.

The CER coils are formed by two layers of concentric windings (as seen to the right in an X-ray image of the prototype) insulated by fibreglass and enclosed in a stainless steel braided sheath. Each coil measures approximately 50 metres in length. By contrast to other common methods of measuring the plasma current, the Rogowski method provides the measurement with a single sensor, resulting in very high reliability.

The prototype was manufactured in the frame of an F4E grant awarded in the spring of 2010 to a group of EU Fusion Associations including CRPP, CEA and RFX. The next step is to subject the prototype to a series of tests in order to confirm its measurement performance and establish its compatibility with the ITER environment. The tests include characterising its behaviour at cryogenic (liquid nitrogen) temperature, in high vacuum and under mechanical stresses foreseen to occur during operation of the TF coils. The testing, which is being carried out at CRPP in Lausanne and CEA in Cadarache, is scheduled to be completed in May 2011.

If the test results are deemed satisfactory, work on finalising the detailed design of the CER coils is expected to follow

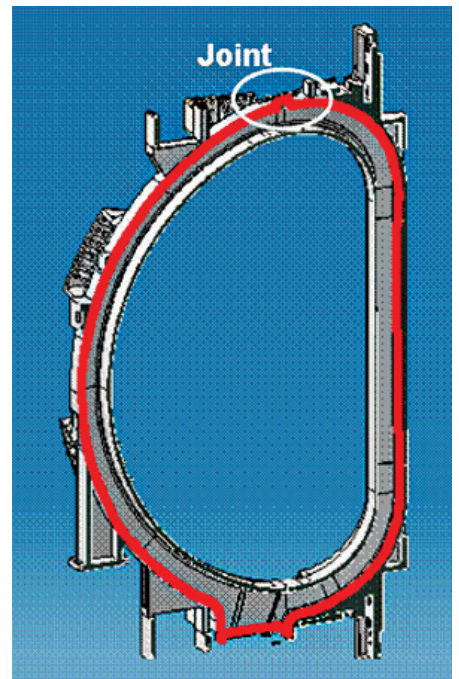


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under the auspices of a new F4E grant and should be completed by the spring of 2012. Thereafter, the coils will be manufactured by F4E and supplied to ITER for installation in the TF coil cases in 2013.



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- 01 This x-ray image of the CER coils shows the two layers of concentric windings which are insulated by fibreglass and enclosed in a stainless steel braided sheath
- 02 Cross section of the prototype CER coil
- 03 The CER coil (in red) installed in a groove in the Toroidal Field coil case. Image courtesy of CEA

## F4E SIGNS CONTRACTS FOR SUPPLY AND MANUFACTURE OF ITER AND JT-60SA SUPERCONDUCTORS

F4E has awarded a contract for cabling and jacketing of approximately 20 km of ITER Toroidal Field (TF) conductors and in the region of 28 km of JT-60SA TF conductors, plus the jacketing of around 22 km of Poloidal Field (PF) conductors.



Worth approximately 49 million EUR, this contract was signed in early December and awarded to the ICAS consortium (ENEA, Tratos Cavi and Criotec) from Italy with duration of five years.

In addition to the cabling and jacketing, ICAS is also responsible for the procurement of the stainless tubes, wraps and central spiral required for the conductors. The copper and Niobium-tin ( $\text{Nb}^3\text{Sn}$ ) superconducting wires (strands) for the ITER TF coils will be supplied by F4E through three existing supply contracts already placed in 2009 to companies Luvata, OST and Bruker EAS GmbH.

The cables for the ITER PF coils will be supplied by the Russian Federation for final jacketing in the frame of a bilateral agreement with F4E. The European contribution to the manufacture of the PF1 and PF6 coil conductors will be approximately one-third, with the Russian ITER Domestic Agency procuring the remaining part.

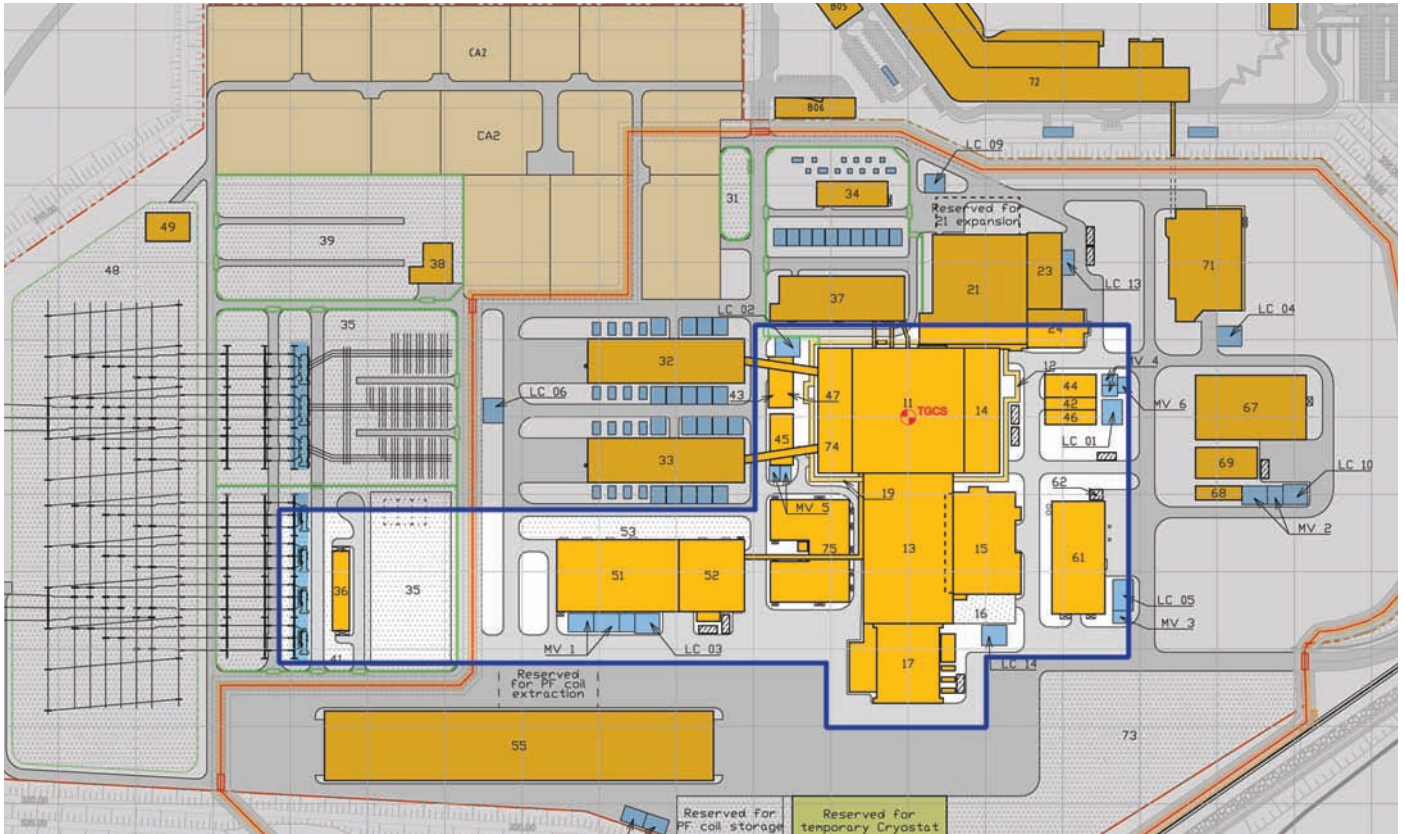
The schedule, technical aspects and legal issues for a successful implementation of the contract were discussed during the kick-off meeting held between F4E and ICAS which took place at the F4E offices in early January. The next steps are for ICAS to complete the building of the jacketing line, a stand of 800 metres where the jacket assembly and inserting of cable into the jacket takes place.

The 5,100 km copper and 10,200 km Niobium-titanium ( $\text{NbTi}$ ) wire required for the JT-60SA conductors will be procured and supplied by F4E to ICAS through another contract, which has been awarded to Furukawa Electric Co. on 17 December 2010 and is worth approximately 5.8 million EUR. The kick-off meeting between F4E and Furukawa Electric Co. was held in January and the evaluation billet manufacturing phase is currently ongoing.

ICAS and F4E representatives at the kick-off meeting in early January.

## NEW CIVIL ENGINEERING TENDERS

In late 2010 F4E hosted an information meeting presenting the overall construction strategy and the procurement packages in the pipeline for the construction of the ITER buildings.



120 participants from companies based in 11 different EU Member States came together to learn, discuss and explore potential collaborations between them. Parallel to the ongoing construction carried out on the site, two additional actions will be launched in 2011: the civil engineering and finishing works for the tokamak complex and the tokamak cargo lift together with the assembly hall cranes.

The tokamak complex, which will host the ITER device, currently includes seven floors and around 10,000 embedded parts. The concrete foundations, walls, slabs, columns and floors are in the range of 130,000m<sup>3</sup>. The shield doors designed in line with the specifications of the Nuclear Regulatory Authority standards will be 4 metres high, 4 metres wide and weigh

approximately 40 tonnes. The works are envisaged to last 54 months and their overall cost is expected to go above 150 million EUR.

Any in-vessel component that requires replacement or maintenance will be moved by the cask transporter from the tokamak building to the hot cell building with the cargo lift, which connects the two buildings. The lift will be 32 metres high with a capacity to lift up to 100 tonnes. The same contract is expected to cover the design, certification, manufacturing testing installation and commissioning of the assembly hall cranes and of one lifting beam able to lift up to 1,500 tonnes.

The works are envisaged to last 54 months and are expected to cost less than 50 million EUR.

Both contracts will be awarded through competitive dialogue which is currently ongoing.

Companies will have to submit an expression of interest by Thursday 3 March.

To find out more about the two procurement packages visit the Industry and Associations portal via the F4E website.

Scope of the civil engineering and finishing works tender

## WE HAVE TO GO-AHEAD TO START BUILDING THE NEUTRAL BEAM TEST FACILITY

At the beginning of November 2010, F4E Director Frank Briscoe and ITER Director-General Osamu Motojima signed the Procurement Arrangement (PA) for the European share of the Neutral Beam Test Facility (NBTF) being built in Padua, Italy.



Worth 27 kUA of credits from ITER IO (approximately 42 million EUR), this PA is an excellent example of the international collaboration of the ITER project.

Today, Neutral Beam Injectors are used routinely in major fusion devices and are normally based on the acceleration of positive ions. However, since ITER will be larger and more powerful than any existing fusion machine, it is necessary that its injectors go beyond the present technology, in particular in terms of beam energy (1 MeV), injected power (16.5 MW from each injector) and pulse length (up to 3600 s). The ITER Neutral Beam system, consisting of 2 Heating Neutral Beam injectors (HNB), with a possible third injector foreseen, will be based on negative ion (hydrogen and deuterium) beams which will be neutralised and then injected into the plasma, transferring the energy from the beams to the plasma particles.

The main aims of the NBTF are to complete the development of the ion source, the beam source and the beamline components for the ITER neutral beam systems. Testing will be carried with the objective of reaching the full performances for

the Heating Neutral Beam (HNB) injectors and the Diagnostics Neutral Beam (DNB) ion source, developing the 1MV ITER Heating Injector to progressively reach the required parameters, as well as mitigating risks and giving support to the ITER operation.

Europe, India and Japan are the three ITER parties that contribute with components to this project which now carries the name "Padua Research on ITER Megavolt Accelerator" (PRIMA). PRIMA itself will host two independent test-stands. A first test bed, named SPIDER, will be aimed at testing and optimising the negative ion source of the HNB. SPIDER will also be used for the development of the ITER Diagnostic Neutral Beam (DNB) whose procurements are under the responsibility of the Indian Domestic Agency. A second test stand, a full size ITER HNB prototype called MITICA, will test the design adopted for the HNB. After the procurement of the first two ITER injectors, the experimental program will be extended to accompany and support the ITER operation. This extended operation phase will be dedicated also to testing possible new operating scenarios and technical improvements.

While India will provide some components for SPIDER and Japan for MITICA, F4E has the responsibility for most of the NBTF procurements, including the core components (beam sources, beam line components, cryopump) and all the supporting systems, the cooling, the distribution of the insulating gas SF<sub>6</sub>, the cryosystem, the instrumentation and the control and data acquisition system, and the gas injection systems for both test beds.

The procurement procedures for the main components of SPIDER, namely the power supplies of the ion source, the vessel and the beam source, have been already launched and it is foreseen to sign the biggest part of all the contracts necessary for its establishment during 2011.

SPIDER is foreseen to be operative by 2014 while MITICA will start operating in 2017.

Artist's impression of the Neutral Beam Test Facility (NBTF) building

## SEE THE PROGRESS OF THE ITER SITE

With more than 160 engineers together with 140 workers on the ground and counting more than seven months of blasting and drilling, construction on the ITER site has taken off!



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Given the increasing volume of requests for photos, we have decided to bring the site closer to you by documenting the pace of change on a monthly basis and offering you a frequent update through our website and F4E News.

We have launched a new section in our image gallery called ITER site 2011 where you can get a glimpse of the most recent developments of the PF coils building, the excavation of the tokamak building and the construction of the ITER Headquarters. To see the progress of the ITER site since the works started you can visit the ITER site 2010 archive.

For those eager to see the blasts happening in action and curious enough to dig more in the site, we have uploaded new clips in our multimedia section and on top of that new clips on the buildings of the ITER site, the Vacuum Vessel and the way the ITER machine works.



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Take a look and let us know what you think at [press@f4e.europa.eu](mailto:press@f4e.europa.eu)

01 ITER site-aerial view-December 2010

02 Excavation for the Tokamak Building, February 2011



## INDUSTRIAL SEMINAR FOR CATALAN INDUSTRY



That interest is high amongst Catalan industry to work with F4E was evident from the high attendance at the F4E-bFUS Industrial Seminar event, which took place on 3 February in Barcelona. Jointly organised by bTEC, IREC and F4E, the seminar aimed to present F4E's procurement policy and this year's work programme as well as describe four work packages (Test Blanket Module, Cryoplant and Fuel Cycle, Diagnostics and Remote Handling). The event also included presentations on CDTI's industrial support activities and the Barcelona fusion project bFUS.

Josep Canòs, newly appointed Director General of Energy, Mines and Industrial Safety General Directorate in the Generalitat de Catalunya, opened the seminar highlighting the importance of fusion energy and the work of F4E in Catalonia. F4E Director Frank Briscoe spoke of ITER as an important step in the roadmap to fusion energy and said that he hoped that the companies present would find opportunities to help F4E in our work. Following the presentations, F4E staff was on hand to answer questions from the audience about the four work packages.

To see the presentations held during the meeting, visit the Events section on the F4E website.

From left: Antoni Martínez (IREC), Josep Canòs (Generalitat de Catalunya), Frank Briscoe (F4E) and Miquel Barceló (bTEC) welcome the seminar attendees

## F4E 2<sup>ND</sup> INFORMATION MEETING: BUILDINGS FOR ITER



F4E hosted an information meeting regarding the procurement packages for the construction of the ITER buildings on 22 November 2010 in Cadarache, France.

As well as finding out more about the general project strategy, getting an overview of the planning and the procurement procedures and learning more about the buildings construction allotment strategy, the 120 participants who came from various industrial companies and from 11 different EU countries had the opportunity to have short face-to-face meetings with the F4E technical and procurement teams and the possibility to develop B2B contacts to form potential consortia and increase the possibilities of subcontracting.

Professor Osamu Motojima, ITER Director-General, was represented during the meeting by Tim Watson, Head of Directorate for Tokamak Complex Civil Construction and Site Support Office, who stressed that the progress of the buildings is an important signal as it shows that ITER is progressing. He also highlighted the significance of delivering the different buildings on schedule as uncompleted buildings would delay the assembling of the machine.

F4E's Head of Contracts & Procurement Department, Philippe Corr ea, and Chief Engineer, Maurizio Gasparotto, highlighted the progress achieved by F4E: over 1 billion EUR worth of contracts have been already awarded in the European market and successful technical development of the vacuum vessel and the divertor has been carried out.

Participants at the F4E meeting concerning Buildings for ITER

## F4E SHOWCASES ITER AT THE EUROPEAN PARLIAMENT

“The way ahead” was the slogan of the EU Agencies exhibition hosted at the European Parliament in Brussels between 31 January and 3 February.



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F4E was there to communicate the merits of fusion energy, present an update on Europe’s contribution to ITER and the overall progress of the project. We took this opportunity to project for the first time the latest images and clips from the site in Cadarache.

In terms of interactive material, F4E took all the way to the European Parliament the ITER mock up which appeared as a principle exhibit at the stand on the launch of the Innovation cluster and with the help of magnets and bucky balls explained how deuterium and tritium fuse and how magnetic confinement keeps the plasma caged.

The exhibition brought together 29 EU Agencies which manage annually a combined budget of 1,2 billion EUR and employ a workforce of approximately 4,500 people. Agencies offer support in implementing EU policies, provide meaningful expertise and execute in a decentralised manner highly technical tasks. The exhibition was structured in four thematic clusters which demonstrated how Agencies contribute towards a free, safe, healthy, innovative, inclusive and sustainable Europe.

F4E contributed to the cluster of “Education, business and innovation for jobs and growth” which was in the spotlight on Tuesday 1 February and Thursday 3 February. The cluster brought together nine Agencies contributing to



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distinct policy areas ranging from energy, business, training and innovation. Their commitment to the European 2020 strategy - to convert the EU into the most inclusive, sustainable, competitive and innovative society- is what unites them.

The opening reception of the event brought together three keynote speakers: Jukka Takala, Director of the European Agency for Safety and Health at Work, Maroš Šefčovič, Vice-President of the European Commission and Jutta Haug, MEP chairing the special committee on the policy challenges and budgetary resources for a sustainable European Union after 2013. All three speakers confirmed their support to the work conducted by Agencies and acknowledged that their insight and expertise serves to tackle the daily and future challenges that European citizens face.

01 European Parliament. Copyright: PHOTO © European Union. Atelier de Genval- Cerau - M. Van Campenhout, - Tractebel dev s.a. et ingénieurs associés

02 Explaining the ITER project at the event

## F4E ORGANISES NEUTRAL BEAM TEST FACILITY INFORMATION DAY IN PADUA, ITALY

F4E has organised a Neutral Beam Test Facility Information Day on 18 November 2010 at the RFX Laboratory in Padua, Italy. Approximately 100 participants representing 72 different companies from all over Europe attended the event which presented the Neutral Beam Test Facility procurement

package and gave a general overview of the relevant technical requirements and applicable procurement rules. For further information, please consult the Events section of the F4E website.

## F4E AT THE FIRST MONACO ITER INTERNATIONAL FUSION ENERGY DAYS

F4E representatives attended the Monaco ITER International Fusion Energy Days event, held on 23-25 November 2010.



F4E representatives meet with His Serene Highness Prince Albert II

The first ever three-day conference gave the opportunity to explore and discuss what is at stake today in the energy world and how fusion and the ITER project can help to meet the challenges of the coming decade.

Processes and strategies for procurement and implementation were also in focus, as well as the ITER materials and technologies. The conference was opened by His Serene Highness Prince Albert II of Monaco who told the audience that the ITER project had caught his eye because it should open the door to an abundant source of energy which is fairly distributed all over the planet. He affirmed his support to the project by pointing out ITER's possibilities in limiting

global warming and producing clean, safe energy on a large-scale to meet humanity's needs.

F4E representatives from the Contracts and Procurement Department and the Buildings and Site team participated. All ITER Domestic Agencies reported on their respective procurement processes and implementation status, with Philippe Corr ea, Head of the Contracts and Procurement Department, representing F4E. F4E's Laurent Schmieder, Head of Site, Buildings and Power Supplies Division, and Graham Strickleton, Site, Buildings and Power supplies Procurement Manager, gave a presentation of progress of the site construction and the building technology of the tokamak complex and hot cell.

The Monaco ITER International Fusion Energy Days conference was jointly managed by the ITER Organization, the Principality of Monaco and the International Atomic Energy Agency (IAEA). The Principality contributes 5.5 million EUR over a period of time until 2018, allowing for the establishment of five Postdoctoral Fellowships every two years within the ITER Organization as well as the Monaco ITER International Fusion Energy Days event.

All the presentations held during the conference are available on the conference website: [www.miifed2010.com](http://www.miifed2010.com)

The next Monaco ITER International Fusion Energy Days event will be held in 2013.

## DANISH INTEREST IN F4E REMOTE HANDLING PACKAGES IS HIGH

F4E representatives had the chance to meet Danish robotics companies at a highly-specialised workshop organised by Big Science Secretariat-Denmark (BSS) at the beginning of this year. While explaining the technical aspects of what is needed in ITER's remote handling work packages and providing an introduction into how the F4E's procurement process works, the workshop also gave the opportunity for the F4E representatives to get to know the Danish companies and to get an overview of where the core competencies lie in the different businesses.

For the Danish companies, this was the occasion to form partnerships and show their interest in participating in a competence group on remote handling which aims to exchange experience and building know-how in ITER. Indeed, this sharing aspect is important as companies are

often stronger in the bidding round when they pool their expertise with others and then have a larger ballast to draw on.

Remote handling in the ITER machine will be necessary as service and maintenance in the machine cannot be carried out by humans after the machine has been used to heat the plasma to the high temperatures necessary to achieve fusion. Specialists in remote handling therefore have a unique opportunity to contribute with their expertise when the first tasks within this field are opened for tenders by this summer.

F4E plans to host an information day in Barcelona for European industries during this spring in order to present the procurement strategy for the awarding of the four Remote Handling packages which fall under its responsibility.

## 2009 F4E ANNUAL REPORT PUBLISHED

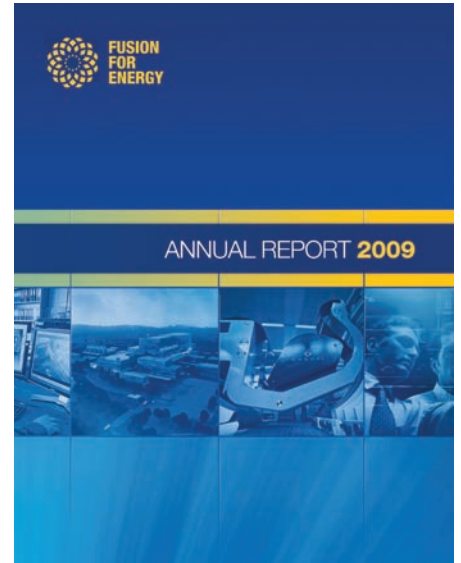
The publication of the 2009 F4E Annual Report offers a comprehensive account of the different achievements regarding the evolution of our organisation and its duty managing Europe's contribution to ITER.

In 2009 F4E consolidated its structure and strived to deliver on all its commitments vis à vis the Community and international parties. This was the year that the construction of the ITER project was launched with the signature of the first manufacturing contract for the superconducting magnets. By the end of the year F4E placed about 50 contracts for around 100 million EUR.

On the international stage, F4E negotiated and signed eight Procurement Arrangements (PAs) with the ITER Organization with a credited value of around 400 million EUR in areas such as the Buildings, Magnets and Vacuum Vessel. In addition, F4E entered into 39 credited Task Agreements to carry out specific activities in support of the ITER project. In parallel, F4E conducted a

thorough risk and cost analysis linked to the ITER construction design specifications and schedule. The activity on the site increased with the first contract for the construction of the Poloidal Field Coils building signed in December. With respect to the Broader Approach, progress was made, in particular for the JT60-SA Satellite Tokamak and the International Fusion Materials Irradiation Facility (IFMIF) projects with the signature of PAs for the value of just under 20 million EUR.

F4E continued to grow counting over 200 members of staff. The establishment of the F4E Cadarache antenna for Site, Buildings and Power Supplies as well as the setting up of the Staff Committee merit separate reference. F4E hosted the ITER IO – Domestic Agencies Coordination meeting and welcomed several important dignitaries including José Montilla, President of Catalonia at the time and H.M. King Carl XVI Gustaf of Sweden as the patron of the Royal Swedish Academy of Engineering Sciences.



You can either receive a hardcopy of the 2009 F4E Annual Report by sending an email to [press@f4e.europa.eu](mailto:press@f4e.europa.eu) or download it from the F4E website under the Publications section.

## BROWSE THROUGH OUR NEW PUBLICATIONS!

Over the last couple of months we have been working towards a new set of publications which offer up-to-date information regarding F4E and the ITER project. Our objective has been to make the content more clear and visual in order to help readers grasp all the information in one go.

The F4E brochure presents the mission of our organisation, its structure and its contribution to the ITER project. The ITER brochure offers an introduction to the current challenges we face in terms of our energy mix and the potential

contribution of fusion. All brochures are available in printed and electronic format in English, French, Spanish and Catalan.

As part of our communications tool kit, we have also been developing a set of six fusion postcards.

To download the brochures and postcards visit the Publications section of our website or send us an e-mail at [press@f4e.europa.eu](mailto:press@f4e.europa.eu) to receive copies.



### Fusion for Energy

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