F4E NEWS

Fusion for Energy Newsletter

No. 16 / February 2015

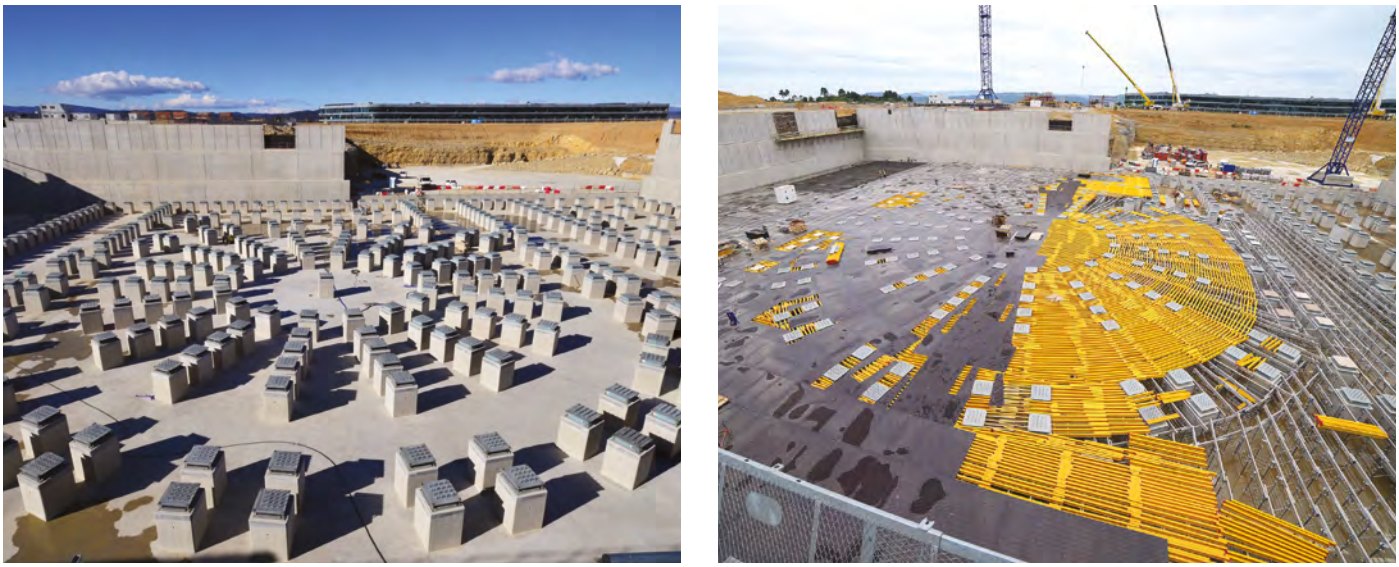
Tokamak complex – The cranes are erected and the concrete is being poured for the First Wall – November 2014

Europe takes ITER construction to the next level

The floor upon which the biggest fusion machine in the world will rely on has been constructed.
This landmark achievement marks the conclusion of the works that started in August 2010 and represents an investment of around 100 million EUR for F4E, the European Union's organisation responsible for Europe's contribution to ITER.

The construction has been carried out by a group of companies led by GTM SUD and under the supervision of Fusion for Energy (F4E) and the ENGAGE consortium consisting of Assystem, Atkins, Empresarios Agrupados and Egis. The floor will be able to support more than 400,000 tonnes of buildings infrastructure and equipment, including the ITER machine weighing 23,000 tonnes.

Professor Henrik Bindslev, Director of F4E, explained that "Europe is taking the ITER construction to the next level. The basemat is the test bed of the biggest international collaboration in the field of energy. It's where the scientific work and industrial know-how will come together and be deployed to seize the power of fusion energy". Professor Osamu Motojima, Director General of ITER International Organization (ITER IO) stated that "the conclusion of this task is a historical moment for the project. Years of hard work by all ITER parties are bearing fruit as the facility takes shape and makes progress on all fronts".



From plinths to full basemat: four key stages of the ITER Tokamak basemat

The ITER basemat in figures:

The basemat is far more complex that it seems. It has a surface of 9,600 m^2 and a thickness of 1,5 m of reinforced concrete consisting of four successive layers - two of 50 cm, one of 30 cm and one of 20 cm. The first of the fifteen plots of concrete was poured in December 2013. Following the approval of the French Nuclear Authority in July 2014, regarding the robustness of the building design, nine central sections of the slab were poured within seven weeks leading to a successful completion of the works in late August 2014. In total 150 workers were involved in this operation, using 14,000 m^3 of concrete, 3,600 tonnes of steel and 2,500 embedded plates.

A web of 493 plinths coated with pads lies beneath the upper slab, able to absorb the effect of an intense seismic shock. More concrete and thick steel rebars form a mesh to keep the foundations stable and lift the immense load of the machine. The design and validation process have been extremely challenging because the basemat will be the floor of the Tokamak building that will house the machine and shield it. For this reason it is has been subjected to heavy scrutiny from ITER IO and the French Nuclear Regulator. The infrastructure fully complies with the set of nuclear safety requirements branding ITER as the biggest nuclear facility in France and the first ever nuclear fusion facility in the world.

How will the ITER site evolve?

With the ITER basemat now completed, the construction of the complex that will house the core buildings of the machine has started. The VFR consortium, consisting of VINCI Construction Grands Projets, Ferrovial Agroman, Razel-Bec, Dodin Campenon Bernard, Campenon Bernard Sud-Est, GTM Sud and Chantiers Modernes Sud are responsible for carrying out the works. The building will be 80 metres tall, 120 metres long and 80 metres wide. It will require 16,000 tonnes of steel rebars and 150,000 m^3 of concrete.

There has also been progress at the Assembly Hall building, where the massive ITER components will be put together. The steel structure of the building has become visible and so far the lower sections of the eight first columns have been erected. They weigh around 15 tonnes and are currently 12 metres high (once fully erected they will be 60 metres high).

The temporary road network, infirmary and restaurant have also been completed making it possible for the contractors to set up their company offices on the site.

Watch how the ITER basemat was constructed, on our YouTube channel.

F4E Top Management changes

The Governing Board of Fusion for Energy (F4E) has decided to appoint Dr Pietro Barabaschi as Acting Director of F4E with effect from 1 March 2015 until a new Director takes up duties.
The Governing Board (GB) has also agreed to initiate the process to recruit a new Director.

(From right to left) Mr Stuart Ward, Chair of the F4E Governing Board congratulating Dr Pietro Barabaschi on his appointment

Dr Barabaschi will replace the outgoing Director, Professor Henrik Bindslev, who will leave F4E on 28 February 2015. Professor Bindslev has been appointed Dean of the Faculty of Engineering at the University of Southern Denmark.

The Chair of the GB, Mr Stuart Ward, expressed, on behalf of its members, his gratitude to Professor Henrik Bindslev for the vision and leadership that he has demonstrated as the Director of F4E which manages Europe's contribution to the ITER International Fusion Energy Project and the Broader Approach projects with Japan.

Dr Barabaschi has been Head of F4E's Broader Fusion Development Department at Garching, Germany, since 2008. An electrical engineer, he started his career in the JET Project. In 1992 he joined the ITER Joint Central Team in San Diego 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 Garching.

First Heavy Exceptional Load arrives at ITER

The size, weight and dimensions of ITER components vary tremendously. Some of them are small and compact and can be delivered through the normal route to Cadarache with no specific traffic protocols. Others, due to their exceptional weight and size, will need to be transported at night, along a specific route, and accompanied by the forces of the gendarmerie so as to minimise any disturbance that may be caused to locals. These are classified as Heavy Exceptional Loads (HELs) in the ITER jargon.

With two successful convoy rehearsals already conducted during the last two years for the transportation of "exceptional loads", carried out by DAHER in collaboration with F4E, ITER International Organization (IO), Agence ITER France and the French local authorities, the arrival of the first real "Heavy Exceptional Load" was an important achievement.

An 87-tonne high voltage transformer procured by the US and manufactured by Korea's Hyundai Heavy Industry plant, made history by crossing the ITER gates around 4:30 a.m. on Wednesday 14 January. The component travelled by sea for roughly one month and was then transported 104 km from the port of Marseille to the ITER construction site in Cadarache. 120 people were mobilised for this operation and all aspects went smoothly without any glitch.

In line with the spirit of collaboration that underpins the international energy project, this exercise has been possible thanks to the financial support provided by F4E to ITER IO and all Domestic Agencies (DAs) which is expected to reach 70 million EUR for the transport of HELs. This operation is expected to be replicated 220 times so that DAs transport their HELs from the port of Marseille to ITER.

The convoy of the Heavy Exceptional Load reaches ITER. © ITER IO

ITER's Liquid Nitrogen Plant and Auxiliary Systems successfully pass the preliminary design review

Think of ITER's cryoplant as a massive fridge that will cool down the machine through different systems. The most advanced cryogenic technologies will be deployed to generate extremely low temperatures needed for the ITER magnets, thermal shields and cryopumps.

F4E is providing the Liquid Nitrogen Plant and Auxiliary Systems that will cool down, process, store, transfer and recover the cryogenic fluids of the machine. Two nitrogen refrigerators will be delivered along with two 80 K helium loop boxes, warm and cold helium storage tanks, dryers, heaters and the helium purification system. The high performance requirements are underpinned by high safety standards and a sophisticated operational system.

A preliminary design phase was completed in mid-2014. In order to comply with the rigorous technical specifications and fabrication, safety, quality and project management requirements, F4E has structured a design review process for its share of components for the cryoplant relying on two main entities: the design review steering committee and the design review panel. The former has the final technical say endorsing or amending the proposals submitted by the latter.

The two bodies bring together more than 13 highly qualified experts from F4E, ITER IO and external organisations, willing to share their knowledge and examine meticulously the technical details that will feed into the final specifications and lead towards the purchase of long lead items such as compressors, heat exchangers, turbines, tanks and cold circulators.

In October, the steering committee was communicated a very positive report on the basis of the observations of the design review panel which met in September. In a nutshell, the quality and the comprehensiveness of the studies performed by the F4E, ITER IO and Air Liquide team were praised. The system was deemed to be at a level of sufficient maturity to move to the next stage. In other words, this is a go-ahead for the final design of the system and the purchase of the heat exchangers, compressors, turbines and tanks which have to be ordered prior to the next design review.

The design review panel at F4E, Barcelona

F4E contractors unveil ITER's business potential

One of the popular misconceptions about fusion is that its complex technical requirements are a major drawback for companies to invest and get involved because they would have to wait forever to see any financial return. The best way to deconstruct this cliché is to speak directly to those that have been involved and find out why they have set their sights on ITER and where is all this leading them.

(Left to right) Pascal Delcey (Cofely Axima), Christian Lismeir (Jülich Forchengzentrum), Patrick Geraud (Apave), Jean Baptiste Haumonte (Bertin Technologies)

What drives F4E contractors forward and keeps them committed to this one-of-a kind international energy collaboration? Do they see new markets in the horizon that will increase their revenue or have they identified new technological breakthroughs that will help them push forward R&D barriers and establish them as pioneers?
We had the opportunity to meet with some of our contractors and asked them to explain in simple words how they have contributed to ITER and what have been the direct benefits stemming from their participation.

The interviews brought together representatives of large companies like GDF Suez, managing together with M+W, the biggest contract awarded by F4E for a budget of approximately 500 million EUR. We spoke to Assystem to hear more about their contribution to the 150 million EUR Architect Engineer contract, and learn more about their strategy in the field of energy beyond Europe's borders.

For Apave, ITER has been carrying a business status and has the possibility to open the doors to new markets like India and Russia where they can export their services. Air Liquide Group, elaborated on the fact that their brand and expertise will always be associated with ITER's cryoplant, which will the biggest in the world. A higher turnover and the recruitment of new staff with expertise in sectors that will generate more profit for AMEC have been reported as direct benefits. The merits of co-ordination and the collaboration with smaller companies and the possibility of spin-off ventures have been identified by Iberdrola.

Small Medium Enterprises (SMEs) like OCEM carrying out specialised work in the area of the Ion Source and Extraction Power Supplies (ISEPs) and SIMIC, in the field of the Toroidal Field Coils, have reported on the business benefits and the skills acquired through their involvement. Laboratories like the Karlsruhe Institute of Technology (KIT) and the Jülich Forchungzentrum have explained the type of R&D activities that they have been carrying out with direct application to ITER and its capacity to serve as a meeting point for industry and fusion laboratories.

To highlight the work that has been carried out in areas like Diagnostics, we have approached National Instruments and Bertin Technologies to hear from them how companies and laboratories can work together and take small steps that will ultimately lead to lead to quantum leaps. Innovation and financial gains underpin the spirit of collaboration.

Listening to the above success stories and thinking of the business opportunities ahead, F4E has decided to develop a clip to explain to potential bidders the different tender procedures with the help of different animated characters. Good soundbites and quick explanations offer an engaging guided tour on what F4E does, where to look for more information, what are the main criteria and procurement procedures and how they are evaluated. The aim is to give potential bidders a quick overview, almost like a teaser, and if they are serious about submitting a tender, direct them to the main info points.

To view the F4E contractors' success stories and learn more on how to submit an F4E tender visit our YouTube channel.

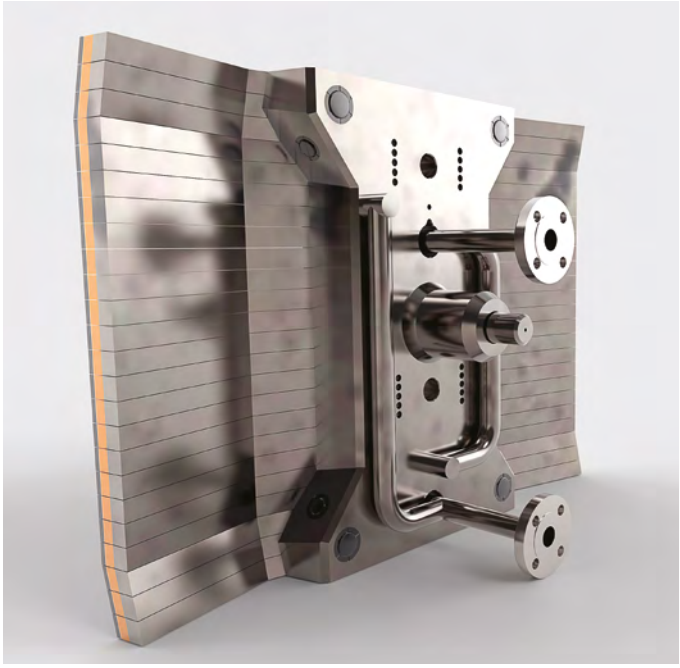
F4E signs contracts for the Blanket First Wall full-scale prototype

With the semi-prototype of the Blanket First Wall completed earlier this year, F4E is moving full-speed ahead and has just completed the signing of the contracts related to the manufacturing of the first full-scale prototypes.

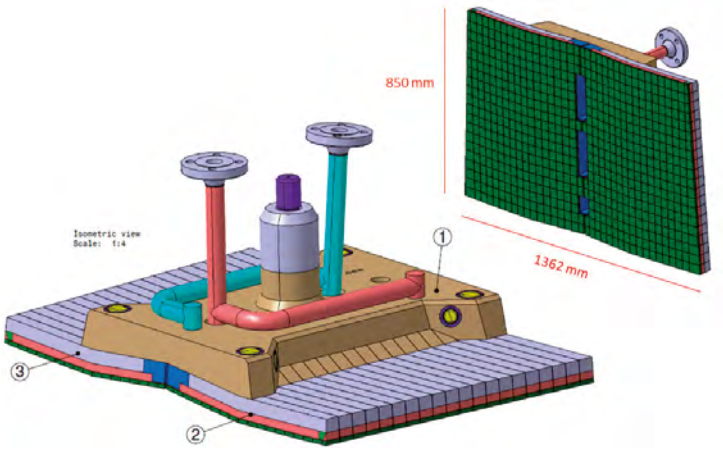
As this is a technically-challenging project which requires hitherto unknown technology and in order to mitigate risks and maintain competition until the series production, F4E has signed contracts with three different entities, namely Atmostat (ALCEN group, France), AREVA (France) and a consortium which consists of AMEC (United Kingdom), Iberdrola (Spain) and MIB (Spain). Each of these companies is to manufacture a prototype of a Blanket First-Wall panel, as well as carry out specific industrialisation studies for the fabrication of the series of the 215 panels and present a cost and schedule assessment.

The First Wall consists of 6-10 mm thick beryllium tile panels of 1 m x 1.5 m which are fixed to a bi-metallic support structure made from a 15-25 mm thick Copper Chromium Zirconium (CuCrZr) alloy bonded using Hot Isostatic Pressing (HIP) to a 40-50 mm thick 316L (N) stainless steel backing plate – together these components form the Blanket modules. The Blanket is the part of the ITER machine that acts as a first barrier and protects the vacuum vessel, which is the heart of the ITER machine, from the neutrons and other energetic particles that are produced by the hot plasma. The First Wall consists of 440 panels, of which F4E will provide about half and depending on the location of the modules in the Blanket, different design parameters are necessary. During operation, the ITER First Wall panels will be cooled by pressurised water.

"We are happy work on the Blanket First Wall continues to move forward", says Francesco Zacchia, Blanket First Wall coordinator in the F4E In-Vessel Project Team dealing with the management of the contracts. "We now look forward with anticipation to the delivery which is foreseen for early 2017 and will qualify the successful companies to participate in a future F4E Call for tender for the manufacturing of the actual ITER Blanket First Wall".



Full-size prototype of a Blanket First Wall panel © ITER Organization



The ITER First Wall will consist of 440 panels, each of which will be fixed on a shield block in order to form the Blanket modules. The Blanket will protect the vacuum vessel from neutrons and other energetic particles that are produced by the hot plasma.

See the progress of the ITER Toroidal Field coils!

We travelled to the ASG facilites in La Spezia, Italy, to follow the progress of the Toroidal Field (TF) coils and speak to the key technical people involved in the supervision of this complex component.

Alessandro Bonito-Oliva, F4E's Project Manager for Magnets, explained the purpose TF coils serve in the machine. The temperature of ITER's superhot plasma is expected to reach 150 million degrees Celsius. The challenge is to keep the plasma burning without touching the walls of the reactor's vessel. The TF coils are "D" shaped gigantic superconducting magnets whose main task will be to create a magnetic cage where plasma will be confined. Europe is responsible for manufacturing 10 out of the 18 TF coils of the machine. The different steps involved in the production process, like the winding and bending tooling, were highlighted. The degree of precision underpinning these operations was particularly emphasized.

Jordi Cornella, TF Coils Technical Officer, guided us through the four different insulation layers of the conductor and offered us the possibility to capture an entire sequence of insulation as the trolleys worked at full speed. At the time, more than 450 metres of conductor had been wrapped for the Double Pancake prototype.

Marc Cornelis, TF Coils Technical Officer, invited us to take a peek inside the laser welding station, where three laser robots operated simultaneously on the cover plate of the first-ever Double Pancake prototype. Laser welding has been chosen because of its low process input causing minimal deformation on the surface of the component. The synchronised manner the three robots operate offers some great viewing.

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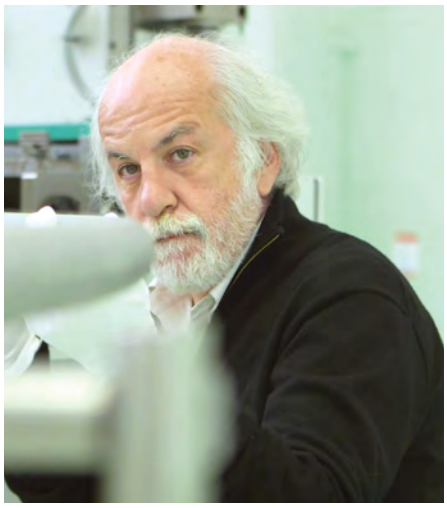

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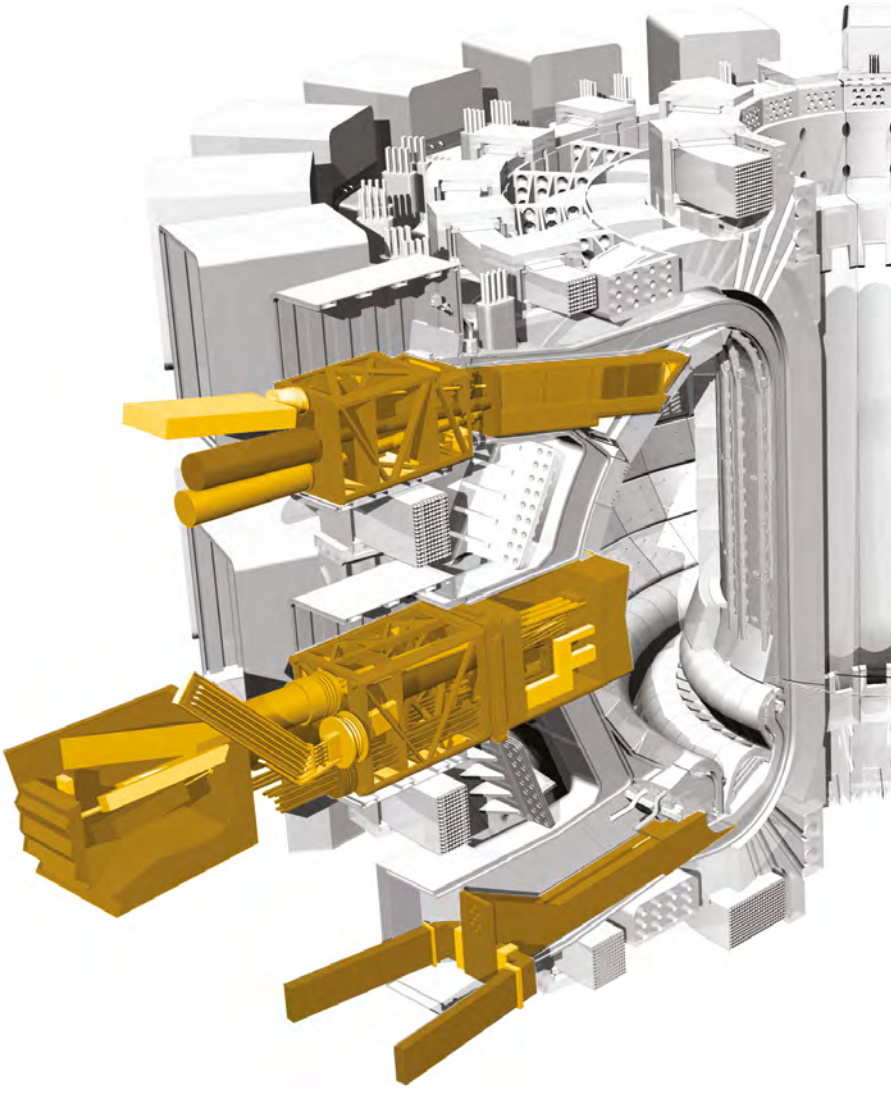
01 Laser welding the first-ever Double Pancake prototype, ASG Facilities, La Spezia, Italy.
02 (Left to right) Alessandro Bonito-Oliva, Marc Cornelis, Jordi Cornella.

Watch the Manufacturing the ITER Toroidal Field Coils video on our YouTube channel.

F4E collaborates with IDOM on high-tech ITER systems

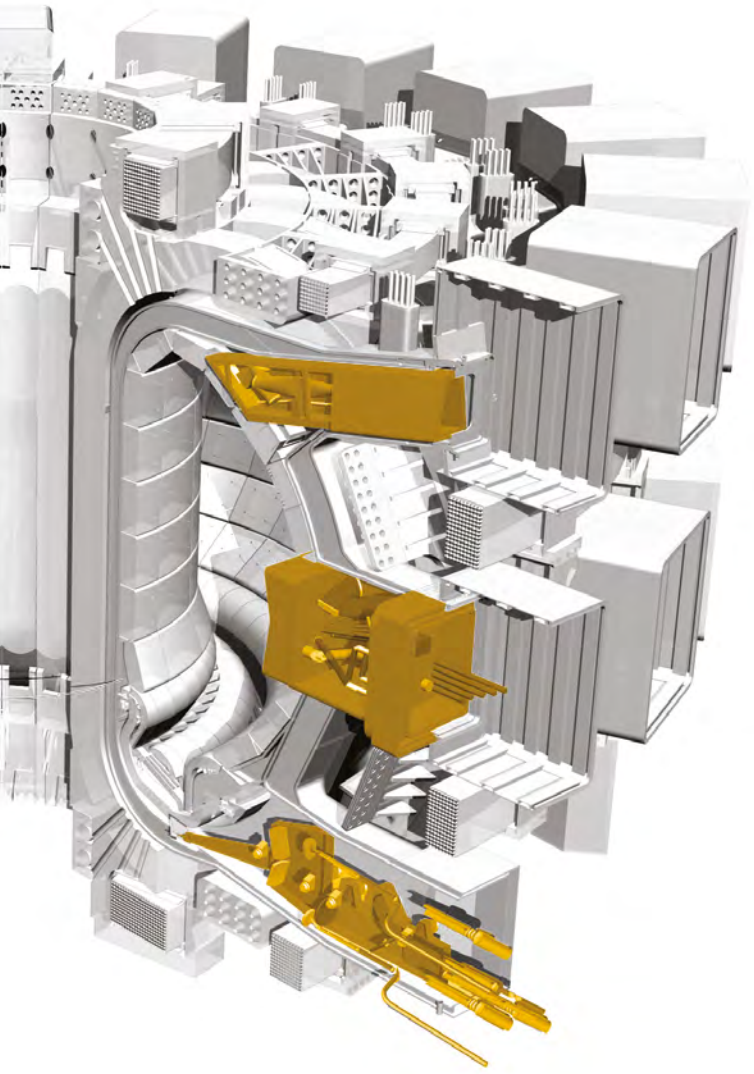
A multimillion contract for the engineering integration of many state of the art instruments that will measure the biggest plasma generated by a fusion device has been signed between F4E and IDOM ADA, the Advanced Design and Analysis division of IDOM, a Spanish-based multinational company specialising in engineering, architecture and consultancy services.

With a value in the range of 20 million EUR, the contract is expected to run for at least four years. IDOM ADA will work with instrument designers in several public European fusion laboratories as well as with experts in Japan, India, China and the US to deliver designs for the systems integration. Professor Henrik Bindslev, Director of F4E, emphasized that "through this contract we are seeing a clear example of knowledge transfer from laboratories to industry. Europe's contribution to ITER, has been a catalyst encouraging the two poles of knowledge and competitiveness to work closer. A new chapter is opening in the field of Diagnostics that will help us analyse the ITER plasma, monitor it and improve our understanding of physics". Mr Fernando Querejeta, President of IDOM, stated that "We are very proud of the opportunity that we have been given to collaborate in what most likely will be the most important research project of the 21st century in the field of energy and engineering. This contract is another big step in our already important activity as science system providers for large scientific installations and instruments".



The role of Diagnostics in ITER

The Diagnostics system will help us understand what exactly will be happening in the machine during the fusion reaction. We will able to study and control the plasma behaviour, measure its properties and extend our understanding of plasma physics. In simple terms, the system will act as the eyes and ears of the scientists offering them insight thanks to a vast range of cutting-edge technologies. ITER will rely on approximately 50 diagnostic instruments that will offer experts an unparalleled view of the entire plasma and ensure the smooth operation of the machine. Given the



duration of the plasma pulse, which will be 100 times longer than in any fusion device currently in operation, the strong fluctuation levels and the extreme environment in the vessel, the diagnostic system will act as the guardian of the safe and sound operation of ITER.

Europe is responsible for roughly 25% of all Diagnostics in ITER.

The scope of this contract

This contract will deliver a comprehensive engineering design integrating around 20 diagnostics instruments into five of the ports giving access to the ITER plasma. In-vessel metallic containers will also be designed through this contract in order to protect the diagnostic equipment from the fierce plasma temperatures that may reach 150 million degrees C, and shield other parts of the machine from neutron radiation. The metallic shields will weigh between 5 and 20 tonnes each and will have to cope with extreme conditions like the high vacuum, colossal electromagnetic forces and high heat fluxes. In addition, other structures will be designed to house diagnostic instruments that will be mounted onto the divertor cassettes of the machine, and even outside the vacuum vessel, as well as specialist flanges providing water and electrical connections to the diagnostic instruments whilst preserving the ITER vacuum.

The ITER ports will house the instruments that will control, evaluate and optimise ITER's plasma performance.
These include measurements of temperature, density and impurity concentration. (Copyright ITER IO)

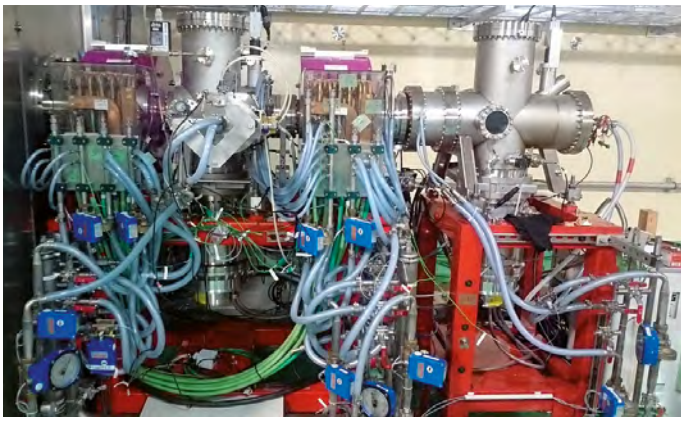
First plasma and ion beam extraction have been achieved at the Linear IFMIF Prototype Accelerator

The International Fusion Materials Irradiation Facility (IFMIF) is one of the projects stemming from the Broader Approach (BA) Agreement, a partnership in fusion energy research between Europe and Japan. IFMIF is an accelerator-based neutron source that produces, using deuterium-lithium nuclear reactions, a large neutron flux similar to that expected at the first wall of a fusion reactor.

Two important milestones have recently been achieved at the Linear IFMIF Prototype Accelerator (LIPAc): the accomplishment of the first hydrogen plasma in the ionisation chamber and the first extraction of an ion beam (H+).

In the case of LIPAc, the Japanese Atomic Energy Agency (JAEA) has been responsible for the procurement of the conventional systems, such as the accelerator building, the secondary cooling system, and the machine and personnel protection system. Europe's contribution, coordinated by Fusion for Energy (F4E), has been delivered by the European countries voluntarily contributing to the BA. The LIPAc injector has been developed and manufactured by France's Commissariat à l'Énergie Atomique et aux Énergies Alternatives (CEA) Saclay. It has been successfully installed in Rokkasho, Japan, and is now under commissioning.

The achievement of the first plasma and beam extraction has been an important achievement for the LIPAc team, including participating experts from France's CEA, led by Raphael Gobin. After the accomplishment of the widely anticipated first plasma, extensively reported in Japanese media, within only two days, further commissioning allowed a proton beam of 100 keV and 100 mA to be obtained. The prospects are now excellent to reach the target of extracting a current of 140 mA of 100 keV D+ ions in the forthcoming commissioning phase with deuterium.

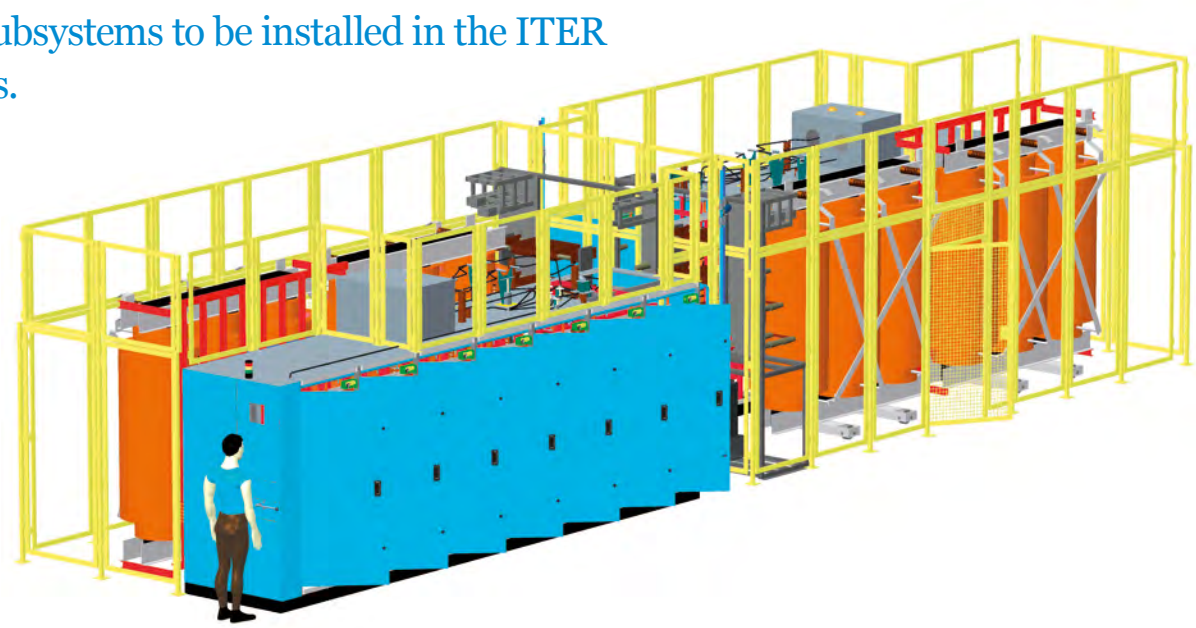


Low Energy Beam Transfer installed in Rokkasho, Japan

The IFMIF/EVEDA team of colleagues behind this very important milestone

First-ever Final Design Review completed for ITER's Electron Cyclotron system

The first ever Final Design Review (FDR) for the ITER Electron Cyclotron (EC) system has been completed and paves the way for the start of manufacturing of the EU contribution to the EC power supplies, the first of the EC subsystems to be installed in the ITER buildings.



The EC system, one of ITER's heating systems, will heat the plasma to reach 150 million degrees Celsius by transferring the energy from electromagnetic waves into the plasma electrons. The EC power supplies have the function of converting the electricity from the grid to regulated direct current and voltage at 55kV nominal that the ITER gyrotrons will need to generate the electromagnetic waves. F4E is in charge of procuring eight sets of ITER EC power supplies with a total rated power of 48MW. Another four sets will be supplied by the Indian Domestic Agency (INDA) and ITER International Organization (ITER IO).

This concluding of the FDR comes after last year's signing of the contract with Ampegon to design, manufacture, install and commission the power supplies for the Electron Cyclotron system.

While many of the components to be delivered by F4E are based on final designs provided by ITER IO, in some cases, such as with the Electron Cyclotron System for which ITER IO provides the functional requirements, F4E is responsible for the design and therefore also for conducting the FDR.

The FDR is held in order to identify, solve and finalise any outstanding issues on the EC power supplies and check that the design solution meets the ITER requirements. It marks the final stage before the manufacturing of components begins and is an important milestone for the F4E and ITER schedule.

The FDR meeting was led by an official review panel, appointed by F4E and chaired by Michel Huart, former Head of Power Supplies Division in JET. It included international technical experts as well as F4E and ITER International Organisation representatives in areas such as safety, control, Quality Assurance, electrical systems, gyrotrons, cooling and buildings. Representatives from the F4E supplier, Ampegon, relevant F4E and ITER IO staff, as well as Russian and European gyrotron developers also attended. Presentations and discussions focused on checking all aspects of the design and integration with ITER.

No major issues were identified during the FDR meeting and it is expected that all open questions will be clarified in the following weeks, thus enabling the process to be formally closed by F4E and ITER IO before the end of the year, ahead of the schedule. The manufacturing of the first set of the EC power supply systems to be manufactured for ITER will start in 2015. The delivery and installation of the first set is planned to take place in 2016/2017.

Two of the eight main HV power supplies (6MW each) for the ITER Electron Cyclotron system that will now be manufactured and then installed in the ITER Radio Frequency building in Cadarache

F4E opts for IBM platform to follow up its share of ITER components

ITER will be the biggest ever fusion machine and will be made up of approximately one million components. Given the fact that Europe is responsible for nearly half of ITER's in-kind contribution, monitoring its share of procurement will be no easy task.

(Left to right) Ivan Bénilan and Gonçalo Serra, members of F4E's Technical Process Integration Team, demonstrating the ITER components database.

Take a minute to count the different stages from the moment a high-tech component is conceived, specified and designed until the moment it is manufactured, tested and finally goes through the rigorous acceptance tests. For a complex project like ITER which aims to push the R&D frontiers further, these stages will be multiplied. Therefore, a system that will encompass the management of all F4E contributions, help with the tracing of their specifications, their final acceptance and delivery is fundamental. For this reason F4E has opted for IBM Rational DOORS® as the platform that will contain the information about anything the organisation will need to procure to ITER. Gonçalo Serra and Ivan Bénilan, working in F4E's Technical Process Integration Team, explain how the workflow is now streamlined and balanced: "Basically we link the requirements received by the ITER International Organization to the industrial specifications of F4E and then cross-check them during the lifetime of the component. The platform is constantly being updated mirroring the progress in design, manufacturing and guaranteeing compliance. In case of an audit conducted by the French Nuclear Safety Authority, we are in a position to provide the relevant information along the way". Both colleagues have spent a lot of time customising this platform in order to suit the needs of F4E's contribution to the ITER project. In the "Innovate" IBM conference that took place in Orlando earlier this year, they unveiled some of the tweaks that they have introduced: i) "the cockpit" is an option that gives users an overview of all the actions taken and pending vis-à-vis the procurement package, ii) a matrix giving the state of play can be generated in just four clicks, iii) the transfer analysis is an option that helps users to capitalise on the requirement analysis performed for each component and incorporate any modifications. The use of Rational DOORS® is spreading fast in F4E and so far at least 80 people have been trained. In future it is envisaged that suppliers will also be fully equipped to use the platform and integrate the progress carried out at their end.

Watch the "Fusion for Energy supports revolutionary new power plant using IBM Rational DOORS" video on our YouTube channel.

Companies get ready to compete for ITER's Cask and Plug Remote Handling System

The new year has kicked off dynamically for F4E's Remote Handling Project Team and their potential suppliers. On 15 January, F4E and ITER International Organization welcomed 20 representatives from companies of three selected competing consortia for Europe's contribution to ITER's Cask and Plug Remote Handling System.

The participants received an overview of the different steps involved in the competitive dialogue process. The importance attached to the technical study, called business case, which seeks to measure the skills and competences of the consortia was highlighted.

How did F4E narrow down the list to three competing consortia? A Call for expressions of interest was launched in 2014, attracting various candidate bidders from across Europe. A pre-selection process of the candidates was carried out and concluded around mid-December 2014, which led to the list of the three competing consortia.
ITER's Cask and Plug Remote Handling System (CPRHS) is devoted to the confinement and transportation of the machine's in-vessel components, and related remote handling equipment, between the Tokamak building and the Hot Cell building, where they are repaired, tested or disposed of. The technologies underpinning this system need to encompass a variety of high-tech skills and comply with the nuclear safety requirements. Mastering high accuracy of mechanical transfer devices and a proven track record in prototyping and the development of bespoke systems are essential. Expertise in radiation tolerance systems, control systems for remote operations, remote handling and navigation operations are indispensable.

Carlo Damiani, F4E's Remote Handling Project Team Manager, explained that "...the event was very much appreciated by all companies because they got a better understanding of the complexity of the system and the value that we attach to a well-prepared business case upon which they will be evaluated".

To see the list of the competing consortia, visit the F4E Industry and Fusion Laboratories portal.

F4E's Remote Handling Project Team welcomes the bidders of the competitive dialogue.

SOFT optimism in the air

The Symposium on Fusion Technology (SOFT) is one of the most anticipated rendezvous of the fusion community. Every two years the most prominent fusion experts from around the globe meet for five days to discuss the progress of their work, present new breakthroughs, debate the future of their field and network.

The 28th edition of SOFT was celebrated in San Sebastián under the auspices of Spain's Research Centre for Energy, Environment and Technology (CIEMAT) and brought together more than 1,100 participants.

The event was hosted at the Kursaal congress centre overlooking the Bay of Biscay. The building has the shape of two translucent glass cubes which let the rays of light come in. At the centre of the hall stood the SOFT exhibition that offered participants the possibility to interact and learn more about the R&D and industrial developments of the 50 entities that took part. Plenary and thematic sessions grouped high profile speakers who addressed a vast range of topics such as ITER, DEMO, JET, K-STAR, Wendelstein 7-X, ASDEX and JT-60SA. Roundtable discussions served as platforms for dialogue about technology transfer and upcoming business opportunities. As always, the poster sessions were buzzing with activity as younger and older generations of scientists proudly presented the latest progress.

F4E was present in all activities through a delegation that counted 40 members of staff ready to take questions on the progress of ITER, communicate the latest Calls for tender and give an overview of the Broader Approach activities. During the opening session, the Director of F4E, Professor Henrik Bindslev, shared the news about the ITER Tokamak basemat with a full auditorium: "This is an important milestone for which we are very enthusiastic! A mesh of very thick irons mixed with high strength concrete is in place to host the most crucial component– the ITER machine" he said. As the image was unveiled to the audience, one could not help noticing the positive impression it made. It was a moment of soft optimism that marked the point of no return. ITER was advancing! The progress report offered by F4E gave a 360 degree overview of the key technologies that Europe is responsible for and gave assurances that we were handling them with great care.

The presence of numerous European Fusion Laboratories (EFLs) and Industry Liaison Officers (ILOs) inspired Ana Belén Del Cerro, Spain's ILO, to organise an Info Day

ITER Industrial Info Day opening ceremony. From left to right: Prof. J. Sánchez, Head of Fusion National Laboratory-CIEMAT, Prof. H. Bindslev, F4E Director, E. Hernáez, Basque Government Deputy Minister of Technology, Innovation and Competitiveness, J.P. Uriguen, Dept. of Innovation, Rural Development and Tourism, Diputación Foral de Gipuzkoa , M.L. Castaño, General Direction of Innovation and Competitiveness, MINECO, Prof. O. Motojima, ITER IO General Director

gathering more than 180 representatives from companies and laboratories interested to hear more about upcoming Calls for tender and potential possibilities of collaboration between the two fusion camps. F4E deployed an army of experts to address multiple aspects. Jean-Marc Filhol, gave a thorough overview of the F4E roadmap to fulfill ITER's short-term technical needs; Glenn Counsell and Filippo Sartori explained the F4E procurement strategy in the areas of Diagnostics and Control Data Access and Communication (CODAC); Mario Cavinato and Tullio Bonicelli gave succinct reports on Plasma and Antennae and the Neutral Beam Test Facility and EC Power Supplies. The business angle was boosted by Mehdi Daval who explained to attendees how to apply to a tender and used the occasion to unveil the brand new F4E clip that guides applicants through the process. Finally, Victor Saez contributed to the roundtable discussion on technology transfer highlighting the benefits of being part of the ITER learning curve and its domino effect on DEMO.

SOFT 2014 managed to meet the expectations of its participants. The combination of interesting scientific topics and its attempt to reconcile them with business offered a new interesting twist to the event. It felt like a fresh start for a community that was on the rebound: onboard to tackle ITER, eager to tussle with its intricacies and enthusiastic about DEMO. The next edition of SOFT will take place in Prague in 2016. Let's see two years down the road where we will stand.

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01 From left to right: Philippe Magaud, CEA, Filippo Sartori, F4E, Sylvain Bremond, CEA, Glenn Counsell, F4E
02 More than 180 participants attended the ITER Industrial Info Day

The clock is ticking for the 2015 ITER Business Forum

On 25-27 March, Marseille will become Europe's fusion business capital hosting the fourth edition of the ITER Business Forum (IBF) organised by Agence ITER France (AIF) in collaboration with the Industrial Liaison Officers (ILOs) Network of F4E, Marseille Tourist Office, the "Invest in Provence" Agency and the Chamber of Commerce and Industry of Marseille-Provence.

The aim of the event is to help participants find out how key ITER technologies and components are progressing, and help economic operators with a clear interest in fusion technology to understand how their services and expertise can be of service to the project. ITER International Organization together with six of the ITER Domestic Agencies will be elaborating on their procurement strategies and the contracts in the pipeline. F4E will be present with an army of contractors so as to offer a comprehensive overview of the state of play and of any future business opportunities.

A series of technical thematic sessions will complement the plenary sessions, offering insight on how the different components are coming along and what work and skills are still in demand. Companies already involved in the manufacturing process will be using this occasion to communicate their work and flag any subcontracting opportunities. In parallel, B2B meetings will be organised in order to help companies network and foster partnerships. The possibility to visit the ITER construction site in Cadarache and Airbus helicopters or Comex Nucleaire is also envisaged for those participants that wish to take a field trip.

Registration is now open!
To learn more about IBF 2015 and see the full programme, visit http://www.iterbusinessforum.com/

F4E meets with the Fusion Industry Innovation Forum

F4E and FIIF representatives during the meeting, October 2014

Reaching out to key stakeholders is one of F4E's key objectives. "We ought to listen, understand and evaluate the different suggestions regarding Europe's contribution to ITER, and the challenging path to DEMO, in order to ensure that our industry and innovation hubs are on board" explained F4E's Director, Professor Henrik Bindslev, in his opening remarks.

In line with F4E's revamped industrial policy, which aims to promote direct interaction with industry and European Fusion Laboratories (EFLs), the organisation has built a communication bridge with the Fusion Industry Innovation Forum (FIIF) which represents different commercial and institutional voices from the fusion community. The FIIF was established in 2010 with a clear focus on the fusion roadmap, the various possibilities of technology transfer and the transmission of technical skills to industry in order to give Europe's workforces a competitive edge and help them bring commercial fusion a step closer.

The composition of this body offers F4E a unique opportunity to liaise with a cluster of professionals, which is manageable in number and is broad in expertise. Moreover, its mission is congruent with the three areas that F4E is expected to deliver: ITER, the Broader Approach and DEMO. For these reasons, F4E has taken the initiative to host a yearly meeting with FIIF in Barcelona, and offer all participants comprehensive updates on the state of manufacturing and construction; the Calls for tender in the pipeline and key events.

The F4E Director together with a team of colleagues working in the areas of market and business intelligence, stakeholder relations, contracts and procurement, welcomed the FIIF members and restated their intention to maintain a frank and constructive dialogue. Mr Alain Henri Bernard Chevalier, Chair of FIIF belonging to AMEC UK, confirmed the value of this annual meeting and thanked F4E for this initiative. A series of topics were tackled ranging from F4E's progress report, its industrial policy and future industry incentives. F4E staff took this opportunity to communicate rules regarding IPR, contract management and the strategy that underpins some of the procurement packages. The next meeting is scheduled to take place in October 2015.

F4E presents ITER business opportunities to Danish industry

Danish as well as other European SMEs must take advantage of the valuable business opportunities that the ITER project offers – this was the message that F4E Director, Professor Henrik Bindslev, made during his intervention at the Big Science Secretariat Network meeting in Copenhagen, Denmark.

Danish Research and Higher Education Minister Sofie Carsten Nielsen also attended the event and spoke strongly in support of fusion energy to the audience of 90 participants who were mainly from the Danish business and research community. As well as the F4E Director and representatives from ITER International Organization, a delegation made up of technical and business experts from F4E were on hand to provide an overview of ITER technical tasks and future Calls for tender whilst also explaining the procurement and quality assurance procedures. Indeed, the presentations highlighted a number of upcoming F4E contracts to be placed in the areas of instrumentation, electronics, machinery, and several R&D activities which require agile and flexible companies. Individual business-to-business meetings were held for especially interested companies in order to discuss specific topics with F4E experts and in the days directly after the Big Science Secretariat Network meeting, F4E experts made a number of on-site visits to relevant companies within the Copenhagen area in order to better understand the technical expertise available within Danish industry.

F4E and ITER IO representatives were on hand to provide an overview of ITER technical tasks and future Calls for tender.

"While ITER was previously not very well known by industry here, we are delighted that Danish companies are so enthusiastic in offering their technical expertise in areas such as diagnostics, cabling and engineering consultancy services. Our F4E network in Denmark has increased by over 300% – a clear sign that Danish industry is very eager to do business with F4E", said Anthony Courtial, F4E Market Intelligence Officer.

Interested SMEs are encouraged to follow the tenders, contracts and arrangements via F4E's Industry and Fusion Laboratories Portal.

Individual business-to-business meetings were held for especially interested companies in order to discuss specific topics with F4E experts. Participants were mainly from the Danish business and research community.

F4E Director, Prof. Henrik Bindslev during his intervention at the Big Science Secretariat Network meeting.

Brand new photos from the ITER construction site

The steel structure of the Assembly Hall building is starting to take shape with the first sections of the massive columns being erected. Once fully constructed, the hall aspires to host one of the most fascinating engineering workshops in the world. This is where the ITER components will be assembled, lifted, rotated and finally transported to their final location in the machine. Its specifications are 60 metres high, 97 metres long and 60 metres wide. The building will rely on 220 steel columns and its total structure will weigh approximately 6,000 tonnes. The first sections of the columns are already in place and measure 12 metres. Due to their impressive size they stand out from a distance on the site. Four more levels will gradually be erected in order to reach the 60 metres off the ground.

Works have also been progressing on the key building of the ITER construction site that will host the machine – the Tokamak complex. Following the completion of the upper basemat, works have been advancing with the pouring of the concrete for the first walls.

Panoramic view of the Assembly Hall building

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