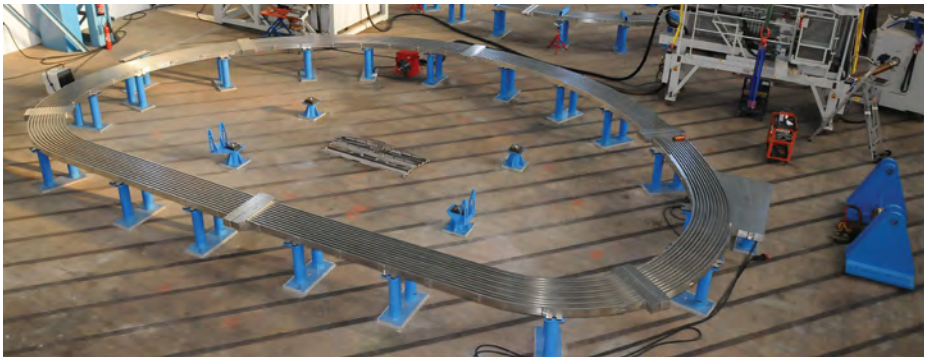
F4E NEWS

FUSION FOR ENERGY QUARTERLY NEWSLETTER

No. 14 - February 2014



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EUROPE MANUFACTURES ITS FIRST CRYOPUMP COMPONENTS FOR ITER

F4E starts the new year with the completion of an important milestone linked to Europe's contribution to ITER: the successful manufacturing of the cryopanels and thermal shields for the Pre-Production Cryopump (PPC).

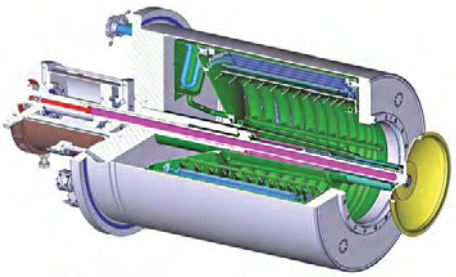
The PPC is the spare cryopump of ITER's eight cryopumps- two are located in the cryostat and six in the torus. The torus cryopumps extract the air out of the machine, capture the speedy hydrogen isotopes and remove the Helium ash. The cryopumps will be constantly operational in the ITER machine and will play a vital role in the production of the Ultra High Vacuum (UHV) inside the torus. In a nutshell, these components will help us attain optimum plasma performance.

After an intense period of research, development and design, F4E was entrusted with the responsibility to manufacture the components. In November 2012, a series of contracts were signed with four companies - based in Germany and in France - as well as with the Karlsruhe Institute of Technology (KIT) for the manufacturing of the PPC. Alain Teissier, Head of F4E's Cryoplant and Fuel Cycle Team, explained that "the successful completion of this contract at SDMS and Ziemex is the fruit of the excellent collaboration between F4E and the ITER International Organization's Vacuum Team led by Robert Pearce, in line with the ethos of a unique ITER team". For Stamos Papastergiou, co-ordinator of the F4E Vacuum Pumping activities, "this cutting edge technological partnership between companies and laboratories, is a clear demonstration of how the ITER project offers opportunities to different innovation actors". Francina Canadell and Jose Andrade, responsible for the monitoring of the contract and the final acceptance activities, highlighted the importance of this big engineering step.

The PPC and the rest of the torus cryopumps operate with Helium at 4.5 K (-268.5oC, 4.5oC above absolute zero). They consist of the cryopanels, which perform the pumping action, and thermal shields that protect the cryopanels from excessive thermal loads. The components were put through complex dimensional controls and UHV leak tests. The design of these components was based on laser welded heat exchangers formed by water pressure (hydroformed), a technique usually employed in chemical and process industries. This design guarantees minimum temperature gradients in the heat exchanger for the production of the UHV conditions inside the torus.

The cryopanels have already been delivered to KIT and the thermal shields to Research Instruments, a German company, which will integrate the manufacturing activities. At KIT, the cryopanels will be sprayed with charcoal, which is necessary for the pumping of Helium and hydrogen isotopes from the torus. Research Instruments, together with Alsyom/Seiv will play a pivotal role in the production of the rest of the cryopump components, their assembly as well as the final cold UHV leak tests of the PPC.

Manufactured hydroformed components of the PPC thermal shields
Copyright SDMS/Ziemex



Isometric view of the ITER PPC

F4E RADIAL PLATE SUPPLIERS START PRODUCTION

CNIM Industrial Systems and SIMIC Spa have started manufacturing the first of the 70 radial plates that will support the superconducting cables of ITER's Toroidal Field coils. The components will essentially confine the hot plasma with the help of powerful magnets. Each company will have to manufacture 35 radial plates that measure 14m by 9m. We visited the facilities of the two companies to find out how works are advancing.

CNIM's building at its Brégaillon industrial site has been renovated, and a brand new 3000m² production hall has been constructed close to the sea, to facilitate the transportation of large items that will be manufactured. The new building is fully air-conditioned to enable equipment to be kept at a constant temperature during its final machining. Inside the building, a 36m by 9m portal machining centre stands out "ready to machine two radial plates simultaneously to a precision of several tens of microns", as Jean-Claude Cercassi, CNIM Commercial Development Manager, confirms. Work is progressing fast at CNIM after the first batches of raw materials were delivered. "The stainless steel segments have been machined and we are about to start with the electron beam welding," Cercassi explains. This is now possible thanks to the installation of a dismountable vacuum chamber.

SIMIC Spa has also built a new industrial building in Porto Marghera to accommodate the production of the radial plate prototype, with brand new facilities and tooling, in order to support the production of the radial plates. A massive portal machine has been installed, which will operate in addition to the existing one that was used for the machining of the prototype, to manufacture the 35 radial plates. Marianna Ginola, SIMIC Spa, explains that "the manufacturing phase of the radial plates is the most exciting part of our contribution to the project. Our new building is ready, new tooling is in place. The production of the radial plates has started! This is a turning point for the project because the design starts taking shape and the impressive milling machine that SIMIC has invested into is put to operation. Our expertise will be fully deployed to deliver these key components".

The first radial plates are scheduled to be completed in July, when they will be transported by sea to La Spezia (Italy) to be fitted inside the ITER Toroidal Field coils at a facility run by ASG Superconductors. After producing a second radial plate five weeks later, CNIM and SIMIC Spa are expected to accelerate production to a rate of one plate every four weeks.

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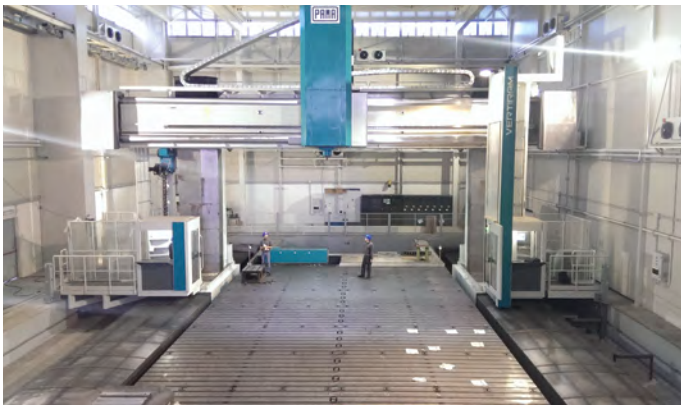

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01 2 pre-machined radial plates ready for electron beam welding operations in the welding shop (copyright Christophe Chabert)
02 Gantry machine to be used for the radial plates final machining operations (SIMIC copyright)
03 Gantry machine to be used for the final machining operations on 2 radial plates at the same time (copyright CNIM/Christophe Chabert)

THE FUSION FOR ENERGY FAMILY GAINS A NEW MEMBER

Fusion for Energy (F4E) welcomed a new addition to the family this week. Following its accession to the European Union on 1 July 2013, Croatia attended this week's meeting of F4E's Governing Board for the first time. Joining the existing 27 EU Member States, Switzerland and the European Commission, Croatia becomes the 30th member of F4E. "We are very pleased that Croatia is being represented at the Governing Board and that Croatian industry and research organisations are already expressing interest in working with F4E" said Mr Stuart Ward, Chair of F4E's Governing Board.

Dr Tonci Tadic (left) is welcomed to F4E's headquarters in Barcelona by Mr Stuart Ward, Chair of the F4E Governing Board (centre) and Professor Henrik Bindslev, F4E's Director (right)

Professor Henrik Bindslev, who has served as F4E's Director since January 2013, informed the Governing Board about progress with the construction of the international ITER fusion energy project, for which Europe is the largest contributor. "We are making steady progress and establishing close partnerships with industries from all corners of Europe to make ITER a reality", said Professor Bindslev. He added that "We started pouring concrete at the beginning of December for the foundations of the building which will house the ITER fusion device – this is another important milestone". "We have also made excellent progress with the fabrication of the superconducting magnets" he added.

Among the most important decisions taken this week, the Governing Board adopted F4E's work programme for 2014 and the associated budget of almost EUR 900 million, the vast majority of which will be used to finance contracts and grants with European industry and research organisations related to the construction of ITER. Mindful of the importance of staying within the overall European budget for ITER construction, the Governing Board approved reductions in areas of F4E's longer-term programme that do not directly impact on its international obligations towards the ITER project.

The Governing Board also approved a number of amendments to the founding statutes of F4E. In addition to the assignment of voting rights to Croatia, the amendments will optimise the responsibilities of the committees that supervise F4E and allow for more durable, long-term partnerships with European fusion research laboratories who have, thanks to the European fusion programme, built up much of the expertise needed to make ITER a success.

Finally, the Governing Board welcomed the progress being made by F4E to reinforce its partnerships with industry and European fusion research laboratories. Professor Bindslev noted that "We have been listening attentively to industry and I am confident that we have made a number of improvements that will ensure that working on ITER with F4E does not only present exciting scientific and technical challenges but also attractive commercial opportunities".

The summary of decisions and output documents from the Governing Board meeting are accessible on www.f4e.europa.eu

Background

The Governing Board is responsible for the supervision of F4E in the implementation of its activities. It makes recommendations and takes decisions on a wide range of matters, such as adopting the financial regulation and its implementing rules, adopting the annual work programmes and budgets, approving the annual accounts and annual activity reports, as well as adopting rules on industrial policy, intellectual property rights and the dissemination of information in agreement with the European Commission. Each member of F4E is represented in the Governing Board by two representatives, one of which has scientific or technical expertise in the areas related to its activities. For further information, consult our webpage.

INSTALLATION OF PROTOTYPE ACCELERATOR OPENS NEW CHAPTER FOR IFMIF

The International Fusion Materials Irradiation Facility (IFMIF) will count on a world leading accelerator to mimic the neutronic conditions of the first wall in future fusion demonstration and commercial power plants. The role of F4E is to coordinate the European activities supported by the voluntary contributions of Belgium, France, Germany, Italy, Spain and Switzerland. F4E's main responsibilities are the integration and follow up of the activities conducted by the European groups working on the prototype accelerator, the test facility and the target facility. The prototype systems have to be designed, manufactured, installed, commissioned and tested in order to validate the newly developed features.

Following months of preparatory work, the installation activities for the Linear Prototype Accelerator (LIPAc) have now started with the set-up of the deuteron injector. This was designed and manufactured at CEA Saclay, one of the voluntary contributions from France to the IFMIF/EVEDA project. The injector, whose target was to generate a 140 mA deuteron beam at 100 keV, passed the acceptance tests and was then shipped to Rokkasho, Japan. In mid-November a joint team of European and Japanese engineers unpacked the injector components and proceeded with the pre-installation activities under the guidance of Raphael Gobin and Patrick Girardot, experts from CEA. The first phase was completed at the end of last year and the installation phase has been initiated under the monitoring of F4E's Broader Fusion Development Department based Garching, Germany. The aim is to complete the assembly of the accelerator components and begin testing by early 2017.

IFMIF is part of the Broader Approach Agreement signed between Europe and Japan. If you would like to read in more detail about the different projects of the Broader Approach visit the F4E website.

Preparing the low energy beam transport for vacuum testing

HIGHLIGHTS FROM THE ITER CONSTRUCTION SITE

The works on the ITER construction site have accelerated. Construction is advancing, new facilities are now open and more resources are being deployed. To help you grasp the pace of change, we have produced a short clip selecting the most significant moments of this year until October 2013.

ITER aerial view - September 2013 ©ITER

We fly over the Tokamak pit and witness the completion of the retaining walls and reinforcement works. Look out for the round area which is now visible on the pit- it's where the ITER machine will be located! The Assembly area is also undergoing through changes. To see its complex geometry and the 1400 tonnes of steel being used as reinforcement we offer you some rare footage.

Then, we go 15 metres deep and walk in the pipes of the critical network that form the precipitation and cooling water release system of ITER. The works at the network are truly impressive. Last but not least, we visit the area where we welcome our contractors in new offices, a recently inaugurated restaurant and infirmary.

You can watch the clip on our website or on our Youtube page

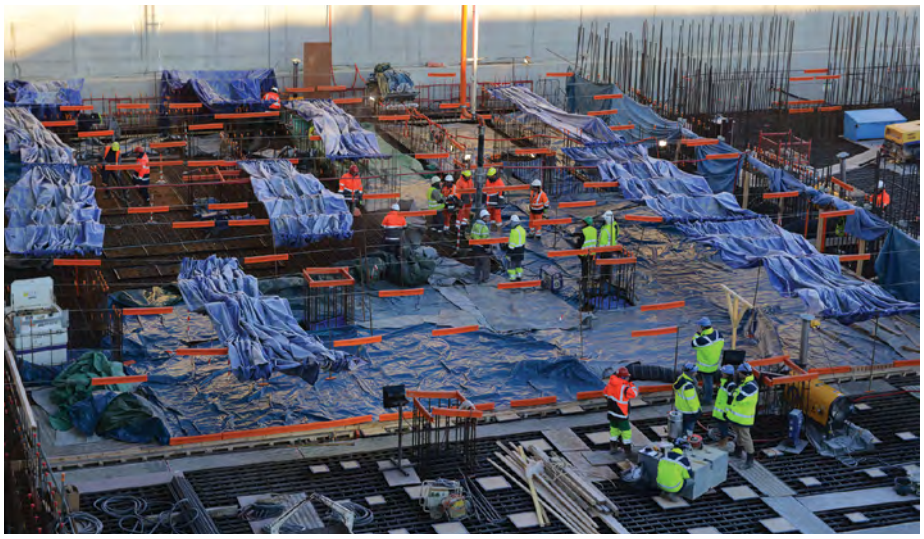
MORE CONCRETE FOR THE ITER TOKAMAK COMPLEX

During 2013, the ITER construction site went through a series of significant changes. As the year was coming to an end, a new chapter was about to open.
It was one of these eagerly anticipated moments in the history of the project: the pouring of the first plot of the concrete for the second concrete slab of the Tokamak complex.
The works for the 1.5 metres thick slab that is going to support the 23,000 tonnes Tokamak machine have officially started.

"This milestone represents for us the achievement of five years of solid work. It represents preparatory works, contract awards, design activities, construction preparation, foundations and site preparation works. We have come a long way. F4E is now ready to build" explained Laurent Schmieder, F4E's Head of Buildings, Constriction and Power Supplies.

The Tokamak complex is made of three buildings: the Diagnostics building, the Tokamak building that will host the machine and the Tritium building. This was the first plot out of the 15 that will be poured during 2014 in order to complete the slab. Twelve hours were needed to pour 820 m^3 of concrete in total starting with the Diagnostics building.

"The coming years will be challenging because of our tight schedule and high technical requirements. Safety and nuclear security remain our two main commitments and priorities", concluded Laurent Schmieder.



Works start for the second concrete slab of the Tokamak complex

MARIA VAN DER HOEVEN- THE PRAGMATIC VISIONARY

Maria van der Hoeven opened MIIFED 2013 with her keynote lecture addressing the global energy landscape.
The Executive Director of the International Energy Agency (IEA) delivered an inspiring talk tackling energy choices, political responsibility and policy foresight. Her capacity to strike a fine balance between what is done and what needs to be done, given the transition that the energy sector is undergoing, did not come as a surprise. Previously, she served as Minister of Science, Education and Culture (2002-2007) and Minister of Economic Affairs (2007-2010) of the Netherlands, during which time she demonstrated leadership on energy policy at the national, regional and global levels. It was during the 2004 EU Dutch Presidency that she demonstrated her full determination to secure an agreement on ITER and the Broader Approach projects.
F4E News met with Maria Van der Hoeven to discuss the politics of energy.

F4E News: You were a key player in keeping all parties together in the negotiations about ITER and the Broader Approach. What is your recollection of this period which was intense in bargaining and trade-offs?

Maria van der Hoeven: Your question takes me back to the period when the Netherlands held the EU Presidency. We had a series of points that had to be addressed at the EU Competitiveness Council, all very important and with severe implications on Europe's capacity to compete with other regions in terms of knowledge, growth and jobs. ITER attracted a lot of attention due to its international profile and repartition of tasks amongst the different parties. It was not easy reuniting all interests, especially when it became clear that Europe was going to host the project. We thought carefully how we could complement fusion research activities and pave the way for the post-ITER era and this is how the Broader Approach emerged. It had a real added value and strengthened the partnership between the ITER parties.

Aris Apollonatos interviews Maria van der Hoeven at MIIFED

F4E News: ITER is the biggest international research collaboration in the field of energy pushing the envelope forward in many ways. Was it a risk to grant your political support to a project that we knew very little about the way it would work?

Maria van der Hoeven: We measure risks by evaluating their redistributive costs and benefits. The potential of fusion energy is still hard to grasp because it is work in progress. In 2004, Europe was standing at the crossroads trying to decide whether fusion could play a role in tomorrow's energy mix. We could not let this opportunity pass by without developing fusion technology and learning more about its potential. We agreed that it was a political priority to invest in fusion and just like any priority it needs to be seen within a certain context. Today, we follow the ITER project with great interest because it will give us a lot of the answers that we are after. The rules of the global energy landscape as we know them are being rewritten. For example: 1.3 billion people lack electricity, 2.6 billion people lack clean cooking facilities, $544 billion went to fossil fuel subsidies in 2012 while we are desperately trying to contain our greenhouse emissions. We need the broadest possible investment in energy R&D in order to be prepared for different energy scenarios. There are two additional parameters that one has to take into consideration: security and abundance of fuel. Take for example fossil fuels, they will not be with us forever and their supply has proven to be a contentious issue. In the Netherlands, we broadened our energy mix not because we were running out of fossil fuels but because it was the right policy decision. We raised public awareness, exposed industry to new markets and fostered the development of new skills.

F4E News: You mention new skills and emerging markets as direct consequences from the energy policies that are being decided. How do you see the collaboration between industry and scientific communities unfolding?

Maria van der Hoeven: The transition from science and technology to products is not an easy task. But this is where Europe needs to be creative and find ways of bringing these communities together to bridge the gap. We need to learn from other big industrial projects and see what worked and what didn't. ITER is a great platform to discover how we can facilitate knowledge transfer and empower business operators to be part of a project, grow because of it and invest future resources. One of industry's key objectives is to make money and this should not be a taboo. The capital raised is not only financial. It is knowledge capital which in turn will generate spin-offs with direct and indirect applications.

F4E News: The beneficiaries of these applications will be citizens. They are at the start of the process financing projects like ITER and at the very end acting as recipients. How can we make sure that they are involved throughout the entire cycle?

Maria van der Hoeven: Engaging with citizens is of fundamental importance. It is our duty to share the knowledge with them, help them make informed decisions, learn from their questions, listen to their concerns and build communication channels in order to receive public acceptance and legitimacy. A project like ITER has to engage with many different publics, especially with young people who want to change the world and declare an active interest in fighting climate change and consuming sustainable energy sources. My advice would be to get out there and reach out to them. Make them part of a project that they can aspire to be associated with and feel strong about financing.

F4E News: Are you optimistic about fusion energy and ITER?

Maria van der Hoeven: Yes, I am. I think it is a project and an energy source that have a tremendous potential to change the world. This said, we ought to be patient in order to witness fusion's transition from research to a commercially viable option. Most of all, we have to be confident and in the same time tenacious to get results. No matter how difficult it may get we must not lose sight of our overarching goal to broaden the global energy mix.

Maria van der Hoeven, Executive Director of the International Energy Agency (IEA), delivers MIIFED keynote lecture

ENERGY DECISION MAKERS MEET AT MIIFED 2013

The Monaco International Fusion Energy Days (MIIFED) celebrated their second anniversary between 2-4 December gathering 350 guests from policy, industry and research at the Grimaldi Forum. The aim of MIIFED is to offer a platform for further cooperation in the fields of energy-related research across a wide web of actors. The Principality of Monaco is also linking this event to the financing of five Post-Doctoral Fellowships awarded every year.

Since the last time, the event has grown in size and ambition. Prestigious keynote speakers at the opening ceremony launched interesting debates which continued in the 20 roundtable sessions. Press activities and virtual ITER visits resuscitated the curiosity of the media about the manufacturing of components, safety and technological spin offs. Delegations from different ITER Domestic Agencies and ITER International Organization took this opportunity to report on the state of the project and their respective procurement packages. The global energy landscape, the policies and the industrial challenges we still face as well as the opportunities ahead, were at the centre of this conference.

F4E's Director, Professor Henrik Bindslev, acted as moderator at the round table discussion exploring the views of industry on ITER and the need to develop new technologies. The business opportunities and the return on invested capital in terms of know-how were also addressed. Two of F4E's Industrial Liaison Officers, Kurt Ebbinghaus and Dan Mistry, joined him sharing their expertise on how to get industry better involved in this international collaboration. Leonardo Biagioni presented the state of play of ongoing and future procurement packages planned by F4E. Alessandro Bonito-Oliva contributed at the round table "Manufacturing the largest magnet in the world" and reported on the Torroidal and Poloidal Field Coils that Europe has to deliver. Victor Saez explained how F4E views the protection of Intellectual Property and how it can benefit those who generate it. Patrick Lorenzetto elaborated the view of F4E in relation to the ITER's tungsten divertor and the collaboration with the WEST project.

Apart from specific contributions to round tables, F4E was also present by means of an exhibition stand where new publications like the 2012 Annual Report, the Broader Approach brochure and the leaflet on the recently adopted industrial policy were unveiled. Audiovisual material reporting on the construction progress, the ITER convoy exercise and manufacturing was also projected in order to help visitors grasp the progress on all fronts. MIIFED was also an opportunity to take the pulse of our stakeholders' engagement. Aris Apollonatos, interviewed 12 representatives from industry, laboratories and SMEs to hear their views on the direct benefits from their involvement to ITER. The new clips will be released next year.

The topics addressed at MIIFED are high on the agenda and will remain relevant in the near future. Energy, environment and the transition from a fossil fuel economy to a more sustainable energy mix will require a lot more planning, investment and a great deal of mutual understanding, which is developed in conferences like MIIFED where policy makers interact with technical experts and identify tomorrow's energy roadmap.

Professor Henrik Bindslev, F4E Director, moderates the round table on "New technologies for a new industry"

DENMARK'S COMPANIES GET READY FOR ITER

ITER will be delivered through the collaboration of small and big companies putting together their resources, expertise and skills. A bit like a puzzle where the different pieces have to be connected in order to see the big picture. Every single piece matters no matter how big or small it is. Søren Bang Korsholm, Denmark's ITER Industry Liaison Officer, has been adamant on the fact that "fusion is full of economic opportunities. All you need to do is scratch beneath the surface, get companies interested and bring them together". And this is exactly what he did late last year with the help of the Danish Big Science Secretariat by organising a one day event in order to put in touch Danish suppliers with prime contractors from ITER and other Big Science projects like CERN, ESA, ESO, etc.

"At first, small companies feel intimidated because of the scale and complexity of the project. But once you start explaining the different angles they start getting more confident. They realise that they can make a contribution, learn through international collaborations and grow". 30 Danish companies responded to this invitation and heard from Astrium Space Transportation (France/Germany), Walter Tosto (Italy) and CSL (BE) about their involvement in big scientific projects. The participants had the opportunity to hear about business opportunities in the areas of robotics, electronics, magnets, mechanical engineering and high precision machining. 55 bilateral business meetings followed, giving the opportunity to existing and potential contractors to explore future collaborations and pursue subcontracting opportunities. The event was a success because companies received feedback on the spot from those already involved in the projects and got to understand better the return they would receive in terms of growth and new markets.

For more information about the event, contact Juliette Forneris at jfor@dti.dk

F4E PRESENTS BUSINESS OPPORTUNITIES TO CROATIAN AND MALTESE INDUSTRY

With Croatia as the latest addition to the EU family of Member States, F4E was eager to create a first link with Croatian industry. With this objective in mind, an F4E Information Day was organised in Zagreb in collaboration with F4E and the Croatian Governing Board Member and Industrial Liaison Officer, Tonci Tadic, in order to present the ITER project and F4E as an organisation as well as upcoming business opportunities and how to submit offers to F4E Calls for Tender. In addition, key emphasis was made on the F4E Industrial Policy. A Question and Answer session as well as face-to-face meetings were also organised in order to gather further details about the current technical state of the art in the Croatian industry and to deal with specific queries. A total of some 50 companies attended the event.

A similar Information Day was organised in Valletta, Malta, where some 30 representatives from industry attended.

CUTTING-EDGE ENOUGH FOR EUROPE'S INNOVATION PRIZE IN FUSION?

Fusion research stimulates creativity and innovation by bringing together laboratories, industry, and SMEs. Their collaboration challenges our current technological limits and helps them develop creative solutions. This joint effort paves the way for new technologies with a direct application.

Innovation is one of the core values for the European Union's Horizon 2020 programme. Within this spirit, the European Commission's Euratom programme has launched a prize to reward excellence in innovation and reward our best researchers and industries involved in fusion.
There are no specific categories for this prize. Participants are free to submit any physics or technology innovation belonging to the European fusion research programme. The candidate innovation market potential should also be demonstrated.
An independent jury appointed by the European Commission will evaluate the proposals and rank the first, second and third placed winners who will receive 15,000, 10,000 and 5,000 EUR respectively. The winners will be announced at the SOFT conference in September 2014.

For more detailed information on the general conditions, eligibility, exclusion and award criteria visit the European Commission website.

SAFETY IS A TOP PRIORITY FOR ITER

ITER is the most ambitious international collaboration in the field of energy. The seven parties participating in the project are determined to demonstrate the viability of fusion energy in compliance with demanding nuclear safety regulation.

This strong commitment has brought together more than 100 specialists between 29-30 January, from F4E and ITER International Organization, to discuss the current state of play, draw lessons from previous projects and highlight good practice that will be of great value to ITER. The event was structured along plenary and thematic sessions, giving the opportunity to different teams to discuss the latest French and International nuclear regulation applying to the manufacturing of ITER components.

Carlos Alejaldre, ITER IO Deputy Director General and Director of the Department for Safety, Quality and Security (SQS), and Joelle Elbez-Uzan, ITER IO Head of the Nuclear Safety, Licensing and Environmental Protection Division, commented on the importance of events like this which unite all actors around a theme which is of pivotal importance.
Jean-Marc Filhol, F4E Head of ITER Department, explained that it is imperative to instil a rigorous nuclear safety culture and encouraged all participants to learn from the valuable observations made by the French Safety Authority (ASN), linked to the inspections on the ITER construction site and the manufacturing facilities.

Experts during the plenary session of the Nuclear Safety meeting

From left to right: Carlos Alejaldre , ITER IO Deputy Director General and Director of the Department for Safety, Quality and Security, Jean-Marc Filhol, F4E Head of ITER Department, Paul Wouters, F4E Nuclear Safety Officer.

Fusion for Energy
The European Joint Undertaking for ITER and Development of Fusion Energy

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