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newsletter

EUROPEAN FUSION DEVELOPEMENT AGREEMENT

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Contents

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News

Competitiveness Council of Ministers

At its session of 24th September 2004 in Brussels (Belgium), the Competitiveness Council of Ministers had an exchange of views on the line to take in the international negotiations on ITER, on the basis of information from the European Commission. The Commission was encouraged to pursue actively these negotiations with a view to enabling the Council, to reach agreement on the main elements of the future international agreement on ITER. The Council reaffirmed its strong support to the current efforts undertaken by the Commission to find a solution in the negotiations with the international partners for the still unsolved question of the host site of ITER, and to the European candidate, Cadarache, bearing in mind its advantageous position both from the scientific and environmental point of view. Because of the global importance of fusion research, there is a consensus that international cooperation should be on the broadest possible basis and involve as many partners as possible. It would be advantageous to pursue a broader approach and the fast track method involving an accompanying programme of research and technological development such as materials research, in addition to ITER, as the means for advancing fusion research. With a view to enabling the rapid commencement of the ITER project on the European site in line with the European Council conclusions of March 2004, the Council has invited the Commission to elaborate a clear roadmap in respect of the final phase of the international negotiations. It is necessary to take every initiative, also counting on Member States' support, to explain Europe's proposal and its position to its partners and make a strong effort to preserve the global character of the project. As the share of the cost of ITER construction to the Community budget should not exceed the present estimate, the Commission should examine the respective financial implications of the possible scenarios for ITER and related activities. The necessary input has to be provided in due time to enable the Council to arrive at an appropriate decision at the next Council of Ministers, which will take place on 25th to 26th November this year.

The French Research Minister visits Cadarache

On September 30, Mr. François d'Aubert, the French Minister for Research, visited Cadarache and recalled the strong EU Competitiveness Council support to the proposal to host ITER in Cadarache.

He expressed high optimism on the final choice of Cadarache as the ITER site while stressing the importance of a wide international collaboration.

The French Research Minister F. d'Aubert, together with J.Jaquinot, in Cadarache

Personality

Janez Potocnik nominated as Member-designate of the European Commission 2004 - 2009

"As a Commissioner I would ensure that we make the 2004 enlargement a success story and that an EU of 25 member states will continue to prosper and develop. One of the main challenges for the next Commission is to increase knowledge and combat ignorance of the EU and its vocation. I would consider it my mandate to bring the EU closer to the citizens and I would see as my particular responsibility to build bridges between the Commission work in Brussels and the people of Slovenia. I want to work for a Commission that is close to the citizens and their needs", said Dr. Janez Potocnik after his nomination as Member-designate of the European Commission 2004 - 2009 on July 28. On 1st November he will succeed Philippe Busquin as Commissioner for science and research.

Dr. Potocnik was born in 1958 and graduated with honours from the Faculty of Economics at the University of Ljubljana. He continued his studies at the same University where he did his Master's degree in 1989 and a Ph.D. degree in 1993. For several years (1989-1993), he worked as a researcher at the Institute of Economic Research in Ljubljana. In July 1994, he was appointed Director of the Institute of Macroeconomic Analysis and Development of the Republic of Slovenia, then a part of the Ministry of Economic Relations and Development. In April 1998, the Government of the Republic of Slovenia appointed Dr. Potocnik Head of Negotiating Team for Accession of the Republic of Slovenia to the European Union. From June 2000 to December 2000, he was also the acting director of Government Office for European Affairs. In June 2001, he was appointed a Minister Councillor at the Office of the Prime Minister.

Since 1991 Dr. Potocnik has also been an assistant professor at the Faculty of Law at the University of Ljubljana, where he lectures on statistics. On 24 January 2002, the Government of the Republic of Slovenia appointed Dr. Potocnik the Minister without portfolio responsible for European Affairs. After resigning from this post, in April 2004 he became member of the European Commission.

JET

Call for Participation in the 2005 JET Campaigns

The JET Experimental Campaigns of 2005 are scheduled to begin next July following a long shutdown and restart and preparations are now well underway. In June 2004, the EFDA Steering Committee approved the 2005 JET Workprogramme (Revision 1) and appointed the leaders (http://users.jet.efda.org/pages/task-forces.html) for the nine Task Forces.

On the 17th September 2005 the first Call for proposals to participate was sent to the Associations (http://users.jet.efda.org/pages/prog). The purpose of this call is to invite Associations, New Member States and Candidate Countries to submit proposals for experiments in line with the 2005 JET Workprogramme. The programme is focused strongly on the preparation of the ITER detailed design and ITER exploitation. Proposals should involve personnel with experience as Session Leader and other key competencies to ensure the highest scientific and technical standard. They should be submitted through an Association before 22nd October 2004 and, following assessment by the Task Force Leaders in collaboration with CSU (Culham), meetings are planned during the week beginning 22nd November 2004 to select proposals and prepare the experimental schedule for Campaigns C15-C17. Based on the outcome of these meetings, a second letter, planned for 6th December 2004, will invite the Associations to make available staff with appropriate competencies and to provide the relevant costings.

JET

Direct observation of fusion alpha particles in JET

The deuterium-tritium (D-T) fusion reaction will be the energy source of a thermonuclear reactor: $^{2}D + {}^{3}T \rightarrow {}^{4}He + 1n$ with 17.6 MeV energy gain released in the form of kinetic energy of the two products. The power for a self-sustained burning plasma will be provided by the slowing down of ^{4}He ions (called alpha particles or alphas) that are produced with an energy of 3.5 MeV. Investigations into the behaviour of these fusion alphas are therefore of crucial importance for burning plasma physics. While the measurement of the 14.1 MeV D-T fusion produced neutrons ^{1}n has been routinely carried out for several years with various neutron detectors, detecting alpha particles has remained a major challenge. The worldwide unique capabilities of JET (confinement of 3.5 MeV alphas and the use of Beryllium first wall) have recently provided a 'natural' solution to this challenge, as explained below. The new technique can be used not only in D-T plasmas, but also in experiments where 110 keV ^{4}He nuclei (injected with helium doped neutral beam injectors in JET) are accelerated to energies of several MeV using Ion Cyclotron Resonance Heating, thus simulating the behaviour of fusion alphas without actually using the D-T reaction. The technique used also enables discrimination of fast alphas from fast deuterium ions, as will be needed for ITER. A simultaneous observation of both fast particles is thus possible.

The JET neutron and gamma detection system (Fig.1) consists of two fan-shaped collimator arrays (cameras), one horizontal (with 10 detector channels) and one vertical (with nine detector channels). Each channel is equipped with three detectors:

- a **NE213*** liquid scintillation detector, for detection of 2.5MeV D-D fusion neutrons
- a plastic scintillation detector for detection of 14MeV D-T fusion neutrons
- a special CsI(Tl) detector for detection of gamma rays

Observation of fusion alphas has become possible by detecting the gamma rays emitted by an excited ^{12}C nucleus, resulting from a nuclear reaction between beryllium and fast alpha particles - the threshold energy for the reaction is 1.7 MeV. The presence of beryllium in JET thus allows to trace fast alphas, such as the 3.5 MeV D-T fusion alphas. In addition a two-dimensional reconstruction of both gamma-ray and neutron emissivity is possible on JET, allowing detailed spatial information on their behaviour. Fast deuterium ions are detected using another nuclear reaction between a ^{12}C nucleus and fast deuterium ions (energy > 0.8 MeV), which emits gamma rays with a different energy.

This new diagnostic method demonstrated its full potential in fusion alpha simulation experiments earlier this year. For the first time ever on a tokamak detailed information was obtained on the trajectories of fast alpha particles, as shown in Fig.1. The figure shows in addition that the alpha particles are well confined in the centre of the JET machine, and is in agreement with simulations. A reconstruction of the location of the fast deuterium ions, measured simultaneously, is shown in Fig. 2.

The density evolution of fast particles as a function of time can also be studied by observing the time evolution of the gamma-ray intensity. This offers the possibility of measuring the confinement of e.g. fast alpha particles in various plasma regimes. A classical slowing down of alpha particles in discharges at high plasma current and monotonic q-profile is observed, confirming predictions. In addition, degraded confinement of the alpha particles is observed in low plasma current discharges and plasmas with a so-called 'Current Hole', an effect for specific JET discharges.

*** NE213 liquid scintillation detector:** Neutron spectrometry is a tool for obtaining important information on the fuel ion composition, velocity distribution and temperature of fusion plasmas. A compact NE213 liquid scintillator was installed and operated at JET during two experimental campaigns (C8-2002 and Trace Tritium Experiment-TTE 2003).

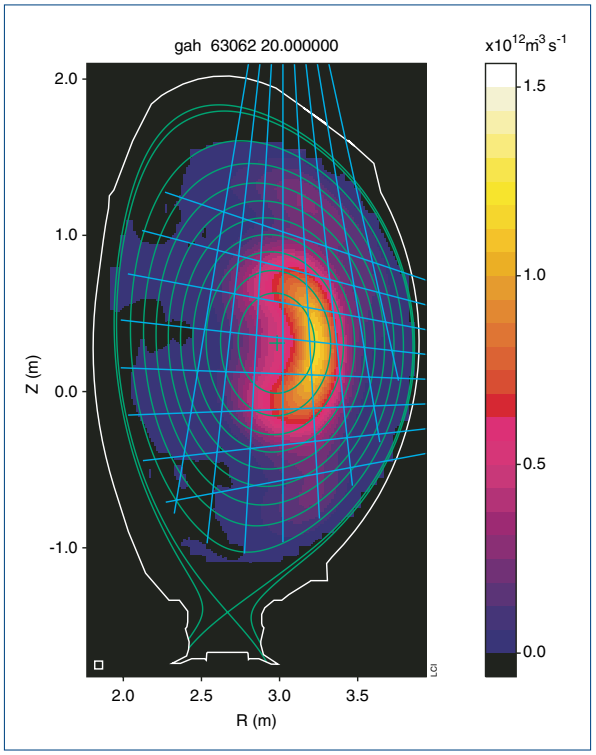


Fig. 1: Schematic of the JET neutron/gamma profile monitor geometry.

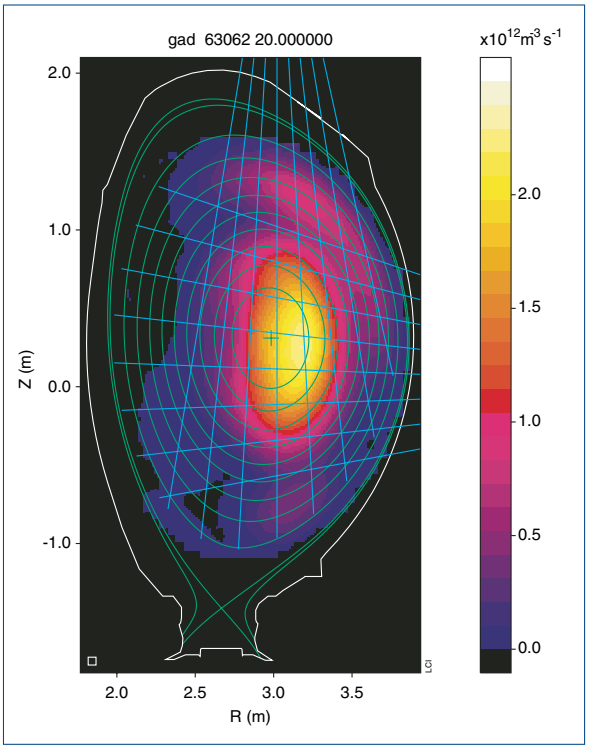


Fig. 2: Two-dimensional reconstruction of gamma-rays emissivity in JET during a fast alpha simulation discharge. The gamma energies are limited to a) fast alpha nuclear reactions on beryllium impurity b) fast deuterium nuclear reactions on carbon impurity. (The reconstruction is constrained to magnetic flux surfaces.)

Associations

Current Composition of the ASDEX Upgrade Programme Committee

K. Behringer (Dept. E4, IPP, DE)
H. Bindslev (Risø, DK) Vice-Chair
H. Bolt (Dept.Mat.Research, IPP, DE)
C. Challis (UKAEA Culham, GB)
A. Fasoli (CRPP Lausanne, CH)
O. Gruber (Project Head, IPP, DE) Chair
S. Günter (Dept. TOK, IPP-, Greifswald, DE)
M. Kaufmann (Dept. E1, IPP, DE)
T. Klinger (Dept. E5, IPP, DE)
K. Lackner (Dept. TOK, IPP, DE)
E. Lazzaro (CNR Milano, IT)
M. Manso (IST Lisbon, PT)
P. Mc Carthy (DCU Cork, IE)
R. Salomaa (TEKES, FI)
HP. Winter (ÖAW, AT)
R. Wolf (TEC, BE/DE/NL)
H. Zohm (Dept. E2, IPP, DE)
S. Zoletnik (HAS, HU)

Increased EU participation in the new ASDEX Upgrade Programme structure

ASDEX Upgrade (AUG) has always had a large deal of collaborations with both European and international partners. Scientists, in particular from other European Associations, analysed data, provided theory and published results. Two years ago the EURATOM-IPP Association in Garching (Germany) changed the formal structure of the ASDEX Upgrade project to allow the involvement of EU Associations in the decision making process, giving them more responsibility for the definition and execution of the programme (see EFDA Newsletter February 2003). At present the ASDEX Upgrade Programme Committee (AUG-PC) has 10 members from the Associations and 8 from IPP.

IPP not only setup a new programme committee, but also improved in many respects the opportunities and working conditions for collaborating scientists. Due to the large number of experiments proposed both by IPP scientists and by external collaborators, a procedure was elaborated for the preparation of the programme. An annual 'Call to Associations for Proposals to Participate' in the next year's programme is sent during Summer. Based on submitted proposals, the Task Force leaders establish a programme which is discussed and further elaborated at the annual 'Programme Seminar'. This programme is then presented to the AUG-PC for approval. All regular meetings important for the preparation and execution of the programme, namely the yearly 'Programme Seminar' at Ringberg Castle, the 'Task Force Meetings' as well as the weekly 'Operations Meeting' on Monday morning are held in English language and are open for external participants. Remote participation in these meetings is now routinely possible via steadily improved video conferencing connections. Especially the weekly 'Operations Meeting' is broadcast on the Internet during campaigns. At this meeting the first analysis of experimental results of the previous week are presented. In addition, the programme for the coming experimental days is chosen from the pool of approved programme elements by taking into account the actual technical boundary conditions. With the installation of a reliable and easy to use video conferencing system, IPP gives all collaborators the opportunity to follow and to participate in the scientific work as closely as possible. Finally, the ASDEX Upgrade Intranet and the means for remote data access have been improved to support a convenient and quick start for scientists visiting AUG for the first time.

The increased level of European participation in the ASDEX Upgrade project was demonstrated by the large number of AUG related papers involving non-IPP scientists presented at the 31st EPS Conference on Plasma Physics in London this year. From a total of 33 contributed papers, 19 had external co-authors and 11 were submitted by a first author from a collaborating European Association. Recently, a new Task Force structure for campaigns 2005/2006 was defined by the AUG-PC. The preparation and the execution of the experimental programme of ASDEX Upgrade will be organised under four Task Forces:

I. Improvement of H-mode and integrated scenarios, TFL: V. Mertens, Deputy: J. Stober

II. Pedestal physics including tolerable ELMs, TFL: W. Suttrop

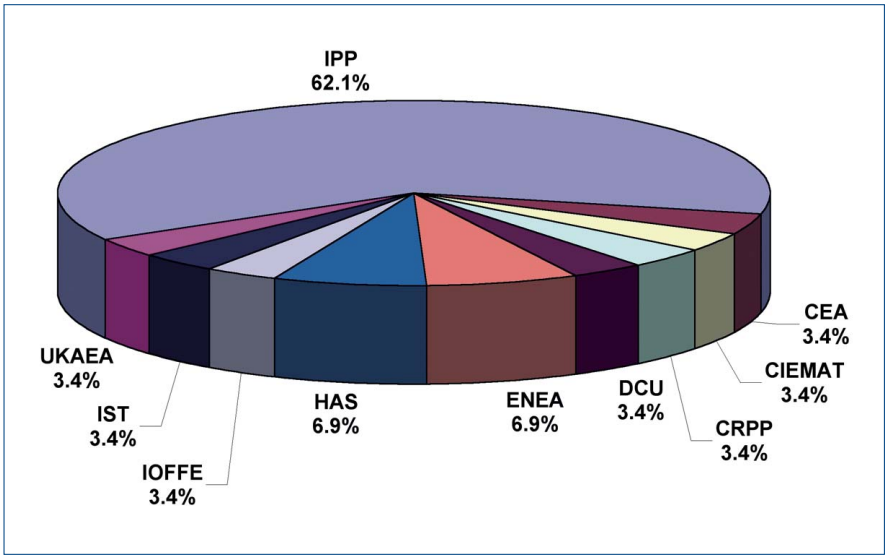
III. SOL & Divertor physics and first wall materials, TFL: A. Herrmann

IV. MHD instabilities and their active control, TFL: P. Martin, ENEA, RFX Padova

The 2003 ASDEX Upgrade Programme Seminar took place at Ringberg Castle (Germany).

The strong European participation in the scientific exploitation of ASDEX Upgrade is also reflected by the leadership of Task Force IV by P. Martin, a scientist from ENEA RFX Padova, Italy. He is already the second non-IPP scientist who is managing an ASDEX Upgrade Task Force, succeeding D. Borba, IST, Portugal.

Besides participation in campaigns, new hardware for diagnostics has been installed on ASDEX Upgrade by several of our European partners. This type of participation opens up exciting new possibilities of joint research. In the long run, ASDEX Upgrade hopes that with such contributions from European Associations larger hardware upgrades e.g. the installation of a new current drive system, can be realised as a joint endeavor. With such external support ASDEX Upgrade will become to an even greater extent an important and valuable tool with true European spirit, in the EU part of the ITER Accompanying Programme.



Breakdown of ASDEX Upgrade related contributions to the 31st EPS Conference on Plasma Physics (London, 2004) by the affiliation of the first author.

Conferences

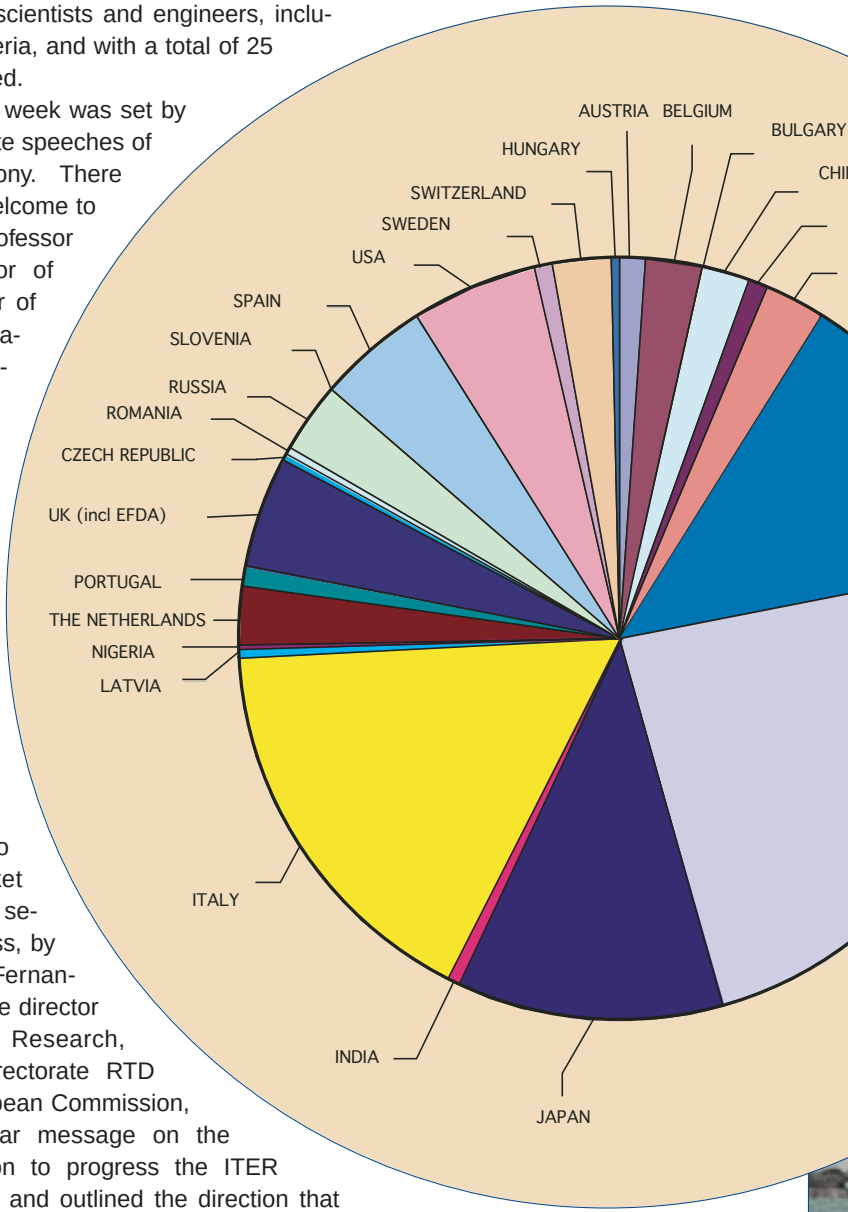
Date / Location	Event / Website
25 - 29 October 2004, Nice, France	12th International Congress on Plasma Physics (ICPP) http://www-fusion-magnetique.cea.fr/icpp2004
1 - 6 November 2004, Vilamoura, Portugal	20th IAEA Fusion Energy Conference http://www.iaea.org http://www.cfn.ist.utl.pt/
22 - 27 May 2005, Tokyo, Japan	7th International Symposium on Fusion Nuclear Technology (ISFNT-7) http://isfnt.naka.jaeri.go.jp/default.htm
27 June - 1 July 2005, Tarragona, Spain	32nd EPS Conference on Plasma Physics http://eps2005.ciemat.es/
26 - 29 September 2005, Knoxville, Tennessee, USA	21st IEEE/NPSS Symposium on Fusion Engineering (SOFE)
4 - 9 December 2005, Santa Barbara, California, USA.	12th International Conference on Fusion Reactor Materials (ICFRM-12) http://icfrm-12.pnl.gov/index.stm

Events

The objective of the **Symposium on Fusion Technology** (SOFT) is to exchange information on design, construction and operation of fusion experiments and on the technology for present fusion machines, the next step and power plants. It includes oral and poster presentations as well as an industrial and R & D exhibition.

SOFT 2004 - the Fusion Community meets in Venice

In September the biennial 23rd Symposium on Fusion Technology (SOFT-23) took place in Venice under the capable management of Association Euratom-ENEA. As the Fusion community has come to realise, this conference is now the premier conference on fusion technology. This year, this was demonstrated by an attendance of over 570 scientists and engineers, including three from Nigeria, and with a total of 25 countries represented.



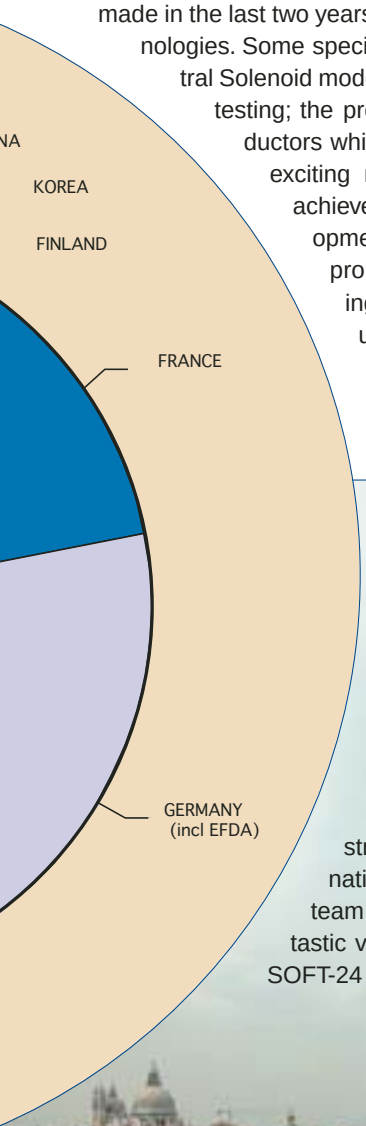
The tone for the week was set by the first three keynote speeches of the opening ceremony. There was a very warm welcome to Venice given by Professor Paolo Costa, Mayor of Venice and Member of the European Parliament. He communicated the local conviction that clean and safe energy sources for future generations must be developed. He also gave his personnel encouragement to the fusion community in their efforts to bring the fusion energy option to the market place. The second address, by Mr Pablo Fernandez Ruiz, the director of Energy Research, General Directorate RTD of the European Commission, gave a clear message on the determination to progress the ITER negotiations and outlined the direction that the Commission would be taking for the future of Research. The participants were informed that negotiations on ITER are being vigorously pursued in order to break the current siting deadlock. From the top political levels, the EU wishes to bring the ITER project to Cadarache, France. Discussions have also started on the content of the 7th Framework programme. Energy research should benefit from an increase budget in line with the Lisbon strategy, and the Barcelona objectives. The third presentation was given by Sir Chris Llewellyn Smith, Director of the UKAEA, Culham Laboratories. He gave his ideas on

More Information on the conference and most of the presentations can be found on the website:

http://soft2004.igi.cnr.it/

the fast track approach to realising fusion energy. He emphasised the need to have a more industrial, project oriented approach to the implementation of the fast track in fusion energy research with all the necessary physics and technological developments required for DEMO being pursued in parallel.

The many oral and poster presentations showed the significant progress that has been made in the last two years in both physics understanding and the many different fusion technologies. Some specific examples are the success of the ITER Toroidal Field and Central Solenoid model coil projects and the many lessons learned in manufacturing and testing; the promising results of initial studies into high temperature superconductors which would economically be attractive for future fusion reactors; the exciting new EAST superconducting tokamak in China, which should achieve its first plasmas in 2005; the progress made in the design, development and testing of the proposed heating systems on ITER; the promising results from DIIID on the stabilisation of neoclassical tearing modes with ECR waves; the advances in plasma control and the understanding of plasma wall interaction processes; the confidence gained in the performance of irradiated high heat flux components; advances in remote handling systems are also benefiting from an increasing collaboration between remote handling researchers in fission and fusion research. In terms of the long term technologies there has been consolidation of the database on EUROFER-type steels, good progress in test blanket module designs and tests, as well as progress in the design and development of the IFMIF materials test facility.



For a lot of the participants though, SOFT was not just a chance to present or catch up with the latest research results. Twenty-four satellite meeting were held including; the Committee of Public Information, the Committee on Fusion Industry, four Executive Council meetings of the IEA Implementing Agreements and the Coordinating Committee for Neutral Beams.

All in all, SOFT-23 was a successful, highly motivating and constructive conference supported by outstanding hospitality. The international fusion community would like to thank Prof. Gnesotto and his team of Consorzio RFX for providing a flawless organisation in a fantastic venue, the “Fondazione Cini” on the San Giorgio Maggiore island. SOFT-24 will be held in Warsaw, Poland in 2006.

Events

Delivering Sustainability: The World Energy Congress 2004

The World Energy Congress takes place every three years and is the international showcase for discussing all topics concerning energy. Technical, economic, political and social issues can all be found in the long and interesting programme which brings together the expertise available worldwide in the field of energy.

The 19th World Energy Congress and Exhibition took place in Sydney (Australia) on September 5 to 9. Energy experts debated on the three A's, the World Energy Council's goals (Accessibility, Availability, Acceptability), presenting their views on these topics and on how sustainable energy systems can be achieved.

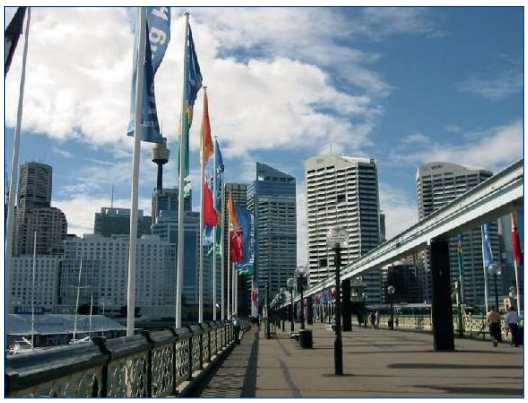


Photo: James Wiseman

Inequalities in energy availability and access around the world were highlighted and the need of a reliable electricity supply reinforced. The importance of pursuing research in all areas was reiterated, as well as the necessity not to demonise nor idealise any energy source, since the world will need a diversity of energy sources especially in the developing countries. It was concluded that an important amount of energy reserves still remains, but the immediate challenge will be to use them in an environmentally friendly way.

It was the first time that, officially, fusion was mentioned as an item among the topics included in the session “Long term technologies for energy supply”.

This year, two papers were presented by the European Fusion community at the congress. One was by EFDA on the ITER project and the second one by the EURATOM-IPP Association on fusion in the context of energy studies.

EFDA was also present at the annexed exhibition thanks to the support provided by the EURATOM Associations FOM, UKAEA and FZK. In the 18 m^2 EFDA stand, fusion was presented with the help of posters, images and films and with a special emphasis on the ITER project. Brochures and the new CD-Rom on fusion were distributed to the visitors as well as a booklet containing the EFDA paper and the posters displayed at the stand.

The EFDA exhibition was very well received by the more than 400 visitors who came to learn more about fusion and the road map of the European programme towards the fusion energy target. Among the visitors we could find scientists working in the energy sector, journalists, top managers of energy companies (utilities and industries) and politicians.

What is WEC?

The World Energy Council (WEC) is the foremost global multienergy organisation in the world today. WEC has Member Committees in over 90 countries, including most of the largest energy-producing and energy consuming countries. The 80-year-old organisation covers all types of energy, including coal, oil, natural gas, nuclear, hydro, and renewables, and is UN-accredited, non-governmental, non-commercial and non-aligned.

For **more information** on WEC:
http://www.worldenergy.org/wec-geis/

You can read the official conclusions of the 19th World Energy Congress:

http://www.worldenergy.org/wec-geis/news_events/19th_congress/19th_congress.asp

For more information see our EFDA website:

http://www.efda.org

and additionally

http://www.jet.efda.org
http://www.iter.org

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