# Fusion Power Report

Complete Coverage Of Worldwide Fusion Developments

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## SLANTS & TRENDS

**OMEGA Laser Sets Record:** During Fiscal Year 2004, a total of 1558 target shots were taken on the OMEGA laser facility at the University of Rochester Laboratory for Laser Energetics.

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**NIF Ignition Prospects Enhanced:** A new point design has been adopted for ignition target capsules for the National Ignition Facility (NIF) at the Lawrence Livermore National Laboratory (LLNL).

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**ITER Update:** As the year 2004 draws near to a close, high level meetings between officials of the European Union (EU) and Japan remain at an impasse on a formula for breaking the deadlock over ITER siting.

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**House-Senate Conferees Agree on FY2005 Funding:** House and Senate Conferees agreed on fusion funding for FY2005, which began on October 1, 2004. The House and Senate are expected to pass the bill and send it to the President.

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## OMEGA Laser Sets Record

During Fiscal Year 2004, a total of 1558 target shots were taken on the OMEGA laser facility at the University of Rochester Laboratory for Laser Energetics. This is a record high number of target shots for OMEGA in any year and the highest number of target shots ever taken in a single year by a comparable-sized inertial confinement fusion facility.

Over 50% of the shots were conducted for external users, including the Lawrence Livermore National Laboratory, the Los Alamos Scientific Laboratory, the Sandia National Laboratories, the Naval Research Laboratory, and other users.

The 60-beam OMEGA laser facility has produced over 10,000 target shots during a decade of operations beginning in FY 1995.

For further information contact:
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## NIF Ignition Prospects Enhanced

A new point design has been adopted for ignition target capsules for the National Ignition Facility (NIF) at the Lawrence Livermore National Laboratory (LLNL). Computer simulations show significantly greater resistance to hydrodynamic instabilities in the new designs, allowing almost an order of magnitude relaxation on specifications for surface roughness over previous designs. Furthermore, the enhanced hydrodynamic stability opens the possibility of in-situ filling of the capsule with the DT fusion fuel using a small tube, a significant simplification in the capsule filling and fielding process. Details of the advance are posted at http://www.llnl.gov/nif/icf/icfpubs/highlights/04_may_jun.pdf

## DOE Responds to Inertial Report

On March 29, 2004 a panel of the Department of Energy's Fusion Energy Sciences Advisory Committee (FESAC), charged with reviewing its Inertial Fusion Energy (IFE) program, urged the Department to carry out "a coordinated program with some level of research on all the key components (targets, drivers and chambers), always keeping the end product and its explicit requirements in mind." The wording was intended to call attention to the fact the DOE had recently announced termination of all its efforts on targets and chambers for IFE as part of its plan to end all work on Fusion Technology.

The panel noted that there are three main approaches to IFE, based on heavy ion accelerators, lasers, and z-pinches. They said, "The recent progress related to these approaches is substantial and the quality of science and engineering research is excellent." They said, "All approaches are currently on track for developing the science and technology to properly evaluate their potential for IFE. However, the planned termination of technology programs in support of the heavy ion approach is not consistent with their importance to heavy ion IFE, and the Panel is concerned about the impact of this action." "In sum," the Panel said, "the IFE Panel is of the unanimous opinion that the IFE program is technically excellent and that it contributes in ways that are noteworthy to the ongoing missions of the DOE. Moreover, the Panel agrees with the IFE community that the most efficient way to achieve the ultimate goal of fusion energy is to carry out a coordinated program with some level of research on all of the key components (targets, drivers, and chambers), always keeping the end product and its explicit requirements in mind." The full FESAC agreed with its panel and so-advised DOE Office of Science Director Raymond Orbach.

In a letter dated October 19, 2004 to FESAC chairman Richard Hazeltine (Univ. of Texas), DOE Office of Science Associate Director for Fusion Energy Sciences (OFES) Dr. N. Anne Davies said "The issue Is broader than Inertial Fusion Energy. It is the degree to which our Fusion Energy Sciences program should become an energy development program. The Administration position on this issue is that now is not the right time for us to invest in energy related R&D for fusion, for both MFE and IFE." In her letter, Davies said "Although we are in substantial agreement with the findings of your report, fiscal constraints will make it difficult to follow through all the recommendations made in the report." Davies said, "I have enclosed a detailed response to your report jointly from OFES and NNSA (National Nuclear Security Administration)." The response is reproduced in full below.

**Response to the FESAC IFE Panel Report**

**Recommendation**: The recent progress related to these approaches is substantial and the quality of the science and engineering research is excellent. All approaches are currently on track for developing the science and technology to properly evaluate their potential for IFE. However, the planned termination of technology programs in support of the Heavy Ion (HI) approach is not consistent with their importance to HI-IFE, and the Panel is concerned about the impact of this action.

**OFES Response**: The issue Is broader than Inertial Fusion Energy. It is the degree to which our Fusion Energy Sciences program should become an energy development program. The Administration position on this issue is that now is not the right time for us to invest in energy related R&D for fusion, for both MFE and IFE.

**Recommendation**: Each of the approaches to IFE may benefit if the technique of Fast Ignition proves effective.

**OFES Response**: We recognize the opportunities provided by Fast Ignition. We have increased funding for research in this area. We have awarded a grant to the University of Rochester to form a Fusion Science Center that will help to address the fundamental scientific issues related to Fast Ignition. A competitive solicitation for research on the science of Fast Ignition and high energy density physics (HEDP) is under consideration, if additional resources become available.

**Recommendation**: The single near-term issue that appears to be most critical for Heavy Ion Fusion is the physics limits to the maximum phase-space density of space-charge-dominated HI beams and the resulting implications for HEDP and fusion ignition.

**OFES Response**: We agree. We are directing the Virtual National Laboratory for Heavy Ion Fusion to make this the central scientific issue in its research plan for the next five years.

**Recommendation**: The single near-term issue that appears to be most critical for the High Average Power Laser (HAPL) program is the durability of KrF lasers, and efficiency and beam smoothing in the Diode Pumped Solid State Lasers (DPSSL) that will scale to the high-energy requirements for IFE.

**NNSA Response**: We agree. For KrF lasers, durability is being addressed in a systematic way, and steady progress is being achieved using advanced materials and foil cooling techniques yielding advances of several orders of magnitude since the IFE panel report (7000 shots) have been achieved. For DPSSLs, beam smoothing and efficiency are issues that require more effort once the basic Mercury architecture has been demonstrated.

**Recommendation**: The single near-term issue that appears to be most critical for Z-Pinch IFE is the physics limitations on power flow in a recyclable transmission line, including the coupling to the pulsed-power driver and the integral target assembly.

**NNSA Response**: These challenges are a major part of the planned effort.

**Recommendation**: The single near-term issue that appears to be most critical for Fast Ignition is the physics of fuel compression to a uniform-density sphere and of energy transport by relativistic electrons to that high density fuel to achieve ignition.

**OFES** Response: We agree. Preliminary investigations of the transport of the relativistic electrons created by petawatt-class lasers in dense matter are being conducted in OFES funded experiments. These investigations will be further complemented by the research that will be conducted at the newly formed Fusion Science Center for Extreme States of Matter and Fast Ignition at the University of Rochester. However, the recommended study of the physics of fuel compression to a uniform-density sphere and of the energy transport by relativistic electrons to that high-density fuel to achieve Ignition will require a substantial expansion of the present level of effort in this area and will require additional resources. It is not clear at this point whether the additional resources will be available in the near term.

**Recommendation**: These issues, along with many other important basic and applied science issues that form the basis of IFE research plans, must be addressed to assess the potential of IFE.

**OFES Response**: We agree with the identification of the issues. However. the Administration's position is that substantial investment in IFE should await the achievement of ignition for an inertially

confined plasma in a controlled manner on NIF or other facilities. For this reason, we are phasing out IFE beginning with FYO5, redirecting the research efforts towards high energy density physics that may in the long term have applications to IFE.

**Recommendation**: The scientific and technical challenges posed by IFE, along with their many connections to HEDP. have attracted many outstanding researchers from academia as well as federal laboratories. Success will depend on sustaining the commitment and involvement of such people in a broad spectrum of scientific disciplines.

**OFES Response**: As noted above, we are redirecting present program elements in IFE towards HEDP and have started work in Fast Ignition, an emerging subfield of HEDP. OFES will pursue some level of effort in HEDP to the extent permitted by the OFES budget as a whole, in meeting the overall priorities and balance in the OFES program.

## ITER Update

As the year 2004 draws near to a close, high level meetings between officials of the European Union (EU) and Japan remain at an impasse on a formula for breaking the deadlock over ITER siting. The other ITER Parties (China, Russia, Republic of Korea and the U. S) have been pressuring the EU and Japan to negotiate an agreement on the site on a bilateral basis and to bring that agreement back to the ministers of the six Parties.

The European Commission has reportedly recommended that the EU take the initiative to proceed with ITER construction in France if a 6-Party agreement cannot be reached by the end of the year. At a meeting of the European Council of Ministers November 25, the Council agreed with the Commission's recommendation but urged the Commission to continue to negotiate with Japan in hopes of reaching a 6-Party consensus on the site.

European sources have told Fusion Power Associates that the EU is seriously considering inviting all interested governments to join with them in building ITER in France. One of the potential new partners is India. According to the October 27 issue of the Calcutta newspaper The Telegraph, French foreign minister Michel Barnier raised the issue on his first official visit to India. According to the paper, the question of India joining ITER was a topic on the agenda at a November 8 EU-India summit meeting in the Hague. Brazil and Switzerland have also expressed an interest in joining the ITER venture.

A Reuters news article on November 9 erroneously reported that Japan would concede the site to the EU. This report reportedly upset Japanese officials. News reports quoted Satoru Ohtake, director for fusion energy at the Science and Technology Ministry in Tokyo, as saying "It is regrettable that they are talking about taking unilateral action. There is no change in Japan's policy to seek to host the project." EU sources continue to insist publicly that they will not yield to Japan on the site. They have reportedly offered Japan a "privileged partnership," implying a more significant role in the management structure than other ITER partners, and to help pay for new fusion facilities in Japan. One news source quotes Ohtake as saying "We don't know about their plan to compensate. But if it is the same proposal as what they had before, it is worth no consideration. It is not acceptable that the EU offers compensation to Japan on condition that the EU hosts the project." Other news reports quote French Research Minister Francois D'Aubert as saying "This is not an ultimatum, but we wish to reach a political agreement before the end of the year. If the negotiations do not come to a rapid conclusion, the commission has the possibility to choose a different path."

The various ITER news stories are posted at http://fire.pppl.gov

## House-Senate Conferees Agree on FY2005 Funding

House and Senate Conferees agreed on fusion funding for FY2005, which began on October 1, 2004. The House and Senate are expected to pass the bill and send it to the President.

For the Office of Fusion Energy Sciences (OFES), the conferees agreed to provide $276,110,000 which is $12 million over the President's request. The said "The additional $12 million is to be used to increase utilization of existing large and small experiments; further work in inertial fusion technology; take advantage of opportunities in High Energy Density Physics, including work on fast ignition, and large scale scientific computing; and provide for cost-effective construction and devel-

opment of the National Compact Stellarator Experiment." They also said, "The conference notes the delay in site selection for the International Thermonuclear Experimental Reactor (ITER) and directs the Department to reduce its planned expenditures on ITER in fiscal year 2005 in consideration of this delay."

For inertial confinement fusion (ICF) in the DOE's National Nuclear Security Administration's account, the conferees agreed to provide $541,034,000. Within the total, they said, "An additional $46 million is provided to support expanded research on non-NIF ICF research including petawatt and high-energy petawatt laser development." They also said, "The conference recommendation includes an additional $6 million for university grants and other support. Of this amount, $3 million is provided for continued development of the petawatt laser at the University of Texas at Austin; $1 million is provided for an optical parametric chirped pulse amplifier upgrade and associated operations of the short pulse laser at the University of Nevada, Reno; $1 million is provided to the University of Nevada, Reno to continue its collaboration with Sandia National Laboratories on highly diagnosed studies of exploding wire arrays and implosion dynamics; and $1 million is provided for research using the Z-Beamlet laser at Sandia National Laboratories under the Z-Petawatt Consortium...."

They also said, "The conferees also include $25 million to continue development of high average power lasers and supporting science and technology, the budget request for the Naval Research Laboratory, and $73,469,000 for the University of Rochester, an increase of $28 million over the budget request." They also said, "The conference recommendation includes $9 million to initiate double-shift operations and assessments and initial development and testing of Z-pinch inertial fusion energy. The conference recommendation includes $1 million to the University of Nevada - Reno for magnetized plasma/laser interaction studies at the Nevada Terawatt Facility, using the Zebra pulse power machine and the Leopard short pulse laser system.

The complete text of the fusion sections of the conference report at posted at http://fire.pppl.gov

## New Stellarator Construction Contracts Awarded

The U.S. Department of Energy's (USDOE) Princeton Plasma Physics Laboratory (PPPL) has awarded two subcontracts for the fabrication of major components for the National Compact Stellarator Experiment (NCSX), now under construction at the Laboratory. NCSX will explore the physics of an innovative concept for fusion energy production and will advance the understanding of the related basic science. PPPL is building the new experiment in partnership with the USDOE's Oak Ridge National Laboratory in Tennessee.

A team led by Energy Industries of Ohio, Inc., of Independence, Ohio, has been selected to manufacture the winding forms upon which unique, modular electromagnetic coils will be mounted. Team members include the C.A. Lawton Company, Pattern Division, of DePerre, Wis.; MetalTek International, Carondelet Division, of Pevely, Mo.; and Major Tool and Machine, Inc., of Indianapolis, Ind. In addition to being part of the winding form team, Major Tool and Machine was awarded a subcontract to manufacture the NCSX vacuum chamber. These components will form the heart of NCSX, which will use a magnetic field to confine a hot ionized gas (plasma) fuel. The modular electromagnets will help shape the magnetic field confining the NCSX plasma within the vacuum chamber.

"These are the most challenging and critical components of NCSX, and we are delighted to award these contracts to such superbly qualified industrial subcontractors," said PPPL Director Robert J. Goldston. The key innovative feature of NCSX is its complex shape, designed through advanced computer simulations, that is predicted to be able to support a high-efficiency, fully steady-state fusion system. The complex shape makes construction of its components especially challenging.

Energy Industries' contract is valued at approximately $8 million and Major Tool's at approximately $4.5 million. Funded entirely by the USDOE's Office of Science, the construction of NCSX will cost an estimated $86.3 million. It is scheduled to begin operation in 2008.

NCSX's modular coils are among the most complex, innovative electromagnets ever designed. The 18 winding forms will consist of non-magnetic

stainless steel castings with the winding surfaces machined to a tolerance of plus or minus 0.020 inch. The largest will be 110 inches tall. Each will weigh approximately 6,000 pounds. The winding forms will provide the backbone of the modular coil system and will be strong enough to support electromagnetic loads in the range of 7,000 pounds per inch. Energy Industries will manufacture six identical sets, each comprised of three types of intricately shaped forms. Delivery of the first winding form is expected in May, 2005. PPPL engineers will then wind layers of insulated copper conductor around the forms to create the modular coils.

## Nat Fisch Wins Lawrence Award

Nathaniel Fisch, a Princeton University professor and a scientist at the Princeton Plasma Physics Laboratory (PPPL), is among seven winners of the U. S. Department of Energy's 2004 E.O. Lawrence Award. Each winner receives a gold medal, a citation, and $50,000. The award is given in categories for outstanding contributions in the field of atomic energy, broadly defined.

"We are all enriched by the contributions these researchers have made ranging from engines with no moving parts to better ways to see the stars," said Energy Secretary Spencer Abraham. "These awards, and the research for which they are given, show that DOE could easily be called the Department of Science and Energy." The Awards were presented at a ceremony in Washington, D.C., on November 8.

Fisch is receiving the award in the nuclear technology category for his discovery of ways to use plasma waves to produce electric current. These wave-induced currents can enable tokamak fusion reactors to operate continuously, which is necessary for an economical and practical fusion reactor, the Department said.

Fisch specializes in theoretical plasma physics with applications to controlled nuclear fusion, plasma devices, lasers, and astrophysics. At Princeton University, Fisch is Professor of Astrophysical Sciences and Director of the Program in Plasma Physics. He also is an Associated Faculty member in the Department of Mechanical and Aerospace Engineering. At PPPL, he is Associate Director for Academic Affairs and Head of the Laboratory's Hall Thruster Experiment.

Pointing to the continuing impact of Fisch's ideas, PPPL Director Rob Goldston said, "Professor Fisch's analyses of techniques to use radio waves to drive electrical currents in plasmas are as elegant and insightful as they are practical. His theoretical work, and close collaboration with the experimental team on the Princeton Large Torus, opened the way for a wide range of experiments and further analyses, and led to a substantial field of research on current-drive in toroidal plasmas. Indeed, sustainment of currents using radio waves may prove to be an essential ingredient in the steady-state operation of fusion power systems." The Princeton Large Torus was an experimental fusion device at PPPL.

Scott Tremaine, Chair of Princeton University's Astrophysical Sciences Department, praised Fisch for his influential role in shaping graduate education in plasma physics. "For over a decade, Nat has headed the Program in Plasma Physics at Princeton University, which is widely recognized as one of the world's premier graduate programs in plasma physics. Under Nat's guidance, Princeton has trained the generation of extremely talented young researchers who may transform the dream of controlled fusion energy to reality. Nat is committed to the concept that both universities and national laboratories benefit from close cooperation in research and education in plasma physics," said Tremaine.

Fisch studied electrical engineering and computer science at the Massachusetts Institute of Technology, receiving a B.S. in 1972, an M.S. in 1975, and a Ph.D. in 1978. Fisch is a Fellow of the American Physical Society (APS). He received a Guggenheim Fellowship in 1985, the 1992 APS Award for Excellence in Plasma Physics, and a Department of Energy Bronze Medal for Outstanding Mentor 2002. Fisch is the author or co-author of more than 200 research papers and has been granted nine U.S. patents. He is a resident of Princeton Borough. He can be reached at nfisch@pppl.gov

The other winners of this year's Lawrence Award are: Bette Korber, Los Alamos National Laboratory (LANL), Los Alamos, N.M.; Claire Max, University of California, Santa Cruz, and Lawrence Livermore National Laboratory (LLNL), Livermore, Calif.; Fred Mortensen, LANL; Richard J. Saykally, University of California, Berkeley, and Lawrence Berkeley National Laboratory; Ivan Schuller, University of California, San Diego; and, Gregory W. Swift, LANL. Additional information

on the winners and their work is available on the web at www.sc.doe.gov.

The Lawrence Award was established in 1959 to honor the memory of the late Dr. Ernest Orlando Lawrence, who invented the cyclotron (a particle accelerator) and after whom two major Energy Department laboratories in Berkeley and Livermore, Calif., are named. The Secretary of Energy makes the final selection of honorees each year.

## Nominations for Teller Awards

Nominations are requested for the 2005 Edward Teller Medal sponsored by the American Nuclear Society. This medal is given in recognition of pioneering research and leadership in the use of lasers, ion-particle beams or other high intensity drivers to produce unique high-density matter for scientific research and to conduct investigations of inertial fusion.

The Medal and a $1000 cash prize will be awarded to each of two individuals at the Fourth International Conference on Inertial Fusion Sciences and Applications which will be held in Biarritz France in September 2005.

Prior recipients of the medal include: Stefano Atzeni, Italy; Nikolai G. Basov, Russia (deceased); E. Michael Campbell, USA; Robert Dautray, France; Larry R. Foreman, USA (deceased); Steven W. Haan, USA; Heinrich Hora, Australia; Michael H. Key, England; Gennady A. Kirillov, Russia; John D. Lindl, USA; Robert L. McCrory, USA; Juergan Meyer-ter-Vehn, Germany; George H. Miley, USA; Sadao Nakai, Japan; John H. Nuckolls, USA; Mordecai D. Rosen, USA; Dov Shvarts, Israel; Laurance Suter, USA; Hideaki Takabe, Japan; Guillermo Velarde, Spain; Chiyoe Yamanaka, Japan; and George B. Zimmerman, USA.

Anyone in the inertial fusion field can nominate someone for the Award. Nominations should include the nominee's curriculum vitae and letters of recommendation from at least two different researchers in the field. The letters of recommendation should cite the nominee's key achievements relevant to the award and should include other supporting material (e.g. copies of relevant published articles). Please note that all this material must be collected by the nominator and forwarded to the Awards Committee as a complete package. The deadline for nominations for the two awards in 2005 is January 17, 2005. Those previously nominated in 2000 or later can be made re-eligible for the balloting this year if the nominator sends two new letters of recommendation from researchers. Further details are available from the Awards Committee Chair. Please direct nominations to: William J. Hogan, Chair, IFSA Awards Committee Lawrence Livermore National Laboratory P.O. Box 808, L-641Livermore CA 94551Email: hogan5@llnl.gov

## Dedication of LDX

A dedication ceremony was held on October 22nd at MIT for the Levitated Dipole Experiment, or LDX. LDX is expected to be an important new collaborative tool for the advancement of plasma, fusion and space science.

LDX is a first-of-its-kind experiment incorporating three superconducting magnets and will explore the physics of high-temperature plasma confined by magnetic fields that resemble those surrounding magnetized planets like Earth and Jupiter. The goal of the experiment is to study the properties of the confined plasma and to determine whether larger dipole magnets could someday be used to create a source of fusion power, according to the investigators.

LDX construction was completed in August. Details are posted at http://www.psfc.mit.edu/ldx/

LDX is a joint research project of Columbia University and MIT, supported by the U.S. Department of Energy Office of Fusion Energy Sciences. It is also a partnership between plasma scientists and experts in magnet technology headed by Dr. Joseph Minervini

The dedication ceremony took place from 3:00 - 3:30 pm in the Nabisco Laboratory, 190 Albany Street, Cambridge, MA, followed by a reception at 175 Albany Street, Bldg NW17-218 from 3:30 to 5 pm.

Congratulatory messages may be sent to any or all of the following:

Miklos Porkolab: porkolab@psfc.mit.edu
Jay Kesner: kesner@psfc.mit.edu
Mike Mauel: mauel@columbia.edu
Joe Minervini: minervini@psfc.mit.edu

## Workshop on Neutron Production

A workshop on Subcritical Neutron Production was sponsored by the East-West Center of the University of Maryland on October 11-13, 2004. The subject of the workshop was the application of subcritical neutrons to transmutation of actinides. The workshop was attended by members of the fission, accelerator and fusion communities. Papers on the state of development of neutron production by accelerators, fusion devices, and fission reactors were presented. Discussions were held on the potential of these technologies to solve the problems of storage and non-proliferation presented by current and future nuclear power reactors.

The workshop concluded that the technologies, presently available or under development, hold out the exciting possibility of improving the environmental quality and long term energy resources of nuclear power while strengthening proliferation resistance. The workshop participants agreed on the following statements.

The workshop considered a number of technologies to deal with spent nuclear fuels and current actinide inventories. The conclusion was reached that substantial increase in nuclear power production will require that the issue of spent nuclear fuel be resolved.

The Workshop concluded that 14 MeV fusion neutrons can be used to destroy nuclear reactor byproducts, some of which would otherwise have to be stored for geologic periods of time. The production of 14 MeV neutrons is based on existing fusion technologies at different research institutions in several countries around the world. At the present time this technology is used to produce 14 MeV neutrons in JET. More development work will be required, however, to bring fusion technology to the level where it can be used for actinide burning on an industrial scale.

The workshop concluded that the potential of current fusion technology to utilize the actinides for generating energy and destroying long-lived fission products calls for a greater international effort in the area of fusion driven sub-critical systems

The Workshop recommends that a series of steps be carried out by the technical community leading to a proof-of-principle. The workshop strongly recommends that the fusion community work closely with other technical communities to ensure that a wider range of technical solutions is available to solve the spent fuel problem and to utilize the current actinide inventories.

The workshop formed a small group to facilitate follow-up interactions and cooperative work. It was agreed that a follow-on workshop, possibly under the aegis of the IAEA , will be held in April of 2005.

For a list of Workshop participants and further information, contact Walter Sadowski (sadowskiwl@comcast.net).

## Papers Posted

The plenary and oral presentations from the 16th ANS Topical Meeting on the Technology of Fusion Energy, held September 14-16 in Madison, WI, have been posted at

http://fti.neep.wisc.edu/tofeorals

Click on the title to download the presentation in PDF format.

The 20th International Atomic Energy Agency Fusion Energy Conference was held November 1-6 in Portugal. Many of the presentations are now posted on the Fire website (http://fire.pppl.gov).

This conference, held every two years, brings together leading fusion researchers from around the world to summarize progress on fusion energy research. The next conference is scheduled for October 16-22, 2006 in Chengdu, China

## FPA Annual Meeting

Fusion Power Associates held its 25th Year Anniversary Annual Meeting and Symposium, "The Fusion Energy Option," Dec 13 in Gaithersburg, MD. Talks included:

Current Perspectives on Fossil Fuel Reserves
- John Sheffield, JIEE
-

Fusion as a Source for Hydrogen Production
-Ken Schultz, General Atomics

Plans for Early Ignition on NIF
-John Lindl, LLN L

Development Paths for Inertial Fusion Energy
- Mike Campbell, General Atomics

Status of Planning for ITER
- Ned Sauthoff, PPPL

Status and Promise of Compact Stellarator
- Hutch Neilson, PPPL

Status and Promise of Compact Tori and Magnetized Target Fusion
- Glen Wurden, Los Alamos National Laboratory

Fusion Technology R&D Needed Now for Magnetic Fusion Energy
- Neil Morley. UCLA

Status of High Average Power Laser Program
- John Sethian, U. S. Naval Research Laboratory

Status of Z-pinch IFE Program
- Craig Olson, Sandia National Laboratories

Status of Heavy Ion Fusion Program
- Grant Logan, LBNL

Perspectives on Fusion Electric Power Plants: Critical R&D Issues
- Farrokh Najmabadi, UCSD

Fusion Energy Development Strategies
- Dale Meade, PPPL
-

Fusion Energy Sciences Update
- N. Anne Davies, U. S. Dept. of Energy

Inertial Confinement Fusion and the NIF Project Update
- Chris Keane, U. S. Dept. of Energy

## In Memoriam: R. S. Pease

R. S. "Bas" Pease, a pioneer scientist of the world fusion program and long time leader of the British fusion effort, died October 17 in England. He was one of the leaders of the world fusion research effort during the 1950s and illuminated many aspects of the pinch effect, especially the limitations on ohmic heating and current in pinch discharges. He retired from his position as Director of the Culham fusion laboratory in 1987. He was the recipient of Fusion Power Associates Distinguished Career Award in 1989.

He was an Individual Affiliate of Fusion Power Associates since its inception 25 years ago. In a recent note to Fusion Power Associates he wrote "Greetings! Well done to keep the ship afloat and on course; and fusion supporters well-informed."

The world fusion effort has lost one of its legends. Bas was a colorful, "larger than life" figure on the world fusion scene during his decades long career. After his retirement, he was active in the Pugwash Trust, working with a group of eminent scientists encouraging international collaboration for world peace.

The funeral will be for family and close friends only but the family has said that they will be an event to celebrate his life sometime next year. They have asked for any donations in his memory to be made to the British Pugwash Trust, Ground Floor Flat, 63A Great Russell Street, London, WC1B 3BJ, United Kingdom.

Condolences may be sent to the family at The Poplars, West Isley, Newbury, Rb20 7AW United Kingdom.

## In Memoriam: Herman Postma

Herman Postma, former director of the Fusion Energy Division at Oak Ridge National Laboratory (ORNL), died unexpectedly over the weekend during a trip to Hawaii. He joined the laboratory in 1959 and made many contributions to the science and technology of heating and confinement of fusion plasmas in magnetic mirror and other configurations.

In 1974, at the age of 40, he was named director of ORNL, a post he held until his retirement in 1988. A native of Wilmington, North Carolina, he attended Duke and Harvard universities and did three summer terms at ORNL beginning in 1954.

ORNL's current strong ties to the University of Tennessee and relationships with other partner universities are also rooted in Postma's tenure as ORNL director.

# Calendar

Dec 13 Fusion Power Associates Annual Meeting and Symposium, The Fusion Energy Option, Gaithersburg, MD. http://fusionpower.org

Dec 14-15 Public Meeting of USDOE Fusion Energy Sciences Advisory Committee. Gaithersburg, MD. Contact albert.opdenaker@science.doe.gov

Jan 10-14 Multiscale Processes in Fusion Plasmas. UCLA, Los Angeles. http://www.ipan.ucla.edu/programs/fus2005_poster.pdf

Jan 15-20 15th Symposium on Applications of Plasma Processes and 3rd EU-Japan Joint Symposium on Plasma Processing. Podbanske, Slovakia. http://www.fmph.uniba.sk/SAPPXV

Feb 22-26 2nd International Conference on the Frontiers of Plasma Physics and Technology. Goa, India. Contact: tara.desai@mib.infn.it

Mar 2-4 Second IAES Technical Meeting on the Theory of Plasma Instabilities and Transport. Miramere, Trieste, Italy. http:..www.ictp.trieste.it

Mar 7-11 Current Trends in International Fusion Research: A Review. Washington, DC. Contact: Ronald Kirkpatrick (rck@lanl.gov).

May 22-27 7th International Symposium on Fusion Nuclear Technology (ISFNT-7). Tokyo. http://isfnt.naka.jaeri.go.jp/

July 12-15 19th International Conference on Numerical Simulation of Plasmas (ICNSP) and 7th Asia Pacific Plasma Theory Conference (APPTC). Naka, Japan. http://www.tcsc.nifs.ac.jp/icnsp/index.html

July 25-Aug 1. 6th International Workshop on Strong Microwaves in Plasmas. St. Petersburg, Russia. http://www.smp.sci_nnov.ru

Aug 21-26 12th International Conference on Emerging Nuclear Energy Systems (ICENES-2005). Brussels. http://www.sckcen.be/sckcen_en/activities/conf/conferences/icenes2005/index.shtml

Sep 4-9 Fourth International Conference on Inertial Fusion Sciences and Applications. Biarritz, France. http://www.celila.u-bordeaux1.fr/ifsa05/

Sep 26-29 21st IEEE/NPSS Symposium on Fusion Engineering (SOFE2005). Knoxville, Tennessee. http://www.ornl.gov/fed/sofe05

Se[ 26-30 5th International Symposium on Applied Science. Hilo Hawaiian Hotel, Hawaii. Contact: kobayasi@jwri.osaka-u.ac.jp

Oct 24-28 47th APS Division of Plasma Physics. Denver, CO

Dec 4-9 Twelfth International Conference on Fusion Reactor Materials. Santa Barbara, California. http://icfrm-12.pnl.gov