FUSION POWER ASSOCIATES
EXECUTIVE NEWSLETTER

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DAVIES, KEANE CLARIFY FY 2004 ACTIONS AND FY 2005 FUNDING

FUSION ENERGY SCIENCES UPDATE

Anne Davies (Associate Director for Fusion Energy Sciences (OFES) at DOE Office of Science) provided an overview of recent activities, including status of the budget, ITER and various reports and reviews at Fusion Power Associates annual meeting December 13, 2004 in Gaithersburg, MD.

Davies said that the FY 2005 budget for the OFES would be $273.9 million compared to the FY 2005 Presidential budget request of $264.1, reflecting a $12 million add-on by Congress, reduced by a $2.2 million "general reduction and rescission." The $273.9 million would be allocated $155.2 M to Science, $90.1 M to Facility Operations and $28.6 M to Enabling R&D. Planned expenditures for ITER would be reduced by $2.0 M "due to delay in site selection," she said.

With respect to ITER, Davies said, "site selection negotiations continue." "Resolution continues to be largely in the hands of the European Union and Japan," she said. She described the Management Structure for the U. S. ITER Project and Program. Within her Office, Warren Marton is designated as ITER Program Manager, reporting to Mike Roberts. The U. S. ITER Project Office would be located at Princeton, with Ned Sauthoff as Project Manager. The Princeton Plasma Physics Laboratory and the Oak Ridge National Laboratory are jointly responsible for the operation of the U. S. ITER Project Office.

Davies said, "Worldwide tokamak experiments validate ITER performance projections." "The recent IAEA Fusion Energy Conference highlighted the exciting progress in tokamak research made during the past two years." Recent experiments validated the expectation that fusion energy more than 10 times the energy required to produce and heat the plasma would be generated in ITER, she said. Other experiments indicated that high performance would be achieved in ITER at lower current than called for in the baseline scenario. Key IAEA papers are posted at http://fire.pppl.gov

"Discussions are in progress within the community to define a Burning Plasma Program," Davies said. "It involves coordination among a large sector of the OFES programs in experiments, theory and modeling, and technology." Davies described the International Tokamak Physics Activity (ITPA). Ron Stambaugh (General Atomics) was selected as the new Chair of the committee. Korea joined the ITPA at its 5th Coordinating Committee meeting in Shanghai in June 2004.

Davies said that two new Fusion Science Centers will be funded at a total level of about $12 million over 5 years, as a result of competitive peer review in 2004. They are at the University of Maryland (combined with UCLA) and at the University of Rochester. The UM/UCLA Center will focus on Multiscale Plasma Dynamics and the UR Center will focus on Extreme States of Matter and Fast Ignition Physics. Davies also discussed three new multi-institutional computation efforts and a fourth that will be funded in FY 2005.

Davies said the OFES is being reviewed using a process of "Committee of Visitors," modeled on the National Science Foundation approach. Theory and Computation was reviewed in FY 2004, Confinement Innovation, Basic Plasma Science, inertial fusion/high energy density physics and junior faculty program will be reviewed in FY 2005 and tokamak research and enabling technologies will be reviewed in FY 2006.

Several recent reports and studies have emphasized the importance of high energy density physics (HEDP). The OFES is re-orienting its inertial fusion energy program towards the study of HEDP, she said. Davies also mentioned the completion of a recent report on an International Workshop on Advanced Computational Materials Science: Application to Fusion and Generation

IV Fission Reactors held March 31 – April 2, 2004. She said the Workshop concluded that an "aggressive theory and modeling effort could reduce the time and experimental investment required for materials development for fusion." However, she said there was a "clear consensus that an irradiation facility is needed."

Davies summarized some aspects of a forthcoming report from a FESAC panel charged to "identify major science and technology issues to be addressed in research campaigns through 2014." The report was to be submitted to FESAC at a meeting Dec 14-15, 2004 but that meeting was postponed. A new National Academies "Decadal Study of Plasma Science," will begin in January 2005, she said. Steve Cowley (UCLA) will chair the study. It is a follow-up to the 1995 study.

The Office of Management and Budget has established "performance measures" for the U. S. fusion program. For FY 2005 these are:

(1) Conduct experiments on the major fusion facilities leading toward the predictive capability for burning plasma and configuration optimization.
(2) Increase resolution in simulations of plasma phenomena.
(3) Achieve average operation time of the major national fusion facilities of greater than 90 percent of the total planned operation time.
(4) Achieve a cost-weighted mean percent variance from established cost and schedule baselines for major construction, upgrade or equipment procurement projects of less than ten percent.

INERTIAL CONFINEMENT FUSION

Chris Keane (Acting Assistant Deputy Administrator for Inertial Confinement Fusion and the NIF Project, National Nuclear Security Administration (NNSA), Department of Energy) described the current status of the Inertial Confinement Fusion Ignition and High Yield Campaign.

Keane said that the inertial confinement fusion (ICF) campaign strategic goals were:

(1) Achieve ignition in the laboratory and develop it as a scientific tool for stockpile stewardship.
(2) Execute high energy density physics experiments necessary to provide advanced assessment capabilities for stockpile stewardship.
(3) Develop advanced technology capabilities that support the long-term needs of stockpile stewardship.
(4) Maintain robust national program infrastructure and attract scientific talent to the Stockpile Stewardship Program.

The ICF Campaign, he said, is a national effort that includes the Lawrence Livermore National Laboratory (LLNL), the Sandia National Laboratories (SNL), the Los Alamos National Laboratory (LANL), the University of Rochester Laboratory for Laser Energetics (LLE), the U. S. Naval Research Laboratory (NRL), General Atomics, and the Academic Alliances Program.

He said the FY 2005 budget for ICF, enacted by Congress, is $541 million, compared to $492 million requested by the President. The $49 M increase includes $34 M for Inertial Fusion Energy Technology that was not requested. This was composed of $25 M for the High Average Power Laser Program (HAPL) and $9 M for second shift operations on Z and Z Inertial Fusion Energy. Other elements added by Congress included funds for Omega Extended Performance at the University of Rochester and additional funds for high-energy petawatt laser development.

Keane called the first experiments using 4 of the planned 192 beams of the National Ignition Facility (NIF) "a major success." He said that NNSA "has set ignition 2010 as a major goal." A review of the NIF ignition plan by the Defense Science Board Task Force on NIF Activation and Early Use Plan is posted at http://www.acq.osd.mil/dsb/reports

Keane said that the 60-beam Omega laser at the University of Rochester had executed over 1400 shots in FY 2004, a record number. The Omega Extended Performance (EP) project was approved for construction in May 2004. It consists of adding two high-energy petawatt lasers for advanced backlighting and fast ignition experiments. It is on a 5-year construction schedule and has a total estimated cost of $67 million.

Keane said the Nike laser at NRL "is examining issues central to defining the physics requirements for direct drive ICF." At SNL, he said, "the Z refurbishment project (ZR) will enable z-pinch implosions to produce over 2.5 Megajoules and 300 Terawatts of x-rays. It was approved in September 2004 at a total estimated cost of $61.7 million and is on a 4-5 year construction schedule. The Z-Beamlet laser at SNL is being upgraded to provide a high-energy petawatt laser for the Z facility, Keane said. Keane said that High
Energy Density Physics is recognized "as an important emerging scientific field," and the NNSA has expanded that component of the ICF program.

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ITER SITE STILL UNDECIDED
PLASMA SUSTAINED IN LHD FOR 30 MINUTES
FY 2006 U.S. FUSION BUDGET SUBMITTED TO CONGRESS

ITER Update

Parties to the ITER site negotiations remain deadlocked, unable to decide whether to construct the multi-billion-dollar fusion engineering research facility in France or Japan. Negotiations between French and Japanese officials appear stalemated, with the other Parties (China, Korea, Russia and the U. S.) playing an apparent waiting role.

A wave of recent news articles (posted at http://fire.pppl.gov) portray the European Union as determined to proceed with or without concurrence from Japan. Janez Potocnik, European Commissioner for Science and Technology, in a speech March 3 at the JET facility in the UK, said, "The EU has spared no effort and has made an offer to Japan that in all respects is comparable to the Japanese proposal. For example, it includes provision for a real partnership of Japan and the EU in ITER and for the EU to procure some key systems from Japanese industry. Technical discussion has now gone as far as it can. I have proposed to our Japanese partners to sit together and find an acceptable compromise at a high political level." However, a March 4 Reuters news agency report quotes Satori Ohtake, Director of Fusion Energy at the Japan Science and Technology Ministry, as saying, "High level political talks would be fruitless. If we were to hold such talks forcibly, we would only reach deadlock. Technical discussions have not been completed yet. We must continue the discussions. Japan's proposal is better, and it is clearer in many ways than the EU proposal."

The European Council discussed the situation at its March 7 meeting in Brussels and will take it up again at its next meeting, April 18. Agency France - Press (AFP), on March 7, quotes Research Minister Francois Biltgen of Luxembourg, who holds the rotating EU Presidency through June, as saying, "Work on ITER should begin by the end of this year. That means a decision should be taken under the Luxembourg Presidency

Fusion Advance Made in Japan

Scientists at the National Institute for Fusion Science (NIFS) in Japan took an important step towards demonstrating the practicality of fusion power plants recently by sustaining a 20 million degree (2KeV) plasma for 30 minutes in the billion-dollar-class Large Helical Device (LHD). The plasma density was around 8 trillion particles per cubic centimeter. During the 30 minute run, 1.3 billion joules of energy was poured into the plasma, setting a new world record in this regard. As part of the demonstration, the scientists demonstrated the successful application of sophisticated radio-frequency power technologies to heat and sustain the plasma for the full duration of the run. Approximately 700 kW of power was continously applied at the electron and ion cyclotron frequencies.

Details are posted at http://www.nifs.ac.jp

FY 2006 Fusion Budget Requests

President Bush submitted to Congress his budget requests for Fiscal Year 2006 which begins October 1, 2005. Fusion research is carried in two parts of the Department of Energy request: the Office of Fusion Energy Sciences (within the DOE Office of Science) and the Office of Inertial Confinement Fusion and NIF (within the DOE weapons budget).

For the Office of Fusion Energy Sciences, the President requests $291 million compared to $274 million in FY 2005. Funding for the International Thermonuclear Experimental Reactor (ITER) would climb from $5M to $56M. Since the total budget increase is only $17M, the budget request proposes $34M in cuts from ongoing

domestic fusion research efforts. Included in the proposed domestic fusion program cuts are total elimination of fusion materials research ($7.3M), halving the effort on heavy ion inertial fusion ($7.2M), reductions in ongoing tokamak experiments and theory ($7.4M), reductions in non-tokamak (alternate concept) research ($10M) and reductions in enabling technology ($3.0M). General Plasma Science would increase by $1M.

Of the $56M earmarked for ITER, $6M would be for ITER Preparations, compared to $5M in FY 2005 and $46M is reserved for ITER hardware on the assumption that ITER construction is proceeding. Currently ITER construction is being held up by failure of the ITER partners to agree on a site. The U.S has negotiated a 10% contribution to the $5 billion estimated cost of the project. However, cost estimates by U. S ITER project office officials put the estimated cost to the U. S. at slightly over $1 billion over 8 years beginning in FY 2006. The U. S figures include inflation and contingency not in the official ITER project cost estimates and also reflects U. S re-estimates on the cost of building components in the U. S. According to U. S. ITER cost profiles, the U. S. contribution would grow from $46M in FY 2006 to $!30M in FY 2007 and peak around $190M in FY 2009 and 2010. Construction is estimated to be completed in FY 2013.

For the Office of Inertial Confinement and NIF, the President requests $460 million, compared to $535 million in FY2005. Almost the entire reduction is due to DOE's failure once more to request funding for Congressionally-mandated programs on high average power laser and z-pinch driver development ($34M) and high energy petawatt laser efforts ($38M).

Cost of US Contribution to ITER

The U. S. Department of Energy has sent to Congress, as part of its FY06 budget submission, an updated estimate of the cost to the U. S. for its negotiated 10% contribution to the cost of ITER construction.

Based on the $5 billion ($FY2002) estimated cost provided by the ITER Project, the original U. S. estimate was $513 million. Using estimates obtained, in part, subsequently from U. S. industry, the U. S. revised that estimate upwards to $792 million, including an estimated $101 million for operation of the U. S. ITER Project Office. The U. S. estimate further added $132 million in contingency, bringing the total U.S. estimate to $924 million ($FY 2002). Including escalation during construction adds another $198 million, bringing the current estimated total cost to the U. S. to $1.122 billion (as spent dollars).

Although it has sometimes been said that ITER construction cost would be spread over 10 years, the DOE says this amount would be required over 8 years as follows:

FY 2006	$ 49.5 M
FY 2007	$146.0 M
FY 2008	$200.8 M
FY 2009	$207.5 M
FY 2010	$199.3 M
FY 2011	$160.3 M
FY 2012	$126.2 M
FY 2013	$ 32.4 M

Bodman: Secretary of Energy

On January 31, 2005, the U.S. Senate confirmed Samuel W. Bodman as Secretary of Energy by unanimous consent. Senator Pete V. Domenici, chairman of the Senate Energy and Natural Resources Committee said in a statement: "I congratulate Mr. Bodman on his swift Senate confirmation. I think the unanimous approval of the Senate reflects Mr.Bodman's considerable success in the private sector and his outstanding service atCommerce and Treasury. Dr. Bodman is a dynamic leader who excels in any venture he undertakes. I look forward to working closely with him to deliver an energy bill to the President in the 109th Congress."

Samuel W. Bodman was recently the Deputy Secretary of the Department of Treasury. President Bush nominated Bodman to be the Deputy Secretary of the Treasury on December 9, 2003. The Senate unanimously confirmed him on February 12, 2004. Dr. Bodman previously served as Deputy Secretary of the Department of Commerce,
beginning in 2001.

Dr. Bodman is a financier and executive by trade, with three decades of experience in the private sector. An engineer by training, he had specific oversight over the National Oceanic and Atmospheric Administration, the Patent and Trademark Office, and the National Institute of Standards and Technology while at the Department of Commerce.

Dr. Bodman's work in the finance industry began when he was professor at the Massachusetts Institute of Technology (M.I.T.) and started consulting with the venture capital sector. He and his partners and associates provided financial and managerial support to scores of new business enterprises located throughout the U. S.

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ITER SITE DECISION DEADLINE NEARS FESAC COMMENTS ON FUSION PRIORITIES

ITER Site Decision Deadline Nears

Negotiations between Japan and the European Union (EU) on whether to site the International Thermonuclear Experimental Reactor (ITER) in France or Japan have entered a critical "final" phase, as both sides expressed confidence that an agreement could be completed by July.

The negotiations are taking place at high levels of the governments, including discussions between Japanese Prime Minister Koizumi and Luxembourg Prime Minister Juncker, during a May 2 EU-Japan Summit Meeting in Brussels. Luxembourg holds the EU presidency through June.

Following the May 2 meeting, Koizumi said "Discussions are proceeding so that an agreement can be produced among the six parties. We agreed that we should engage in efforts so an agreement can be reached as early as possible."

Orbach: Fusion "Reorientation"

Testifying at a recent hearing of the House Science Committee, Subcommittee on Energy, U.S. Department of Energy Office of Science Director Ray Orbach said "In the FY 2006 budget, we have had to reduce somewhat the domestic (fusion) program, but I would like to look at that in terms of a reorientation of the domestic program rather than a reduction." The FY 2006 budget request reduces the U. S. domestic fusion effort by $34 million, resulting in, among other things, termination of the fusion materials program, halving the effort on heavy ion fusion, reductions in ongoing tokamak experiments and theory, reductions in non-tokamak (alternate concept) research, and reductions in enabling technology.

Orbach's comments were in response to criticism from Subcommittee Chair Judy Biggert (R-IL) who asked about the status of the ITER project and its impact on funding for the domestic fusion program. Biggert stated, "I am very concerned about the significant amount of our limited resources that this budget has allocated to the international fusion experiment known as ITER, which doesn't even have a home yet. And considering that the patience of this committee is growing thin, as we continue to wait for the DOE to respond to our written questions from a full committee hearing on the President's budget held over two months ago, I must again express skepticism and concern about the moving target that is the U.S. contribution to the ITER project. I certainly hope this is something we can nail down, and soon."

FESAC Cautions on Fusion Priorities

The U. S. Department of Energy's Fusion Energy Sciences Advisory Committee (FESAC) recently approved a report of its "priorities panel" and sent it to DOE Office of Science Director Ray Orbach with "our strong endorsement." However, the FESAC noted that the charge letter from Orbach to which they were responding with the report had instructed them to assume that U.S. funding for construction of ITER would be provided above the current level of the U.S. domestic fusion program. In its letter of April 11, 2005, transmitting the report to Orbach, FESAC said:

"However, FESAC is deeply troubled by the

President's proposed budget for FY 2006 and its implications for later years. In particular, the core program cannot shoulder a significant portion of the ITER construction costs without dismantling the fusion scientific enterprise.

"Already, the proposed FY 2006 budget compromises an essential feature of a viable domestic fusion energy science program, highlighted in the priorities panel report: a strategic balance among the major scientific campaigns." "It will not be possible to address the central scientific questions and campaigns noted above with the implied long-term reductions in the core research program," FESAC said.

The 157-page priorities panel report describes the U. S. fusion program in terms of three "overarching themes." and identifies 15 "topical scientific questions." The fifteen questions were then grouped into six "campaigns." In a set of 4 recommendations, the panel lists 14 "high priority activities," and comments on priorities for these activities.

The panel recommended a distribution of effort among the six scientific campaigns as follows:

Macroscopic plasma physics: 27%
Multi-scale transport physics: 25%
Waves and energetic particles: 15%
Fusion engineering science: 13%
Plasma boundary interfaces: 13%
High energy density physics: 7%

A copy of the report is posted on the DOE Office of Fusion Energy Sciences web site at http://www.ofes.fusion.doe.gov/more_html/FESAC/pp_Rpt_Apr05R.pdf

Fonck Named Burning Plasma Science Leader

Dr. N. Anne Davies, U. S. Department of Energy fusion head, has announced the appointment of Dr. Raymond Fonck (University of Wisconsin) as Leader of a newly established group called the U. S. Burning Plasma Organization.

The general mission of the organization is to coordinate and advocate technical work in burning plasma science research, with an emphasis on support of participation in ITER.

Davidson Receives IEEE Award

The Particle Accelerator Science and Technology Technical Committee of the IEEE Nuclear and Plasma Sciences Society has announced the lifetime achievement Award for Particle Accelerator Science and Technology for 2005. The Award was conferred on Professor Ronald C. Davidson, of the Princeton Plasma Physics Laboratory of Princeton University, at a ceremony on May 18, 2005 during the biennial Particle Accelerator Conference in Knoxville, Tennessee.

Davidson will be recognized for pioneering contributions to the theory of charged particle beams with intense self fields, including fundamental studies of nonlinear dynamics and collective processes. This is the highest award in the field of particle accelerator science and technology in the nation and is conferred biennially.

John Willis Retires

Dr. John W. Willis retired April 1 as the Director for the Research Division, Office of Fusion Energy Sciences at the U.S. Department of Energy (DOE) after 34 years of federal service.

Dr. Willis received his B.A. and Ph.D in Physics from the University of California at Riverside in 1966 and 1971 respectively. After completing his doctorate in experimental plasma physics, Dr. Willis worked at the U. S. Naval Research Laboratory in Washington, DC on a series of wave propagation studies in the Ionosphere.

From 1975 on, Dr. Willis has held a series of positions in the DOE's fusion office, with increasing levels of responsibility. In his most current position he was responsible for the bulk of the U.S. research on fusion energy sciences. Dr. Willis helped shepherd the program through growth, contractions, and redirection, with an eye always on the future.

He can be reached at willis@fred.net

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FRANCE PICKED AS ITER SITE
HEAVY ION FUSION ADVANCE MADE AT LBNL

France Designated as ITER Site

Representatives of the governments of the European Atomic Energy Community, Japan, Russian Federation, People's Republic of China, Republic of Korea and the United States, meeting in Moscow on June 28, signed a Joint Declaration designating Caderache, France, as the site for constructing the International Thermonuclear Experimental Reactor, ITER. The group emphasized "the importance of exploring the long-term potential of fusion energy as a virtually limitless, environmentally acceptable and economically competitive source of energy" and said they advocated "wide international co-operation in developing this source of energy for all mankind."

The group ratified an agreement on cost sharing and other items negotiated between representatives from France and Japan over the past year. That agreement specified that the "host" will contribute 50% of the construction cost with the other five parties bearing 10% each. In addition the host will bear the costs of site preparation. In addition the host party will make procurements in Japan of components equivalent to 10% of its 50% contribution. The host party will provide 40% of the ITER staff, Japan will provide 20% and the other four parties will provide 10% each. Japan will provide "a suitably qualified candidate" for the post of ITER Director-General. The host will also provide contributions for a new fusion support facility in Japan for a facility to be decided later by Japan. In addition the group endorsed that "If a future demonstration reactor, Demo, is realized in the framework of an international co-operation" that facility would be built in Japan.

Details of the agreement and other related news articles on the ITER site selection are posted at http://fire.pppl.gov

Heavy Ion Fusion Advance

Scientists at the Lawrence Berkeley National Laboratory (LBNL) have made important advances toward the goal of improving the attractiveness of heavy ion beams for high energy density physics (HEDP) research and as drivers for inertial confinement fusion power plants in the future.

Dramatic success was recently achieved in a laboratory experiment by compressing an intense an ion beam fifty-fold. The resulting 4 nanosecond pulse puts heavy ion beams, for the first time, within range of the pulse lengths necessary for meaningful HEDP experiments and for fusion power application. The result adds great flexibility for the design of the high energy end of heavy ion fusion drivers for inertial fusion, lowering the cost, and potentially shortening the development timetable, The result is even more impressive when one considers it involves a new approach that was first conceived only 12 months ago.

In the NDCX-1a facility, which began operation December 9, 2004, an induction "tilt" core was used to place a velocity ramp on a 25 mA, 255 keV beam, inducing compression. Space charge repulsion during compression was essentially eliminated by neutralizing the beam with a pre-formed plasma downstream of the core. Modeling showed good agreement between the data and particle-in-cell simulations.

Grant Logan, director of the Heavy Ion Fusion Virtual National Laboratory, said that these new results "may revolutionize high peak power accelerators in a manner analogous to the role frequency chirp played in ultra-high power lasers."

The next step is to accelerate the beam before compression. For this, a new accelerator concept is being developed called the "Pulse-Line Ion Accelerator" (PLIA). First proposed by LBNL consultant Dick Briggs (Patent Disclosure August 2004), the PLIA is a traveling-wave accelerator, with a helical winding around the beam pipe acting as a transmission line to produce the wave which accelerates the beam. The novel idea here is to use dielectric around the helix to slow the wave to nearly match the ion speed. First operation of experiments using a 1 meter PLIA test accelerator section began May 5, 2005. The experimental PLIA test section delivers 0.2 volt-seconds of acceleration capability at 10x lower overall total cost per MeV compared to induction acceleration. This technique would greatly lower the cost of heavy ion accelerators for both high energy density physics experiments and for fusion power plants. In addition, it is likely that the low-energy ends of many other accelerators can benefit from this concept.

For further information, contact Grant Logan (bglogan@lbl.gov).

First ITER Full Power Shots 2021

Assuming initiation of the project in early 2006, ITER (the International Thermonuclear Experimental Reactor) would make first burning (DT) plasma in 2020 (first plasma operation in 2016) and first full power (500 Megawatts thermal) operation in 2021, according to Y. Shimomura, head of the international ITER design team. Shimomura made the projections in a talk to the 7th International Symposium on Fusion Nuclear Technology, May 23-27 in Tokyo. Shimomura acknowledged, however, that the Final Design Report (completed in 2001) was "not sufficiently detailed for call for tender" and said the international design team "has been developing further the design where it was not developed in sufficient detail for call to tender." He said there are still "about 200 design issues" remaining to be resolved. Shimomura's talk is posted at http://fire.pppl.gov/isfnt7_shimomura.ppt

Power Plant Study Completed

"A first commercial fusion power plant . . . will be economically acceptable, with major safety and environmental advantages. These models rely on plasma performance marginally better than the design basis for ITER." So concludes a 3-year "Conceptual Study of Commercial Fusion Power Plants," sponsored by the European Commission within the framework of the European Fusion Development Agreement (EFDA). The final report of the study is available for download at http:www.efda.org click on "downloads" and then click on "EFDA Reports."

Around 100 individuals contributed to the study, which was prepared by an 11-member team headed by D. Maisonnier of the EFDA. The report says, "These studies showed that fusion power has very promising potential to provide inherent safety and favourable environmental features, to address global climate change and gain public acceptance. In particular, fusion energy has the potential of becoming a clean, zero-CO2 emission and inexhaustible energy source. The cost of fusion electricity is likely to be comparable with that from other environmentally responsible sources of electricity generation."

The report concludes that "the main thrusts of the European fusion development programme are on the right lines," and recommends a "performance study" for a fusion Demonstration Power Plant. "The time is now ripe for such a study to give guidance to the (fusion) programme," the report says

Anti-terrorism Device

Princeton University and InSitech, Inc. have signed a licensing agreement for InSitech to commercialize an anti-terrorism device developed by the Princeton Plasma Physics Laboratory (PPPL). PPPL is the site of the largest component of fusion research in the U. S. The device, the Miniature Integrated Nuclear Detection System (MINDS), would have applications in transportation and site security.

MINDS would be used to scan moving vehicles, luggage, cargo vessels, and the like for specific nuclear signatures associated with materials employed in radiological weapons. The system could be employed at workplace entrances, post offices, tollbooths, airports, and commercial shipping ports, as well as in police cruisers, to detect the transportation of unauthorized nuclear materials.

A team of PPPL researchers led by Charles Gentile designed a prototype system and InSitech, through the licensing agreement signed March 28, has certain rights to the commercial development, manufacture, use, and sale of the product.

FPA Annual Meeting, Oct 11-12

Fusion Power Associates Annual Meeting and Symposium: Fusion and Energy Policy will be held October 11-12, 2005 at the Capitol Hill Club, 300 First Street SE, Washington, DC. The conference hotel is a block away: Capitol Hill Suites, 200 C Street SE, Registration information is posted at http:fusionpower.org and click on Annual Meeting, Agenda and Registration.

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FUSION ENDORSED IN US ENERGY POLICY ACT
FPA AWARDS TO STAMBAUGH, BAKER, MEADE, ROBERTS

Fusion in the Energy Policy Act

House-Senate Conferees approved the text of the U. S. Energy Policy Act of 2005 on July 27 and the House of Representatives passed the bill on July 28. The Senate is passed the bill on July 29 and the President signed it into law.

Included in the Act is a section on The Fusion Energy Sciences Program. The Act states, "It shall be the policy of the United States to conduct research, development, demonstration, and commercial applications to provide for the scientific, engineering, and commercial infrastructure necessary to ensure that the United States is competitive with other countries in providing fusion energy for its own needs and the needs of other countries, including by demonstrating electric power or hydrogen production for the United States energy grid using fusion energy at the earliest date."

The Act calls upon the Secretary of Energy to submit a plan within 180 days that ensures, among other things, that "existing fusion research facilities are more fully used" and that "inertial confinement fusion facilities are used to the extent practicable for the purpose of inertial fusion energy research and development," and that "attractive alternative inertial and magnetic fusion energy approaches are more fully explored."

The Act authorizes the Secretary of Energy to "negotiate an agreement for United States participation in ITER" but specifies that "no federal funds shall be expended for the construction of ITER until the Secretary has submitted to Congress ... a report describing how United States participation in the ITER will be funded without reducing funding for other programs in the Office of Science (including other fusion programs), and 60 days have elapsed since that submission."

The Act says that "fusion science, technology, theory, advanced computation, modeling, and simulation" should be strengthened and that "new magnetic and inertial fusion research and development facilities (should be) selected based on scientific innovation and cost effectiveness, and the potential of the facilities to advance the goal of practical fusion energy at the earliest date practicable." It says the "facilities that are selected (should be) funded at a cost-effective rate."

Interest in Inertial Fusion Rising

International interest in applying the inertial fusion for energy applications is rising. A new facility, FIREX (Fast Ignition Realization Experiment) is under construction at Osaka University in Japan and recently a panel of laser physicists from seven European countries, chaired by Prof. Henry Hutchinson of Rutherford Appleton Lab (H. Hutchinson@rl.ac.uk), has put forth a proposal that Europe build a 735 million euro facility (called HIPER) to achieve high energy gains using fast ignition in combination with laser compression of fusion fuel pellets. The proposed facility would consist of a long-pulse (ns) 200kJ laser to compress the pellet and a short-pulse (ps) 70kJ laser to ignite the fuel.

Fast ignition was first proposed by Max Tabak and others at LLNL. Aspects of it were demonstrated experimentally at the Gekko XII laser at Osaka University by R Kodama and colleagues in 2001. Experiments and simulations are also underway or planned in the U.S. at several sites. Fast ignition is of interest to inertial fusion physicists because it holds the potential for reducing symmetry requirements on pellet compression and predicted higher energy gain.

Rising interest in inertial fusion is also due, in part, to the nearing completion of construction and beginning of operation of the LMJ laser in France and the National Ignition Facility (NIF) in the U. S. The NIF project recently announced operation of the second set of four beams, producing 137 kJ (compared to a design goal of 125 kJ). When fully operational, NIF will have 192 beams producing 1.8 MJ. Ignition experiments are set to begin in 2010.

FPA 2005 Awards Announced

Fusion Power Associates Board of Directors announces the recipients of the FPA 2005 Awards.

The Board has selected Ronald D. Stambaugh (General Atomics) to receive the FPA 2005 Leadership Award. FPA Leadership Awards have been given since 1980 to recognize individuals who have shown outstanding leadership qualities in accelerating the development of fusion.

In selecting Ron, the Board recognizes his outstanding leadership of the DIII-D tokamak program at General Atomics over many years, resulting in many important scientific contributions to the fusion venture, and his focus on finding ways to improve the ultimate fusion product, an economic fusion power plant.

The Board has selected Charles C. Baker (UCSD) and Dale M. Meade (PPPL) as recipients of the FPA 2005 Distinguished Career Awards. These awards have been given since 1987 to individuals who have made distinguished, lifelong career contributions to fusion development.

In selecting Baker, the Board recognizes his decades of outstanding contributions to the fusion effort, including but not limited to his roles in leading the fusion technology program and his inspirational leadership of several important planning and FESAC panel activities.

In selecting Meade, the Board recognizes his decades of outstanding contributions to the fusion effort, including but not limited to his roles in leading the TFTR and Next Step Options programs and his inspirational guidance in the search for an affordable path to fusion power.

The Fusion Power Associates Board of Directors has selected Dr. Neil Morley of UCLA to receive its 2005 Excellence in Fusion Engineering Award. These Awards, in memory of Prof. David J. Rose of MIT, have been presented since 1987 to individuals in the early part of their careers (maximum age 42) who have shown both technical accomplishment and potential for becoming exceptionally influential leaders in the fusion field.

In selecting Dr. Morley, the Board recognizes his outstanding technical contributions to fusion development in areas such as high heat flux components, liquid walls and MHD fluid flow and heat transfer. The Board also recognizes his leadership qualities in such areas as the US program for the ITER Test Blanket Module and the liquid surface divertor module on the NSTX facility at the Princeton Plasma Physics Laboratory.

Fusion Power Associates Board of Directors will honor Dr. Michael Roberts of the US Department of Energy Office of Fusion Energy Sciences with a Special Award for the Advancement of Fusion Power. FPA Special Awards have been given periodically since 1980 to recognize individuals who have made some special contribution to the cause of fusion power development.

Roberts will be honored for his "tireless efforts over the past two decades to make ITER a reality." He will also be recognized for his "early efforts to promote the construction of the first U.S. DT-burning tokamak, that led ultimately to the construction of TFTR, and his continuing devotion to international collaborations and to the technology and facilities needed to make fusion power a reality."

The awards will be presented at Fusion Power Associates annual meeting and symposium, October 11-12 in Washington, DC. Names of previous recipients are posted at http;//fusionpower.org A list of previous recipients is posted on the FPA web site, http://fusionpower.org

Fossil Fuels Lead Energy Growth

According to the Energy Information Administration (EIA), total U. S. energy consumption grew nearly 2% in 2004, to 100.3 quadrillion Btu. Petroleum and natural gas supplied most of the increase, the EIA reported. The use of so-called "renewable" energy sources grew by less than 1% in total, despite robust growth in the use of wind energy and ethanol. Renewable-generated electricity actually fell 1%, even with a 27% increase in wind power. If hydropower is excluded, renewable power provides 2% of U.S. electricity needs, the EIA reported. Wind power accounts for 0.36% of the electricity mix.

Of the total 100 Quadrillion Btu, petroleum contributed 40%, natural gas and coal each provided 23%, nuclear energy contributed 8% hydroelectric and biomass each provided about 2.76%, geothermal contributed about 0.36%, wind provided about 0.12% and solar provided about 0.06%

The EIA report, "Renewable Energy Trends 2004," is available at
http://www.eia.doe.gov.

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IKEDA NAMED ITER DIRECTOR GENERAL
US FY 2006 BUDGET AGREEMENT REACHED
BOEHLERT THREATENS ITER PROJECT

Kaname Ikeda to Head ITER

At a meeting 7 November 2005 in Vienna, Austria, the six ITER Parties (China, European Union, Japan, Korea, Russia and United States) agreed to appoint the Japanese Ambassador to Croatia, Kaname Ikeda, as Director General of the ITER Organization. Ikeda, a "graduate nuclear engineer," joined the then Science and Technology Agency of the Japanese government in 1968 and served as head of the research and development bureau and deputy vice minister, as well as director of the now-defunct National Space Agency of Japan. He has been Japanese Ambassador to Croatia since 2003.

An official of the Japanese Ministry of Education, Culture, Sports, Science and Technology said Ikeda was recommended for the post by the Japanese government because "he is versed in science and technology policies and has also been involved in major international projects." A statement from the six Parties after the Vienna meeting states that he "has extensive experience in the management of large scale high technology projects and international cooperations."

The six Parties "asked Mr. Ikeda to take up his duties promptly." However, the ITER Organization, which he will head, will not be formed officially until the six Parties sign an international agreement formalizing all aspects of the ITER venture. Officials said they hoped to finalize an agreement by the end of the year.

At the Vienna meeting, the six Parties also said they looked favorably on a request by India to join the ITER venture and asked India to provide an official letter requesting to join. The ITER team is now working "to review the necessary adjustments to be made to the provisional allocations among the ITER Parties of responsibilities for procuring components" should India join.

FY 2006 US Fusion Budget Action

House-Senate Appropriation Committee conferees met November 7 and agreed to a common position on Fiscal Year 2006 funding for the U. S. Department of Energy, including funding for fusion research.

For the Office of Fusion Energy Sciences (OFES) the conferees provided $290.55 million, the same as the President's request and $16.7 M over FY 2005. The distribution of funds provided, however, is different from the President's proposed distribution. The President proposed spending $55.5 million on ITER, an increase of $50.1 M over FY 2005. The President proposed drastically cutting the U. S. domestic fusion program. The Conferees directed that $29.9 be retained in the domestic fusion program and that proposed ITER funding be reduced accordingly. The Conferees warned, "As in previous years, the conferees direct the Department to fund the U. S. share of ITER in fiscal year 2007 through additional resources rather than through reductions to domestic fusion research or to other Office of Science programs." The threatened domestic programs were ordered to be restored to Fiscal Year 2005 levels.

The conferees also directed "the Government Accountability Office (GAO) to undertake a study of the Office of Fusion Energy Sciences program in order to define the role of the major domestic facilities in support of ITER, including recommendations on possible consolidation or focus of operations to maximize their research value in support of ITER. The GAO shall also evaluate the opportunities to leverage the National Nuclear Security Administration investment as an alternative to the tokamak concept."

The conferees provided $549 million for the Inertial Confinement Fusion Ignition and High Yield Program,

compared to $541 M in FY 2005. Included in the mark, "The conference agreement includes $11,012,000, a $901,000 increase over the budget request, for pulsed power ICF to assess Z pinches as drivers for ignition and high yield fusion." The conferees also provided $48 M for the inertial fusion technology program (inertial fusion for energy). Within that total, $25 M is provided for continuing development of high average power lasers, $2 M for the high density matter laser at Ohio State University, $15 M for the Naval Research Laboratory (Nike Laser) and $6 M to prepare Z-machine to support extended operations. The conferees also provided additional funds for petawatt laser development and the Omega laser program at the University of Rochester, including an additional $22 M to accelerate the Omega Extended Performance capability project.

The complete conference language on fusion is posted at http://fire.pppl.gov

The House and Senate are expected to pass the bill and send it to the President for signature.

Boehlert Threatens to Kill ITER If ...

The House Committee on Science (Sherwood Boehlert (R-NY), Chairman, and Bart Gordon (D-TN), Ranking Minority Member) issued a press release on November 9 which reads in part:

"I want, though, to bring attention to one concern I have about the conference report. The conferees dropped House language preventing an agreement on ITER, the international fusion project, from being finalized before March 1. This language, which I offered and the House approved by voice vote, was designed to prevent the U.S. from moving ahead with ITER until we had a consensus on how to finance the billion-dollar U.S.contribution.

"You'd think that would just be common sense in this period of fiscal austerity when we are talking about cutting programs that Americans rely on. But the House language has been replaced by weak report language calling for a study by the Government Accountability Office.

"I want to make clear to everyone concerned that I will do everything in my power to kill the ITER project if there is not an agreement by March that the domestic fusion program has to be scaled back to pay for ITER.

"I am not going to allow the U.S. to enter into an international commitment that it cannot afford. I would rather kill the ITER project.

"The fusion community will have to be realistic. It cannot have all its current projects and ITER. And it will not.

"This year's appropriation already makes clear why this is so. Just about every area of activity under the DOE Office of Science sees a cut, especially if earmarks are excluded, except Fusion Energy Sciences. Fusion science is important and may be a key to our energy future, but it cannot consume the entire budget of the Office of Science. And that is what will happen if the domestic program is held harmless while ITER is constructed.

"So I look forward to working with my colleagues on Appropriations and all my colleagues to make sure that the U.S. handles its international commitments responsibly. No one should misread what happened in this conference. The ITER program is in grave danger, and I guarantee you that it will not be completed with U.S. participation unless there is a more realistic plan to fund it."

Fisch and Tang Honored

Nathaniel Fisch, Princeton Plasma Physics Laboratory, is the 2005 recipient of the American Physical Society's prestigious James Clerk Maxwell Prize for Plasma Physics. Fisch is cited "for theoretical development of efficient radiofrequency-driven current in plasmas and for greatly expanding our ability to understand, to analyze, and to utilize wave-plasma interactions."

William Tang, Princeton Plasma Physics Laboratory, is the recipient of the Chinese Institute of Engineers - USA Distinguished Achievement Award. Tang is cited "for his outstanding leadership in fusion research and contribution to fundamentals of plasma science.

Hiroshi Kishimoto Killed in Accident

Fusion researchers around the world were saddened to learn that one of the leaders of the fusion research effort in Japan, Hiroshi Kishimoto was killed in a mountain climbing accident on September 18. He was 63.

Kishimoto was the long-time Executive Director for Fusion at the Japan Atomic Energy Research Institute.