FUSION POWER ASSOCIATES
EXECUTIVE NEWSLETTER

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http://fusionpower.org

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LOGAN, MEADE RECEIVE FPA LEADERSHIP AWARDS

NEW MEMBER

AlliedSignal Technical Services Corp., Lanham, MD, has become a member of Fusion Power Associates. Dr. Alan Murdoch, Director, Earth Sciences and Laser Technologies, will represent the corporation. He can be reached at (301)805-3993; fax -3974; email (MurdochA@thorin.atsc.allied.com). AlliedSignal has been supporting the Inertial Confinement Fusion program at the Lawrence Livermore National Laboratory for over 20 years. We welcome AlledSignal's participation.

FY 2000 Budget

Under the terms of President Clinton's FY 2000 budget, submitted to Congress February 1, the fusion technology element of the Fusion Energy Sciences Program would be slashed by $15 million, within a total fusion energy budget that remains flat at $222.6 million identical to FY 1999. Within the total, however, the OMB earmarked $10 M for "decontamination and decommisioning" of the Tokamak Fusion Test Reactor, which ceased operation at the end of CY 1997. Previously it had been assumed that such costs would be paid from another account at DOE. DOE also is proposing to reserve about $5 million for new starts in the "alternate concepts" category.

The Inertial Confinement Fusion (ICF) program, funded within DOE's Defense Programs account, would also receive essentially flat funding in its research budget ($211.7 M in 2000 compared to $212.4 M in 1999). However, DOE has not requested funds to continue development of rep-rated drivers, for which Congress added $10M last year. Construction of the National Ignition Facility will receive all necessary funding ($248.1 M) to maintain schedule.

DOE as a whole did well, receiving a $1 billion increase, from $17.4 B in 1999 to $18.1 B in 2000. The DOE Office of Science (previously called the Office of Energy Research), where civilian fusion is funded, also did well, receiving a $137 M increase, from $2.698 B to $2.835 B.

The Federal Budget document can be accessed on the web at //www.gpo.gov/usbudget/fy2000/maindown.html

Dale Meade and B. Grant Logan

LEADERSHIP AWARDS TO LOGAN, MEADE

Fusion Power Associates presented its 1999 Leadership Awards on January 25 to B. Grant Logan (LLNL) and to Dale M. Meade (PPPL). FPA Leadership Awards have been presented annually since 1980 to recognize individuals who have shown outstanding leadership qualities in accelerating the development of fusion. Logan's award states, "Your innovative contributions to both magnetic and inertial fusion energy programs, as well as to fusion power and fusion applications in general, have provided researchers a rich array of options to explore." Meade's award states, "Your early leadership of the TFTR program and continuing contributions to the field of energy-producing plasmas and fusion applications have challenged the community to move forward expeditiously toward practical fusion power." In presenting the awards, FPA president Steve Dean said, "In selecting you, the FPA Board of Directors recognizes your many past contributions and continued dedication to finding viable pathways to practical applications of fusion." Congratulations both!

NEW FACE OF CONGRESS

Rep. Ron Packard (R-CA) has assumed the chair of the House Appropriations Subcommittee on Energy and Water, the body that oversees fusion appropriations. He succeeds Rep. Joseph McDade (R-PA) who has retired. Packard has been on the Appropriations Committee for many years, but not on this particular subcommittee. Nevertheless he has been a strong supporter of fusion research and has signed "Dear Colleague" letters to other members of the House, urging them to support the fusion program.

Other members of the Subcommittee are: Harold Rogers (R-KY), Joe Knollenberg (R-MI), Michael Forbes (R-NY), Rodney Frelinghuysen (R-NJ), Sonny Callahan (R-AL), Tom Latham (R-Iowa), Peter Visclosky (D-IN, Ranking Minority Member), Chet Edwards, (D-TX), Ed Pastor (D-AZ), and James Clyburn (D-SC). Bill Young (R-FL) will chair the full Appropriations Committee; David Obey (D-WI) is ranking member of the full committee. In the Senate, Ted Stevens (R-AK) will chair the Appropriations Committee and Pete Domenici (R-NM) will chair the Energy and Water Subcommittee.

The House Subcommittee on Energy and Water is scheduled to begin public hearings on the DOE budget request on March 9 at 10 AM in Room 2362 of the Rayburn House Office Building. On March 11 at 10 AM they are scheduled to hear testimony from DOE on "Energy Resources and Science." Persons planning to attend these sessions should contact the Subcommittee in advance (202-225-3421) to ensure the schedule has not changed. The subcommittee also accepts testimony from the public, to be scheduled at a later date. Persons wishing to submit oral or written testimony should advise the subcommittee in writing at 2362 RHOB, Washington, DC 20515-6020.

DAVIES KEYNOTES FPA/UCLA WORKSHOP

Dr. N. Anne Davies, Associate Director for Fusion Energy Sciences, Office of Science, DOE, gave the keynote address at Fusion Power Associates annual meeting and symposium, "Cost-Effective Steps to Fusion Power," January 25-27, in Marina del Rey, CA. The Workshop was jointly sponsored with UCLA. Davies told the 65 attendees, "While the U.S. fusion program has been restructured from fusion energy development to innovation-driven research focused on fusion's scientific foundations, we must preserve our long-term energy vision. The restructuring process has created opportunities to explore cost-effective pathways to this vision, with steps that are more affordable, deliver an improved fusion product, and provide the greatest return on investment of federal research funds." She noted, "There are trends in the marketplace that could make it difficult for fusion to compete, such as abundant supplies of fossil fuels, coupled with the possibility of sequestering carbon; declining net costs of producing electricity; and movement toward more distributed generation units in relatively small sizes. However, for the longer term, there are several factors that make us optimistic about the prospects for fusion." Among these factors, Davies noted that "One could imagine the emergence of large nuclear operating companies that have a long term view and, because of a high comfort level with nuclear technologies, might embrace fusion and recycle former nuclear fission sites into fusion facilities." She also said that "environmental issues, such as climate change, will persist and perhaps grow more threatening with continued fossil fuel burning." And she noted that "global population growth, desire for standard of living improvements, and resource depletion issues strongly favor fusion in the long term." She said that "The viability of fusion in the marketplace will depend on its cost, reliability, and development path requirements relative to competing new energy sources."

SYSTEMS STUDIES PLANNED

In her keynote address to the FPA/UCLA Workshop, DOE fusion head N. Anne Davies announced that "Later this year, our systems studies effort will begin two tasks that address issues of the future marketplace for fusion, which will aid in our thinking about how to integrate fusion into the planning and vision of the larger energy research community." She said that "A strategic planning and forecasting task will assess the role of fusion in the long term vision of a sustainable global energy strategy. Strategic pathway analysis will consider a range of scenarios to deal with future social, economic, and environmental conditions, such as limits on greenhouse gases. This will determine how fusion can best fit, given its environmental and economic characteristics, as well as better define the goals and requirements for fusion. Initial efforts will focus on the role of large fusion power stations, macro-economic modeling of global energy markets, and outreach to other communities."

Davies also said that "A fusion applications task will explore the full range of fusion applications based on projected supply, demand, and cost factors. The potential of large output fusion devices for hydrogen production will be evaluated. Conceptual design studies of fusion neutron sources for both near term and non-electric applications and fusion test facilities will define costs, benefits, and risks associated with development paths that might attract new clients for fusion."

Davies said that "This attention to a wider range of fusion applications and test facilities highlights the importance of maintaining a portfolio of confinement concepts for both near and long term energy applications." Regarding "nearer term applications" for fusion research, Davies said, "While magnetic fusion has not pressed hard to find a possible nearer term customer for fusion-grade plasmas, it is time now to fully explore all possibilities and determine if there is potential to expand fusion's customer base and build a stronger underpinning of support for the program."

NEW PLAN

DOE fusion director N. Anne Davies told the FPA/UCLA Workshop that "By the end of 1999, it is our goal to provide more detail in conjunction with the preparation of a new program plan that will accompany the submission to Congress of the Administration's FY 2001 budget request." She said, "The development of the new plan will be driven largely by program reviews," noting that three review activities and an intensive summer study are scheduled to be completed by fall." (The three reviews will be carried out by the Secretary of Energy Advisory Board, a National Research Council panel, and the DOE Fusion Energy Sciences Advisory Committee) Davies said that "These reviews will provide the working consensus for the new program plan, which will consider pathways for both energy and science goals, address needs for both magnetic and inertial fusion energy, and deal with issues of overlaps, international collaboration, and funding constraints."

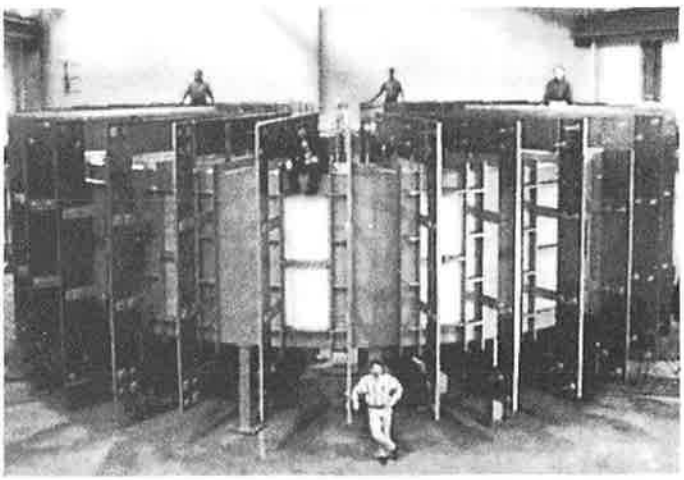
ELECTRIC TOKAMAK ON DISPLAY

Participants at the FPA/UCLA Workshop in January had the opportunity to see the new "Electric Tokamak" at UCLA. Invented by UCLA's Bob Taylor, the "ET" is the latest, and largest, in a series of low cost, low field "university tokamaks" pioneered by Taylor since his days at MIT. Taylor says this is the twelfth tokamak he has constructed, using graduate student labor. Taylor hopes the device will exceed tokamak record values of plasma pressure relative to magnetic pressure and have lower plasma loss rates than typical tokamaks. The ET is just beginning operation.

GLUKHIKH CELEBRATES 70th BIRTHDAY

Academician Vasilii A. Glukhikh, Director of the D.V. Efremov Institute, St. Petersburg, Russia, celebrated his 70th birthday on February 10. Over the years he and his Institute have been responsible for the fabrication of Russian fusion devices and for much of Russia's participation in ITER. Born in 1929 in a small town in Siberia, his engineering and research work at the Efremov Institute of Electrophysical Apparatus began in 1953. At the Efremov he rose to the position of Deputy Director of Science in 1967 and in 1974 became Director. In 1981 he was elected Corresponding Member of the USSR Academy of Sciences and in 1989 became a full Academician. Since 1989, he also is head of the chair "Electrophysics and High Voltage Technique" at the St. Petersburg State University. Fusion Power Associates presented its Distinguished Career Award to Academician Glukhikh in 1992.

He is the author of more than 150 scientific publications and three monographs, including 20 patents, and serves as editor-in-chief of the journal "Plasma Devices and Operations." We wish Academician Glukhikh a happy birthday and many more to come!



The Electric Tokamak at UCLA

MILORA NAMED OAK RIDGE FUSION HEAD

Effective January 11, Dr. Stanley L. Milora became the Director of the Fusion Energy Division at Oak Ridge National Laboratory (ORNL). Stan succeeds Mike Saltmarsh, who has retired. Since 1994, Stan has been head of the Fusion Energy Division's Technology Section, which conducts R&D on plasma heating and fueling systems and applications of those and other technologies to areas outside of fusion research. Stan holds a B.S. in Aerospace Engineering from Pennsylvania State University (1967) and a Ph.D. from MIT (1972) in Aeronautics and Astronautics. He joined the Reactor Division at ORNL in 1972. Since then, his experience has included the application of non-aqueous fluids to low temperature power conversion cycles, experimental and theoretical work on the interaction of hydrogenic fuel pellets in high temperature plasmas, and development of fusion plasma fueling systems and their implementation on fusion experiments both in the domestic and international fusion program.

PEOPLE

Tom James has left his ITER Home Team fusion post at UCSD to become Associate Director of the UCSD Center for Wireless Communications. Tom says, "I hate leaving fusion, as my heart is still with the program and I wanted very much to help make it successful. If the USA can ever get its act together on a next step, or if we return to the ITER collaboration, I'd like to come back and contribute again." Our best wishes to Tom and thanks for the energy, dedication and enthusiasm that have marked his fusion career.

Rick Kessler, who represented fusion from his post at the Washington Office of Princeton University, has taken up a new position as Democratic professional staff member for the House Commerce Committee, working on energy, superfund and clean air issues. Rick wants his friends in the fusion community to know "how much I appreciated all the help you've given me and how great it was to work with all of you."

Mark Prelas, Professor at the University of Missouri -Columbia, has been named a Fellow of the American Nuclear Society, "for outstanding contributions to research and technical literature on nuclear driven lasers, wide band gap materials, plasma applications, diamond and diamond film fabrication, for education of nuclear engineers, and for reaching out to scientists in the former Soviet Union."

Ron Stambaugh (GA) and **Gerald Navratil** (Columbia U.) have joined **Paul Rutherford** (PPPL) and **John Sheffield** (ORNL) as U.S. members of the ITER Technical Advisory Committee.

Masami Fujiwara (NIFS), **Satoru Tanaka** (U. Tokyo), **Sanae-I Itoh** (Kyushu U.), **Kunihisa Soda** (JAERI), and **Takeshi Fukuda** (JAERI) will be an all-new team of Japanese members of the ITER Technical Advisory Committee.

Toshihide Tsunematsu (JAERI), Japan ITER Home Team Leader and Deputy Director of Department of ITER Project, will join **Masaji Yoshikawa** (JAERI), **Shinzaburo Matsuda** (JAERI), and **Yukitoshi Miura** (JAERI) as Japanese members of the ITER Management Advisory Committee.

Robin Staffin has become Senior Policy Advisor for Science and Technology to Energy Secretary **Bill Richardson**. Previously he served as Deputy Assistant Secretary for Research and Development in the DOE Office of Defense Programs. Staffin came to DOE from the Lawrence Livermore National Laboratory, where he worked (1981–1993) in several areas, including laser physics, optics and fusion.

IN MEMORIAM: JIM PHILLIPS

Los Alamos fusion pioneer Jim Phillips died December 1 from a sudden massive heart attack. He was 79 and in otherwise good health, having just attended the annual American Physical Society Division of Plasma Physics meeting in New Orleans and having put in a days work at the Lab the day he died. He was among the original group of researchers at Los Alamos who began working on fusion in 1949. Under his leadership, a working toroidal pinch fusion device was constructed and brought to Geneva for the first United Nations International Atoms for Peace Conference in 1958. Later he was a leader of reversed field pinch research at Los Alamos, a field he continued to pursue until his death.

Born in South Africa to American missionary parents, he attended Carleton College in Minnesota and later graduate school at the University of Illinois, where he received his Ph.D. in nuclear physics. He was a Fellow of both the American Association for the Advancement of Science and the American Physical Society. After retiring from the Laboratory in 1987, he maintained a Laboratory Associate position that enabled him to continue his research, including extensive collaborations with scientists in Italy, Japan, Sweden and the University of Wisconsin. Sympathy may be expressed to his wife, Ginnie, at 48 Loma Del Escolar, Los Alamos, NM 87544.

Dr. James A. Phillips

IN MEMORIAM: DAVE JUDD

Accelerator physicist David L. Judd, known to generations of scientists and students at the Lawrence Berkeley National Laboratory and the UC Berkeley campus, and throughout the physics and fusion communities, as a mentor, colleague and friend, passed away November 23, 1998 in Berkeley after suffering a heart attack. He was 75.

Dave worked on the Manhattan Project at Los Alamos (1944-1946) as a Navy Lieutenant. He received his Ph.D. in theoretical physics and mathematics from the California Institute of Technology in 1950 and joined the Berkeley Lab in 1951 at the request of Ernest Lawrence, as head of the Theoretical Physics Group. In 1965 he became head of the Physics Division and in 1967 became the Associate Director for Physics. Beginning in the 1970s he became active in the pioneering days of heavy-ion inertial fusion. Heavy-ion fusion leader Roger Bangerter recalls, "Dave was really influential in the early days of heavy-ion fusion. He was going around the country, setting up meetings, building support. I took physics from him as did my son. One of his greatest roles in heavy-ion fusion was as mentor to new people coming into the program." In the summer of 1976, Bangerter and Judd co-chaired a conference on the subject that some would mark as the birth of the field of heavy-ion inertial fusion. We are saddened by his passing.

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NSTX BEGINS OPERATION
SEAB STARTS FUSION REVIEW

NEW MEMBERS

Los Alamos National Laboratory, Fusion Energy Program, has become a Member of Fusion Power Associates. Dr. Richard E. Siemon, Program Manager for Fusion Energy, will represent the Laboratory. He can be reached at (505)667-2040; email: rsiemon@lanl.gov

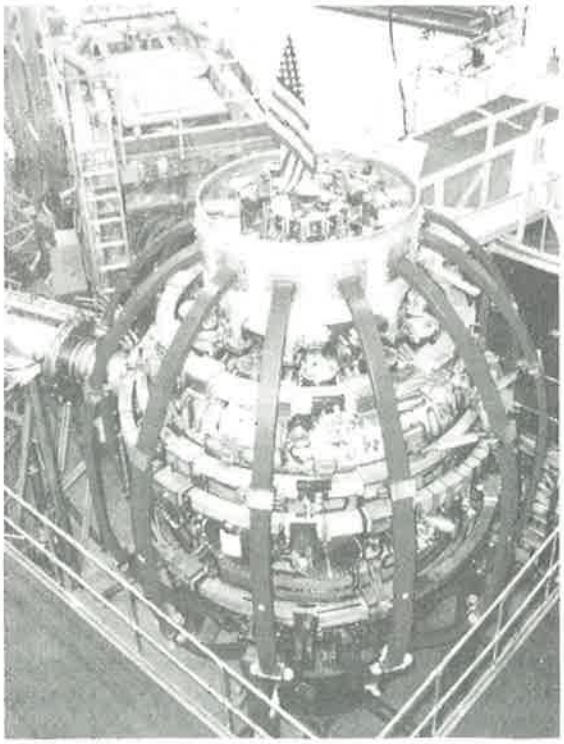
Sandia National Laboratories, Pulsed Power Sciences Center, has become a Member of Fusion Power Associates. Dr. Donald L. Cook, Director, will represent the Center. He can be reached at (505)845-7446; email: dlcook@sandia.gov

We welcome the participation of Los Alamos and Sandia in Fusion Power Associates.

NSTX OPERATES

Energy Secretary Bill Richardson cut a ribbon February 26, marking the beginning of experimental operations of the National Spherical Torus Experiment (NSTX) at Princeton Plasma Physics Laboratory (PPPL). Richardson was joined in the ceremony by U.S. Congressmen Rodney P. Freylinghuysen and Rush D. Holt and by the mayors of Plainsboro and Princeton, New Jersey. NSTX successfully produced its first plasma in the new device on February 12 at 6:06 PM, on budget and 10 weeks ahead of schedule. Three days later, during its second run, the device achieved its milestone of 50 kiloamperes of plasma current.

Richardson said, "I want to applaud everyone at this Laboratory for the path-breaking success of the National Spherical Torus Experiment, which through hard work has been brought in ahead of schedule and on budget. It is outstanding research such as this that leads to important breakthroughs." Richardson said the Department of Energy especially values its relationships with "America's blue chip universities, like Princeton and MIT." Freylinghuysen said, "Princeton has a proven track record of scientific accomplishments and technological advances that



National Spherical Torus Experiment

make it unlike any other research facility of its kind. Fusion energy has the potential to be an unlimited and ultra-clean source of energy for the world. I remain committed through my work on the Appropriations Committee to see to it that Congress continues to support this important work. Whether it be for fusion or a cure for cancer, our nation must continue its investment in important research and development in the scientific community if we are truly to be prepared for the 21st Century." Holt said, "I am proud of the research and teaching taking place at the lab. I applaud the staff's efforts to create a sustainable fusion energy source." Holt noted that an energy source, such as fusion, "would prove less costly— both in terms of dollars spent and environmental damage" in the long run.

NSTX is a low aspect ratio (1.25) tokamak designed to test the predicted advantages of the spherical torus concept, including the potential to confine plasma at higher plasma pressure for a given magnetic field, and the potential for smaller, less costly facilities for fusion power development. The project is a joint

project of PPPL, Oak Ridge National Laboratory, Columbia University and the University of Washington at Seattle. Researchers from 14 institutions compose the national NSTX research team.

NSTX Program Director Martin Peng noted that NSTX achieved first plasma ten weeks ahead of schedule. He said, "This accomplishment attests to the super dedication and expertise of the entire NSTX Team and the great support of the host and participating institutions." NSTX Project Director Masa Ono said, "I'm very excited about actually getting first plasma. Everything came together in the critical moment." PPPL Director Rob Goldston said, "We are started off on a new adventure. I believe that it will be an exciting one."

For further information, contact Martin Peng (mpeng@pppl.gov) or check out the NSTX web page (//fileroom.pppl.gov/nstxhome/index.shtml).

SEAB STARTS FUSION REVIEW

The DOE Secretary of Energy Advisory Board (SEAB) Task Force on Fusion Energy held its long anticipated meeting (August and November 1998 Newsletters) on March 29-30 in Washington, DC. The meeting was open to the public. The agenda included overview presentations on magnetic and inertial confinement fusion by DOE program managers N. Anne Davies and David Crandall, respectively, and additional overviews by Rob Goldston (PPPL) and Mike Campbell (LLNL), respectively. Talks were also given by Stewart Prager (University of Wisconsin) on the 1995 fusion review by the President's Council of Advisors on Science and Technology (July 1995 Newsletter) and by John Sheffield (ORNL), current chair of the DOE Fusion Energy Sciences Advisory Committee.

The Terms of Reference for the review asks the Task Force to "analyze and provide recommendations on the role of each of these technologies (magnetic and inertial) as part of a national fusion energy research program." The Terms state that the analysis "should address whether the current and planned resources within the Office of Fusion Energy Sciences budget are appropriately balanced among the concepts to provide the scientific basis for an informed selection of the best option for development as a fusion energy source." The Terms state that the Task Force "should specifically take into account the relationship to international fusion energy programs, the connection of inertial fusion energy research to the stockpile stewardship activities in Defense Programs, and the broader science and educational goals that may be enabled by these fusion technologies."

Dr. Richard A. Meserve, Partner, Covington & Burling, Washington, DC, a member of SEAB and of the National Research Council Energy Board, will chair the Task Force. Dr. Steven E. Koonin, Provost, California Institute of Technology, will be Vice Chair. Koonin has chaired National Academy panels to review inertial confinement fusion in the past and was a recipient of Fusion Power Associates Leadership Award in 1994.

The members of the Task Force, in addition to Meserve and Koonin, are: Ira Bernstein, Professor of Mechanical Engineering and Physics, Yale University, a pioneer fusion theoretical physicist; Edward A. Frieman, Director-Emeritus, Scripps Institute of Oceanography, and former Deputy Director of the Princeton Plasma Physics Laboratory; Hermann Grunder, Director, Thomas Jefferson National Accelerator Laboratory, who chaired a panel to review ITER for the DOE Fusion Energy Advisory Committee in 1997 (he was a recipient of Fusion Power Associates Leadership Award in 1998); Robert Hanfling, Senior Advisor, Putnam, Hayes and Bartlett, Washington, DC, a member of SEAB; Larry Papay, Senior Vice President and General Manager, Bechtel Group; Stewart Prager, Professor of Physics, University of Wisconsin, a prominent fusion researcher; Barrett Ripin, Associate Executive Officer, American Physical Society and former inertial confinement fusion researcher at the U.S. Naval Research Laboratory; and Allen Sessoms, President, Queens College, CCNY, Flushing, NY, a member of SEAB.

The review was precipitated by language contained in a Senate Appropriations Committee report (August 1998 Newsletter). The Senate report "recommends that the Department, prior to committing to any future magnetic fusion program or facilities, conduct a broader review to determine which fusion technology or technologies the U.S. should pursue to achieve ignition and/or a fusion energy device."

In addition to holding public meetings, the Task Force also welcomes written submissions of opinions. These should be sent to Skila Harris, Executive Director, SEAB, AB-1, USDOE, 1000 Independence Avenue, Washington, DC 20585. The Task Force expects to hold future meetings at PPPL, LLNL and DC on approximate one month intervals between now and June. The exact dates of the meetings were not set as of press time. Information on the Task Force is posted on the web (//vm1.hqadmin.doe.gov/seab/new.html) or by calling Richard Burrow (202)586-7092.

SUMMER STUDY UPDATE

Fusion Power Associates is among the many co-sponsors of a two week workshop called the "1999 Fusion Summer Study," July 11-23, in Snowmass Colorado. Richard Hawryluk (PPPL), Grant Logan (LLNL) and Mike Mauel (Columbia University) are co-chairs of the workshop. They are coordinating the activities of an Organizing Committee, whose members also include Dan Barnes (LANL), Arnold Kritz (Lehigh University), Farrokh Najmabadi (UCSD), Craig Olson (SNL), Tony Taylor

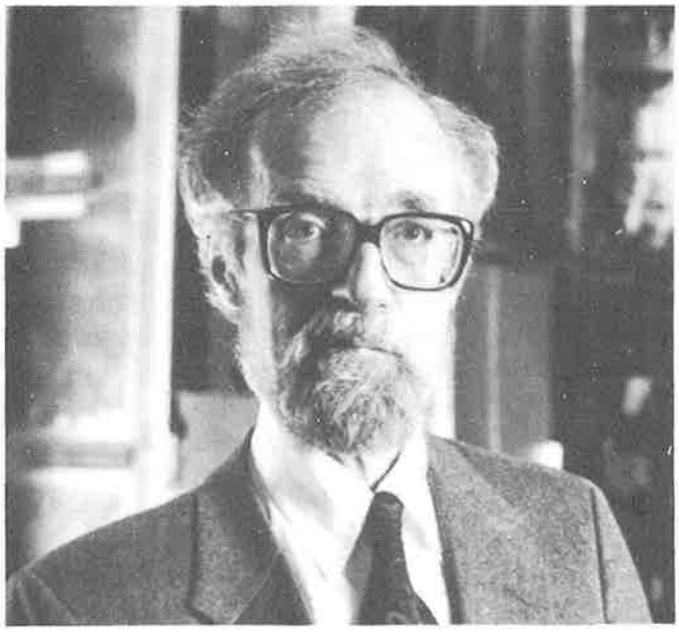
(GA) and Mohamed Abdou (UCLA). Other organizations co-sponsoring the workshop include DOE, GA, LANL, LBNL, LLNL, MIT/PSFC, ORNL, PPPL, SNL, UFA and VLT. The workshop is also endorsed by the APS Division of Plasma Physics.The theme of the Summer Study is "Opportunities and Directions in Fusion Energy Science for the Next Decade." According to the organizers, the workshop will "provide the participants a setting to develop a scientific and technical basis for consensus on: (1) the key issues for plasma science, technology, and energy and environment for fusion energy development; and (2) the opportunities and potential contributions of existing and possible future facilities and programs to reduce fusion development costs and achieve attractive economic and environmental features."

The meeting will be organized into two types of working groups: Fusion Concepts (meeting in the mornings) and Cross-Cutting Issues (meeting in the afternoons). The Concepts working groups will "work together and identify the important issues to be faced for concept development during the next decade" in the areas of magnetic confinement, inertial confinement and "emerging concepts." The Cross-Cutting Issues working groups will "address topics of general importance, often emphasizing those issues in common to more than one fusion concept," in the areas of plasma science, technology and energy. Opening and closing plenary sessions are also planned.

A web site is available for the latest information regarding this workshop (//www.pppl.gov/snowmass/). Links are provided to the organizers of the various working groups that are busy defining subgroups and topics in advance of the workshop. Registration and lodging information is available on the web page and can be accomplished on-line. The organizers request that people register for the conference as soon as possible.

HEAVY-ION DRIVER PROJECT AT UNIVERSITY OF MARYLAND

An accelerator under construction at the University of Maryland has potential application to a heavy-ion driver for Inertial Fusion Energy. It is an electron recirculating induction linac designed to be a model for a larger accelerator. The term "model" is appropriate since the energy, current and particle mass of such one-component beams can be scaled with confidence, given beam stability. The electron energy, 10 keV, is kept low to make the particle velocity similar to heavy ions and reduce the size and cost of the accelerator. The number of turns is limited to avoid well-known instabilities. The goal is high beam current, of order of 100 times a conventional synchrotron, for perhaps 100 turns. To make the method attractive, space-charge-dominated (SCD) beams must be used. Such beams behave like a one-component plasma compared to the single-particle behavior of conventional rings. However, the physics and limitations of SCD beams must be explored, as well as other technical issues.



Dr. Harold P. Furth

The University of Maryland project, sponsored by the Department of Energy, is directed by Martin Reiser and Patrick O'Shea. FM Technologies (FMT) is responsible for the injector under a DOE small business research project. Under a DOE-sponsored collaboration, Michigan State University is fabricating major parts of the accelerator. Innovative printed-circuit quadrupoles and dipoles, developed by FMT and the University of Maryland collaboration, are used for the ring lattice. The model has application to high-energy muon colliders as well as to inertial fusion energy. The project was described in detail at the Particle Accelerator Conference, March 29–April 2, in New York City (weng@bnl.gov) and is also described at a web site (//www.ipr.umd.edu/ebte/ring).

FURTH TO BE HONORED

The Princeton Plasma Physics Laboratory (PPPL) will host a "Scientific Symposium in Honor of Harold P. Furth," June 6-7, at the Laboratory.

Furth, a former Director of PPPL, and one of a select group of early fusion researchers at the Lawrence Livermore National Laboratory, has also been one of the most prolific scientific contributors to fusion over the past four decades. He will assume the status of Professor Emeritus at Princeton University upon his planned retirement this year. He has received numerous awards and honors, including Fusion Power Associates Leadership Award (1982) and Distinguished Career Award (1995).

A welcome reception will be held at Prospect House, on the Princeton University campus, from 6-7 PM on Sunday evening, June 6. The symposium will be held at PPPL on June 7, followed by a banquet at the Forrestal Hotel. Information on the

symposium is posted on the web (//www.pppl.gov/Workshops/furth). For more information, or to register to attend, contact: Barbara Sarfaty (bsarfaty@pppl.gov).

ITER MAGNET COMPLETED

A United States engineering team led by MIT has completed a 40-ton magnet that, when combined with a similar magnet in Japan, will serve as a testbed for the researchers' ultimate goal: a magnet weighing 1300 tons that will be key to an international experiment on nuclear fusion (ITER). Some of the technologies behind the U.S. magnet could also have other applications. For example, it employs novel superconducting cables wound into a coil that could be adapted for energy storage or to stabilize disturbances on a power grid.

The magnet left the U.S. on a ship bound for the Japanese Atomic Energy Research Institute (JAERI). Once it reaches Japan sometime in April, the magnet will be installed with another superconducting solenoid module manufactured by Toshiba Corp. for JAERI. When combined, the modules will form the world's most powerful pulsed superconducting magnet, weighing over 150 tons. The purpose of the combined magnet, called the Central Solenoid Model Coil (CSMC), is to demonstrate superconducting performance parameters and manufacturing methods for the full-size magnet planned for the International Thermonuclear Experimental Reactor (ITER) project. ITER goals include demonstrating fusion as an energy source.

Once the U.S. and Japanese test modules are joined "we'll conduct a series of tests to show that the magnet can do what it's designed to do. We also want to find its performance limits," said Joseph V. Minervini, head of the MIT CSMC team and a Principal Research Engineer at MIT's Plasma Science and Fusion Center (PSFC) and Department of Nuclear Engineering.

Some 20 PSFC researchers were involved in the work, including David A. Gwinn, who was in charge of overall fabrication, and William K. Beck, who led manufacturing operations in Hingham, Mass. MIT's partners on the U.S. CSMC team are Lawrence Livermore National Laboratory (LLNL) and the Lockheed Martin Corporation (the prime industrial contractor). Dr. Raghavan Jayakumar, a Visiting Scientist to MIT from LLNL, served as the US CSMC Program Manager.

PEOPLE

T. J. Glauthier has been confirmed by the Senate to be Deputy Secretary of Energy. He was previously at the Office of Management and Budget.

Gerold Yonas has been named Principal Scientist and Vice President for Advanced Concepts at Sandia National Laboratories in Albuquerque, NM.

IN MEMORIAM: GLENN T. SEABORG

Glenn T. Seaborg, a giant of the nuclear age, died February 26 at his home in Lafayette, CA. He was 86. A nuclear chemist and Nobel Laureate, Seaborg was co-discoverer of plutonium and nine other transuranic elements. He also co-discovered many other isotopes now commonly used in nuclear medicine and industry. He had a life-long association with the University of California and especially with the Lawrence Berkeley National Laboratory. From 1961–1971, he had oversight of the nation's fusion energy program as Chairman of the U.S. Atomic Energy Commission. In his later years, he took an occasional technical interest in various fusion concepts. Fusion Power Associates regrets his passing.

CALENDAR

Apr 12-14 – 13th Topical Conf. on Applications of Radio Frequency Power to Plasmas, Annapolis. Contact: sbernabe@pppl.gov

May 2-7 – Process Control, Diagnostics and Modeling in Semiconductor Manufacturing, Seattle. Contact: meyya@orbi.arc.nasa.gov

May 24-28 – 2nd International Conference on the Physics of Dusty Plasmas, Hakone, Japan. Contact: nakamura@bochan.ted.isas.ac.jp

June 6-11 – IEE Plasma Technology Training School, Buxton, England. Contact: hpope@iee.org.uk

June 14-18 – 26th European Conf. on Controlled Fusion and Plasma Physics, Maastricht, Netherlands. Contact:donne@rijnh.nl

June 19-20 – 2nd Workshop on Role of Electric Fields in Plasma Confinement and Exhaust, Maastricht, Netherlands. Contact: stockel@ipp.cas.cz

June 20-24 – IEEE International Conference on Plasma Science, Monterey, CA. Contact: //www.ieee.org/conference/conflinks.html

June 21-23 – First Principle-Based Transport Theory for Tokamaks, Kloster Seeon, Germany. Contact: biskamp@ipp.mpg.de

QUOTABLE

"The farther you can see into the past, the better will be your vision of the future."

- Winston Churchill

FUSION POWER ASSOCIATES
EXECUTIVE NEWSLETTER

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85 MEMBERS OF CONGRESS URGE FUSION SUPPORT

CONGRESS URGES FUSION

Eighty-five members of the U.S. House of Representatives indicated their strong support for the U.S. Fusion Program in a letter sent to the Chair and Ranking Minority Member of the House Appropriations Subcommittee on Energy and Water. This is three more than signed a similar letter last year. The text of the letter is provided below. A complete listing of those signing the letter is available from Fusion Power Associates.

"Dear Chairman Packard and Ranking Member Visclosky:

"We are writing to thank you for your strong support of fusion energy science research in the past and to request that your Subcommittee provide the funding necessary to implement a new, broader program which is responsive to direction from your subcommittee.

"Fusion research is one of the best examples of a government program that has a clearly defined and sorely needed end product —a fundamentally new source of energy—and at the same time advances basic scientific research. As an extra benefit, the inherently difficult nature of the fusion challenge continues to produce important spinoffs in other scientific fields, and provides important technological benefits to society.

"As you know, fusion energy science funding fell 40 percent between FY 1995 to FY 1997, from approximately $370 million to $225 million. Since that time, the budget has remained essentially level, except for the inflation that continues to erode the program's effective buying power. Despite these declines, fusion researchers have made significant progress towards the eventual realization of this essential energy source of the future. Now, in response to substantial progress in fusion science as well as to Congressional direction, the fusion community is working together to develop a plan for reaching the goal of practical fusion energy while at the same time maximizing the scientific and technological benefit to the nation. This plan will be inclusive of all potentially viable fusion concepts and will rely heavily on a thorough peer review process to select the best combination of findings at each stage for further development. It will also leverage for energy purposes the substantial investment in inertial fusion made by DOE's defense programs and the substantial investment made by other nations in magnetic fusion.

"Implementing this broader fusion energy science program will require an increase in the fusion budget to levels approaching, though not reaching, those of several years ago. As a step in this direction, we ask that your Subcommittee appropriate no less than $250 million for fusion energy science research in FY 2000, plus the additional $10 million required for the decommissioning of the TFTR facility. While funding at this level is significantly below the program's $370 million of just four years ago, it will allow the program to expand into new and innovative avenues of research while also ensuring improved utilization of existing experimental facilities.

"Thank you again for your past support of this program and for your attention to this request."

SEAB REVIEW CONTINUES

The Secretary of Energy Advisory Board (SEAB) Task Force on Fusion Energy (see Mar/Apr 1999 Newsletter) held its second meeting April 29–30 at Princeton Plasma Physics Laboratory (PPPL) and its third meeting May 26–27 at the Lawrence Livermore National Laboratory (LLNL). At PPPL the Task Force heard mostly about the magnetic fusion program, while at LLNL they heard mostly about inertial confinement fusion. However, the Task Force also received briefings on world energy use, global warming, commercial "spinoffs" from fusion research, fusion power plant designs, development pathways, international collaboration, and connections to weapons research and non-proliferation.

The Task Force meets June 14 in closed session to begin drafting its Interim Report, which is due in early July. The Task Force also plans a late June public meeting to discuss its draft report. For information, contact Richard Burrow (richard.burrow@hq.doe.gov), phone (202)586-1709.

NRC STARTS FUSION REVIEW

The National Research Council (NRC) began its "Assessment of the Fusion Energy Sciences Program (see our November 1998 newsletter)" with a meeting May 16-19 at the Hotel La Jolla, La Jolla, CA. The meeting was partially open to the public.

According to the NRC, the Project Scope is as follows: "The Fusion Science Assessment Committee will assess the scientific quality of the fusion program of the DOE's Office of Science. Criteria will include excellence, impact, role in education, and contribution to strengthening the scientific foundation for fusion. A science strategy for the program will provide a context for judgment and a direction for future development." The NRC says the Project Duration is 24 months although sources indicate that a partial report will be issued this summer.

At the La Jolla meeting the panel heard the following presentations: Study Overview (Charles Kennel, Chairman), DOE Overview (John Willis, DOE), Overview of Theory and Computation (William Nevins, LLNL), Overview of Experiment (Michael Mauel, Columbia University), Computational Models (William Dorland, U. Maryland), Contributions of Theory to Other Disciplines (Steven Cowley, UCLA), Experimental Tests of Neoclassical Theory (Michael Zarnstorff, PPPL), and Basic Plasma Experiments (Clifford Surko, UCSD). Parallel working sessions were also held on Theory and Computation and on Experiment.

The Committee membership is as follows: Charles Kennel (Director, Scripps Inst. of Oceanography, Chair), Robert Socolow (Princeton University), Robert Frosch (Harvard University), Claudio Pellegrini (UCLA), George Gloeckler (University of Maryland), Patrick Colestock (Fermi National Accelerator Laboratory), Robert Siemann (Stanford University), Robert Rosner (University of Chicago), James Van Dam (University of Texas at Austin), Nathaniel Fisch (Princeton University), James Drake (University of Maryland), Stewart Prager (University of Wisconsin), and Andrew Sessler (Lawrence Berkeley National Laboratory).

Socolow and Frosch will serve on a "Steering Group." Pellegrini, Gloeckler, Colestock and Siemann will specialize in "Experiment." Rosner, Van Dam and Fisch will specialize in "Theory and Computation." Drake, Prager and Sessler will deal with "Program Architecture."

The NRC is an arm of the National Academy of Sciences and the National Academy of Engineering. It was recently announced that these three groups will henceforth be referred to jointly as "The National Academies."

The review was requested by DOE Director of Science Martha Krebs, who asked for an "independent assessment of the scientific quality of the (DOE Office of Fusion Energy Sciences) research programs."

In her request letter Krebs said, "Among the things you may wish to consider in your assessment are the quality of fusion research itself as evidenced by progress in the understanding of fundamental plasma physics issues in fusion energy; the impact that fusion energy research has had in other scientific areas such as astrophysics, geophysics, computational science, and technological areas such as plasma processing; and the role of fusion research in the academic community including graduate student training." Krebs commented, "I anticipate that those who carry out the assessment will have the broad scientific expertise necessary to provide the critical judgment required in such a task and that they will represent a broad segment of the scientific community."

For further information contact Ms. Grace Wang (gwang@nas.edu). Information can also be found on the web at //www.nas.edu/ and search for "Current Projects."

LLNL FUSION CONSOLIDATION

At the Lawrence Livermore National Laboratory (LLNL), effective April 1, the Magnetic Fusion Energy (MFE) program, headed by Keith Thomassen, and the Inertial Confinement Fusion program, headed by Joe Kilkenny, will both report to LLNL Associate Director, Mike Campbell. Previously the MFE program reported to the Associate Director for Energy Programs. Campbell currently heads the Laser Directorate, which will be renamed appropriately to reflect its broader mission. Other missions which will report to Campbell include the Missile Defense & Space Logistics Program and the Atomic Vapor Laser Isotope Separation (AVLIS) Program.

In making the change, LLNL Director Bruce Tartar said, "I believe the Lab's fusion efforts will benefit by integration in one organization, so I am transferring the magnetic fusion work to Lasers, where a significant level of national leadership in fusion science is already underway."

HORTON PUBLISHES MAJOR REVIEW ARTICLE ON PLASMA TRANSPORT

A major review article on "Drift Waves and Transport" has been published by Wendell Horton (University of Texas at Austin) in the April 1999 issue of Reviews of Modern Physics. In the article, Horton notes that "the past decade of research in plasma confinement has shown that plasma transport across the magnetic field is largely controlled by low-frequency drift-wave fluctuations." He states, "The purpose of this review is to describe the current understanding of the drift-wave transport phenomenon." Correlations with experiments are described and an extensive list of references is provided. For further

information contact Wendell Horton (horton@peaches.ph.utexas.edu).

NIF TARGET CHAMBER DEDICATED

The "spectacular" 10-meter diameter target chamber for the National Ignition Facility (NIF) at the Lawrence Livermore National Laboratory was dedicated June 11 by Energy Secretary Bill Richardson. NIF is a key element in the U.S. Stockpile Stewardship Program and an essential step in demonstrating the physics of inertial confinement fusion for civilian power. NIF began construction two years ago, is now 67 percent complete and is on schedule for completion in 2003. Industries around the nation are now manufacturing the optics, laser and experimental equipment for the 192-beam, 500 trillion watt NIF laser.

The ceremony was marked by the lifting of the chamber by a large crane from its construction site into the NIF building and also marks the ending of research on the Nova laser and the beginning of the transition from Nova to NIF as the primary laser fusion research facility at LLNL. Since its beginning of operation in 1984, more than 14,000 research experiments were conducted using the Nova laser on stockpile stewardship, inertial confinement fusion and high-energy-density science.

LINER TEST SUCCESSFUL

On 12 May a team of researchers from Air Force Research Laboratory and Los Alamos National Laboratory imploded a liner (no plasma inside) on the Shiva Star facility in Albuquerque. Liner performance was documented in this first-ever test using dimensions and energy matched to requirements of the proposed Magnetized Target Fusion (MTF) proof-of-principle program (see May 1997 and November 1998 newsletters). Preliminary assessment of data confirms theoretical predictions: velocity of 3 mm/microsecond corresponding to Kinetic Energy of 1.4 MJ (capacitor bank energy 4.5 MJ). Dimensional stability, the major concern for this unusually elongated liner geometry (3:1 length to diameter), looked excellent. More-than-required radial convergence of 15:1 was achieved with negligible inner surface perturbations. For further information contact Dick Siemon (rsiemon@lanl.gov).

INERTIAL FUSION CONFERENCE

The First International Conference on Inertial Fusion Sciences and Applications will be held September 12-17 in Bordeaux, France, under the patronage of Le Haut-Commissaire a l'Energie Atomique. Fusion Power Associates is one of several sponsoring organizations, including the Japan Nuclear Society, the American Nuclear Society, the American Physical Society, the Canadian Nuclear Society, the Atomic Energy Agency and the International Atomic Energy Agency. Bill Hogan (LLNL) is chair of the Technical Program Committee. The conference is an extension and expansion of the former international conference series called Laser Interaction and Related Plasma Phenomena. Information on the conference is on the web at //lasers.llnl.gov/lasers/ifsa/

LASER DIAGNOSTIC MEETING SET

The 9th International Symposium on Laser-Aided Plasma Diagnostics (LAPD-9) is set to take place September 26–October 1, 1999 at Lake Tahoe, California, USA. Information on the symposium can be obtained from Lynette A. Lombardo (lalombardo@ucdavis.edu) or on the web at //tempest.engr.ucdavis.edu/lapd/lapd9.html

The LAPD-9 Symposium is the continuation of a biennial series which was originally inaugurated at Kyushu University in 1983 and which has been alternatingly organized in Japan, Europe and the United States of America. The Symposium brings together physicists from various disciplines including laser physics, low-temperature plasma chemistry and physics and nuclear fusion. The Symposium is an important and fruitful source for cross-fertilization between these fields. The topics for the Symposium include laser diagnostics and diagnostics aided by lasers for fusion plasmas, industrial process plasmas, environmental plasmas as well as for other plasma applications and processes related to plasmas. Hardware developments related to laser-aided plasma diagnostics is another topic that is emphasized.

The scientific sessions will be mainly organized in the morning and early evening. It is planned to keep the afternoons free to facilitate the interactions between participants.

PLASMA SCIENCE CONFERENCE

The 2nd International Symposium on Applied Plasma Science (ISAPS '99) will be held September 20 - 24, 1999 at the OSAKA SUN PALACE, Osaka, Japan. This symposium is held to promote international collaboration in Applied Plasma Sciences. The 1st International Symposium on Applied Plasma Science (ISAPS '97) was held at UCLA, Los Angeles, USA in 1997, on the occasion of the 5th anniversary of the Institute of Applied Plasma Science (IAPS). The 2nd symposium will be also held jointly sponsored by IAPS and the Institute of Plasma and Fusion Research (IPFR) at UCLA.

The topics of this symposium focus mainly on plasma applications, including applications to environmental problems, and also contain applications of other high energy sources, such as electron, ion, and laser beams. Participants in this symposium cover a wide range of interdisciplinary scientific activities in the fields of energy, mechanical, electrical, material, and chemical sciences. The Symposium chairmen are A. Kobayashi (Osaka U.) and N. M. Ghoniem (UCLA).

This Symposium mainly focuses on the applications of Plasma Science and other high energy sources (electron beam, ion beam, laser beam, etc.). The topics in this Symposium are as follows: plasma production, modeling & simulations; plasma processing (surface modification, thermal spraying, etc.); plasma applications to environmental problems; advanced materials (hybrid functional material, composite materials, etc.); characterization and evaluation of materials; and industrial applications of directed energy sources (e-beams, ion beams, lasers).

All questions related to this symposium should be directed to Akira Kobayashi (kobayasi@jwri.osaka-u.ac.jp).

PPPL WINS SMALL BUSINESS AWARD

The Princeton Plasma Physics Laboratory (PPPL) has won the United States Small Business Administration's 1999 Dwight D. Eisenhower Award for Excellence in Small Business Subcontracting in the research and development category. This is the SBA's highest award to Federal prime contractors. PPPL's program was selected from a nationwide pool of more than 2500 eligible firms doing business in the research and development category. The award was presented to PPPL June 10 at the 32nd Annual Joint Industry/SBA Procurement Conference in Washington, DC.

WEB NOTES

The May issue of Stellarator News can be downloaded from //www.ornl.gov/fed/stelnews/

The Spring 1999 issue of the American Physical Society Division of Plasma Physics newsletter is available at //w3fusion.ph.utexas.edu/aps/newsletters/Spring99.pdf

NUCLEAR NOTES

During 1998, 4 new nuclear power plants (3 in Korea and 1 in the Slovak Republic) began operation, producing about 3 gigawatts of electricity and bringing the world total to 434 operating power plants. Currently there are also 36 nuclear power plants under construction. Overall, nuclear power provided about 16 percent of electricity, worldwide. The countries with the highest percentage of nuclear-generated electricity in 1998 were: Lithuania (77 percent), France (76 percent), Belgium (55 percent), Sweden (46 percent), Ukraine (45 percent), Slovak Republic (44 percent), Bulgaria (42 percent), Korea (41 percent), Switzerland (41 percent), Slovenia (38 percent), Japan (36 percent), and Hungary (36 percent).
Source: International Atomic Energy Agency.

CALENDAR

July 5–16 Culham Plasma Physics Summer School, Abingdon, Oxfordshire, UK. Contact: julie.bright@ukaea.org.uk Web: //www.fusion.org.uk/info/sschool/99.htm/

July 7–9 Research and Applications of Plasmas (PLASMA'99), Warsaw, Poland. Contact: msadowski@ipj.gov.pl Web: //www.cbk.waw.pl/plasma99/

July 11–16 XXIV International Conference on Phenomena in Ionized Gases, Warsaw, Poland. Contact: icpig99@ifpilm.waw.pl Web: //www.icpig99.ifpilm.waw.pl/

July 11–23 Opportunities and Directions in Fusion Energy Scienc for the Next Decade, Snowmass, CO. Contact: mauel@columbia.edu Web: //www.pppl.gov/snowmass/details.htm/

July 19–21 2nd IAEA Technical Committee Meeting on Control, Data Acquisition and Remote Participation for Fusion Research, Lisbon, Portugal. Contact: TCM@cfn.ist.utl.pt Web: //www.cfn.ist.utl.pt/tcm/

July 19–22 Workshop on Non-Neutral Plasmas, Princeton, NJ. Web: //www.pppl.gov/workshop/NNP/

July 22–27 21st International Conference on the Physics of Electronic and Atomic Collisions, Sendai, Japan. Contact: info@power1.pc.uec.ac.jp Web: //power1.pc.uec.jp/sendai/

July 22–30 International Seminar on Atomic Processes in Plasmas, Toki, Gifu, Japan. Web: //dpc.nifs.ac.jp/icpeac-99/index.html

August 1–8 Fourth International Workshop on Strong Microwaves in Plasmas, Nizhny Novgorod-Saratov, Russia. Contact: smp@appl.sci-nnov.ru Web: //www.sci-nnov.ru/science/microwave/

August 2–6 14th International Symposium on Plasma Chemistry, Prague, Czech Republic. Contact: sember@ipp.cas.cz Web: //www.ipp.cas.cz/NTP/ispc-14/index.html/

August 2–27 Second Latin American Course on Plasma Processing of Materials, Buenos Aires, Argentina. Contact: rodrigo@cnea.edu.ar

August 26–28 International Workshop on Plasma Diagnostics, Belgium. Web: //ovpserv4.rug.ac.be/AppliedPhysics/Workshop/

August 30–September 10 4th Carolus Magnus Summer School on Plasma Physics, Maastricht, The Netherlands. Contact: egert@rijnh.nl

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MIT PLASMATRON WINS DISCOVER AWARD
FPA ANNUAL MEETING SET OCTOBER 19-21

FPA 20-YEAR ANNIVERSARY MEETING

Fusion Power Associates will hold a special Anniversary Meeting and Symposium, October 19–21, 1999, in Washington, DC, celebrating the 20-year anniversary of our founding. Fusion Power Associates was incorporated August 16, 1979 as a non-profit public benefit corporation in the State of California. The first meeting of our Board of Directors was held September 24, 1979 in La Jolla, CA. There were 13 institutional Charter Members. Today, Fusion Power Associates has 28 institutional Members and Affiliates and over 400 Individual Affiliates.

The theme of the October 19–21 Meeting and Symposium will be "Fusion Power for the 21st Century: Science and Technology for the New Millennium." We intend to discuss the future prospects for fusion science and related technologies, including results from currently-ongoing reviews. These include the 1999 Fusion Summer Study, SEAB review, National Academies review, and FESAC review. We will also get updated on current policy views of Congress and the Administration.

On the technical side, we will be taking a look at many items, including the status of the National Ignition Facility, inertial fusion energy programs, ITER, magnetic fusion concepts and near-term "spin-off" applications. The meeting program, in the initial stages of formulation, will consist of a mix of invited and contributed papers. Persons wishing to make a 10-minute contributed presentation should contact Fusion Power Associates (fpa@compuserve.com).

A block of rooms has been reserved at a rate of $155 per night under the name of Fusion Power Associates at the conference hotel: The Washington Court Hotel, 525 New Jersey Avenue NW, Washington, DC 20001. For reservations contact the Hotel at (800)321-3010 before September 18.

The preliminary program and registration materials will be sent to the recipients of Fusion Power Associates Executive Newsletter in the near future. To pre-register, send an email to FPA expressing your intentions and providing us with your mailing address if you think we do not have it. Registration fee for the symposium is $425, payable by check (no credit cards). Non-US checks in equivalent amount of local currency are acceptable.

We hope that all our friends will join us for this celebration.

L. Bromberg, A. Rabinovich and D. Cohn of MIT, holding Plasmatron. The "soup-can" sized device is designed to add a small amount of hydrogen-rich gas to the gasoline powering a car, making possible a significant decrease in pollutant emissions.

MIT PLASMATRON WINS AWARD

Winners of the Tenth Annual Awards for Technological Innovation, sponsored by Discover Magazine and the Christopher Columbus Foundation, were feted at Epcot Center, Florida. MIT's Microplasmatron Fuel Convertor was the winner in the transportation category, beating out two other finalists: a hybrid electric vehicle developed by Toyota and NASA's intelligent flight control system. In all, there were 27 categories and winners out of an original field of 4000 entries.

The award was presented to Dr. Daniel Cohn, senior research scientist and head of the MIT Plasma Science and Fusion Center's (PSFC) Technology Division. Dan said, "This work is a spin-off from the PSFC's fusion activities." The specific project was funded by DOE's Office of Heavy Vehicle Technologies. The device, about the size of a large soup can, takes in a small amount of gas from the stream heading for a vehicle's engine and, by ionizing it, creates a hydrogen rich mixture that, when mixed back with the gasoline stream and burned, reduces smog-producing nitrous oxide pollutant emissions by about 90 percent.

The microplasmatron has been shown to be effective with a wide variety of fuels, including ordinary gasoline, natural gas, diesel oil and oils derived from biomass. Similar devices have been used previously to produce hydrogen-rich gas in large industrial applications, like metallurgical processing. "Our key step was the development of a compact, efficient, high-throughput, plasma generator," said Dr. Cohn. "You can hold the device in your hands, operate it at low power (around one kilowatt) and can process difficult-to-use fuels."

"This device could greatly reduce air pollution from cars, trucks and buses, using present internal combustion engine technology, without a major increase in costs and without any inconvenience to the driver," said Dr. Cohn. "Thus it could be possible to have a significant effect on the environment within the next decade."

Dr. Cohn's colleagues on the work at the MIT Plasma Science and Fusion Center were Leslie Bromberg and Alexander Rabinovich. Collaborating on the work also were Jeffrey Surma and Jud Virden at Battelle Northwest National Laboratory and Charles Titus of T&R Associates.

For more information, contact Dan Cohn (cohn@psfc.mit.edu).

U. S. BUDGET UPDATE

The US House of Representatives has approved a FY 2000 budget for the DOE Office of Fusion Energy Sciences (OFES) of $250 million, $27.4 million above the President's request and $26.7 million above the current FY 1999 level. The Committee also added $10 million to the DOE Defense Program's request "to further the development of high average power lasers." A similar amount had been added by Congress in FY 1999 for laser development, but continuation of that effort was not contained in the President's FY 2000 request. The Senate had previously approved for OFES only $220.6 million, $2.7 million less than the FY 1999 level. The House bill must still go to conference with the Senate to resolve differences, before being signed into law by the President. The level approved for Inertial Confinement Fusion in DOE's Defense Programs Office was $475.7 million, of which $254 million is for construction of the National Ignition Facility (NIF), $10 million more than the President's request.

The relevant House Appropriation's report language is reproduced below.

"FUSION ENERGY SCIENCES

"The Committee recommendation is $250,000,000, a $27,386,000 increase over the amount provided in the current fiscal year. The Committee commends the Department for its efforts to pursue the most promising paths towards producing electricity from fusion. The Committee has provided sufficient funding to accelerate and fully utilize the user facilities currently in operation. The Committee will work closely with the Department to review the work done by the Secretary of Energy's Advisory Board and continue to support the goals of the fusion energy sciences program.

"The Committee remains committed to a fusion program that is based on both quality science and the ultimate goal of practical fusion energy. A positive development in this regard is the "roadmapping" process, which the fusion community is now undertaking and which includes both the MFE and IFE approaches. Positive aspects of this process include the emphasis on increasing diversity in the program and the strengthening of peer review. The Committee is pleased with the advanced-tokamak emphasis of current tokamak research, which is in keeping with the program emphasis of innovation.

"Additional funds are provided to support new work in concept innovation in both MFE and IFE, to provide for more effective utilization of the existing national research facilities, and to support the underlying technology development which sustains this research. The Department is directed to provide an updated spending plan to the Committees on Appropriations within thirty days of enactment of the accompanying bill. The Committee looks forward to working with the Department on budget and program to accelerate the accomplishments in the fusion program.

"The recommendation includes $13,600,000, the same amount as the budget request, to continue landlord activities and begin decontamination and decommissioning of the Tokamak Fusion Test Reactor (TFTR). The committee expects that decontamination and decommissioning of the TFTR facility will go forward as proposed and will be managed by the Princeton Plasma Physics Laboratory. In developing future budgets and program plans, the Committee strongly encourages the Department of Energy and the Administration to ensure that this work can proceed without negatively affecting the ongoing research program."

"INERTIAL FUSION

"The committee recommends $475,700,000 for the inertial

fusion program, an increase of $10,000,000 over the budget request of $465,7000,000, and $32,300,00 less than fiscal year 1999. The recommendation includes $254,000,000 for the National Ignition Facility, $30,450,000 for the University of Rochester's OMEGA laser, and $9,500,000 for the Naval Research Laboratory. Consistent with the fiscal year 1999 program, the recommendation includes $10,000,000 to further the development of high average power lasers."

The relevant language in the Senate Appropriations report is as follows:

"FUSION ENERGY SCIENCES

"The Committee recommendation for Fusion Energy Sciences is $220,614, a reduction of $2,000,000 from the request. While in the past, the Committee has supported increases above the level of the request for this program, severe budget constraints and shortfalls elsewhere in the Department's request, necessitate the reduction at this time.

"The Committee recommendation includes $19,000,000 for inertial fusion energy research to improve heavy ion accelerator efficiency, heavy ion and laser chamber designs, and the design of fusion energy target pellets."

"INERTIAL CONFINEMENT FUSION (ICF) — An appropriation of $475,700,000 is recommended for the Inertial Confinement Fusion Program. The ICF Program continues to be a major contributor to the science and technology base supporting the nuclear deterrent through improved understanding of the underlying physics of nuclear weapons and computational modeling that will provide the future basis for ensuring safety, reliability, and performance on nuclear components.

"The Committee recommendation includes $248,100,000 to continue construction of the National Ignition Facility and $15,900,000 for operating expenses to support research activities related to NIF. The President's fiscal year 2000 budget request significantly underfunded several areas of NIF research which would place at risk the success of scientific and stewardship objectives of the National Ignition Facility. With capital investment of over $1,000,000,000, the Committee believes the Department's budget request is unwise and jeopardizes a key element of the Stockpile Stewardship effort and, therefore, our national security, and the safety and reliability of the nuclear weapons stockpile. The additional $10,000,000 recommended by the Committee provides an additional $3,600,000 for core NIF diagnostics, $1,000,000 for direct drive laser beam smoothing development, and $5,400,000 to initiate critical cryogenic activities. Without this additional funding, the operational schedule, established by the Department of Energy, would be delayed by 1 year at a minimum."

"NATIONAL IGNITION FACILITY (NIF) — The NIF is a key facility in maintaining nuclear weapons science expertise required for the stockpile stewardship program, and in supporting weapons effects testing. An appropriation of $248,100,000, the full amount needed in fiscal year 2000 to keep this important project on schedule, is recommended for the NIF project. Fiscal year 1999 was the peak year for construction funding, and with the appropriation recommended for fiscal year 2000, the project will be 75 percent complete on an appropriations basis. The project remains on schedule and within the projected construction cost of $1,046,000,000. The Committee is pleased with the management and oversight attention provided by LLNL on the project."

JOBS OPEN AT LLNL, NRL

Due to the recent retirements of Dr. Stephen Bodner at the U.S. Naval Research Laboratory (NRL) and Dr. Keith Thomassen at the Lawrence Livermore National Laboratory (LLNL), as well as a recent reorganization at LLNL, combining responsibility for both magnetic fusion energy and inertial fusion energy into the Lasers Directorate headed by Dr. E. Michael Campbell, openings for fusion leaders at both NRL and LLNL now exist. Both positions require U. S. citizenship and security clearance.

At LLNL, the posting notes that "Livermore has recently integrated its research in magnetic and inertial fusion energy, and beam research, within the Laser Directorate. The position, called Deputy Associate Director for the Lasers Directorate, will have primary responsibility for developing and directing LLNL's programs in fusion energy, and in the application of high current particle beams." Candidates must have a "Ph.D. in Physics with an emphasis in plasma physics or an equivalent level of demonstrated knowledge; significant experience in fusion research, either magnetic fusion research, or inertial fusion research, with a preference to a candidate with several years of experience in both areas; demonstrated ability to lead and manage a group of people with diverse backgrounds toward a common objective; demonstrated excellent communication skills, both written and verbal; demonstrated ability to sustain and develop productive relationships with other laboratories, academic institutions, industry and international organizations; demonstrated ability to develop programs; and background and knowledge of the structure and administrative processes within DOE agencies." Interested parties should send a resume by mail or email, referencing job posting LA-9276, to Ms. Barbara Tuck, Senior Employment Representative, LLNL (Mail Stop L-491), 7000 East Avenue, Livermore, CA 94550; email:tuck1@llnl.gov

At NRL, the posting notes that "Applications are invited for the position of Head of the Laser Plasma Branch in the Plasma Physics Division at the Naval Research Laboratory,

Washington, DC. The Laser Branch develops new high powered lasers and utilizes these high power lasers for fundamental and applied research in laser-matter interaction." NRL has in operation a large Krypton Fluoride laser, called Nike, for laser fusion research in support of DOE's Defense Programs. Substantial efforts are also directed at developing the complex computational tools needed to simulate and understand the physics of laser target interactions. The Branch has also begun development of large high-repetition rate KrF lasers of interest for energy applications. Applicants should have "a Ph.D or its equivalent in the field of plasma physics and extensive experience in the areas of plasma physics and laser fusion, and have authored a number of important publications, of which some have had a major impact on advancing the field of laser fusion." The applicant "must be able to guide and lead a research group in carrying out the technical and scientific requirements (and) have a special quality to meet, cooperate, and coordinate with scientists and officials at NRL and other government agencies, as well as other laboratories." Interested applicants should send a detailed resume to NRL, Human Resources Office, Attn:Code 1810kw, ID# 67-5020-99, 4555 Overlook Avenue, SW, Washington, DC 20375-5320 or call (202)767-3030.

SPHEROMAK BOOK PUBLISHED

Dr. Paul M. Bellan (California Institute of Technology) has just published a book entitled Spheromaks (Imperial College Press, London). Spheromaks are easily formed, self-organized magnetized plasma configurations that have intrigued physicists and fusion power plant designers for over two decades. Sometimes called magnetic vortices, magnetic smoke rings, or plasmoids, spheromaks first attracted attention as a possible fusion power plant scheme, but are now known to have many other applications. For further information, contact Paul Bellan (pbellan@cco.caltech.edu). The book can be ordered on the web (//www.wspc.com.sg/books/physics/p121.html/).

PEOPLE

L. David Cherrington has joined the Princeton University Government Affairs Office in Washington, DC as Associate Director, with primary responsibility for covering matters having to do with the Princeton Plasma Physics Laboratory. Most recently, he was Legislative Director for Congressman Joe Knollenberg (R-MI). David may be reached at (202)639-8429 (ldcher@princeton.edu).

IN MEMORIAM

Congressman George Brown (D-CA) passed away July 15, 1999, due to complications following heart surgery. He was 79. He served in the House from 1962 to 1970 and again from 1972 til his death. From 1990 to 1994, he was chairman of the House Committee on Science and Technology. Currently he was ranking minority member on the House Committee on Science. Throughout his tenure, he was a strong supporter of research and development, in general, and fusion research, in particular.

Approximately 300 fusion researchers, meeting at the 1999 Fusion Summer Study, voted unanimously to endorse the following resolution:

"The U. S. Fusion Community is deeply saddened by the loss of Congressman George Brown, ranking Democrat on the House Science Committee, and previously Chairman of the House Committee on Science and Technology. Congressman Brown was one of the strongest and most consistent voices in Congress articulating the importance of research and development. Throughout his career, Congressman Brown was a strong and reliable supporter of fusion energy research. His departure is a great loss to fusion and to the scientific community as a whole."

Fusion Power Associates president Steve Dean had the resolution inscribed on parchment and transmitted the document to Mrs. Brown with a letter of condolence, in which he called Brown "a great man (who) will be sorely missed by all of us." He said, "On behalf of fusion energy researchers worldwide, I am writing to express our profound sorrow and deep sense of loss on the passing of your husband, the Honorable George Brown, and to offer you our most sincere condolences."

QUOTABLE

"The farther you can see into the past, the better will be your vision of the future."

Winston Churchill

CALENDAR

Sep 12–17 First International Conference on Inertial Fusion Sciences and Applications (IFSA). Bordeaux, France. Contacts: IFSA99@llnl.gov; or voirin@ixl.u-bordeaux.fr; or //lasers.llnl.gov/lasers/ifsa

Sep 20–25 Second International Symposium on Applied Plasma Science (ISAPS'99). Osaka, Japan. Contact: kobayasi@jwri.osaka-u.ac.jp

Sep 26– Oct 1 Ninth International Symposium on Laser-Aided Plasma Diagnostics. Lake Tahoe, CA. Contact: lalombardo@ucdavis.edu; or //tempest.engr.ucdavis.edu/lapd/lapd9.html

Sep 27–Oct 1 International Stellarator Workshop. Madison, WI. Contact: lyonj@fed.ornl.gov; or //www.ornl.gov/fed/stelnews/

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SEP/OCT1999
Vol. 21, No. 5

SEAB ENDORSES FUSION EFFORT
FESAC RECOMMENDS FUSION PRIORITIES
KREBS LEAVING DOE POST

U.S. BUDGET UP

House and Senate Conferees agreed on a U.S. fusion budget for FY 2000 of $250 million, $27.4 million above the President's request. Until recently, the fate of the DOE Appropriations Bill was in doubt, due to many differences between House and Senate versions (see July/Aug Newsletter). The Senate, for example, had allocated only $220.6 million for fusion previously. The Conference Report contains the following language:

"The conference agreement includes $250,000,000, the same amount provided by the House instead of $220,614,000 as provided by the Senate. The conferees are pleased with the highly supportive recent report on fusion energy science from the Secretary of Energy's Advisory Board and with the comprehensive scientific plan developed by the Fusion Energy Sciences Advisory Committee (FESAC). The FESAC plan should be used by the Department as guidance in the allocation of the resources provided for fusion energy sciences."

The Conference Report also contains a total of $475,000,000 for inertial fusion in DOE's Defense Programs budget, of which $248,100,000 is for NIF and $227,600,000 is for base program activities. The Conference Report contains the following language:

"The agreement includes the additional $10,000,000 proposed by the House for the inertial fusion program to further the development of high average power lasers."

"The National Ignition Facility has been described as one of the cornerstones of the Stockpile Stewardship Program. The conferees understand that the most recent internal review of the project has concluded that the projected cost to complete the project has increased and the completion date will be delayed. The conferees are very disappointed by this. Additional reviews will be performed in coming months to establish the appropriate future actions for proceeding with this project."

"The conferees direct that the Secretary of Energy complete and certify a new cost and schedule baseline for the National Ignition Facility and submit that certification to the Committees by June 1, 2000. If the Secretary is unable too provide such a certification, the Department should prepare an estimate of the costs necessary to terminate the project."

SEAB ENDORSES FUSION EFFORT

The DOE Secretary of Energy Advisory Board (SEAB) Fusion Task Force (see May/June 1999 Newsletter) issued its Final Report August 9. The report can be accessed at http://fire.pppl.gov/ or://www.hr.doe.gov/seab/

In its report, the Task Force states, "It is the Task Force's view that the threshold scientific question—namely, whether a fusion reaction producing sufficient net energy gain to be attractive as a commercial power source can be sustained and controlled—can and will be solved. The time when this achievement will be accomplished is dependent, among other factors, on the creativity of scientists and engineers, skill in management, the adequacy of funding, and the effectiveness of international cooperation."

The Task Force says, "In spite of the extended effort and expense that will be required, the fusion program deserves continued support because of its unique energy potential. Constraints on supply and limits on the atmospheric loading of combustion products will eventually require that we diminish our reliance on fossil fuels. Because of this reality, the Department is wisely advancing a portfolio of energy technologies to meet future energy needs. Indeed, in light of the promise of fusion and the risks arising from increasing worldwide energy demand and from eventually declining fossil energy supply, we simply cannot afford to fail to pursue fusion energy aggressively."

With respect to the Magnetic Fusion Energy (MFE) program, the Task Force said that they endorse the "revised focus of the

program" away from a "nearly exclusive focus on the achievement of fusion energy in tokamaks to a broader program that would also explore scientific foundations and other confinement approaches." They said "OFES (DOE Office of Fusion Energy Sciences) has begun to expand the fusion portfolio and it should be encouraged to continue this effort." They said, "It is our view that the Department must participate in international activities that enhance our fusion effort. Communication with the Congress on these points is essential."

With respect to Inertial Fusion (IFE), the Task Force says, "As is the case for MFE, progress in inertial fusion has been remarkable. The scientific basis of inertial fusion has progressed to the point where the driver and pellet requirements to achieve ignition are known to high confidence and are within reach." The Task Force noted that "Some considerations favor heavy ion beams as the driver technology for IFE." But, they said, "Given the immature state of the technology, it is not appropriate at this time to select only one driver technology for continued exploration." They also said that reactor studies "should continue to be used as guides in establishing the direction and balance of research efforts, as well as to establish goals that constitute thresholds for further investment."

With respect to "balance and funding," the Task Force said, "OFES alone can not dictate the overall direction of the (world fusion) effort and, as a result, it should not be expected that the overall fusion program will be balanced solely in terms of the energy objective. Rather, OFES should be expected to use its program to leverage activities undertaken elsewhere (in the world and in DOE Defense Programs) to assure effective collaboration and coordination and to establish world leadership in selected niche areas." They said, "In light of the promise of fusion, the Task Force concludes that the funding for fusion energy is now subcritical." They said, "Given the large DP (DOE Defense Programs) program in inertial fusion research, only a relatively modest increase in the OFES budget is needed to support the IFE activities that should be funded by the OFES program – endeavors which address issues of significance to the energy objective and which are not supported by DP." They said, "Since the present funding is barely adequate to sustain the restructured MFE program, and since OFES is the sole steward of MFE, any significant increases in IFE funding within OFES should come from an increment to the present budget. Moreover, DP should dedicate funds to dual-purpose activities, consistent with DP's mission statement, that exploit the synergy between the defense work and IFE science. For example, DP might appropriately take the lead in the development of high-average-power lasers because of DP's very significant involvement and accomplishments in the laser field."

The Task Force says, "To achieve its goal, the program must be directed by strong management—a management that leads the effort toward the fusion energy goal at reasonable pace, with sufficient budget, with solid accountability, and high-quality science and technology." They say, "Management should seek to restore credibility by articulating clear and sensible milestones and goals and to deliver on them." They state, "Given constrained budgets, the wide variety of options, and the linkages of one issue to another, increasingly sophisticated management of the program will be required."

The Task Force states, "Management of the fusion energy effort is complicated by the fact that there is a separation of the magnetic (fusion program) and main locus of the inertial confinement effort in different parts of the Department. This structure serves as an impediment to the establishment of a coherent and integrated program to pursue fusion energy. Although practical constraints no doubt inhibit major shifts in structure, some strengthened means for overall coordination should be established. One possible approach, for example, is to give both the responsibility and authority for integration of the "virtual" combined program to a Deputy Undersecretary (who might also have responsibility for integrating other energy technology programs as well)."

The Task Force also commented on the following "Other Issues:" Materials, Plasma Science, Manpower, Engineering and Computer Simulation. With respect to Engineering, they stated, "While, given the state of knowledge, the program should now focus on developing the scientific underpinnings for fusion energy, the engineering challenges are also immense and early planning for them is warranted."

In a Conclusion section, the Task Force states, "The fusion program is in a state of transition and extensive self-examination in the aftermath of the restructuring and as a result of declining funding. Nonetheless, the Task Force believes that the foundation for a vibrant and valuable program is being created. Given the promise of the technology and the significant scientific advances, continuing support and efforts to strengthen the program are warranted."

FESAC RECOMMENDS FUSION PRIORITIES

The DOE Fusion Energy Sciences Advisory Committee (FESAC) met September 8-9 to finalize its recommendations on fusion program priorities and balance. After making several relatively minor changes to its draft report, the FESAC adopted the report and presented it to the Director of the DOE Office of Science, Dr. Martha Krebs. Dr. Krebs praised the FESAC for making some "hard choices" and especially expressed her admiration to the many scientists in the Magnetic Fusion Energy (MFE) and Inertial Fusion Energy (IFE) communities for working effectively together over the past year.

A key recommendation of the FESAC is that, even at the present $222 million level of funding, some $5 million should be shifted from MFE into IFE, with a resulting distribution of

$207 M for MFE and $15 M for IFE. However, the FESAC toldKrebs, there are "exciting opportunities to move forward in both MFE and IFE approaches," and therefore "we urge the Department to move towards our $300 million budget case in a timely manner." In the $300 million case, FESAC recommended $250 M for MFE and $50 M for IFE. FESAC also considered an intermediate case of $260 M, with $230 M going to MFE and $30 M going to IFE. FESAC had previously issued, in June, a document, "Opportunities in the Fusion Energy Sciences Program." The FESAC said that "the achievement of a more integrated national program in MFE and IFE (should be) a major programmatic and policy goal in the years ahead."

The FESAC said the MFE program "is currently reasonably well balanced among its programmatic subelements," saying that the program "properly emphasizes steady-state, externally-controlled configurations, such as the advanced tokamak and spherical torus." However, they said, "To maintain a proper balance, care must be taken to also maintain an emphasis on pulsed and/or self-organized concepts."

The FESAC made four MFE recommendations:

"(1) Strengthen theory and computation as very cost effective means to advance fusion and plasma science, taking advantage of advances in computation science and technology. Strengthen activities in general plasma science and encourage research on near-term applications of plasma science and technology.

"(2) Pursue an aggressive portfolio of confinement concepts through increased effort in the Proof of Principle area, and through strengthening of the Concept Exploration program.

"(3) Focus the moderate-pulse advanced tokamak program, including U.S. collaboration on leading international facilities, and to a lesser degree the spherical torus program, towards a 5-year assessment point; and prepare for participation in a burning plasma experiment.

"(4) Revitalize the technology program to provide for continued innovation in this area because of its overall importance to the success of fusion science and fusion energy and applications. Utilize systems studies to identify attractive fusion energy concepts and affordable development paths."

The FESAC said that "Approximately two-thirds of additional resources relative to the Administration's proposed FY2000 budget should be divided about equally between support for goals (2) and (3). However, it is also high priority to increase support for achieving goals (1) and (4), with somewhat greater emphasis on (4), especially under small budget increases."

With respect to the IFE program, the FESAC said that "the two central objectives of inertial fusion energy research are (1) advance the fundamental understanding and predictability of high energy density plasmas, and (2) develop the science and technology of attractive rep-rated IFE power systems leveraging from the single shot work in the (DOE Defense Inertial Confinement Fusion) Program."

The FESAC noted that "at the present time, two approaches are the most advanced and have the greatest potential of meeting near term IFE requirements: One approach utilizes the indirect drive targets, heavy ion drivers, and chambers with first walls protected from neutrons by a thick liquid layer. The other approach utilizes direct drive targets, either a krypton fluoride (KrF) or diode-pumped solid-state laser, and a dry wall chamber." However, they say, "It is important to emphasize that there are other possible combinations of drivers and chambers, as well as other approaches including z-pinches, fast ignition targets, and light ions." The FESAC states that "The recommended IFE program of $50 M per year ($300 M case) would prepare three driver candidates for an IRE (Integrated Research Experiment) stage, develop the necessary chamber and target technology and pursue some limited efforts at the concept exploration level. At a funding of $30 M ($260 M case), the emphasis would be on the heavy-ion driver option and associated chamber/target technology, while maintaining reduced efforts on advanced laser options." At lower levels, the FESAC "recommends mounting an adequate, albeit delayed program to develop the ion beam option, while reducing the funding for the laser option."

The FESAC also reviewed the priorities to be attached to three new MFE "Proof of Principle" (PoP) proposals that had received technical reviews earlier: the Reversed Field Pinch (RFP) (University of Wisconsin), the Compact Stellarator (CS) (Princeton Plasma Physics Laboratory) and the Magnetized Target Fusion concept (MTF) (Los Alamos Scientific Laboratory). The FESAC said, "The RFP is ready for PoP designation but a more focused sequential approach should be implemented." They said "The CS is not ready at this time for PoP designation because of one important technical concern." However, they said they believed that "this concern will likely be addressed in the near future." With respect to MTF they said it "is not ready at this time for PoP designation." However, they recommended "a three-year continuation of the MTF concept exploration program at approximately the present level of effort to produce and translate the required target plasma for the experiment."

Copies of the panel report can be accessed at: http://fire.pppl.gov/ or at http://vlt.ucsd.edu/

KREBS LEAVING DOE POST

Dr. Martha Krebs, Director, Office of Science, U.S. Department of Energy, is leaving her post, effective in "early December."

After six years in the job, she noted that she was "the longest serving Director of Science in the history of the Department." In a letter to President Bill Clinton, the Presidential appointee said "It has been my deep honor to serve you, the Vice President, and three Secretaries of Energy in your administration," whom she said "have each supported the science mission of the Department with enthusiasm and commitment." She described "some of the many accomplishments of which you should be proud," including a variety of new research facilities. Of fusion, she said, "As the fusion program has moved toward a science-based program, their facilities at our laboratories and universities have become true user facilities, where research requires national and international collaborations. Most recently, the magnetic fusion and inertial fusion communities have joined to provide a consolidated plan for developing these different approaches for an eventual energy producing technology."

Energy Secretary Bill Richardson issued a statement saying, "The Department of Energy and the nation owe Martha Krebs a debt of gratitude, for her stewardship for the past six years of some of the nation's premier scientific research. Her expertise, energy, vision, professionalism, and her leadership will sorely be missed."

PCAST ON INTERNATIONAL COOPERATION

The President's Committee of Advisors on Science and Technology (PCAST) has issued a report stating, "It is in our fundamental National Interest to greatly strengthen international cooperation in energy innovation." The report, entitled "Powerful Partnerships," was prepared by a PCAST Panel on International Cooperation in Energy Research, Development, Demonstration, and Deployment, chaired by Prof. John P. Holdren of Harvard University. The full report, and also a color brochure summary, can be accessed at //fire.pppl.gov/

With respect to fusion, the report recommends "pursuit of a new international agreement on fusion R&D that commits the parties to a broad range of collaborations on all aspects of fusion energy development, while selectively enhancing U.S. participation in existing fusion experiments abroad and inviting increased foreign participation in new and continuing smaller fusion experiments in the United States." It notes, "The DOE's nuclear fusion program has had a history of international cooperation, dating back to the 1960's, but most recently has been centered around the International Thermonuclear Experimental Reactor (ITER). Proposed by the USSR in 1985, ITER was subsequently developed as a collaboration among Europe, Japan, Russia, and the United States through conceptual design (1988-1990) and engineering design (1992–1998). Congress directed DOE to end U.S. participation in ITER in FY 1999, and future U.S. options are currently being explored." The panel notes further that "Japan has consistently been one of the leading supporters of fusion research through its participation in the ITER project . . . ."

The panel concludes, "Because fusion is a long-term energy option for which R&D costs are large, international collaborative R&D is an attractive approach for sustaining the fusion option. Any new agreement should not be restricted to construction of a single device, although U.S. participation in construction of a scaled-down ITER along the lines now being explored by the parties to the ITER agreement would not be ruled out. Increased U.S. participation in selected existing fusion experiments abroad was recommended in the 1997 PCAST report. The DOE should continue to make a vigorous case to Congress for restoration of recent fusion budget cuts to a degree sufficient to pay for the U.S. share in these international collaborations while protecting a robust domestic program in fusion science."

JUNIOR FACULTY GRANTS

The DOE Office of Fusion Energy Sciences has posted the following notice in the Federal Register: September 16, 1999 (Volume 64, Number 179, Page 50278).

"DEPARTMENT OF ENERGY Office of Science Financial Assistance Program Notice 99-26: Plasma Physics Junior Faculty Development Program.

"The Office of Fusion Energy Sciences (OFES) of the Office of Science (SC), U.S. Department of Energy hereby announces its interest in receiving grant applications for support under its Plasma Physics Junior Faculty Development Program. Applications should be from tenure-track faculty investigators who are currently involved in experimental or theoretical plasma physics research and should be submitted through a U.S. academic institution.

"The purpose of this program is to support the development of the individual research programs of exceptionally talented scientists and engineers early in their careers. To permit timely consideration for awards in FY 2000, formal applications in response to this notice should be received on or before January 20, 2000.

"Completed formal applications referencing Program Notice 99-26 should be forwarded to: U.S. Department of Energy, Office of Science, Grants and Contracts Division, SC-64, 19901 Germantown Road, Germantown, Maryland 20874-1290, ATTN: Program Notice 99-26.

"FOR FURTHER INFORMATION CONTACT: Dr. Ronald McKnight, U.S. Department of Energy, Office of Fusion Energy Sciences, Science Division, SC-55 (GTN), 19901 Germantown Road, Germantown, Maryland 20874-1290. Telephone: (301)903-4597. E-mail: ronald.mcknight@science.doe.gov"

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NOV/DEC 1999
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U.S. FUSION BUDGET UP
FPA AWARDS TO HOLT, PACKARD, STIX, TAYLOR, YOSHIKAWA, PETERSON, WILLIAMS

U.S. FUSION BUDGET UP

After five years of decline, the U.S. Congress has approved, and the President has signed, legislation providing increased fusion funding for Fiscal Year 2000, which began October 1, 1999. House and Senate Conferees agreed on a fusion budget for FY 2000 of $250 million, $27.4 million above the President's request.

The Conference Report contains the following language:

"Fusion Energy Sciences

"The conference agreement includes $250,000,000, the same amount provided by the House instead of $220,614,000 as provided by the Senate. The conferees are pleased with the highly supportive recent report on fusion energy science from the Secretary of Energy's Advisory Board and with the comprehensive scientific plan developed by the Fusion Energy Sciences Advisory Committee (FESAC). The FESAC plan should be used by the Department as guidance in the allocation of the resources provided for fusion energy sciences."

The Conference Report also contains a total of $475,000,000 for inertial fusion (within DOE's Defense Programs account), of which $248,100,000 is for NIF (National Ignition Facility) and $227,600,000 is for base program activities. The Conference Report contains the following language:

"Inertial Fusion

"The agreement includes the additional $10,000,000 proposed by the House for the inertial fusion program to further the development of high average power lasers."

"The National Ignition Facility has been described as one of the cornerstones of the Stockpile Stewardship Program. The conferees understand that the most recent internal review of the project has concluded that the projected cost to complete the project has increased and the completion date will be delayed. The conferees are very disappointed by this. Additional reviews will be performed in coming months to establish the appropriate future actions for proceeding with this project.

"The conferees direct that the Secretary of Energy complete and certify a new cost and schedule baseline for the National Ignition Facility and submit that certification to the Committees by June 1, 2000. If the secretary is unable too provide such a certification, the Department should prepare an estimate of the costs necessary to terminate the project."

FPA HONORS HOLT AND PACKARD

Fusion Power Associates Public Service Awards, for exceptional public service, were presented October 19, 1999 by Fusion Power Associates president, Dr. Stephen O. Dean to Congressman Ron Packard of California and to Congressman Rush Holt of New Jersey. The text of Dr. Dean's presentations is given below.

Congressman Ron Packard:

"At this time, I have the honor and pleasure to present Fusion Power Associates Public Service Award to Congressman Ron Packard of California. Congressman Packard has long been a champion of high technology programs, including fusion. He was first elected to Congress in 1982 by a write-in vote, becoming only the fourth successful write-in candidate for Congress in the history of the United States. Prior to his election to Congress, he served four years as mayor of Carlsbad, California, in the district he now represents. A dentist by education and profession, he was always active in civic affairs, which no doubt led to his current occupation. A long-time member of the House Committee on Appropriations, he is currently serving as Chairman of its Energy and Water

Subcommittee, He also served for a time on the House Science, Space and Technology Committee. Throughout his career he has taken a keen interest in science and technology as essential for the future well-being of our citizens. Consequently, it is fitting that we recognize Congressman Packard's many years of interest and support for the nation's science and technology programs by presenting him with Fusion Power Associates Public Service Award."

Congressman Rush Holt:

"Fusion Power Associates also recognizes our former colleague, Congressman Rush Holt, with our Public Service Award. Prior to his election to Congress in 1998, Rush spent ten years working in fusion at the Princeton Plasma Physics Laboratory. Throughout that period, he constantly worked to ensure that we built connections with the public into our programmatic thinking. He was especially effective in working to ensure that teachers and students in the schools had access to information on fusion. Though he has been in Congress only a short time, he has been one of the most active members of Congress, proposing and supporting numerous bills in support of education, health care and science. We recognize Rush today not only for the dedication he has shown to public service both before and since coming to Congress, but also for the personal career risk he has taken in running for Congress, a step he took because he believed the principles and policies he espouses are important to the future of our country. So it is my great pleasure to present Fusion Power Associates Public Service Award to Rush today."

DISTINGUISHED CAREER AWARDS

Fusion Power Associates Distinguished Career Awards for 1999 have been presented to Prof. Thomas H. Stix, Dr. J. Bryan Taylor, and Dr. Masaji Yoshikawa. FPA Distinguished Awards have been presented annually since 1987 to individuals who have made extraordinary career contributions to the development of fusion over many decades.

Thomas H. Stix

Prof. Stix is one of the pioneers of the U.S. fusion program. He received his Ph.D. in physics from Princeton University in 1953 and has spent his career working on plasma physics and fusion at the Princeton Plasma Physics Laboratory (PPPL) since that time. Since 1962, he has also been a Professor of Astrophysical Sciences at Princeton University. He has held many positions at PPPL, including Head of the Experimental Division, Assistant Director for Academic Affairs, and Head of the Basic Plasma Physics Group. He has served on numerous advisory committees over the years and is a Fellow of the American Physical Society. He is perhaps best known for his outstanding original contributions to the physics of plasma waves. His 1962 text, "The Theory of Plasma Waves," is one of the classics of our field.

In presenting the award to Prof. Stix, on October 19, Fusion Power Associates president, Dr. Stephen O. Dean, stated that, "In addition to his many technical contributions, Tom is also known and respected among his colleagues for his objectivity in judging the work of others and his interest in the human aspects of our field, including the training of students and the plight of less fortunate scientists in other countries."

Masaji Yoshikawa

Dr. Yoshikawa has been a leader of the fusion program in Japan throughout his career. He received his Ph.D in physics from the University of Tokyo in 1961. From 1963 to 1971 he was a research scientist at General Atomics, in the U.S., where he was an early pioneer of the Doublet concept, with Dr. Tihiro Ohkawa, who received the Fusion Power Associates Distinguished Career Award in 1998. In 1971, Dr. Yoshikawa joined the staff at the Japan Atomic Energy Research Institute (JAERI). In 1975, he became Head of the Office of Large Tokamak Development there and in 1984 he became Director of the Department of Large Tokamak Development. Under the guidance of Dr. Yoshikawa, the largest and one of the most productive tokamaks in the world, JT-60, was built and operated.

In 1988 Dr. Yoshikawa became Director General of the Naka Fusion Research Establishment at JAERI, eventually rising to become the President of JAERI in 1995. He has been a champion of fusion research in Japan and worldwide throughout his career, serving on the ITER Council and chairing the ITER Management Advisory Committee.

In presenting the award to Dr. Yoshikawa, Dr. Dean stated that, "In addition to his technical leadership, Masaji is known as a man of high integrity and sound judgment."

J. Bryan Taylor

Dr. Taylor has been a leading theoretical physicist in the world fusion effort throughout his career. He received his Ph.D. from Birmingham University in England in 1955. From 1955 to 1962, he worked at the Atomic Weapons Research Establishment at Aldermaston. In 1962, he joined the fusion effort at Culham Laboratory as Head of the Theoretical Physics Division, a position he held until 1981; He spent 1980-81 at the Institute for Advanced Study at Princeton University. From 1979 to 1989, he was Chief Physicist at Culham. He then spent several years at the University of Texas. He is a Fellow of the Royal Society and of the American Physical Society.

Dr. Taylor is widely recognized for his many original contributions to the theory of magnetic confinement of plasma, which have had a broad impact on our current understanding of fusion plasma behavior. Dr. Taylor's award was presented to him by Fusion Power Associates Board Member, Dr. David

Baldwin, at the Annual Meeting of the American Physical Society Division of Plasma Physics in Seattle.

EXCELLENCE IN FUSION ENGINEERING

Fusion Power Associates Board of Directors has announced the recipients of their 1999 Excellence in Fusion Engineering Awards. Fusion Power Associates Excellence in Fusion Engineering Awards were established in 1987 in memory of Professor David J. Rose of MIT, a pioneer in the field of fusion engineering. They are presented to individuals, relatively early in their careers, who have shown both outstanding technical accomplishment and potential to become exceptionally influential leaders in the fusion field. Two such awards were presented October 19 by Fusion Power Associates president, Dr. Stephen O. Dean, at Fusion Power Associates 20-Year Anniversary Meeting and Symposium in Washington, DC, to Prof. Per F. Peterson and to Mr. Michael D. Williams.

Per F. Peterson

Prof. Per F. Peterson received his Ph.D from the University of California at Berkeley in 1988. After spending a year at the University of California at Irvine and a year at the Tokyo Institute of Technology, he returned to the University of California at Berkeley in 1990 as an Assistant Professor in the Department of Nuclear Engineering. In 1998, he was made a full Professor and also became Chair of the Energy and Resources Group. He and his students have made, and continue to make, key technical contributions to fusion in the area of thick-liquid protected fusion chambers for both inertial and magnetic fusion. He has also been making other contributions to the engineering aspects of a wide variety of fusion concepts.

Michael D. Williams

Mike Williams received his B.S. in Electrical Engineering from Rutgers University in 1976, after which he joined the Princeton Plasma Physics Laboratory. Over the years he has been involved in all engineering aspects of the design, construction and maintenance of fusion experimental devices, including heating and control systems for the Tokamak Fusion Test Reactor. Recently, as Deputy Project Manager, he led the engineering effort on the National Spherical Torus Experiment. Currently he is Head of the Engineering and Technical Infrastructure Department at PPPL, where he is responsible for managing all technical engineering, facilities and environmental engineering, computing and technology transfer resources at the Laboratory.

PEOPLE

Dr. N. Anne Davies, Associate Director for Fusion Energy Science, DOE Office of Science, has received the Meritorious Presidential Executive Rank Award, the highest award presented by the U.S. government to career employees. Anne was cited "for having successfully restructured a resource-intensive, development-oriented fusion program to focus on near-term science goals leading to a long-range attractive energy resource, at much lower annual funding." The citation says, "She led the effort to refocus the design of the International Tokamak (sic) Experimental Reactor to a smaller-scale, lower-cost device which may yet prove to be affordable for the world's fusion programs. She converted the major facilities of the United Stages Fusion Program into national experimental resources, with agendas established by representatives of the fusion science community."

Barrett Ripin will leave his post as Associate Executive Officer of the American Physical Society after his five-year term ends in January. Ripin previously was a laser-fusion research physicist at the U.S. Naval Research Laboratory. The APS is soliciting nominations for his successor. Send your nominations to franz@aps.org

Ned Sauthoff, Princeton Plasma Physics Laboratory, has been elected President-elect of the IEEE-USA (Institute of Electrical and Electronic Engineers) for the year 2000 and will become president in 2001. In 1998-99 he has been IEEE-USA Vice-president for Technology Policy Activities. IEEE-USA provides professional development opportunities and promotes the career and public policy interests of the 240,000 US members of IEEE.

Yevgeny Velihkov, Director of the Kurchatov Institute, Moscow, has announced that he his running for the State Duma from his native district in northwestern Moscow. Yevgeny is Chairman of the ITER Council and a former Supreme Soviet Deputy. In 1985, as chief science advisor to Chairman Gorbachev, he was instrumental in launching the international collaboration on design of the world's first fusion experimental reactor.

LEADERSHIP

Leadership Awards are presented by the Fusion Power Associates Board of Directors to those individuals who have shown outstanding leadership qualities in accelerating the development of fusion.

1980	S. J. Buchsbaum R. L. Hirsch M. McCormack P. Tsongas
1981	E. E. Kintner
1982	H. P. Furth J. H. Nuckolls
1983	J. L. Emmett T. K. Fowler
1984	T. Ohkawa G. Yonas
1985	E. P. Velikhov C. Yamanaka
1986	R. C. Davidson
1987	M. N. Rosenbluth
1988	J. F. Clarke
1989	P-H. Rebut
1990	B. B. Kadomtsev
1991	B. Coppi E. Storm
1992	R. W. Conn G. L. Kulcinski
1993	D. L. Cook J. Sheffield
1994	C. A. Baker S. E. Koonin
1995	E. M. Campbell D. O. Overskei
1996	M. Abdou R. L. McCrory
1997	D. E. Baldwin
1998	H. Grunder J. Holdren
1999	B. G. Logan D. M. Meade

DISTINGUISHED CAREER

Distinguished Career Awards are presented to those individuals who have made distinguished lifelong career contributions to fusion development.

1987	M. B. Gottlieb D. Kerst R. F. Post L. Spitzer, Jr.
1988	K. Husimi D. Palumbo R. S. Pease
1989	F. H. Coensgen D. J. Grove F. L. Ribe
1990	N. G. Basov T. Sekiguchi
1991	H. K. Forsen J. W. Landis R. L. Sproull H. G. Stever
1992	R. Bickerton A. Bishop V. Glukhikh S. Mori
1993	R. A. Gross M. W. Rosenthal
1994	C. A. Flanagan W. G. Kunkel
1995	T. K. Fowler H. P. Furth
1996	J. G. Gavin J. H. Nuckolls
1997	M. N. Rosenbluth B. B. Kadomtsev
1998	D. B. Montgomery T. Ohkawa P. H. Rutherford
1999	T. H. Stix J. B. Taylor M. Yoshikawa

EXCELLENCE IN ENGINEERING

Excellence in Fusion Engineering Awards are presented to those individuals who, in the early part of their careers, have shown both outstanding technical accomplishment and potential to become exceptionally influential leaders in the fusion field.

1987	S. J. Piet
1988	M. A. Ulrichson
1989	D. Ehst Y-K. M. Peng
1990	W. Reierson
1991	J. Santarius
1992	O. Filatov S. Zinkle
1993	J. D. Galambos S. W. Haney
1994	C. E. Kessel K. A. McCarthy
1995	F. Najmabadi
1996	G. G. Denisov P. J. Gierszewski
1997	P. Barabaschi
1998	S. Payne M. Tillack
1999	P. F. Peterson M. D. Williams