Newsletter, June 1998

The content of this newsletter represents the views of the authors and the FED Executive Committee and does not constitute an official position of any U.S. governmental department or international agency

This issue contains the following topics:

Message from the Chair

With this message, I want to amplify on the theme of renewal I began in the last newsletter. I spoke last time about the renewal of purpose that the ANS is attempting. That is still ongoing. Now I would like to speak specifically about the Fusion Energy Division (FED). The FED has shrunk to 687 members from more than 1100 a few years ago. Not surprising in view of the budget shrinkage in the areas from which our traditional membership comes. But one of the collateral effects in such situations is the aging of the membership --- it is the younger people that tend to leave. Your Executive Committee is very concerned about this situation and has discussed various options from enlarging our scope to encouraging student participation. One concrete measure we have taken is increasing our support to students who present papers at the Fusion Topical. Using $2000 of surplus funds in our treasury, we are partially supporting the travel of seven students from three universities to this year's fusion topical. Universities have a difficult time sending students to conferences and our support can send the message to these students that the FED is interested in their participation. Our efforts this time cannot be repeated, however, unless we find a new source of revenue. The surplus in our account resulted from past stand alone Topicals. Embedded Topicals do not earn as much revenue for the Division and the ANS has put increased pressure on Divisions to embed their special meetings unless they also have significant participation in the ANS summer and winter meetings --- a feat that would be impossible for FED. Should the FED consider enlarging our scope and/or merging with another ANS division to give us a larger interest pool? Just as the new ANS statement of purpose has focused upon nuclear science and technology instead of just nuclear energy, and OFE has now become OFES, the FED could consider expanding our scope beyond fusion energy. There is a new particle beams topical section that has just formed and we could consider a merger to benefit us both. Many at ANS are suggesting this to smaller divisions such as ours. On the other hand, many are concerned that such an increase of scope and/or a merger would dilute our focus on energy and many of us are in FED because of our belief in that long range vision. Thoughts, suggestions and, particularly, help from the membership that addresses these issues and the revitalization of the FED would be greatly appreciated.

In June, my term as Chair expires. One responsibility of the past Chair is to obtain nominations for Vice Chair (who will automatically become Chair the following year), Secretary/Treasurer, and Executive Committee for the following year's election. In the last several FED elections most offices had only one candidate. I strongly believe that membership interest in Division activities will further wane if this situation persists. I intend to seek enough candidates so that all offices are contested. Again I ask for your help in this. If you have an interest in helping us revitalize the FED, please call or E-mail me. I would like to tell you what is involved in serving in the various offices and ways you can help even if you happen to loose the election the first time.

Several activities have occurred in the last six months that are further evidence of renewal in the programs in which we all participate. These include a review of the OFES materials development program, new initiatives for international cooperation on IFE, and a call for a new National Academy of Sciences (NAS) review of the OFES program.

For the last several months I have served on a new FESAC subpanel, Co-Chaired by C. Baker and S. Harkness, charged with reviewing the existing materials development program and recommending changes. A draft final report was submitted to the full FESAC at a meeting on May 26 and 27. There was a strong consensus on the subpanel that the current program is focused too narrowly on the experimental investigation of radiation effects on three specific materials (Ferritic steel, Vanadium, and SiC). It was felt that, in view of the current program situation, it is premature to narrow the focus of this research so much. Therefore, the report contains recommendations to broaden the effort on materials to include materials damage issues relevant to a wider variety of fusion power plant concepts, including both alternative MFE concepts and IFE concepts. Secondly, the panel was impressed with the progress on modeling damage in various materials and encouraged OFES to increase the level of effort on modeling compared to the experimental effort. Recognizing how easy it is to recommend increases, the panel went further and suggested that if new funds are not available, the OFES should redirect existing funds within the current $6 million per year materials development program.

For many years research in MFE has been conducted with a strong element of international cooperation and collaboration. The opposite has been true for IFE. In January, Mike Roberts, the OFES representative to the International Energy Agency, submitted a draft proposal for comment to the other parties. If adopted, this proposal would expand the existing IEA multilateral cooperation on fusion energy issues to include IFE. In some cases, e.g. materials development, adding IFE experts to the existing committees would be appropriate. For other issues, e.g. laser or particle beam driver development, new committees would be formed. Japan and the EC have named points of contact (POCs) to begin discussions with Bill Dove who is the U.S. POC for this draft. The purpose of the discussions will be to clarify or modify the proposal and discuss whether, when, and how to consider and possibly implement the proposal. In parallel with this activity the OFES also helped organize the first annual Japan/U.S. Joint Symposium on Inertial Fusion Energy. This meeting was hosted by UCSD and General Atomics and held in San Diego last month. It looks like the declassification of ICF in December, 1993 and the recommendations of two independent review panels in 1994 and 1995 to encourage international cooperation on IFE are beginning to have positive results and the Japanese and Germans (there are ongoing negotiations for a science agreement between LLNL and GSI), who were reluctant to form agreements with DOE/DP are finding these new avenues attractive.

Incidentally, I have been asked repeatedly in the last few days what effect the Indian and Pakistani nuclear tests will have on ICF and NIF. Many scenarios have been put forth and no one knows for sure, of course. However, I believe the tests are re-emphasizing several points that we in ICF have been making for a long time:

1. Nuclear weapons are not going to disappear from the earth very soon,
2. The basic scientific understanding necessary to develop nuclear weapons is widespread,
3. Nonproliferation efforts need to focus on controlling the means of making weapons rather than trying to put the genie back into the bottle,
4. Our best bet at controlling nuclear weapons in the future is to maintain the knowledge and skills of our own scientists and engineers through a strong Stockpile Stewardship Program.

Thus, I believe the current situation strengthens the case for ICF and NIF and that countries like Japan and Germany should want a strong U.S. program and want the internationalization of the basic knowledge necessary for such control. In short, better knowledge is the best basis for better understanding and agreed upon political control.

The DOE Director of Energy Research, Martha Krebs, has requested the NAS to appoint a committee to provide "an independent assessment of the scientific quality of the (DOE Office of Fusion Energy Sciences) research programs." Among the things to be considered include:

1. the quality of fusion research itself as evidenced by progress in the understanding of fundamental plasma physics issues in fusion energy,
2. the impact that fusion energy research has had on other scientific areas such as astrophysics, geophysics, computational science, and technological areas such as plasma processing, and
3. the role of fusion research in the academic community including graduate student training.

The ICF experience with such independent reviews suggests that we should welcome this new review. Since 1985, the ICF program has been subjected to six such reviews by outside experts and, I believe, these have been instrumental in helping our community face up to and resolve difficult internal issues, understand how outsiders may view our favorite positions and develop the necessary ammunition and support for the NIF. No issue has been raised by the current opposition that was not discussed and resolved during the independent reviews. The OFES community should embrace this new review as an important opportunity and help it succeed in laying a good foundation for the future of the program and in developing supporters outside of it.

William J. Hogan

Executive Committee List

Members of the ANS Fusion Energy Divisions elected 4 new members to the FED Executive Committee (EC). On behalf of the FED Nominating Chair, we would like to welcome the new members and thank those that agreed to run on the FED slate. Although some were not elected, we encourage them to run again if they are nominated in the future.

The latest list of FED officers and committee chairs is given below along with the years of term for the period starting July 1, 98. For the following year, the Vice-Chair becomes the Chair and the past Chair becomes the Nominating Committee Chair.

Chair:	Wayne Houlberg	(98-99)	houlbergwa@ornl.gov
Vice-Chair:	Clement Wong	(98-99)	wongc@gav.gat.com
Secretary/Treasurer:	Sandra J. Brereton	(98-00)	brereton1@llnl.gov

Executive Committee Members:

Mohamed Bourham	(98-01)	bourham@ncsu.edu
Don Dudziak	(96-99)	dudziak@ncsu.edu
Grant Logan	(97-00)	logan1@llnl.gov
Charles Martin	(98-01)	charlesm@dnfsb.gov
Kathryn McCarthy	(96-99)	km3@inel.gov
Stan Milora	98-01)	miloras1@ornl.gov
David Ruzic	(96-99)	druzic@uiuc.edu
Robert Santoro	(97-00)	santorr@sat.ipp-garching.mpg.de
Yasushi Seki	(97-00)	sekiy@naka.jaeri.go.jp

FED Committee Chairs:

Nominating Committee:	William Hogan
Honors/Awards Committee:	Gerald Kulcinski
Membership Committee:	Ken Schultz
Representative on ANS Publications Committees:	Ken Schultz
Representative on ANS National Program Committees:	Kathy McCarthy
Representative on ANS Public Policy Committee:	William Hogan
Liaisons to other Organizations:	John Davis - MS&T George Miley - IEEE
Editor, Fusion Technology Journal:	George Miley
Newsletter Editor:	Laila El-Guebaly
Web site maintenance:	Mark Tillack

One position for the Vice-Chair and three positions for the EC open each year. The past Chair obtains nominations in the fall for the following year's election. The Chairman's message and the other articles written by the EC members highlight what the division offers to the FED members. If reading the newsletter initiated your interest in the FED activities or you know someone interested in being nominated for an EC position, please contact any FED member. Self-nomination is strongly encouraged.

Highlights from the 1998 ANS-FED 13th Topical

The ANS-FED Topical Meeting on the Technology of Fusion Energy was held June 7 through June 11 in Nashville, Tennessee in conjunction with the ANS Summer Meeting. The technical program emphasized the latest technical developments in both magnetic and inertial fusion, highlighting ITER, NIF, advanced concepts, and non-electric applications. The embedded Topical provided an opportunity for technical interaction with ANS colleagues in the other nuclear fields.

A total of 196 papers were presented in 17 oral and 11 poster sessions on a wide variety of magnetic topics (75%) and inertial topics (25%). About 37% of the papers were from foreign participants. The 28 sessions included 3 concurrent oral sessions in the mornings (8:30-11:30 AM) and 3 concurrent oral sessions in the afternoons (1-4 PM) followed by 5-6 poster sessions (3-5 PM). It was a very busy week for the attendees.

The opening session on Monday afternoon included perspectives from national and international speakers. At the conclusion of this session, the Fusion Topical reception was held and followed by a Forum on ITER Engineering Design Activity Extension. In the Wednesday evening mixer, G. Kulcinski, Chair of Honors and Awards committee, announced the recipients of the three 1998 FED Awards. Dr. John Wesley (GA) has received the Outstanding Technical Accomplishment Award for his work on the design of ITER divertor poloidal field system. Prof. Nasr Ghoniem has received the Outstanding Achievement Award for his work in developing low activation ferritic steels and basic damage analysis of fusion materials. The Best Student Paper Award was presented to Dr. John Menard (PPPL, formerly at Princeton University) for his paper "Ideal MHD Stability Limits of Low Aspect Ratio Tokamak Plasmas" published in Journal of Nuclear Fusion, Vol. 37, 595 (1997). Congratulations to the recipients of the FED Awards for their professional accomplishments.

Various industry, laboratory, university, and organization sponsors have financially supported the various special events at the 13th Topical. The 11 sponsors have received recognition for their supports with a sign at the event, verbal recognition from the podium at the event, and written acknowledgment in the meeting program and proceedings. The food and beverages at the reception, mixer, and coffee breaks have been provided by the generosity of General Atomics, Lawrence Livermore National Laboratory - National Ignition Facility, Los Alamos National Laboratory, Oak Ridge National Laboratory, University of California - San Diego - US ITER

Home Team, TSI Research, Sandia National Laboratories, The Boeing Company, University of Wisconsin - Madison -Fusion Technology Institute, Princeton Plasma Physics Laboratory, and Fusion Power Associates.

Many thanks to the program organizers: T. Shannon, M. Bourham, J. Davis, and J. Haines. The meeting was a great success and the technical sessions were well organized.

Treasurer's Report

As of April 1998, our division has a balance of $7537: $612 from membership and $6925 from carry forward money from 1998. We have projected to receive $1800 from the 1998 Fusion Topical meeting. For CY98, our executive committee has approved spending as follows: $1500 for awards, $800 for national meeting expenses and $2000 for student travel support. With these income and spending, the projected balance at the end of the year is $5037.

FED Journal "Fusion Technology" Needs Your Help

Our fusion journal, Fusion Technology, is under continuing financial pressure due to declining library subscriptions. If present trends continue, we face the risk of Fusion Technology being unable to survive financially. It is imperative that all members of the Fusion Energy Division support our journal. In particular, we request that each member please take the following steps to keep Fusion Technology healthy:

1. Library subscriptions. Make sure the library at your organization receives a subscription.
2. Page charges. Make sure that you and others in your organization pay page charges for their papers. Although ANS policy is to publish papers even if page charges cannot be paid, Fusion Technology counts on these page charges to balance its budget. Authors can prepay estimated page charges while their contract is flush, for a paper they expect to write at the conclusion of the work when the money is gone. Contact Mary Beth Gardner at ANS Headquarters, 708-352-6611.
3. Personal subscriptions. A good deal at $95/year! Buy one! Just call ANS at 708-579-8210.
4. Contribute articles. For Fusion Technology to remain the leading journal, we must keep a steady flow of high-quality papers. We particularly encourage you to consider special issues and review articles.

Update on ITER matters

Michael Roberts, Office of Fusion Energy Sciences, USDOE

The accompanying chart provides an update on the status of the ITER Engineering Design Activities and related collaboration as seen from the USDOE Office of Fusion Energy Sciences. The outlook today, in June, 1998, is compared point-by-point with the situation about a year ago. SWG is the acronym for the Special Working Group established at the most recent ITER Council meeting, held in late February, 1998. The SWG is composed of senior technical representatives from each of the four ITER Parties. Task 1 is to propose to the Council technical guidelines for possible changes to the current detailed technical objectives and overall technical margin, with a view to establishing option(s) of minimum cost still satisfying the overall programmatic objective of the ITER EDA Agreement. The Task 1 Report is being presented to the ITER Council at its June 25, 1998 meeting. The Madison meeting refers to a broad fusion community forum on major next step experiments in fusion held at the end of April, 1998, in Madison, Wisconsin. The chart does not address any near-term U.S. budget issues associated with ITER and US participation in ITER.

ITER Outlook - Now and Then - A Perspective from DOE's Office of Fusion Energy Sciences

Current (6/98) Outlook	Previous (year ago) Outlook
Design SWG Task 1 report to ITER Council recommends same overall programmatic objective but with reductions in detailed technical objectives, i.e., pulse length, wall load, fluence, and ignition margin, and with deletion of tritium self-supply, and with minimum cost (understood to be ~50% capital), but with intent of advanced physics modes capability. Directorâs initial studies seem promising. New point design to be ready by 12/98.	ITER DirectorÕs Detailed Design Report had just been approved by ITER Council. ITER project and Home Teams were strongly focused on overall programmatic objective, i.e., to demonstrate scientific and technological feasibility of fusion energy, as well as original detailed technical objectives. Some US comments emerging on limitations of the design to achieve advanced physics modes.
Cost Capital cost target is reduced by ~ 50%, resulting in a number that US believes the Parties might be able to afford. Total project cost would then be about $5.5B in 98$ using DOE project accounting practice.	Total project cost is $10B in 98$ using DOE project accounting practice. Comments becoming stronger on Partiesâ inability to support the cost and on need to bring cost down to be closer to that of eventual power plant product.
3 Year Extension Four ITER Parties are proceeding to 3 year extension, now including reduced cost design, and each, "when ready", plans to sign Agreement before 7/20/98.	Parties recognized that some form of extension was needed if ITER were to continue, especially to focus on site-specific design adaptations and dialogue with regulators.
Siting Prospective ITER hosts have agreed to provide characteristics typical of their sites to project team before 7/20/98, enabling informal dialogue with regulators to begin.	No commitment had been made by prospective ITER hosts to provide site characteristics by a specific date. No dialogue with regulators had begun or was scheduled.
US Community View From Madison meeting, consensus is US should remain in ITER process and support reduced cost and scope, and increased attractiveness. SWG Task 1 report is consistent with this view.	Comments from US fusion community noting that ITER design was too big a step, both financially and technically, and that it needed more advanced mode physics capability.
Related Collaboration ITER Parties have exchanged letters indicating their willingness to increase collaboration on existing major fusion facilities and to initiate discussions on future fusion development paths.	There was no consideration being given to such matters.

Status of the NIF Project

John R. Murray, Chief Scientist, National Ignition Facility Project, Lawrence Livermore National Laboratory

The National Ignition Facility for Inertial Confinement Fusion (NIF) project continues on schedule at Lawrence Livermore National Laboratory. The concrete foundations for the building have been completed, and steel erection for the building frame has begun.

One of the first components of the special (scientific) equipment to be delivered for the facility will be the 10-m diameter spherical aluminum target chamber. The plates for the chamber have been formed in France and delivered to Precision Components Corporation (York, PA) for final machining. The chamber fabricator, Pitt-Des Moines Industries, will shortly begin constructing a temporary facility at LLNL where the chamber will be assembled. The chamber is scheduled to be installed in the NIF building in March 1999. Contracts are about to be signed for fabrication of the large stainless steel vacuum vessels for the vacuum spatial filters in the laser. Other laser components are proceeding through final design.

We expect to have the building finished to a state that we can begin to install special equipment in the laser bays in late 1999, with eight of the 192 beams operational by September 2001. The project ends in September 2003 with all equipment installed and half of the laser beamlines operational.

For more information on the NIF project, visit the NIF Web site:
http://lasers.llnl.gov/lasers/nif.html
The NIF construction Web site is :
http://lasers.llnl.gov/lasers/nif/building/

The National Spherical Torus Experiment (NSTX)

Charles Neumeyer, NSTX Project Engineering Manager, Princeton Plasma Physics Laboratory

The NSTX Project will provide a national facility for investigating the fusion physics principles of plasma confinement, heating, and current drive in a low aspect ratio, spherical torus (ST) configuration. The device, designed by a team led by the Princeton Plasma Physics Laboratory (PPPL) and including the Oak Ridge National Laboratory (ORNL), University of Washington, and Columbia University, is now under construction at PPPL. First Plasma is planned for April 1999.

The ST configuration is an alternate confinement concept which is characterized by very high beta, high elongation, high bootstrap fraction, and low toroidal field compared to the conventional high aspect ratio tokamak. NSTX will build on the encouraging results from exploratory experiments such as the PPPL CDX-U (Current Drive Experiment, Upgrade), the START (Small Tight Aspect Ratio Tokamak) at Culham, U.K., and the HIT (Helicity Injected Tokamak) at University of Washington. The NSTX is similar in scale and complementary in testing capabilities to the MAST (Meg-Amp Spherical Tokamak) machine now under construction at Culham.

Main characteristics and ratings of the machine are as follows.

Major Radius (R_o)	85.4 cm
Aspect Ratio (R/a)	>/= 1.26
Plasma Current	1.0 MA
Flat Top (Inductive)	0.5 sec
Flat Top (non-Inductive)	5.0 sec
Toroidal Field @ R_o for 5 s	3.0 kG
OH Flux Swing	0.6 volt-sec
RF Power	6.0 MW
NBI Power (Upgrade)	5.0 MW
PFC Bakeout Temperature	350°C

The core of the NSTX machine consists of a narrow center stack (CS) bundle, which contains the inner legs of the Toroidal Field (TF) coil, an Ohmic Heating (OH) solenoid coil, the associated tension cylinder, a pair of inner Poloidal Field (PF) coils, thermal insulation, and a center stack casing that forms the inner wall vacuum vessel boundary. All of the coils utilize water cooled copper conductors. The CS Casing is electrically isolated from the remainder of the machine via ceramic insulator assemblies, which permit the use of Coaxial Helicity Injection (CHI) as an advanced method of current drive. The CS bundle presents one of the main engineering challenges of NSTX and of STs in general; the design maximizes performance while minimizing radial build and the plasma aspect ratio.

The outer vacuum vessel (VV) consists of a cylindrical section with upper and lower domes. It is equipped with ports suitable for mounting a 12-strap High Harmonic Fast Wave (HHFW) RF antenna assembly, and for future attachment of up to two of the Tokamak Fusion Test Reactor (TFTR) Neutral Beam Injection (NBI) systems. There are additional seven 24-inch-diameter ports at the mid-plane for diagnostic access. Four outer PF coil pairs (symmetric about the mid-plane) are mounted directly on the VV.

Plasma Facing Components (PFCs) were designed by ORNL and consist of copper passive plates (to aid plasma stabilization), an inner wall, inboard divertor, and outboard divertor. The PFCs are covered with a combination of carbon fiber composite (CFC) and graphite tiles. The inner wall tiles are mounted via a special rail/pin design, which provides the required mechanical integrity while minimizing the radial build. The PFCs are designed to withstand a temperature of 350oC via the circulation of a high temperature fluid for the outboard and via a DC current for the CS.

NSTX will be installed in the Hot Cell of the D-site facility at PPPL, adjacent to the former TFTR Test Cell. The D-Site infrastructure and equipment including magnet power supplies, and RF sources, cooling water systems, etc., are used extensively to minimize the overall cost of the NSTX facility.

The TF inner leg bundle was manufactured by Everson Electric Company (Bethlehem, PA), and has been delivered to the site. The OH coil, also being built by Everson, is expected to be completed prior to the end of May. The fabrication of the outer legs of the TF coils is well underway. The inner PF coils were manufactured by Magnet Enterprises, International (Oakland, CA), and have been delivered to the site. The Vacuum Vessel fabrication is underway at Process Systems International, Inc. (Westborough, MA).

For further information, contact C. Neumeyer (neumeyer@pppl.gov) or visit the NSTX Web site: http://www.pppl.gov/oview/pages/NSTX.html

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Comparison of Compact Toroid Configurations,

Thomas J. Dolan, Head Physics Section, IAEA

Background:

In nuclear fusion research the "tokamak" type of plasma confinement has achieved the most successful plasma parameters, and it is expected to achieve ignition in the International Thermonuclear Experimental Reactor (ITER) device. However, tokamaks are relatively large and complex, so alternative plasma confinement schemes are being studied. The compact toroid approach has only been studied in small experiments, but in principle it could afford smaller, less-expensive fusion power plants, so it is becoming increasingly popular.

The Small Tight Aspect Ratio Tokamak (START) experiment in the UK achieved remarkable results in 1994-96, which have stimulated worldwide interest in this field. Therefore, the UK is building the Meg-Ampere Spherical Tokamak (MAST) experiment to pursue this concept further. Some other laboratories around the world are now planning or operating compact toroid experiments. For example, the National Spherical Torus Experiment (NSTX) is under construction at Princeton, USA; a spheromak experiment is under construction in Livermore, USA; the GLOBUS-M spherical torus experiment is under construction in Russia; Japan has the TST and FIX experiments; and several developing countries have expressed interest in compact toroid research. This fall we will hold a TCM on "Spherical Torus" (compact toroid) research.

Here, the word "compact" refers to toroidal devices with low aspect ratios ($R/a < 2.5$, where R = major radius, a = minor radius of the plasma ring). This is a broad definition that includes devices with center posts (such as spherical tokamaks). There are several types of compact toroids:

- spheromaks
- field reversed configurations (FRCs)
- spherical tori
- other compact toroidal devices.

There are also several means of forming and sustaining the plasmas, including:

- magnetic induction
- radiofrequency and microwave current drive
- neutral beam injection
- external electrodes
- injection of many small compact toroids from plasma guns
- bootstrap current.

The main technical problems facing compact toroid research are:

- plasma formation without excessive impurity ingress
- plasma stability against magnetohydrodynamic instabilities, such as the tilt mode, especially at large ratios of (plasma size)/(ion gyroradius)
- plasma current sustainment by non-inductive means
- plasma fueling for density sustainment
- plasma-wall interactions.

Budgetary constraints have limited compact toroid experiments to small sizes and modest plasma parameters. There is a lack of a large experimental database, as exists for tokamaks, so it is difficult to develop confinement scaling relations with confidence. Therefore, it is not clear which configurations and sustainment methods will ultimately prove to be superior for the economical production of fusion energy. Recently several new compact toroid experiments have been constructed or approved, but there is not yet effective international coordination of these efforts. This IAEA Coordinated Research Project (CRP) will aim to coordinate world research efforts and to promote the comparison of various compact toroid configurations.

The proposed CRP pertains to comparatively long-term plasma confinement of medium-density plasmas, and not to brief confinement of fast-pulsed high-density plasmas ($n > 10^{22}\ m^{-3}$), even if they have compact shapes. This CRP does not include stellarators or reversed field pinches.

Objective:

The specific objective of this CRP is to compare various compact toroid configurations with regard to:

- plasma stability
- plasma sustainment techniques
- both experiments and theoretical models
- relative advantages and disadvantages
- prospects for fusion energy production.

The individual research projects can be theoretical models, experiments, or both. They may involve other related phenomena, such as plasma heating, fueling, turbulence, edge effects, impurities, and diagnostics, but the focus must be on understanding plasma stability and sustainability. The research results will be individual annual reports, reports of Research Coordination Meetings, a final report summarizing the results and conclusions, papers in the IAEA Fusion Energy Conference proceedings, and publications in scientific journals, such as *Nuclear Fusion*.. Research collaborations will be formed that may be continued after the CRP. The recommendations for future research may include international collaboration on a large joint experimental project

Activities:

1. We will form a communication network of interested laboratories in the fall of 1998 and discuss what each is working on.

2. At a Research Coordination Meeting (RCM) in late 1998, we will write a report summarizing the current state of compact toroid research and the plans for the CRP. (One possible date for the RCM could be 29-31 October).

3. The participants will continue to discuss their research problems and progress by electronic means in the months after the meeting. This will include some joint studies arranged at the RCM.

4. At the second RCM in 2000, we will write a report with the preliminary comparison of the various configurations studied.

5. At the third RCM in 2002, we will write a final report summarizing:
   - the research results of each participant
   - the advantages and disadvantages of the various configurations and helicity injection methods<
   - conclusions, with regard to the development of fusion power plants.

6. Then we will edit and publish the final report in a technical journal or as a IAEA Technical Document (TECDOC).

Possible Participating Countries :

Possible research contracts are Argentina, Brazil, China, Egypt, India, Russia, Turkey, Ukraine, and Venezuela. Possible research agreements are Australia, France, Germany, Italy, Japan, UK, and USA. Other countries may be added, if appropriate.

Applications:

If you would like to apply for a research contract or research agreement to participate in this CRP, please request the application forms from:
Research Contracts Administration
Room A2222 IAEA
P.O. Box 100
Wagramer Strasse 5
A-1400 Vienna, Austria

FAX 43 1 20607
E-mail: official.mail@iaea.org

and submit your applications to that address, specifying that the research is to be part of CRP number F1.30.07 entitled "Comparison of Compact Toroid Configurations". Proposals should state how your research will contribute to the theme of the CRP. Proposals are due 15 August 1998, but proposals received after that date may still be considered.

General Information on IAEA Coordinated Research Projects:

The purposes of an IAEA Coordinated Research Project are:

- to advance the state of the art
- to provide coordination for work in many countries
- to reach conclusions regarding the subject matter
- to publish a document of technical value
- to encourage cooperation between developing countries and advanced countries.

A CRP typically lasts 3-5 years and involves about 5-15 participants, which are usually institutes, government labs, or university labs. A joint research topic is selected, and each participant works on an appropriate aspect of the problem. A Research Coordination Meeting (RCM) is held about every 18-24 months.

Participants from developing countries receive small research contracts (3-5 k$/year) from the IAEA. Participants from advanced countries have "agreements" with the IAEA, but do not receive financial support for the research. The IAEA pays the travel expenses of all participants to the RCMs, which are either in Vienna or at one of the participating Institutes.

The steps in setting up a CRP are approximately as follows:

1. The idea is discussed by Agency staff and sometimes at a consultants meeting. The list of potential topics and participating institutes is refined.
2. Potential participants are told informally the Agency is considering a CRP. An external advisory group (the IFRC) may be consulted.
3. A formal proposal is submitted to the IAEA "Research Coordination Committee" (RCC). After approval by the RCC, a formal announcement is sent out to potential participants.
4. Proposals are submitted and evaluated.
5. Contracts are awarded or agreements are signed with the selected participants. The CRP begins.
6. RCMs are held about every 18-24 months. Participants submit annual progress reports.
7. In the final year, each participant reports in detail the research and accomplishments. These results are combined, edited, and published by the IAEA (or by a technical journal).

In the field of plasma physics and nuclear fusion, the IAEA has the following CRPs recently completed, in progress, or in preparation (shortened titles):

- Software development for numerical simulation and data processing
- Plasma heating and diagnostics systems
- Lifetime prediction for a fusion reactor first wall
- Plasma-interaction induced erosion of fusion reactor materials
- Radiative cooling rates of fusion plasma impurities
- Reference data for thermomechanical properties of fusion reactor plasma facing materials
- Tritium retention and release from fusion reactor plasma facing components
- Atomic and plasma-wall interaction data for fusion reactor divertor modeling
- Engineering, Environmental, and Industrial Applications of Plasma Physics and Fusion Technology.

Calendar of Upcoming Conferences on Fusion Technology

20th Symposium on Fusion Technology - SOFT 98
September 1998, Marseille, France

IAEA Technical Committee Meeting on Steady-State Tokamak Operations

October 13-15 , 1998, Hefei, China.

17th IAEA Fusion Energy Conference

October 18-24, 1998, Yokohama, Japan
t.dolan@iaea.org
http://www.convention.co.jp/iaea/

ANS Winter Meeting

November 15-19, 1998, Washington, DC
http://www.ans.org/

ANS Annual Meeting

June 6-10, 1999, Boston, MA
http://www.ans.org/

14th International Conference on Inertial Fusion Sciences and Applications"

(IFSA, formerly LIRPP)
September 12-17, 1999, Bordeaux, France

5th International Symposium on Fusion Nuclear Technology - ISFNT-5

September 19-24, 1999, Roma, Italy

8th International Conference on Fusion Reactor Materials - ICFRM-9

October 10-15 , 1999, Colorado Spring, Colorado

18th IEEE/NPSS Symposium on Fusion Energy

October 11-15 , 1999, Albuquerque, NM

ANS Winter Meeting

November 14-18, 1999, Long Beach, CA
http://www.ans.org/

Editor's Note

Last December, we explored the electronic mail as a possible alternative to the printed newsletter. Thanks to those who responded to our request and sent their E-mail addresses. In the future, we do plan to distribute the newsletter by E-mail. We also plan to use the E-mail service to distribute ANS-FED information when an item cannot wait for the regular biannual editions of the newsletter. Few ANS members have expressed interest in receiving hard copies of the newsletter. We encourage you all to advise us if you get access to the Web site or have a new E-mail address.

The ANS-FED Web site address is included at the beginning of the E-mail for those who prefer to go to the Web to read the newsletter. The articles are listed at the beginning of the E-mail to alert the readers to the subject to look for in the text. The "Chairman's Message" and the division-related topics will be published on a regular basis. As we begin to target a wider audience in the fusion community, the newsletter will cover a broad spectrum of subjects that emphasize the engineering and technology aspects of fusion. While some articles are devoted to the national fusion activities, we do plan to continue covering the international activities as they drew a wide interest in the U.S.

Please contact us or any of the Executive Committee members if you have any suggestions or comments.