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NINTH ITER COUNCIL MEETING

by Dr. E. Canobbio, EU Contact Person

The Ninth Meeting of the Council of the International Thermonuclear Experimental Reactor (ITER) Engineering Design Activities (EDA) was held on December 12 and 13 in the European Union (Garching bei München, Germany).

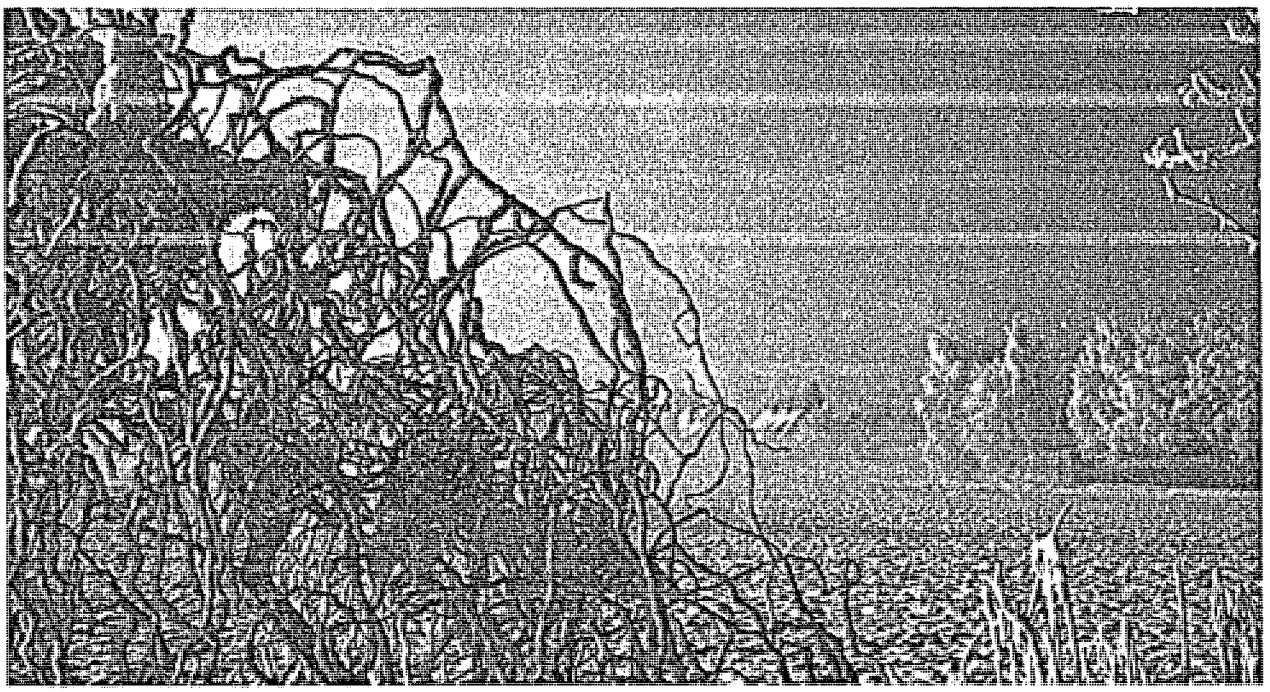
The four ITER Parties' delegations that attended the meeting were headed, for the EU, by Professor Paolo Fasella, Director-General for Science, Research and Development of the European Commission, for Japan, by Mr. Naotaka Oki, Deputy Director-General of the Atomic Energy Bureau of the Science and Technology Agency, for the Russian Federation, by Academician Evgenij Velikhov, President of the RRC "Kurchatov Institute", and, for the United States, by Dr. James Decker, Deputy Director of Energy Research of the Department of Energy.

Having heard the positive views of the Parties based on in-depth assessments, the Council:

(1) approved the ITER Interim Design Report, Cost Review and Safety Analysis, produced by the Director with the integrated support of the Joint Central Team and the Parties' Home Teams, as the basis on which to continue the technical work of the EDA until their completion in 1998;

(2) concluded that the Report of ITER Site Requirements and ITER Design Assumptions is a reasonable basis for continuing with the EDA and for undertaking activities in preparation for possible future decisions on the construction of ITER; and

(3) concluded that the Tentative Sequence of Events for such a decision making process appears to be an appropriate basis for moving towards joint implementation.



Garching, December 1995 *Photo by C. Stahlberg*

Furthermore, the Council appointed a Special Working Group (SWG) with E. Canobbio and K. Tomabechi as SWG Co-Chairs, with the task of developing proposals on approaches to joint implementation, for approval at the tenth meeting of the ITER Council. Finally, after considering the Parties' technical comments, and noticed with satisfaction the continuing progress of the technical work (for details, see the following article by Dr. R. Aymar, ITER Director), the Council provided guidance to the Director for future technical work to be included in the Detailed Design Report.

The Council reaffirmed that a next step such as ITER is a necessary step in the progress towards fusion energy, that its objectives are valid and timely, that the cooperation among four equal Parties has shown to be an efficient frame to achieve the ITER objectives and that the right time for such a step is now. The success of fusion worldwide depends on this step, and ITER should continue to benefit from the full international cooperation. The Council heard the Parties' statements regarding their willingness to continue to fulfil their obligations in fully contributing to the ITER Engineering Design Activities.

In Garching, expressions of interest in hosting ITER were reported by representatives from the European Union and Japanese Parties. Also, representatives of a Canadian consortium made a presentation on the Canadian Government's preparation to consider an offer to host ITER.

LIST OF ATTENDEES

EU

Prof. P. Fasella	IC Member
Dr. Ch. Maisonnier	IC Member
Prof. K. Pinkau	Permanent Expert
Prof. R. Toschi	Expert, HTL EU
Dr. E. Canobbio	Expert, CP EU

JA

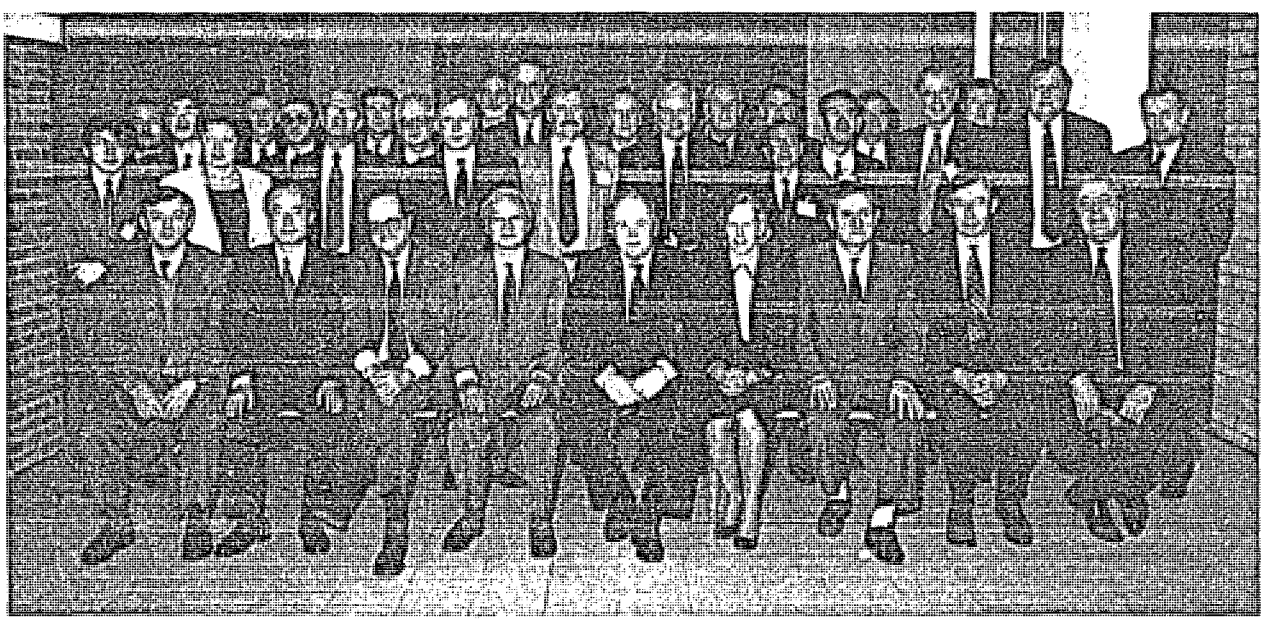
Mr. N. Oki	IC Member
Dr. M. Yoshikawa	IC Co-Chair
Mr. S. Tanaka	Expert, STA
Dr. S. Mori	Expert, JAERI
Dr. S. Matsuda	Expert, HTL JA
Mr. Y. Hishiyama	Expert, JA Embassy Bonn
Dr. A. Kitsunezaki	Expert, CP JA

RF

Acad. E. Velikhov	IC Chair
Dr. N.S. Cheverev	IC Member
Dr. O.G. Filatov	Expert, HTL RF
Dr. N.P. Kornev	Expert, MINATOM
Dr. B.A. Kouvchinnikov	Expert, MINATOM
Mr. A.E. Lebedev	Expert, MINATOM
Dr. L.G. Golubchikov	Expert, CP RF

US

Dr. J.F. Decker	IC Member
Dr. N.A. Davies	IC Member
Mr. B. Weakley	Expert, US DOE
Mr. W. Marton	Expert, US DOE
Dr. M. Roberts	Expert, CP US



Participants in the Meeting

ITER: Dr. R. Aymar (Director), Dr. R. Iotti (Administrative Officer), Dr. R. Parker (Deputy Director, Head of Garching JWS), Mr. M. Drew (Point of Contact with the Director)

Dr. P. Rutherford (TAC Chair), Dr. V. Vlasenkov (IC Secretary)

IAEA: Dr. T. Dolan (IAEA Representative)

STATUS OF THE ITER EDA

by Dr. R. Aymar, ITER Director

Very good progress was made on the technical work of the ITER EDA during 1995. The focus of the first half of the year was the Interim Design Report, Cost Review, Safety Analysis and Report on Site Requirements. The completion of these major items of work and their submission, through the advisory committees and review groups, to IC-8 in July was reported in the ITER EDA Newsletter of August 1995.

This article summarizes progress made in the ITER Engineering Design Activities in the period July to December 1995, as reported to IC-9.

Overview

Following IC-8 decisions on the Interim Design Report, the Project has embarked on the phase of detailed design work on all aspects of the ITER design on the basis presented in the Report. Particular attention is being paid to the technical issues raised by TAC, to the sensitivity studies and other points raised by the SRG and to issues related to integration of the design. The results of these studies will be incorporated, with the progress in other areas, in the Detailed Design Report which is scheduled for the end of 1996.

In parallel, the JCT has been working closely with the Home Teams to establish the detailed work content, distribution, planning and time scales for seven major R&D Projects (see in the following text), so as to ensure that these essential and high-profile elements of the ITER EDA collaboration are coherently managed and brought to fruition. *)

Detailed discussions have been held with all the Parties, with a view to implementing IC-8 decisions related to the level and mix of resources for the remainder of the EDA. Progress has been made in undertaking joint planning with Parties in anticipation of a range of outcomes of the current budget uncertainties, in order to review possibilities which can best serve the interests of the project and the Parties.

The work on ITER Physics carried out in the Parties' voluntary Physics programmes has developed well. The structure established with the Parties for this purpose has proved a successful way of offering focus to the Parties' efforts. Relevant results are flowing from the Parties' Physics programmes. Through the Physics Expert Group Workshops, the output is being fed to the Project effectively at the same time as the projects needs and physics issues are being further refined and re-presented to the Parties. All Parties have paid their full contributions to the 1995 Joint Fund budget and, by IC-9, IAEA had been requested to transfer to the Agents $2,120,800 of the total of $2.4M collected. The 1996 budget is now adopted at the level of $2.4M and the call for contributions has been sent to the Parties.

Design Work

The main thrusts of design work are at present:

- to review each of the Design Description Documents (DDDs) in order to eliminate any inconsistencies with the General Design Requirements and to select options and enhance systems to optimize overall cost/performance;
- to undertake formal interface reviews for each DDD;
- to pursue important integration studies, notably seismic features, site layout and the balance of plant. Task forces have been established to draw together work at the three Joint Work Sites on these matters which have potential cost implications.

*) It is expected that a separate article on the subject will be published in the next Newsletter issue.

These issues were reviewed in a series of joint meetings at the Joint Work Sites over the closing months of 1995. The objective is to establish, by January 1996, a point design which takes account of the above work and of any output from IC-9 to provide the base line for all Detailed Design Work.

Joint Central Team and Support

The status of the JCT is summarized by Joint Work Site and by Party in Table I. In the period between IC-8 and IC-9, three members left the team. By mid November seventeen new team members had arrived on site (3 EC, 4 JA, 6 RF and 4 US), and one more RF team member was imminently expected. Selection activity has been continuing with the objective of filling the priority posts in the JCT structure.

TABLE I. JCT – Numbers on Site by JWS and Party at mid November 1995

Garching	Naka	San Diego	Total	EC	JA	RF	US	Total
45	53	52	150	45*)	39	27	39	150

*) *includes three Canadians provided through the Canadian association with the EC Party.*

The estimated cumulative PPy effort on site to 21 October 1995 is shown in Table II by Joint Work Site and by Party.

TABLE II. JCT – Cumulative PPY's on-site to 21 October 1995

	EC	JA	RF	US	Total
Garching	28.3	23.5	9.3	21.4	82.4
Naka	28.2	25.0	9.4	25.5	88.1
San Diego	22.3	28.4	19.4	34.8	104.9
Total	78.8	76.9	38.0	81.7	275.5

The Work Programme assumed a significant buildup of JCT members throughout 1995 as part of a rising trend to meet the approved target of 800 PPy for the EDA. Figures presented to IC-8 indicated that, to meet the target effort, JCT numbers on site would need to rise to a plateau of about 188 – 25 more than currently selected – by the end of the year. In order to pursue the Work Programme as approved by the ITER Council, the buildup of suitable professional staff on the JCT has to continue as far and as fast as is practicable. Where budgetary or other problems such as language make it difficult to assign JCT new members to the Joint Work Sites as foreseen, alternative constructive approaches need are being vigorously pursued.

One such approach is evolving through action taken to use the Joint Fund to provide a means for RF design support directly to the JCT. Working closely with the RF institutes concerned, the JCT has specified hardware and software configurations which will provide most rapid start-up of effective design support. A number of urgent tasks have been identified and developed with a design centre being assembled in the Efremov, Kurchatov and ENTEK Institutes, and the RF Joint Fund Agent has been instructed to prepare and execute contracts for the work. The successful implementation of these arrangements, which are entirely separate from the ITER Design Tasks undertaken by the RF Home Team, could offer an effective way to supplement JCT on-site design capacity.

In parallel to the establishment of RF design support for the JCT mentioned above, options are being reviewed for assisting the RF Party to develop its CAD capability in order to gain progressive access to ITER's Catia system, so that the RF may realize full benefits from the information being generated in ITER collaboration.

The Work Programme also indicated the need for increases in the CAD support – both staff and equipment at Garching and Naka. Following IC-8, action has been taken at both sites to increase the resources. The necessary equipment is being procured under Host Support, and possible candidates for the CAD staff are under consideration. The US Party's budget limitations mean that it is not possible at present to enhance host support at San Diego as foreseen.

Task Assignments
The total value of technology R&D credits granted, or proposed, as previously reported, exceeds 621 KIUA and the total of ITER design credit assigned or proposed for assignment now exceeds 701 PPY (including 16.03 PPY of Visiting Home Team Personnel (VHTP) effort). Total values of task allocations to date, excluding the VHTP tasks, are as shown below.

Party	IUA	PPY	Type	IUA	PPY
EC	179,773	181.68	TA Work Completed	93,427	121.44
JA	167,034	165.70			
RF	109,677	159.35	TA Committed/ongoing	528,106	564.13
US	165,149	178.84			
Totals	**621,553**	**685.57**	**Totals**	**621,553**	**685.57**

Note: the design task data in the table above exclude VHTPs. VHTP completed and committed to date total 16.03 PPY.

The JCT and Home Teams have been closely interacting in the detailed development of plans and schedules for the seven major R&D Projects (see box). The successful and timely execution of these major programmes are vital to the EDA, both for the information that they are due to yield and to provide concrete demonstration of ability to manage a complex interactive schedule of industrial scale technical work within the ITER framework.

SEVEN LARGE R&D PROJECTS

Recognizing the need to complete certain key features of the technology R&D for ITER, it has been agreed to highlight and focus the ITER EDA R&D activities on seven critical areas:

Central Solenoid Model Coil project
Toroidal Field Model Coil project
Vacuum Vessel Sector project
Blanket Module project
Divertor Cassette project
Blanket Module Remote Handling project
Divertor Module Remote Handling project

Each project includes the development and verification of the full scale manufacturing techniques at the industrial scale. The JCT and Home Teams share responsibility for bringing the projects to fruition. The JCT takes primary responsibility for defining requirements, deliverables, time schedules and milestones; the Home Teams take primary responsibility ior R&D implementation including task sharing among the four Home Teams to achieve maximum effectiveness.

ITER Physics
In connection with the Interim Design and Cost Review of July 1995, a physics description of ITER was presented and documented in the Interim Design Report, and the Physics Design Description Document. The informal and formal reviews conducted by TAC-8 generally endorsed the physics basis of the ITER Design as providing sufficient capability to enable ITER to meet its goals. Nonetheless, TAC-8 raised a number of important issues for further investigation within the four Parties' Voluntary Physics Programs. Examples include: operation above the Greenwald density limit, physics of pellet fuelling in a highly baffled divertor, quantification of physics benefits resulting from segmenting the central solenoid, the H-to-L power threshold, and -limits in long pulse discharges.

During the fall of 1995, the ITER Physics Expert Groups met to assess the progress made in addressing issues identified in the 1995 ITER Physics Research Needs table and to produce a revised 1996 Research Needs table which reflects the concerns raised by TAC-8 as well as progress during 1995 in both physics and the Design. The subsequent 1995 ITER Physics Committee meeting was invited to discuss, modify and endorse the 1996 Research Needs table. The Physics Experts Group Workshops have continued to provide relevant and valuable interchange between the JCT and the Parties' Physics programmes on matters which have direct impact on the design related work.

NINTH MEETING OF THE ITER TECHNICAL ADVISORY COMMITTEE

by Prof. P. Rutherford, TAC Chair

The ninth meeting of the ITER Technical Advisory Committee (TAC-9) was held on 27 – 29 November at the ITER Garching Joint Work Site.

At the eighth meeting of the ITER Council (IC-8), the following new charge was given to the TAC:

"The ITER Council requests the TAC to assess from a technical viewpoint the status and progress of the R&D within the ITER Work Program, including priorities, so as to confirm that the planned R&D supports the Engineering Design. The TAC is requested to report on this charge at the ninth meeting of the ITER Council."

The TAC-9 meeting was called to address this charge.

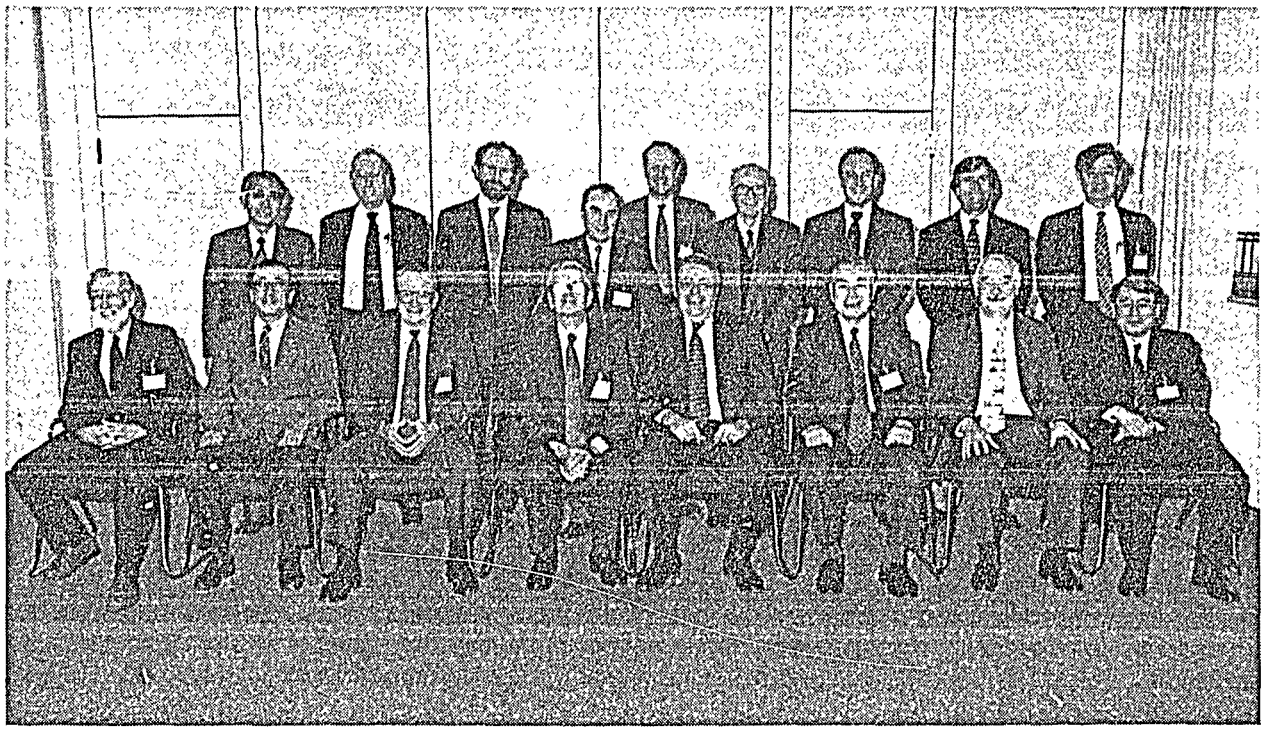
In preparation for the meeting, the JCT distributed descriptions and status reports on each of seven major R&D projects. Presentations at the TAC-9 meeting were given both by JCT staff and by Home Team (HT) staff. In several cases, the HT presenters described R&D activity in all four Parties.

The "large-seven" R&D projects are as follows:

1. Central Solenoid (CS) Model Coil Project (L-1);
2. Toroidal Field (TF) Model Coil Project (L-2);
3. Vacuum Vessel Sector Project (L-3);
4. Blanket Module Project (L-4);
5. Divertor Cassette Project (L-5);
6. Blanket Module Remote Handling Project (L-6);
7. Divertor Module Remote Handling Project (L-7).

The TAC found that the technical scope of the R&D program is well-matched to the Interim Design.

The TAC noted that, despite some shifting of resources to improve the schedule, all seven major projects are now approximately equally constrained in funding and schedule, with key results coming in most cases only in 1998. The TAC cautioned that there is essentially no schedule slack anywhere in the R&D program and that exceptionally effective management in the HTs will be needed to maintain the present schedule.



Participants in the Meeting

The TAC noted that a strong project management structure has been implemented for each of the seven major R&D projects. In each case, there is a responsible Deputy Director and a responsible HT Leader (in one case, two responsible HT Leaders). Once the technical scope and milestones have been specified (a joint responsibility of the JCT Directorate and the HT Leaders), the responsibility for implementing each R&D project lies with a designated person under the responsible HT Leader's authority. The TAC noted that it will be essential that the HTs notify the JCT immediately of any impending threat to the R&D schedule. Consistent enforcement of QA procedures among the four HTs will also be beneficial.

The TAC noted that approximately 95% of the total R&D program is now in committed credits. Of the committed program, approximately 57% is represented by the "large-seven" R&D projects; all of the work within these seven major projects is already committed. Of the overall R&D program, approximately 40% is either completed or in already-active tasks. Within the "large-seven" projects, little of the R&D has yet been fully completed and documented, but approximately 30% is in active tasks and the remainder is in the later stages of preparation of task agreements. Because of the presently well-advanced stage of work assignments and the general tightness of the schedule and resources, the TAC would strongly caution against the reallocation among Parties of technical work already assigned.

The TAC's overall assessment was that the "large-seven" R&D projects developed for ITER are appropriate, both in the large-scale tests and in the individual sub-tasks which support them. When completed, they will provide the necessary information to start the construction of the major ITER tokamak components after the EDA, assuming completion of the remaining R&D which accompanies the construction phase.

The TAC found a high degree of interdependence among the four Parties in the implementation of these seven major R&D projects. Although there is in all cases a "lead Home Team", the completion of these projects is critically dependent on hardware and other contributions from the other HTs. It will be essential that all four Parties fulfil their commitments to provide the resources needed to execute their assigned tasks, and that the four HTs adopt effective management techniques to ensure on-schedule completion of these tasks.

LIST OF PARTICIPANTS

TAC Members

EU:	JA:	RF:	US:
Dr. R. Andreani	Prof. N. Inoue	Dr. E. Adamov	Dr. H.K. Forsen
Dr. J. Jacquinot	Prof. S. Itoh	Acad. V. Glukhikh	Dr. D.O. Overskei
Dr. D. Robinson	Prof. K. Miya		Dr. P.H.Rutherford*)
Prof. F. Troyon	Dr. K. Tomabechi		Dr. J. Sheffield

*) Chair

Secretary: Mr. C.A. Flanagan

JCT: Dr. R. Aymar, Dr. V. Chuyanov, Dr. M. Huguet, Dr. R. Parker, Dr. Y. Shimomura, Dr. R. Haange, Dr. G. Kalinin, Dr. K. Ioki, Dr. G. Janeschitz, Dr. G. Johnson, Dr. E. Martin, Dr. N. Mitchell, Dr. R. Thome.

Home Team Leaders: Prof. R. Toschi (EU), Dr. S. Matsuda (JA), Dr. O. Filatov (RF), Mr. T.R. James (US, for Dr. C.C. Baker).

Home Team Presenters: Dr. G. Bevilacqua (EU), Dr. W. Dänner (EU), Dr. D. Maisonnier (EU), Dr. R. Maix (EU), Dr. E. Salpietro (EU), Dr. M. Akiba (JA), Dr. T. Kato (JA), Dr. K. Koizumi (JA), Dr. E. Tada (JA), Dr. A. Shikov (RF)

PAUL RUTHERFORD RETIRES, WILL CONTINUE AS TAC CHAIR*)

Dignitaries in the field of fusion gathered at Princeton University's Prospect House on October 17 for a retirement party for Paul Rutherford, Chairperson of ITER's Technical Advisory Committee, who is stepping down as PPPL's Associate Director for Research. Rutherford plans to devote most of his efforts to ITER while at PPPL through next September.

"Since 1965, Paul has served the University, the Plasma Physics Laboratory, and the national and international fusion effort with great distinction, and we are very grateful for his numerous contributions," said PPPL Director Ronald C. Davidson. In written remarks, ITER Director Robert Aymar noted his appreciation of *Rutherford's contribution to ITER as Chairperson of TAC. "Paul has brought to this job an absolute commitment* to see ITER succeed in relation to its scientific and technological mission combined with qualities of Chairmanship which service this objective so well, notably: scientific and intellectual rigor and honesty ... and impartiality and open-mindedness," Aymar wrote.

Aymar and N. Anne Davies, the Associate Director for Fusion Energy at the DOE's Office of Energy Research, expressed gratitude to Rutherford for continuing his work with ITER. "I am very pleased that you will be able to continue as the Chairman of the Technical Advisory Committee for the International Thermonuclear Experimental Reactor project. In this capacity you have gained the respect of a diverse group of independent members from all of the ITER Parties and are now leading a highly effective advisory group", wrote Davies in a letter to Rutherford.

Discussing fusion and his continuing commitment to ITER, Rutherford described a painting, "Fasching und Fasten," by Peter Bruegel the elder, which is in Vienna's art museum. The painting depicts a small town the night on which Fasching, the season of merrymaking, ends, and Lent, the season of fasting, begins. In the town square is a somber group in black who have come to proclaim the start of Lent. Everywhere around them, people are hiding to prolong the merrymaking. "Fusion surely finds itself in just such a situation. The past 30 to 40 years of fusion research – the phase in which plasma physics has been the dominant activity – have been enormous fun. Years filled time and time again with the exhilaration of fundamental scientific discovery", said Rutherford. "But we know now how to make a burning plasma, so let's do it. And in so doing, let us recognize that it is also time to turn to the serious and somber business of developing the engineering and the technology needed to make fusion energy practical." He said many in the fusion program – like those in Bruegel's picture – will try to hide so they can continue the merrymaking. "But in truth, for fusion also, the season of Fasching is over, and the season of Lent is at hand. So that's why I'm in ITER ... The crowning moment for me will come in 1998 if ITER moves forward into construction, and if I can have done something, however small, to help bring that about."

*) reprinted from U.S. ITER News (November 1995)

Items to be considered for inclusion in the ITER Newsletter should be submitted to B. Kouvchinnikov, ITER Office, IAEA, Wagramerstrasse 5, P.O. Box 100, A-1400 Vienna, Austria, or Facsimile: (+43 1) 237762; phone (+43 1) 2060 26392.

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