

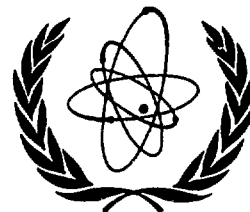
INTERNATIONAL THERMONUCLEAR EXPERIMENTAL REACTOR



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THIRD MEETING OF THE ITER TECHNICAL ADVISORY COMMITTEE (TAC-3)

by Prof. P. Rutherford, TAC Chairman

TAC-3 was held at the ITER Joint Work Site Naka, Japan, on 9-11 September 1993. The following TAC members attended the meeting: R. Andreani, R. Aymar and F. Troyon (EC); N. Inoue, S. Itoh, K. Miya and K. Tomabechi (JA); E.O. Adamov, V.A. Glukhikh, B.B. Kadomtsev and M.I. Solonin (RF); J.F. Clarke, R.W. Conn, P.H. Rutherford (Chair) and J. Sheffield (US). In addition, the following attended as invited experts: G. Marbach and A.A. Tavassoli (EC); H. Tsuji and T. Tsunematsu (JA); S.A. Egorov and Y.S. Strebkov (RF); C.C. Baker and E.E. Bloom (US).

The present meeting of the TAC arose from the IC-3 meeting in Tokyo, which formulated the following new charge to the TAC:

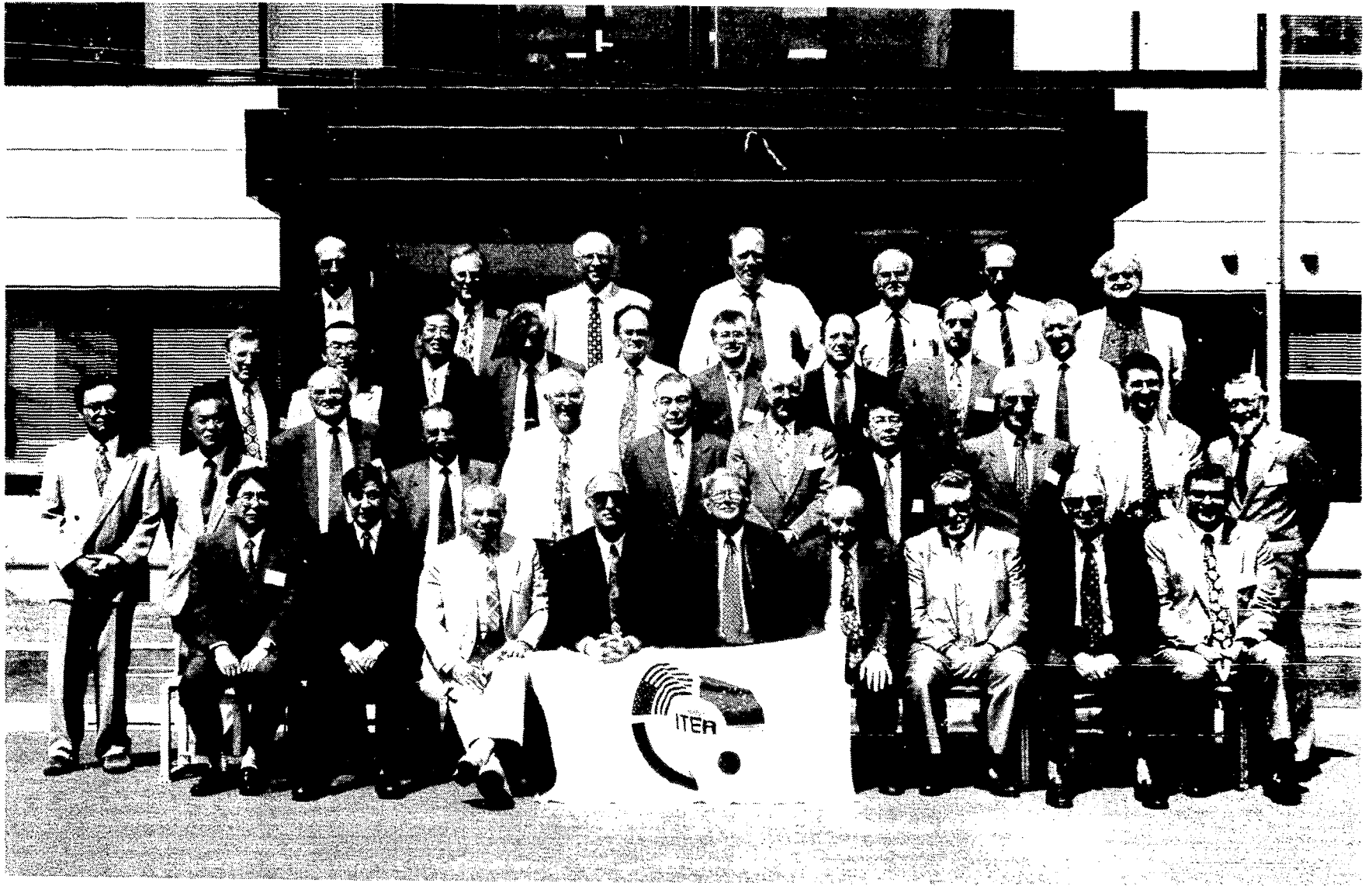
"The ITER Council requests TAC to continue its assessment of the design being developed by the Director and the Joint Central Team (JCT). This further assessment should address in particular the key systems for which the design fulfilling the detailed technical objectives is still evolving, such as the magnets and the first-wall/blanket/shield.

The TAC should also continue to assess the cost estimates being developed by the Director and the JCT, so as to confirm for the next Council meeting the ability of the design to satisfy simultaneously the three conditions on cost, technical objectives and safety margins, as requested at the previous Council meeting (IC-2). This assessment should be in the context of the recommendations of TAC-2, including those on cost considerations, which were endorsed by the Council (IC-3)."

IC-3 had also invited the Director to make all efforts to streamline the preliminary design, and, in particular, with regard to the first-wall/blanket/shield system, to consider (i) a solution which is compatible with the available experience, e.g., use of low-temperature, medium-pressure water-cooled steel, and (ii) a solution using advanced materials.

In a letter to the TAC Chair, the Council Co-chair conveyed the sense of consultations between the Director and the ITER Council members who are program directors on the outline design. On the basis of this guidance, the format of the TAC-3 meeting was changed to one of technical consultation and discussion between the Director and the TAC.

The Director and the Joint Central Team (JCT) had prepared the report entitled "ITER Design Option Developments" for consideration at TAC-3. The report was presented by the Director and the JCT in eight sections:



Participants in the Meeting

- A. Introduction
- B. General ITER Design Options
- C. ITER Physics and Plasma Operation Studies
- D. ITER Blanket and Shield Design Options
- E. ITER Divertor Design Developments
- F. ITER Magnet Concepts and Design Principles
- G. Basic Safety and Environmental Considerations in the ITER Concept
- H. ITER Cost Estimates.

These were described in presentations to the TAC by Dr. P.-H. Rebut, Dr. M. Rosenbluth, Dr. Y. Shimomura, Dr. R. Parker, Dr. Y. Gohar, Dr. D. Smith, Dr. G. Saji, Dr. R. Thome, and Dr. V. Chuyanov. Dr. S. Piet presented material in response to a request for an assessment of activated waste. Dr. D. Gambier and Dr. M. Huguet from the JCT also attended the meeting.

Although the JCT report, "ITER Design Option Developments", provided essential technical information on the JCT's design concept for ITER, the scope of the discussions at TAC-3 extended beyond these specific JCT proposals.

The TAC's review of the JCT report, "ITER Design Option Developments", and the discussions at the TAC-3 meeting focused on three issues perceived to be critical at this time: (i) the physics basis for the machine and plasma operating parameters, especially the accessible range of fusion power, which depends on the confinement scaling law and the level of helium/impurity contamination, and the overall construction cost estimates and their possible variation with modifications in machine and plasma operating parameters taking into account the guidance from IC-3 and from the Co-chair's letter on the consultations; (ii) the first-wall/blanket/shield design concept, especially the choice of materials and coolants, taking into account the request from IC-3 that two options be developed and noting that the Co-chair's letter on the consultations reaffirmed the SWG-1 guidance that a non-breeding shield will suffice for the Basic Performance Phase, and safety and environmental issues, especially those relating to the first-wall/blanket/shield and to the quantities and levels of activated waste produced in ITER; and (iii) the magnet design, manufacturability and updated cost estimates, based on the results of the manufacturing feasibility studies.

The TAC's findings and recommendations are summarized in a report which will be presented to the ITER Council at its meeting on September 30 - October 1.

SUMMARY REPORT FOR ITER MAGNET TECHNICAL MEETING

by B.J. Green, Senior Scientist, ITER Joint Work Site, Naka

A Magnet Technical Meeting was held at the Naka Joint Work Site on June 1-4, 1993. Representatives from all four Parties attended. The list of attendees at the meeting is shown below.

LIST OF ATTENDEES

EC: P. Bruzzone N. Mitchell A. Torossian A. Ulbricht	RF: S.A. Egorov A.I. Kostenko	JCT: P. Barabaschi C. Bushnell B.J. Green M. Huguet F. Iida
JA: T. Ando M. Sugimoto H. Tsuji K. Yoshida	US: J. Minervini D.B. Montgomery S. Shen P. Titus	H. Matsumoto K. Okuno Z. Piec P.-H. Rebut R.J. Thome F.M.G. Wong

The meeting began with a plenary session in which a representative from each Party summarized the homework done since the January meeting and the status of the manufacturing feasibility studies that are underway by each Party.

The manufacturing studies have all concluded that construction of the TF & CS coils is feasible using the present concepts for windings and structure. Several different concepts and methods have been suggested for component preparation, winding and coil assembly. Studies are not yet complete nor at a common level of completion. The JCT will review the summary material provided at the meeting and provide a list of comments to the Home Teams for possible consideration by the industries in completing these studies. Upon completion of the studies, the JCT will summarize the approaches used, comments, R&D required, and conclusions, then select a baseline approach for coil construction for further evaluation and R&D.

After the plenary session, the attendees were divided into three groups: Conductors, chaired by N. Mitchell and H. Tsuji, Model Coils, chaired by D.B. Montgomery, and Full Scale Coils by A. Kostenko. In parallel working sessions, the homework was discussed in more detail, issues were raised and resolved, and homework for the next meeting was discussed. The meeting closed with a plenary session in which the group leaders summarized the group conclusions and homework tasks.

The next Magnet Technical Meeting has been scheduled for October 5-8, 1993 and will be held in Naka.

INTERNATIONAL WORKSHOP ON NUCLEAR DATA FOR FUSION REACTOR TECHNOLOGY

by E.T. Cheng, Y. Gohar, F.M. Mann, A.B. Pashchenko, G.E. Shatalov

The International Workshop on Nuclear Data for Fusion Reactor Technology was organized by TSI Research (Dr. E.T. Cheng) and Westinghouse Hanford Company (Dr. F.M. Mann) on behalf of the U.S. Department of Energy, and held near the ITER Joint Work Site at Del Mar, California on 3-6 May 1993, in co-operation with the IAEA.

The Workshop was attended by 65 scientists from 14 countries and from two international organizations, the International Atomic Energy Agency and the Nuclear Energy Agency.

The Workshop was convened immediately after the IAEA Research Co-ordination Meeting (RCM) of the Agency's Co-ordinated Research Programme on "Activation Cross Sections for the Generation of Long-Lived Radionuclides of Importance in Fusion Reactor Technology". This close scheduling of these two meetings has given many Workshop participants the chance to participate in the RCM and contribute to the agenda. On the other hand, the RCM attendees also participated in the Workshop, essential for successfully achieving the Workshop objectives.

The main objective of this Workshop was to arrange for an international gathering of the fusion nuclear data researchers to exchange information and discuss on the planning and strategy for improving the database for fusion reactor technology. More specific purposes have included the following functions to satisfy the recent regional and international nuclear data development activities:

- (1) Presentation of fusion nuclear data measurements and techniques. Review of recent measurement activities and state-of-the-art techniques seem to be very helpful for the improvement of the database and promotion of international co-operation activities.
- (2) Discussion of Fusion Evaluated Nuclear Data Library (FENDL) activities. The IAEA-sponsored FENDL Library activity has been active since November 1987 following the recommendation of the IAEA Advisory Group Meeting on Nuclear Data for Fusion Reactor Technology held at Gaussig/Dresden, Germany, in December 1985. This Workshop provided an opportunity to review the progress of this activity from a broader spectrum of expertise provided by the international participants.

- (3) Activation data evaluations and calculation co-operation. Activation calculation methods and issues important for fusion energy development were discussed
- (4) General purpose evaluation comparisons. The Workshop provided an opportunity for the evaluators of recently released files such as ENDF/B-VI, EFF-2, JENDL-3, and BROND, to exchange useful information for improving the evaluations needed for fusion, as well as fission technologies.

The focus of the Workshop was to come to a consensus on a number of questions important to the nuclear data community. The questions have been received from the U.S. Department of Energy, the International Atomic Energy Agency, and the internationally organized Technical Program Committee. However, discussion cannot happen in a vacuum. Therefore, there were a series of presentations. The organizers of each block of sessions (P. Young and M.B. Chadwick for Theory and Evaluations, D. Larson, S. Grimes, and R.C. Haight for measurement, F.M. Mann for activation, and R. White for Benchmarking) tried to organize the sessions around the talks (most 10 minutes long with 5 minutes discussion) that the participant wanted to give but still provided time to reach consensus on the questions.

The Workshop learned that the uncertainties in nuclear data lead to uncertainties in nuclear responses which will lead to concern in

- a) safety (due to uncertainties in radionuclide production);
- b) operations (due to uncertainties in the time periods necessary to allow entry into the torus), and
- c) waste management (due to uncertainties in radionuclide production).

Of course, uncertainties in nuclear data also lead to flux uncertainties in any nuclear response. Other concerns are:

- a) heating in critical components such as the superconducting magnet, and
- b) determination of shielding thickness.

Drs. Shatalov and Gohar described plans of the ITER project for utilization of the FENDL database. The project plans to begin benchmark calculations in approximately 8 - 9 months, which means that processed data libraries must be available by around the end of 1993. Validation calculations for the database will be performed at participating institutions in the ITER home countries.

The main objectives of the International Workshop on Nuclear Data for Fusion Reactor Technology were achieved to a large extent, and, as a result of discussions, the strategy and following steps for improving the database for fusion reactor technology have been worked out. These future plans, as they were formulated and discussed at the Workshop, coincide with those from the IAEA Medium Term Plan. This implies that the tasks formulated in the Medium Term Plan in the field of nuclear data are correct and appropriate. The Workshop greatly benefitted from the contributions of the ITER team. The detailed conclusions and recommendations of the Workshop are planned to be published as USDOE or TSI Research Report.

ARRANGEMENTS FOR VISITING HOME TEAM PERSONNEL

by B. Kouvochinnikov, ITER Office Vienna

Soon after the start of the ITER EDA it was recognized that, in addition to the formal assignment of staff to the Joint Central Team (JCT) under Article 8(2) of the ITER EDA Agreement, consideration should be given to other modes of interaction between the JCT and individuals from within the ITER Parties. It was also understood that the principles and means of implementation of any scheme developed for this purpose would need to be agreed upon by the ITER Council.

These considerations prompted the ITER Director, Dr. P.-H. Rebut, to present his views on the matter to the ITER Management Advisory Committee so that the Parties' opinions could be taken into account in framing a proposal to the Council.

After reviewing the need for visiting specialists from the Home Teams to the JCT, MAC recommended to establish a new arrangement, the so-called Visiting Home Team Personnel (VHTP), allowing visitors from each Home Team to participate in the activities of the JCT for limited periods to implement tasks assigned to the JCT.

Acting upon the MAC recommendation, the ITER Council approved at its third meeting (21-22 April 1993, Tokyo) the following arrangements for VHTP:

1. Objectives of the Arrangement

The overall objective of the Visiting Home Team Personnel (VHTP) arrangement is to enhance the collaboration between each Home Team and the Joint Central Team in implementing the ITER EDA Agreement and to offer the Parties some flexibility in the modalities of their interactions with the Joint

Central Team, which, in turn, widen the range of people with specific knowledge of and experience in the evolving ITER design, including people coming from the Parties' industries.

2. Operational Arrangements

The visits by Home Team members should take place within the terms of Task Agreements established between the Director and the Home Team Leader concerned.

Each such Task Agreement would specify the content of the work to be undertaken, identify the person(s) concerned and specify the period of visits to Joint Work Site(s) involved.

For the period during which the VHTP leaves the Home Team to be made available to the Joint Central Team for the execution of tasks assigned to the Joint Central Team, the VHTP shall come under the functional authority of the Director. Protectable subject matter created by the VHTP shall be treated as protectable subject matter created by personnel of the Joint Central Team (Annex C 2(B) of the ITER EDA Agreement). Personnel assignment agreements shall be developed so as to reflect the temporary change of the administrative status of the personnel concerned.

The duration of a visit should be between a few months up to two years.

The VHTP arrangement is not intended to expand the JCT design activity beyond the approximate level of 840 professional man-years (pmys), as previously understood. Therefore, during each calendar year, the total VHTP activity shall not exceed five pmys per Party, and shall not exceed seven pmys at each JCT site. The peak numbers of the VHTP at any of the Co-Centres at any one time will be subject to the acceptability of the host institution operating the Co-Centre.

FORTHCOMING EVENTS ^{*)}

- Magnet Technical Meeting, Naka, Japan, 5-8 October
- RF & Current Drive Technical Meeting, Garching, Germany, 21-23 and 25-26 October
- Safety & Environment Technical Meeting, San Diego, USA, 3-12 November
- Plasma Equilibrium Technical Meeting, Naka, Japan, 9-12 November

^{*)} Attendance at all ITER Meetings by invitation only.

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