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FUSION POWER ASSOCIATES AWARDS

In 2000, the Fusion Power Associates Awards were given, among others, to the following persons closely associated with the developments of ITER. These Awards are given annually for Distinguished Career, for Leadership, and for Excellence in Fusion Engineering.

Distinguished Career Award

Ken Tomabechi was a recipient of this Award, which is presented to those individuals who have made distinguished, lifelong, career contributions to fusion development. He has been a leading fusion researcher and director of the Japan Atomic Energy Research Institute.

His many years of leadership of the fusion programme in Japan and his essential contributions to the ITER project and to international collaboration on fusion were recognized.

Leadership Award

Robert Aymar was a recipient of this Award, which is presented to individuals who have shown outstanding leadership qualities in accelerating the development of fusion. He is a leading European fusion researcher and has been ITER Director since 1994.

His dedication to an ambitious approach to the development of practical fusion power, as represented by both his early career accomplishments and his more recent outstanding leadership of the ITER international collaboration, were recognized.

Excellence in Fusion Engineering

Gianfranco Federici was a recipient of this Award, which is 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. He is a staff member of the ITER Joint Central Team, working at the ITER Joint Work Site at Garching, Germany.

He is recognized for both his broad perspective and his many contributions to the ITER design and R&D, including his role in broadening perceptions of the importance of plasma-material interactions for the material choice and design of ITER and for stimulating and co-ordinating required research activities.

The recipients of the Fusion Power Associates Annual Awards are selected by its Board of Directors. Nominations from any source are welcome throughout the year. Therefore, everybody is invited to advise the FPA Board of Directors about possible candidates for 2001.

ITER TECHNICAL ADVISORY COMMITTEE MEETING

by Prof. M. Fujiwara, TAC Chair

The 17th Meeting of the ITER Technical Advisory Committee (TAC-17) was held on February 19-22, 2001 at the ITER Garching Joint Work Site in Germany. The objective of the meeting was to review the Draft Final Design Report of ITER-FEAT and assess the ability of the self-consistent overall design both to satisfy the technical objectives previously defined and to meet the cost limitations. TAC-17 was also organized to confirm that the design and critical elements, with emphasis on the key recommendations made at previous TAC meetings, are such as to extend the confidence in starting ITER construction. It was also intended to provide the ITER Council, scheduled to meet on 27 and 28 February in Toronto, with a technical assessment and key recommendations of the above mentioned report.

Eleven TAC members and three Home Team Leaders participated in the review. The Joint Central Team staff gave a total of eleven presentations related to the above report. After the introductory remarks made by the Chairman, the Director made a presentation on the highlights in the scientific and supporting programmes, explorations, industry liaison meeting and International Tokamak Physics Activity (ITPA) framework. The Director also informed the TAC-17 participants of the relevant activities performed during the second half of 2000 by the JCT and Home Teams, such as the cost estimate and safety meetings. The Joint Central Team staff then gave a total of 11 presentations, covering the majority of the aspects contained in the report. The presentations were mainly made during the first one and a half days of the meeting. After having detailed discussions on the second and third days in three consecutive plenary sessions, for the review of the Draft Final Design Report of ITER-FEAT, the preparation of a draft report and its review reading was performed on the last day. The following excerpt from the TAC report summarizes the conclusions of the meeting.

Overall assessment by TAC

(1) TAC appreciates the substantial progress made in physics and engineering design activities throughout the process of elaborating the Outline Design Report, Progress Report and Draft Final Design Report, which has led to the establishment of a design basis. TAC hereby gratefully acknowledges the dedicated effort and the intensive design work carried out by the Director, the JCT and the Home Team members.

(2) TAC has high confidence that in the inductive mode of operation ITER-FEAT can meet its objectives of extended burn at a power multiplication of Q = 10 for the reference operating scenario (I_p = 15 MA, Paux = 40 MW). This scenario provides adequate margins to achieve the objectives and is robust against the principal operational boundaries. The approach to ignition ($Q \geq 50$) can be explored at higher plasma currents (~ 17 MA), consistent with the engineering design, with a sufficient margin based on existing physics databases. With the addition of non-inductive current drive, it has the flexibility to establish hybrid scenarios with Q ~ 5 and pulse durations of up to 1500 s, as a route to establishing steady-state operation. The capability to investigate scenarios aimed at demonstrating full steady-state operation with the ratio of fusion power to input power for current drive of at least 5 has been confirmed in some detail.

(3) TAC notes that the engineering design has made good progress since the last TAC meeting and that the results achieved in all R&D areas validate the ITER-FEAT engineering design.

In particular, the vacuum vessel (VV) structural integrity has been validated by the results of VV structural analyses on single and combined load cases for the I_p = 15 MA standard operation. Operation in the range 15-17 MA offers one route to allow studies of performance with higher Q. TAC agrees to the proposed addition of local reinforcement of the vessel to accept the rare occurrence of high load conditions in 17 MA operation with full confidence.

(4) TAC is pleased to note that considerable effort has been made by the JCT and the Home Teams to assess the safety of ITER and acknowledges the conclusion of the informal meeting of the Parties' designated safety representatives that the overall approach of ITER safety, based on the deployment of the defence-in-depth and the ALARA principles, appears to be compatible with the licensing requirements of the Parties.

(5) The investment cost for the construction of ITER-FEAT has been estimated by the JCT to be 49.2% of the cost of the 1998 design of ITER. TAC considers this figure to be credible. Some R&D in order to optimize manufacturing in view of potential cost reductions should be continued.

(6) The focus of the international activities on Physics R&D should continue, together with close co-ordination with technology R&D, including safety studies, in support of ITER and to further enhance the prospects for the development of fusion as an attractive future energy source.

Conclusion

TAC considers that the proposed design is based on a firm physics and engineering basis, satisfying the ITER objectives and cost limitations. The proposed design gives confidence in the ITER-FEAT physics and engineering performance and in the attainment of the envisaged technological goals of the project. ITER-FEAT is now ready for a decision on construction.

Recommendations by TAC

a. TAC recommends that to take ITER forward under the new arrangements there is a need for strong leadership and a focus for co-ordinated physics design and coherent technology activities. TAC believes that this is essential to ensure that ITER-FEAT fully benefits from the international physics and technology programmes, thereby enhancing its performance, flexibility and reliability.

b. A technical review body should be established which comprises the present range of disciplines as represented, for example, in TAC. This would bring together the physics expert groups, the physics committee (under the International Tokamak Physics Activity), and the technology (and materials) R&D programmes of the Parties, together with the possibility of the participation of third parties.

Participants in TAC-17 Meeting

ITER MANAGEMENT ADVISORY COMMITTEE MEETING

by Dr. M. Yoshikawa, MAC Chairman

The ITER Management Advisory Committee (MAC) Meeting was held on 23 February in Garching, Germany.

The main topics were: the consideration of the report by the Director on the ITER EDA Status, the review of the Work Programme, the review of the Joint Fund, the review of a schedule of ITER meetings, and the arrangements for termination and wind-up of the EDA.

ITER EDA Status. MAC noted the Status Report presented by the Director for the period between the ITER Meeting in Moscow (June 2000) and February 2001.

MAC appreciated the efforts of the Director, Joint Central Team, Home Teams and industrial participants to enable the draft Technical Basis for the ITER Final Design Report to be completed on time.

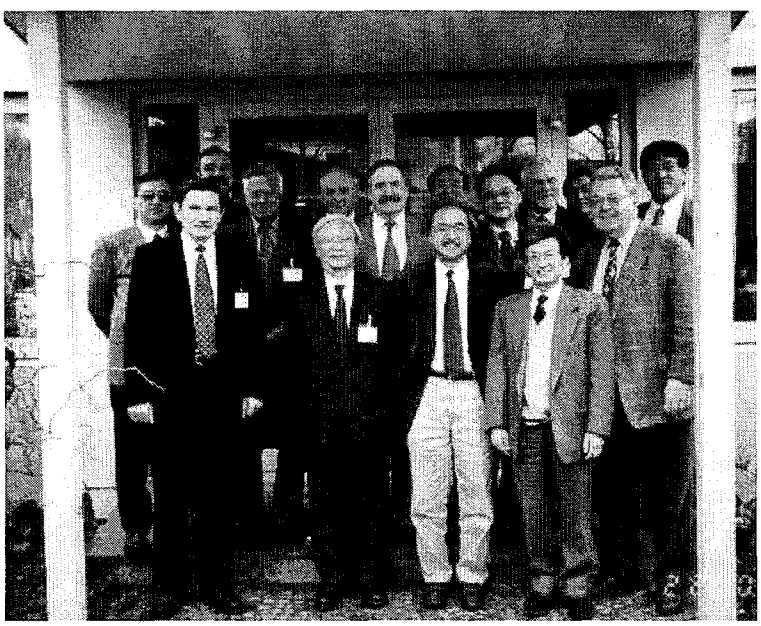
Task Status Summary and Work Programme. MAC took note of the Task Agreements Status Summary and of the compiled list of Task Agreements per Party.

MAC took note of four new R&D Task Agreements for which credit is not more than 500 IUA per task. MAC took note of six new Design Task Agreements including VHTP for which credit is not more than 500 IUA or 2.5PPY per task.

MAC reviewed and supported the modifications of Task Agreements since MAC Moscow in June 2000 that involve credit changes of more than 500 IUA or 2.5 PPY, or more than 20%. MAC took note of the modifications of Task Agreements since MAC Moscow in June 2000 that include credit changes of not more than 500 IUA or 2.5 PPY, or not more than 20%. MAC took note of the cancellation of some Task Agreements.

Joint Fund. MAC noted that the indicative balance of 2000 budget appropriations left at the end of 2000 appears adequate to cover likely needs for expenditure till the end of EDA on the assumption that all Parties pay their outstanding Joint Fund contributions.

Having noted the Director's statement on the indicative amounts of unspent 2000 budget appropriations, MAC recommends to the Council to approve the following proposed budget transfers in order to meet the expected patterns of expenditure in the first half of 2001:



Participants in the Meeting

1) in the budget allocation of the EU Agent, $ 60,000 from Other Expenses to Travel and Subsistence;

2) in the budget allocation of the RF Agent, $ 10,000 from Other Expenses to Travel and Subsistence.

MAC noted the status of the US Agent for the Joint Fund. MAC recommended to the ITER Council to make adequate procedures to discharge the US Agent from Joint Fund responsibilities and to request the Director to inform ITER Council Members when the discharge of the US Agent is completed.

Schedule of ITER Meetings. MAC reviewed and supported the schedule of ITER Meetings shown in Tables 1 and 2. MAC noted that the seven ITER Physics Expert Groups are in full operation and the arrangements for continued interaction with US fusion scientists on generic issues of tokamak physics are proceeding smoothly.

Table 1 Physics Expert Group Workshops including pre-meetings

Date (incl. Pre-Meeting)	Title	Location
19 - 23 March 2001	Diagnostics	Juelich
2 - 6 April 2001	Confinement Database and Modelling	Lausanne
23 - 27 April 2001	Energetic Particles, Heating and SS	Garching
23 - 27 April 2001	Transport and ITB Physics	Garching
23 - 27 April 2001	Edge Pedestal Physics	Garching
25 - 26 June 2001(after EPS)	MHD, Disruption and Plasma Control	In Europe (TBD)
9 - 11 July, 2001	SOL and Divertor Physics	Naka

Table 2. Workshop and a technical meeting

Date	Title	Location
12 - 16 March 2001	Workshop on Materials for In-vessel Components	Garching
7 - 11 May 2001	Technical Meeting on Safety and Environment	Garching

Arrangements for termination and wind-up of the EDA

Completion of Task Agreements. MAC recommended that Parties should undertake to complete EDA Task Agreements and to share the results in accordance with normal EDA practice. For specific Tasks that might not be completed before the end-date of the EDA, each Party concerned should designate a person responsible for pursuing its Tasks to completion following normal EDA practice. MAC recommended to the ITER Council to endorse this approach as a proposal to the Parties for appropriate action under Section 5 of Protocol 2 to the EDA Agreement.

R&D hardware and facilities. MAC took note of the mode of disposition and associated cost sharing for R&D hardware and facilities.

Initial discussions on ways to handle data produced on facilities constructed during the ITER EDA and that would be operated beyond the end of the EDA. MAC recommended to the ITER Council to support the proposal on ways to handle data produced on facilities constructed during the ITER EDA and that would be operated beyond the end of the EDA and, accordingly, recommended to the ITER Council to ask each of the Parties, by the next MAC meeting, to designate a person who is to be responsible for the supervision of both disposition and utilization of the R&D hardware and facilities.

Joint Fund Assets. MAC recommended to the ITER Council to approve valuation procedures for ITER Joint Fund property at the end of the EDA.

MAC also recommended to the ITER Council:

1) to endorse the proposals towards disposition of the ITER Joint Fund, including the establishment, according to Section 5 of Protocol 2 to the EDA Agreement, of an ad hoc body for the exercise of continuing joint responsibilities for the winding-up of the EDA which cannot be completed within the duration of the EDA;
2) to request the Parties, assisted by the Director and acting through the MAC-CPs, to make necessary preparations to implement the above proposals, including preparation of specific actions/documents to be approved/adopted, following MAC review, at the final meeting of the ITER Council.

TEST BLANKET WORKING GROUP'S RECENT ACTIVITIES

by Dr. J.E. Vetter, TBWG Chair

The ITER Test Blanket Working Group (TBWG) has continued its activities during the period of extension of the EDA with a revised charter on the co-ordination of the development work performed by the Parties and by the JCT leading to a co-ordinated test programme on ITER for a DEMO-relevant tritium breeding blanket. This follows earlier work carried out until July 1998, which formed part of the ITER Final Design Report (FDR), completed in 1998.

Whilst the machine parameters for ITER-FEAT have been significantly revised compared to the FDR, testing of breeding blanket modules remains a main objective of the test programme and the development of a reactor-relevant breeding blanket to ensure tritium fuel self-sufficiency is recognized as a key issue for fusion. Design work and R&D on breeding blanket concepts, including co-operation with the other Contracting Parties of the ITER-EDA for testing these concepts in ITER, are included in the work plans of the Parties.

During the second half of 2000 there was one meeting of the TBWG (18-19 October 2000 at Garching) which was preceded by a two day working meeting of Experts, in which interface issues between the blanket test modules and the ITER machine were addressed, covering remote handling, port interface, ITER services, integration in the pit, tritium plant and tokamak cooling water systems (TCWS) vault.

The key focus for the October meeting and the key action addressed during the period was the completion of the TBWG Report for the period of extension of the EDA, in which the work performed by the Parties and by the JCT, related to blanket R&D and to the test programme, is described. A first working draft was completed before the end of the year 2000. The boundary conditions for testing and the requirements imposed on the test blanket modules (TBMs) have been determined by the ITER JCT.

Three adjacent main horizontal ports have been allocated for blanket testing, numbers 1, 2 and 18. A Design Description Document (DDD) has been produced for each of the ports to be used. All common features, including frame details and a remote handling description, are included in the DDD for port 1. Features specific to a particular port are described in the port specific DDD. A co-ordinated blanket test programme has been developed and is described. Each of the Parties has provided detailed descriptions of the TBMs. Interface issues, auxiliary systems and safety considerations are also described in the report.

It is concluded in the report that for the blanket test programme, the three ports allocated offer adequate space for testing of up to six different types of breeding blanket. Most of the important breeding blanket functions can be investigated with the parameters of ITER-FEAT and the machine operational scenario offers a stepwise increase in performance, to which the overall blanket test programme can be synchronized. The test strategies differ for the different blanket concepts, resulting in sequential testing involving different test modules, which may be optimized for single or combined effects testing. The main effects to be studied relate to electro-magnetics, neutronics, thermo-hydraulics, thermo-mechanics and tritium breeding/extraction/migration.

Key aims of the tests are code validation and verification of design assumptions based on calculations and out-of-pile or in-pile fission reactor experiments. However, for some testing parameters considerable extrapolations have to be made from the ITER conditions to those of a potential fusion reactor. This is in particular the case for the first wall heat load and for the pulse length. It is desirable to obtain the longest possible single pulse length. Furthermore, due to the limited neutron fluence available in ITER, materials studies related to neutron irradiation will have to be conducted in fission reactors and in an accelerator based intense 14 MeV neutron source, such as IFMIF.

The ITER remote handling and maintenance scheme will permit the exchange and servicing of the blanket test modules. Space available in the hot cell is limited and must be taken into consideration for operations of longer duration. Finally, operational safety during blanket testing can be assured at all times on the basis of the safety principles adopted for ITER. Accident hazards are generally minimized by material inventories.

Overall, the Report concludes that, from the data presented, a high level of confidence in a successful test programme on the ITER-FEAT machine for a DEMO-relevant tritium-breeding blanket is justified. It is recommended that effort be maintained on this area of R&D in the future.

The Report, together with revised DDD's for the blanket concepts will be completed during the first half of 2001. A final TBWG Meeting is scheduled for mid May 2001 in Moscow.

LIST OF PARTICIPANTS IN TBWG AND EXPERTS' MEETINGS

EU: L. Boccaccini, S. Booth (Secretary), M. Gasparotto, L. Giancarli*, S. Malang, Y. Portevin, S. Paidassi*, J. Vetter* (Chair)
JA: M. Enolda*, T. Kuroda, Y. O'Hara*, S. Tanaka*
RF: I. Kirillov*, G. Shatalov*, Y. Strebkov*
JCT: R. Aymar, H.-W. Bartels*, V. Chuyanov * (Co-Chair), R. Haange*, T. Honda, K. Ioki*, Y. Kataoka

* TBWG Members

Items to be considered for inclusion in the ITER Newsletter should be submitted to B. Kuvshinnikov, ITER Office, IAEA, Wagramer Strasse 5, P.O. Box 100, A-1400 Vienna, Austria, or Facsimile: +43 1 2633832, or e-mail: c.basaldella@iaea.org (phone +43 1 260026392).

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