

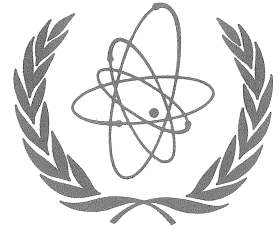
INTERNATIONAL THERMONUCLEAR EXPERIMENTAL REACTOR



ITER EDA NEWSLETTER

VOL.7, NO. 8

AUGUST 1998



INTERNATIONAL ATOMIC ENERGY AGENCY, VIENNA, AUSTRIA

ISSN 1024-5642

FOURTEENTH MEETING OF THE ITER COUNCIL (IC-14)

by Dr. L.G. Golubchikov, ITER RF Contact Person

The Fourteenth Meeting of the ITER Council was held in Vienna, on the premises of the IAEA, on 21 July 1998. The principal topics were the extension of the ITER EDA Agreement, the ITER Director's Progress Report documenting the outcome of a six years' effort in the ITER EDA and the Director's ITER Status Report.

Dealing with the EDA extension, the Council noted that three Parties, the Russian Federation, the European Union and Japan, have signed the Amendment extending the ITER EDA Agreement.

The Council also noted the following statement by the US Representative:

- Recognizing the progress made to date in the ITER EDA Agreement, the US Party has completed all the formal preparations to sign the Extension Agreement except the Congressional consultations.
- These consultations with the U.S. Congress must proceed to a satisfactory conclusion before the US Party will sign.
- A conclusion to these consultations is expected by October 1998.
- Pending such conclusion, and subject to the availability of appropriated funds, the US Party will continue to be a participant on a voluntary basis.



Participants in the Meeting

The four Parties confirm their intention to maintain activities at the level each Party deems appropriate, pending resolution of the issues noted above.

In accordance with this confirmation, the delegations noted that for the current period each delegation will take the necessary actions to provide an appropriate continuity of staff assignments at the Joint Work Sites (JWS), noting the Director's advice regarding staff required to maintain activities at the three Sites. Further, the EU, JA and the US delegations expressed their intentions that appropriate arrangements would continue at the JWSs.

The Council noted with great satisfaction the Director's Progress Report, documenting the outcome of six years of effort during the ITER EDA (see separate article in this issue).

The Council also noted the Director's Status Report, summarizing the progress made during the ITER EDA in the period between IC-13 (February 1998) and July 1998. In the light of the approval by the ITER Council at its Extraordinary Meeting, of the Final Design Report, Cost Review and Safety Analysis (FDR), the Project has focussed on finalizing all the FDR documentation for publication/distribution to the Parties.

As stated in the Status Report, all FDR documents will be available in electronic form (CD-ROM), with the exception of three reports in hard copy only. The first volume of such documents, comprising 3 CD-ROMs (~1.5 Gigabytes), has been prepared and circulated to Home Teams. This volume includes, among others, the FDR and FDR Technical Basis, the ITER Plant System Integration Report, the ITER Nuclear Analysis Report, a number of manuals and three sets of Design Description Documents, covering all 34 major systems or components of ITER.

The entire set of current CAD models and drawings for ITER (more than 10 GB of data) have been collated in "tree" structure for access by the Parties through the Home Teams. In addition, all completed Home Team Task reports that are referenced in the FDR documentation and others that had material impact for the design have been scanned to CD-ROM (~10 000 pages) for ready access by the Parties. The ITER Physics Basis document is being submitted for publication in the journal "Nuclear Fusion" published by the IAEA.

As anticipated in previous Council actions, the Director has received from the EU delegation Italian site characteristics (and, informally, information on possible Canadian site characteristics); and from the JA delegation, informally, information on possible Japanese site characteristics.

Upon hearing that Dr. Charles Maisonnier will no longer be serving as an EU Council Member, the Council expressed its warm appreciation to him for his outstanding contributions and dedication to ITER from the outset.

The delegations will meet in Japan in mid-October. The following meeting will be held in the EU.

In conjunction with IC-14, a ceremony was held at the IAEA Headquarters on 22 July to celebrate the achievements of the ITER EDA during the period 1992 – 1998. The Director General of the IAEA, Dr. M. ElBaradei, and his Deputy for Research and Isotopes, Dr. S. Machi, the Ambassadors of the four ITER Parties, the ITER Council Members, Experts and Observers, participated in the ceremony (for details, please see the Newsletter Special Issue of July 1998).

FOURTEENTH MEETING OF THE ITER MANAGEMENT ADVISORY COMMITTEE **by Dr. M. Yoshikawa, MAC Chairman**

The Fourteenth Meeting of the ITER Management Advisory Committee (MAC-14) was held assuming the Extension of the ITER Engineering Design Activities (EDA) at the IAEA in Vienna on 20 July 1998.

The Director summarized the progress made in the ITER Engineering Design Activities in the period between IC-13 (February 1998) and July 1998. The ITER Council approved the Final Design Report, Cost Review and Safety Analysis (FDR) at its Extraordinary Meeting in February 1998 (EIC-1) in Tokyo in June. It is recognized that the FDR provides the first comprehensive design of a fusion reactor based on well established physics and technology. All FDR documents will be available in electronic form (CD-ROM), with the exception of three reports in hard copy only. (Material Properties Handbook, Material Assessment Document and Structural Design Criteria for In-Vessel Components).

Following the Director's Report, MAC reviewed the Task Status Summary, Work Program and Task Agreements for EDA Extension, Joint Fund and a schedule of ITER meetings.

The task status summary showed overall completion for committed tasks of about 96% for R&D tasks and 97% for design tasks.

MAC took note of the ITER task status summary and new Task Agreements of which credits are less than 500 IUA or equivalent. MAC reviewed and supported the modification of Task Agreements. MAC also took note of the cancellation of Task Agreements.

MAC urges the Home Teams to circulate promptly the remaining final task reports after approval, according to the agreed procedures.



Participants in the Meeting

Work Program and Task Agreements for EDA Extension. The Director proposed the Work Program during the ITER EDA Extension Period based on the project Milestones for work on reduced cost options and working assumptions given at the Extraordinary ITER Council EIC-1. The specific R&D activities required for the ITER EDA Extension period are of two priorities:

- Priority 1
Continuation and completion of activities committed before July 1998 or R&D activities valid equally for the reference or the reduced cost options of ITER.
- Priority 2
Other R&D, especially, which might be affected by design choices for a specific reduced cost option and will have to be reviewed after December 1998.

MAC took note of the Work Program and its allocation of resources for Priority 1 items during the three-year extension of the EDA. MAC recommends the ITER Council to approve the Work Program, recognizing that it will be implemented flexibly. After the ITER Council decision on the design option ((around the end of 1998), the Work Program will be reviewed again.

The Director also proposed the new R&D Task Sharing for the ITER EDA Extension. MAC recommends that the implementation of tasks should proceed on the basis of the Director's proposal subject to updating as soon as information is available on the US R&D sharing.

Joint Fund. MAC reviewed consolidated accounts for the ITER Joint Fund Budget of 1997 as presented by the Director with supporting detailed information. On the basis of the information provided, also concerning the allocation of the Joint Fund property, MAC recommended to the ITER Council to approve the consolidated annual accounts of the ITER Joint Fund for 1997.

MAC reviewed the Director's proposals for the Joint Fund Supplementary Budget for 1998 and budget for 1999. MAC recommends the ITER Council to approve the Joint Fund Supplementary Budget for 1998 and budget for 1999 as proposed by the Director.

Proposed Schedule of ITER Meetings. MAC reviewed and supported the schedule of Technical Meetings and Workshops proposed by the Director. MAC proposes that the MAC-15 Meeting will be held in connection with the IC-15 Meeting as done with MAC-14.

Decision at IC-14 for the MAC Report and Advice. The MAC-14 meeting was held assuming the ITER EDA Extension would have been concluded by all Parties by the time of the ITER Council Meeting. Since this was not the case, the Council accepted the MAC Report and approved recommendations applicable to the circumstances.

ITER EDA TECHNICAL ACTIVITIES

by Dr. R. Aymar, ITER Director

July 1998 marks the end of the six-year period first established for the ITER Engineering Design Activities (EDA) Agreement. Under the terms of the Agreement the ITER Parties undertook to conduct jointly the engineering design activities to produce a detailed, complete, and fully integrated engineering design of ITER and all technical data necessary for future decisions on the construction of ITER. This article summarizes the results of the technical work performed in the frame of the Agreement over that period as reported to the ITER Council at its 14th Meeting.

Under the terms of the Agreement, work on the ITER design has been shared among the personnel resources of the ITER Joint Central Team (JCT) and the Home Teams of each of the ITER Parties. Validating technology research and development was carried out by the Home Teams.

The JCT has been located at three Joint Work Sites: Garching near Munich, Naka and San Diego. In accordance with the Agreement, the three Host Parties to the sites have provided, through local host organizations, support as defined by the ITER Council consistent with the needs of the JCT. This support has included office accommodation, design office staff and equipment, information technology and administrative support.

In addition, the Host Parties have provided the necessary support for Workshops and other multi-Party meetings undertaken in the ITER EDA frame.

The following data summarizes the actual resources expended in each of the main categories during the six year period (IUA - ITER Units of Account; 1 IUA = 1,000 US\$ of January 1998).

	Design Resources (Professionals Per Year)		Technology R&D (kIUA)
	Joint Central Team	Home Teams	
Resources expended	718	728	565

As required by the Agreement, six years of technical work under the ITER EDA Agreement has resulted in a design which constitutes a complete description of the ITER device and of its auxiliary systems and facilities. All outstanding design issues have been settled except for any adaptations that may be required to accommodate the design to specific characteristics of the site to be chosen for ITER. Detailed designs exist for the components of ITER and the coherence of the parts with the whole is established. Specifications are being prepared to allow the immediate call for tender for long lead-time items that would be needed upon the start of ITER construction, if and when so decided.

The design has been validated by wide-ranging physics and engineering work, including detailed analyses, experiments in existing fusion research facilities, and dedicated technology developments and tests. Unavoidable uncertainties remain in the extrapolation of performance from current experience to the ITER size and parameters; these can only be fully resolved through experiments at ITER scale.

Within the ITER framework, the Parties conduct well-focussed physics investigations which strengthen further the physics database, reduce the ranges of uncertainty in extrapolation and explore wider options for possible ITER operation.

The Parties' work on ITER Physics has drawn on inputs from within each of the Parties' base fusion physics programmes. The contributions were provided on a voluntary basis focussed and co-ordinated through a network of seven Expert Groups under the general co-ordination of an ITER Physics Committee. Because the inputs were voluntary and flowed naturally from the base programmes, it was neither feasible nor necessary to quantify the resources allocated to ITER. Nonetheless, the ITER physics framework has proven to be a most effective means for focussing on key issues of fusion physics and for co-ordinating and collating results.

The major validating technology R&D projects are now in their concluding stages for the purpose of confirming performance and understanding operating margins. Some are foreseen to continue beyond July 1998 in order to broaden operating experience. Assessment of results to date indicates, from an engineering and technology point of view, that the design is feasible, that ITER can be manufactured to specifications and that it will be capable of meeting its operating objectives.

A comprehensive non-site-specific safety and environment report (NSSR) has been prepared which indicates that ITER will meet the objective of demonstrating the safety and environmental potential of fusion power. The NSSR is a generic report which has been developed so as to be readily extended to meet the specific regulatory needs of possible host Parties. Such an extension remains to be done, in consultation with the relevant authorities of potential host Parties.

A planning schedule for ITER constructing and commissioning, operations and decommissioning has been developed and a comprehensive set of project cost estimates has been established, based on studies by the Parties' industries of procurement packages for the supply, fabrication and assembly of all the ITER systems/components. Given appropriate preparations, construction is expected to last about 9 years from the start of on-site construction until first plasma. Total costs for constructing ITER according to the present design are estimated at 5460 kIUA (~7210 M\$, ~6550 MECU, 787 000 M¥ in mid 1997 money values) for direct capital costs plus 780 kIUA for construction management/support and 150 kIUA for R&D during the construction period. Yearly operating costs average about 350 kIUA. The overall estimated costs comply with the general cost constraint set at the start of the EDA and remain in line with previous estimates.

The progress of the ITER design and supporting technical activities has been presented through the ITER Council to the Parties in a number of major milestone reports. An Outline Design Report was presented in January 1994 to the ITER Council and provided a basis on which the Parties concluded Protocol 2 of the ITER EDA Agreement. Further development and enhancements of the design were presented in the ITER Interim Design Report, Cost Review and Safety Analysis (IDR) which, with companion documents, was presented and accepted by the ITER Council in July 1995. Following domestic reviews by the ITER Parties, the Interim Design Report Package was approved by the ITER Council at its meeting in December 1995. Results of the technical work to late 1996 were embodied in the Detailed Design Report, Cost Review and Safety Analysis (DDR) which was presented to the ITER Council in December 1996 and approved, following domestic reviews in the Parties, in July 1997.

In February 1998 the ITER Council accepted the Final Design Report, Cost Review and Safety Analysis (FDR), the last milestone design report foreseen during the initial duration of the EDA. Following domestic reviews, the FDR was approved at the Extraordinary Meeting of the ITER Council (EIC-1) in Tokyo on 25 June 1998.

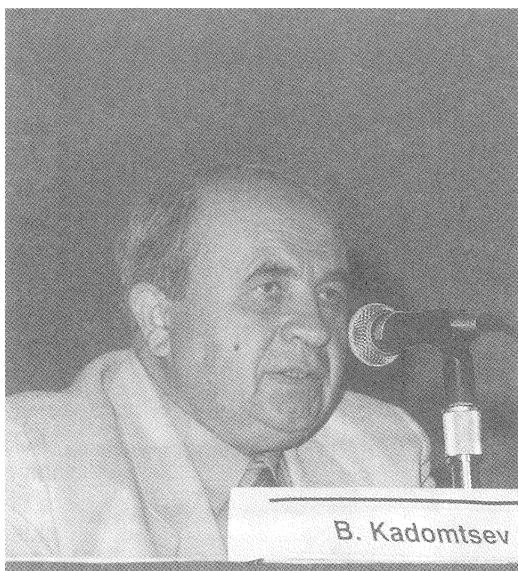
In approving the FDR, the ITER Council commented that:

"The FDR provides the first comprehensive design of a fusion reactor based on well established physics and technology. The FDR and accompanying documents would be sufficient, when complemented by site-specific adaptations of the design, to provide the necessary technical basis to a construction decision."

The Final Design Report, Cost Review and Safety Analysis is supported by detailed technical documentation in all areas which has been reviewed and is available to each of the Parties as foreseen in the Agreement. In addition, the full detail of the design is encapsulated in a comprehensive set of integrated CAD files. Together these documents and the CAD files embody the full results of the six years collaborative design and related technical work by the ITER participants, in accordance with the objectives set out in the ITER EDA Agreement.

ACADEMICIAN BORIS B. KADOMTSEV

in memoriam



Academician Boris B. Kadomtsev, pioneer researcher of the world fusion program and one of its most prolific scientists, passed away on August 18 in Moscow, after a long and severe illness. We have lost an outstanding physicist, one of the founders of thermonuclear plasma physics, one of the leaders of the Russian theoretical school, and a stalwart supporter of the ITER project.

Boris Kadomtsev graduated in physics from Moscow State University in 1951. After working at the Institute of Physics and Energetics in Obninsk he joined, in 1956, M. Leontovich's theory group at Kurchatov Institute. In 1970 he became Academician of the USSR Academy of Sciences and was awarded the State Prize of the USSR in the same year and the Lenin Prize in 1984. In 1973, after the death of L.A. Artsimovich, he became Director of the fusion program at Kurchatov Institute and then, until his death, Director of the Institute of Nuclear Fusion at the Russian Research Centre "Kurchatov Institute".

Boris has always been one of the strongest proponents of ITER within the world scientific community, leading the Russian team during INTOR, then chairing the ITER Scientific and Technical Advisory Committee (ISTAC) during the ITER CDA and, lately, being a leading and loyal member of the ITER Technical Advisory Committee (TAC). Paul Rutherford, Chair of TAC, commented: "Boris Kadomtsev provided the inspiration to an entire generation of plasma theorists by his genius in applying the most advanced theoretical techniques to the most practical problems of actual fusion plasmas."

He was not only the smartest, but one of the nicest, and a friend and colleague of total integrity. Tadashi Sekiguchi, professor emeritus, University of Tokyo, said: "Academician Boris Kadomtsev was really one of the giant theoretical leaders in our academic society and was yet a scientist of warm-hearted personality. Together with my Japanese colleagues, I wish to present our deepest condolences toward his family." Charles Maisonnier, former Director of the European Fusion Programme, insisted on Boris' human qualities: "I have known him for almost thirty years and even in those difficult times, he managed to create around him an atmosphere of quiet friendship; his wisdom and his competence gained him respect from everybody." ***They speak for us all.***

Items to be considered for inclusion in the ITER Newsletter should be submitted to B. Kouvchinnikov, ITER Office, IAEA, Wagramer Strasse 5, P.O. Box 100, A-1400 Vienna, Austria, or Facsimile: +43 1 237762, or e-mail: c.basaldella@iaea.org (phone +43 1 206026392).

Printed by the IAEA in Austria
September 1998