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MANAGING THE ITER JOINT CENTRAL TEAM

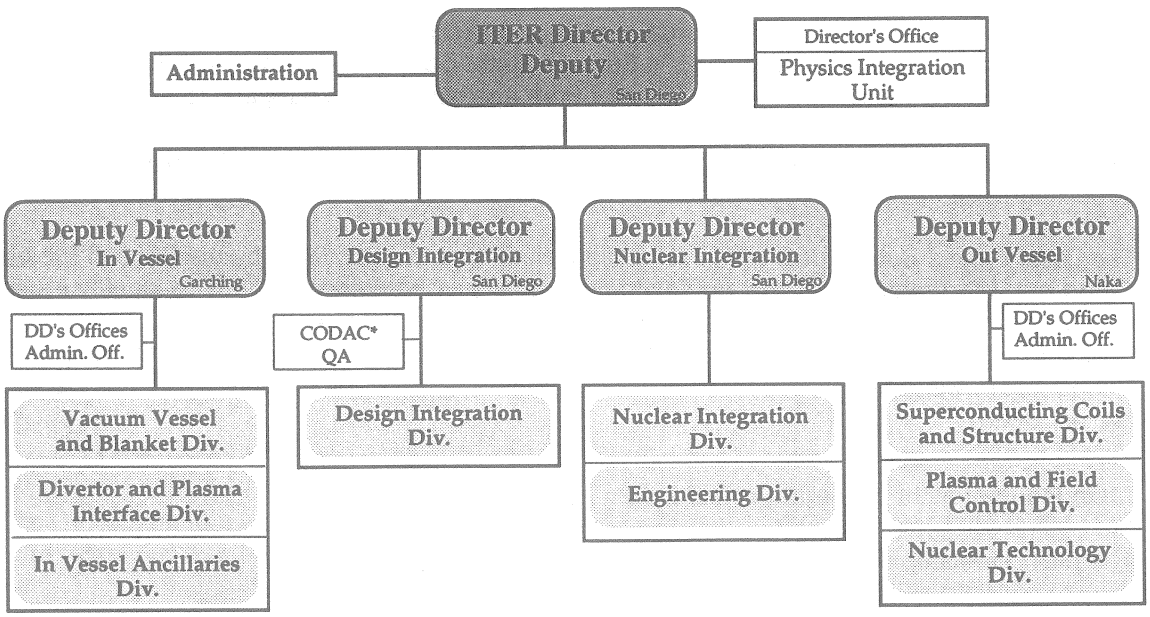
by M. Drew, Secretary of the ITER General Project Board

The Director and Deputy Directors have to exercise management responsibility for the overall activities of the JCT. The following is a summary of the system established for this purpose. Determining how a geographically distributed Joint Central Team (JCT) should manage its own affairs presents no less demanding challenges. The JCT's work on design and R&D is managed through a structure of "Co-ordinating Committees" and "R&D Committees" that are given the tasks of managing and controlling the advance of the detailed design and the direction of the supporting R&D programme.

ITER JCT Organization

The following diagram shows the main structure of the JCT as approved at the first meeting of the ITER Council.

Main Structure of the ITER Joint Central Team during EDA



* CODAC : Control Command and Data Acquisition, Communication

As the organization chart indicates, line responsibility for management of the JCT rests with the ITER Director and Deputy Directors. The Director and Deputy Directors are also assisted in the exercise of their management responsibilities by a General Project Board and three Local Project Boards as described below. The Boards are all advisory.

ITER General Project Board

The General Project Board for ITER comprises:

- Director
- Deputy Directors

Assistants to the Deputy Directors also attend the meetings. The Board is serviced by Directorate staff. Other specified Division Heads or senior members of the JCT can be invited by the Director to attend as appropriate.

The issues to be dealt with by the ITER General Project Board include:

- General Orientation of the Project and JCT;
- Overall Review of Technical Progress;
- Internal Management;
- Project Planning and Monitoring;
- General Interactions with the Home Teams and Parties;
- Interaction with ITER Council, MAC and TAC; and
- General Evolution of ITER (e.g. evolution towards possible construction).

Whenever possible, General Project Board meetings are linked to other scheduled meetings, such as the ITER Council, MAC and TAC or technical meetings, to help ease the burden of travel and to make most effective use of the staff concerned.

To date three meetings have taken place at San Diego and two at Garching. The next General Project Board meeting is scheduled for Naka to follow the ITER Council meeting in April.

Local Project Boards

The ITER General Project Board is supplemented at local level by Local Project Boards set up for each of the three Joint Work Sites. These are generally held every two weeks or so (alternating the co-ordination meetings) unless a General Project Board meeting takes precedence.

Membership of the Local Project Boards comprises the Directors concerned and local Division Heads supported by the Local Director's Support Staff. To maintain coherence throughout the JCT, if the ITER Director or a Deputy Director from another location happens to be on site they have a right to attend. Visiting Division Heads from other sites may also be invited to attend at the discretion of the Head of Site concerned. Minutes of Local Project Board meetings are circulated to all members of the General Project Board.

The Local Project Boards deal with local analogues of the issues covered by the General Project Board but with greater emphasis on day-to-day matters. One responsibility is to identify issues which have a wider impact and to ensure that the general interests of the Team as a whole are best served. This can be done either through informal consultations, e.g. through the Director's Support Staff with special responsibility for interface matters, or by a reference to the General Project Board.

Main Issues for the General Project Board

The main preoccupations of the General Project Board to date have been:

- Assembly of the JCT;
- Startup of the Joint Work Sites;
- Initiation of the Technical Work Including Specification of Tasks; and
- Development of the Main Outline Design.

Assembly of the JCT - The assembly of the JCT from the four Parties has created some challenging management issues since there are many steps in this process: specification of posts, nomination of candidates, selection of team members, arrival and startup of work, and completion of secondment procedures.

The Director, Deputy Directors and Division Heads are pressing on with the selection of qualified team members for the JCT with the objective of rapidly assembling the 150 JCT members to be in place by the end of Protocol 1 (March 1994) as agreed by the ITER Council. Interviewing and selecting from among four Parties for three sites has proved a time consuming activity for the small number of members already in the JCT. Most Division Heads and some key group leaders are now in place and are taking up their responsibility for formulating the work programme. The General Project board has kept an overall review of the process and has sought ways to facilitate the logistics.

Startup of the Joint Work Sites - The General Project Board has reviewed the issues of common interest arising form the startup of the three Joint Work Sites. In order to maintain balance the Director has proposed that there should be committees to each of the Sites to provide liaison between the JCT, the Host Organization and the Host Party. Consultations between the Director and the Host Party of each site concerning the support and the conditions under which it is supplied continue.

Initiation of Technical Work - As the Team assembles, each person member has been asked to give immediate attention to the formulation of the programme of design and R&D work needed in their areas of responsibility and to the preparation of Task Specifications and Task Agreements. The General Project Board has overseen the preparation of the first Work Programme which has now been circulated to MAC for review before its submission to the ITER Council.

The Development of the Main Outline Design - The request of the first ITER Council meeting to have the main outline design presented within ten months has stimulated very intensive work throughout the JCT. The General Project Board has devoted much of its effort to overseeing this work. Progress to date is incorporated in the Preliminary Design Outline which has been presented to the second Meeting of TAC at Garching (16-18 March 1993).

Conclusion

By its nature the ITER EDA will continue to provide unprecedented challenges in both the technical and managerial domains. The internal management systems introduced to date have the aim of expediting the work within the framework established by the ITER EDA Agreement. The specific issues discussed above will continue to preoccupy the senior management of the JCT for some time to come. However, different issues and unforeseen problems are bound to arise in such a novel venture. It will be essential to be flexible in approach; the management system will have to evolve accordingly.

ITER MANAGEMENT SYSTEM AND SUPPORTING SOFTWARE PROGRESS REPORT

by Dr. D. Gambier, Chairman, ITER Computer and Communication Group

The ITER Computer and Communication Group was established before the signature of the ITER EDA Agreement to provide technical recommendations on the hardware and software tools required to manage the ITER Engineering Design Activities over three geographically distributed Joint Work Sites. The Group's findings and recommendations on the ITER Management System were presented at the first meeting of the ITER Management Advisory Committee (MAC) and then to the ITER Council in December 1992. The following summarizes the ITER Management System and supporting software.

ITER Internal Management System

Article 2 of the ITER EDA Agreement specifies that the Parties conduct jointly the ITER Engineering Design Activities, in particular:

2(a) to establish the engineering design of ITER including
  (i) a complete description of the device and its auxiliary systems and facilities,
  (ii) detailed designs with specifications, calculations and drawings of the components of ITER with specific regard to their interfaces,
  (iii) a planning schedule for the various stages of supply, construction, assembly, tests and commissioning of ITER together with a corresponding plan for human and financial resources requirements, and
  (iv) specifications allowing immediate calls for tender for the supply of items needed for the start-up of the construction of ITER if and when so decided;

2(b) to establish the site requirements for ITER and perform the necessary safety, environmental and economic analyses.

In order to achieve the foals specified in this Article it was necessary to devise a system for managing the engineering design work process across the three Joint Work Sites (Co-Centres). To this end, an Internal Process Management System was developed by the JCT. This ITER System was modelled after the successful JET management system with some modifications incorporated to reflect the specific and unique features of the ITER EDA.

Several organizational components were established:

- ITER Project Boards: a General Project Board and three Local Project Boards to assist the ITER Director in managing the ITER EDA Project;
- ITER Co-ordination Committees: to track the design of ITER components;
- ITER R&D Committees: to monitor the development of external ITER work (including technology R&D, design, and physics);
- ITER Task Committee: to ensure the overall balance of external work between the Parties.

Electronic Communications

With the ITER EDA distributed among three Co-Centres, effective management could not be accomplished with travel and post mail - it demands an electronic communications network as well as an on-line Integrated Process Management System.

Data communication, now operational among the three Co-Centres, is made possible through a combination of existing scientific networks. In the US, the Energy Sciences network - ESnet - (supported by the National Energy Research Supercomputer Center (NERSC) provides both a national infrastructure and a means of linking internationally to other national networks. A 64 kbps link is provided from the US to Naka, JA. Garching, EC is accessible through a 256 kbps link between ESnet and the scientific network WIN in Bonn, Germany.

Future plans for the ITER network include: improving the communication between the Co-Centres by upgrading some network connections to higher transmission speeds; and establishing electronic access to the Russian Home Team.

Integrated Process Management System and Supporting Software

After careful evaluation by experts of each Party, CATIA was selected to be the Computer Aided Design (CAD) software for the ITER EDA.

The Computer and Communication Group also recognized that the CAD system is a major tool to enable the three Co-Centres to work as a single entity and that the management of design drawings must also be a function of the CAD software. After further evaluation, the Group determined that the CATIA Data Manager (CDM), a process and database management software based on CATIA and ORACLE, was the best choice for the ITER computing environment.

To enter the construction phase, history of decisions, detailed designs, specifications, schedules, and reports must be equally accessible to all Parties via an electronic support system. In the ITER design the most advanced technologies should be utilized to ensure successful operation of ITER over a thirty-year period. With a complex project of this magnitude, the ITER managing process should be very sophisticated to limit the possibilities of error propagation. Thus, the ITER information infrastructure must be at the leading edge of technology.

Since the ITER Team does not have the breadth of experience or expertise necessary for developing an internationally distributed process management system, the three Host Parties agreed to jointly contract for the design of an electronic Integrated Process Management System (IPMS). The successful design and implementation of the ITER IPMS is crucial to completing the ITER EDA according to schedule.

The ITER Computer and Communication Group recommended IBM/Dassault USA for the task of designing the IPMS because of their experience in developing management tools for CDM and ORACLE, as well as their implementation of systems with similar capability and functionality. The design phase of the IPMS will be jointly carried out by representatives of IBM/Dassault USA and the ITER Project. This collaboration will help to transfer the IBM/Dassault know-how to ITER and provide us with the necessary skills to enhance and maintain the system over the long term. Due to the novelty of the ITER Project, at this time the IPMS contract has not yet been let since there are compromises and accommodations to be negotiated to satisfy the contracting rules and regulations of the three Host Parties.

Conclusions

Overall, the implementation of the first phase of the ITER Management System will help the ITER Director to cope with the challenge of managing three geographically distributed Co-Centres. In the second phase of the System there are plans to extend it to the Home Teams to more efficiently integrate their design work with other ITER activities. In order to meet the schedule for the ITER EDA, collaboration among the Co-Centres and the Home Teams will continue to grow - the ITER Management System will be of key importance to achieving the goals of the project.

SPECIAL WORKING GROUP 2 BEGINS DRAFTING TEXT FOR PROTOCOL 2

by Dr. M. Roberts, Chair, SWG-2

The SWG-2 met in Tokyo on February 16-18 to begin the work of developing a draft Protocol 2 as required by the Parties in Protocol 1. The JA Party provided the hosting through JAERI. The members designated by the Parties for this second task for SWG-2 are shown below:

EC: E. Canobbio
J. Grunwald - TL
P. Kind

JA: M. Aniya
S. Aoyama
S. Hino
T. Ide
A. Kitsunezaki
S. Takizaki - TL

RF: Yu. Balasanov
L. Golubchikov
A. Mostovets - TL

US: L. Howe
W. Marton
A. Opdenaker
M. Roberts - Chair
G. Taft - TL

[TL = Treaty Lawyer]

The objective of this particular meeting was to prepare a working draft of Protocol 2 so that a final draft could be agreed upon at a later meeting in time to provide recommendations to the Council for its third meeting, to be held on April 21-22.

In order to meet this objective, SWG-2 reviewed the relevant contents of the Agreement and Protocol 1, the guidance of the Council, and the views of the Director incorporating the recent experience encountered in the startup of the EDA. Particular attention was given to the six topics suggested in Protocol 1, Section 4, as requiring consideration by SWG-2.

As a result of the discussions led by the treaty lawyers, SWG-2 came to a likely structure for the documentation involved as well as a possible language for most of the topics. This working draft language will now be reviewed on each of the four sites before the next SWG-2 meeting.

At its next meeting, to be held in Garching from March 30 through April 1, SWG-2 will attempt to prepare its report on draft Protocol 2 for Council consideration. Once the report is considered and a draft text accepted by the Council, the Parties will be in a position to proceed with their formal domestic reviews and then quadripartite negotiations. SWG-2 will also focus on the additional task assigned at the last Council meeting, namely, the longer term disposition of facilities and assets.

TECHNICAL MEETING ON EXPERIMENTAL APPROACH TO THE PHYSICS OF THE HIGH DENSITY DIVERTOR

by J. Dietz, Head of Divertor and Plasma Interface Division, ITER Co-Centre Garching

A technical meeting on the Experimental Approach to the Physics of the High Density Divertor was held at the ITER Garching Co-Centre on 25-27 February 1993.

Twenty-one participants and observers from the ITER Parties attended together with members of the Joint Central Team.

The aim of the meeting was to inform the Joint Central Team about experimental activities in the area of divertor physics and divertor simulation experiments and to establish the relation of these activities with the research requirements for the high density divertor as proposed for ITER.

The fusion power for the Extended Performance Phase for ITER will be about 3 GW. It is expected that the divertor will have to accommodate a load of 480 MW. This is not possible by a direct transfer in a narrow region on the target plates, but it is necessary to spread the power over an area which is as large as possible.

The ITER proposal employs processes such as radiation and charge exchange to achieve this aim and support for this scheme is required in order to arrive at a solution which guarantees power and particle exhaust, plasma cleanness and an adequate lifetime of the plasma facing components.

The meeting came to the conclusion that

- the existing major divertor tokamaks (i.e. plasma current > 1 MA) JET, JT 60-U, DIII-D, ASDEX Upgrade and Alcator C-Mode have all the potential together with the assistance of other tokamaks, to provide valuable contributions.

- The experiments have to be supported by modelling and model validation in order to allow for an extrapolation to the parameter regime of ITER.

- Existing small-scale simulation experiments can help the modelling work and in many cases have the advantage of continuous operation. They are, however, in their dimensions too far away from ITER so that an additional simulator, closer to ITER exhaust parameters, could be useful, for physics investigation as well as for material tests.

The result of the discussions reflects the thinking of the Joint Central Team that the divertor development should be carried out through a three-pronged approach, namely by tokamak

experiments, edge models and simulators. The interaction of all three elements and the resulting model validation will allow an extrapolation to ITER parameters and in the end will give confidence in the divertor concept.

Participants of the Technical Meeting on
Experimental Approach to the Physics of the High Density Divertor

List of Attendees

M. Chatelier	EC
V. Chuyanov	JCT
S. Cohen	US
J. Dietz	JCT
F. Engelmann	EC
W. Gauster	JCT
Y. Gohar	JCT
I.H. Hutchinson	US
K. Igitkhanov	RF
A. Kukushkin	RF
R. Mc Grath	US
P. Mioduszewski	US
I. Neuhauser	EC
H. Ninomiya	JA
G. Oktay	US
H.D. Pacher	EC
R. Parker	US
W.I. Pistunovich	RF
F. Puhn	JCT
P.-H. Rebut	JCT
G. Shatalov	JCT
M. Shimada	JA
Y. Shimomura	JCT
Y.A. Sokolov	RF
R. Stambaugh	US
M. Sugihara	JA
P. Thomas	EC
V.A. Vershkov	RF
J. Winter	EC

STATUS OF THE INTERNATIONAL FUSION EVALUATED NUCLEAR DATA LIBRARY (FENDL)

by S. Ganesan and A.B. Pashchenko, Nuclear Data Section, Division of Physical and Chemical Sciences, IAEA

The IAEA Nuclear Data Section, in co-operation with several national nuclear data centres and research groups, is creating an internationally available Fusion Evaluated Nuclear Data Library (FENDL), which will serve as a comprehensive source of processed and tested nuclear data tailored to the requirements of the ITER Engineering Design Activities and other fusion reactor development projects. The first version of this library, FENDL-1, consists of the following sublibraries:

- Coupled 175-group neutron-42group gamma cross-section sets (VITAMIN-J structure) processed with the NJOY system for neutron and gamma-ray transport calculations for 62 elements and isotopes of primary fusion interest.

- The FENDL pointwise activation sublibrary (FENDL/PA-1) consisting of 256 of the most important neutron activation cross-sections for the estimation of radiation hazards.

- Charged particle nuclear reaction cross-sections for the D-T plasma constituents p, d, T, ^{3}He and ^{4}He.

- Fusion-relevant neutron dosimetry cross-sections.

The FENDL activity has been performed under the dynamic leadership and brilliant supervision of D.W. Muir, who left the Agency in May 1992. The activities are being continued by S. Ganesan and A.B. Pashchenko of the NDS.

For the multigroup cross-section library, ENDF/B-VI files were selected by a series of IAEA Advisory Groups as major source of basic evaluated data, supplemented by JENDL-3 and BROND files. Pointwise cross-section data have been reconstructed from resolved resonance parameters and linearized with thinning tolerances of 0.1%. Self-shielded cross-sections are being calculated for 300, 900 and 1500 Kelvin and dilution factors of 10^{0}, 10^{1}, 10^{2}, 10^{3}, 10^{4} and 10^{10} barn. Thermal scattering-law data are being included for Be in Be metal, C in graphite and H in water. Following a request from ITER for neutron and gamma shielding calculations, the following specific elements were added: Na, Mg, P, S, Cl, K, Ca and Ta.

In order to allow the users to carry out realistic activation calculations, the activation cross-section sublibrary FENDL/PA-1 was extended by several thousand additional reactions in 1992, so as to contain in this new FENDL/PA-1.1 (Revised) all targets with half lives greater than 10 days and all reactions energetically possible below 20 MeV.

For the second version of FENDL, FENDL-2, extensive benchmark-testing of FENDL-1 data and intercomparison with newly available data files are planned with the aim to improve the physical reliability of FENDL-1 data for neutron-gamma transport and activation studies.

For further details of the current FENDL project activities the reader is referred to the following publications:

- D.W. Muir, S. Ganesan and A.B. Pashchenko; FENDL: a reference nuclear data library for fusion applications. Proceedings of the International Conference on Nuclear Data for Science and Technology, Juelich, Germany, 13-17 May 1991; to be published.

- D.W. Muir, S. Ganesan and A.B. Pashchenko; Status, plans and international co-operation in the preparation of the International Fusion Evaluated Nuclear Data Library (FENDL), Proceedings of the International Workshop on Fusion Neutronics, Karlsruhe, Germany, 7 June 1991 [JAERI-memo 03-305, September 1991, p. 205f].

PROFESSOR HENRY SELIGMAN

in memoriam

HENRY SELIGMAN passed away on 3 March 1993 at the age of 84. Henry was the fusion advocate within the IAEA when it acted as midwife for the birth of ITER in the mid-to-late 1980s. He had played a similar role for the birth of INTOR a decade earlier and brought all his wiles to the ITER task.

After a distinguished career in the UK, Henry came to Vienna in 1957 and served the International Atomic Energy Agency (IAEA) for more than ten years as its first Deputy Director General for Research and Isotopes.

In a recent prayer service for Henry Seligman in Vienna, Dr. Sigvard Eklund, Director General Emeritus, IAEA, said that

"Henry was a good and deeply respected character. He had himself a profound disrespect for authority. He had an intimate knowledge of science and a keen interest in scientific development. Henry got great international recognition for his productive work and administrative ability. The Seibersdorf Laboratory of the IAEA and its co-operation with FAO, the Marine Environment Laboratory, Monaco, together with the Trieste Centre for Theoretical Physics, are reminders about institutions started and supported by the fertile mind of Henry Seligman."

In keeping with his disrespect for authority he was always suggesting ways of challenging the status quo when it was an obstacle to progress. Dr. Michael Roberts, Chairman of SWG-2 and previous ITER Working Groups recalls in his obituary notice for Henry Seligman:

"In the picture taken six years ago at the landmark first quadripartite meeting in Vienna which led to the formation of ITER, Henry sits at the table, beaming. At each meeting I attended in Vienna over the past many years, whether it was for the International Fusion Research Council, the ITER Council or the ITER Working Group, Henry was invariably there, bringing suggestions for advance through the bureaucratic thickets, snapping human interest photographs, and bringing friendship and humor to the formal meeting rooms".

We have learnt to consider meeting Henry as something natural, to have a word with him and appreciate his charms and get enthusiastic about his comments regarding the questions of the day. To that end the following quotation from the eulogy by Mr. Walter P. Scherzer, President, IAEA Staff Council, may be added:

"Henry Seligman himself maintained for 84 years a most impressive joie de vivre, as all who heard him singing his way along the corridors will know. As a gentle, but determined mediator, he was

able to overcome seemingly insurmountable barriers and, with his endless motivation, optimism, generosity, sheer love of life and delightful sense of humor, he brightened the lives of all those, regardless of rank and background, who had the privilege of knowing him personally."

We deeply regret that Henry Seligman is no longer with us and thank him for what he has given us. A pioneer of the atomic age has left us his legacy, and the impact of his wisdom is felt throughout the world. Fusion has lost a good friend.