# **Status of ITER**

# K. Ikeda, for the ITER Project Team

### ITER International Team, ITER Cadarache Joint Work Site, 13108 St. Paul lez Durance, France

e-mail contact of main author: kaname.ikeda@iter.org

**Abstract.** The ITER Project Team now coming together in Cadarache is currently being shaped from the old, preserving the legacy of technical know-how built up in the ITER Joint Central Team since 1992. It is particularly strong initially in the most urgent areas, related to long lead items - magnets, the main vessel and the buildings - as well as in work related to licensing. But it also incorporates new functional needs - financial, administrative, and procurement - and ties in the needs of future users during operation.

The project team is urgently engaged in preparations for the new ITER Organisation, to enable it to operate effectively by recruiting staff and placing contracts to the extent possible as soon as possible after signature. The relationship with the Domestic Agencies over procurement is also being developed in detail. At the same time a design review involving the Parties is getting underway to confirm that ITER can meet its objectives and to confirm the design requirements.

This paper gives a status report on these activities.

#### 1. Introduction

Following a protracted period of negotiations, and the proposal of four candidate sites for ITER construction, a site adjacent to the CEA research centre in Cadarache, France, was finally selected by the then six ITER Parties (Euratom, the People's Republic of China, Japan, the Republic of Korea, the Russian Federation, and the United States of America) in June 2005. Since then India joined the Project, the inter-Party negotiations have concluded, and the Parties initialled the "Agreement on the Establishment of the ITER International Fusion Energy Organization for the Joint Implementation of the ITER Project" in May 2006. This agreement is now expected to be signed in November 2006, and ratified in 2007. If this timetable is maintained, it is planned for the ITER Organisation to begin operation provisionally by the end of 2006, starting to employ its first staff and place its first contracts. This paper therefore reviews the planning and preparations being made for a swift ramp-up of activity towards ITER construction. It covers the appointment of senior staff and the establishment of the configuration of the future organisation, the planning of staff buildup and the future budget profile, and the aim of the design review.

### 2. ITER Organisation (IO)

In November 2005 the author was unanimously accepted by the Parties as Nominee Director General (DG), pending confirmation of the appointment by the first ITER Council, the governing body of the ITER Organisation. In March 2006 I took over as Project Leader of the existing International Team from Yasuo Shimomura, who has been in the team since the very beginning of the project. In November 2005 the search began in Europe for my Principal Deputy (PDDG), and following the screening of more than 400 applicants Norbert Holtkamp was appointed in April 2006. On proposal from the Nominee DG and PDDG, the Parties confirmed the senior management structure and divisional responsibilities for the future Organisation. The Deputy Director Generals (DDGs), chosen to achieve a balance between the Parties, were designated in July 2006. The organisation as currently conceived, is shown in Figure 1, indicating the new senior management. As this organisation develops, there may be some modifications in the detail. With the appointment of the senior

management team, further appointments only need to respect in general the accepted overall balance of staff from the various Parties.



Fig.1 ITER Organisation Structure and Senior Management

The IO will be officially established only after signature and ratification of the ITER Agreement, but nevertheless many preparations are underway under the umbrella of ITER Transitional Arrangements to facilitate its earliest start up. These include the finalisation of staff regulations, with their implied employment conditions (e.g. salary scales, pension and medical insurance schemes). They also include the finalisation of financial regulations and procedures, and the preparation of the first Project Plan and Resource Estimates for 2007, in line with the Project Resource Management Rules. The details of the Site Support Agreement, between the IO and the European Host, and the Headquarters Agreement, between the IO and France, also have to be finalised. These documents need to be approved by the first provisional ITER Council Meeting, immediately after signature, to legitimise the operation of the IO.

### 3. Staffing

The ITER Organisation is now under development. To maintain the legacy of the design know-how, existing International Team staff have been encouraged to move from the Garching and Naka Joint Work Sites to the Cadarache Joint Work Site as fast as possible. This is underway, as fast as the Parties and their staff are able, with major moves taking place in August/September, and at the end of 2006. The August/September move is being bolstered by the influx of DDGs and the PDDG, who can further help to specify the functions and jobs within their divisions.

In addition, urgent positions have been identified, and the Parties have agreed to propose candidates so that about 25 of these can be actively occupied well before the year end. Under present arrangements, these staff can only come as secondees. It is hoped that, following signature of the ITER Agreement, contracts of employment between the (provisional) ITER Organisation and the first professional and support staff can be concluded before the end of 2006.

Beyond 2006, the planning keeps to the integrated project schedule, and respects the budget envelope agreed in the ITER Technical Basis [1], namely 477 kIUA (1 kIUA= 1000 US\$ in 1989). This converts to ~1800 professional person years (PPY) and ~2760 support person years (SPY) during the construction period. Further aims are to ensure a smooth transition of staff across different phases of the project, and to ensure an early start-up for team building.

Assessments of the build up of project team staff during construction have been made (see figure 2). These show the eventual number of team professionals rising to 220, with 410 support staff, transitioning smoothly into the operational level. Figure 2 also shows the relationship between staff recruitment and procurement commitment volume at a given date, with a 1-2 year time buffer for professional staff and initial procurement specification, which continues as the procurements are further detailed by CAD support staff and tracked by technical support staff deployed in industry.

These figures show that by the end of 2007, the total number of professionals at Cadarache should reach 150, with 120 support staff.

The original estimates in 2001 were based on 3 Parties, not the present 7, and no split procurements between Parties (many are now split). It will be necessary to review the staffing requirement and staff costs in the coming years, in light of the design review (see below) and when an agreed resource-loaded schedule has been developed.



**Project Staffing In Relation To Procurement Commitment** 

## 4. Expenditure

Expenditure estimates cover the scheduling of procurement, staff costs (counting both costs of directly employed staff of the ITER Organisation plus those of the Parties through seconded staff), and R&D during construction. The current estimates are based on work done before 2001 on the scheduling of procurements, and thus need to be updated following the design review (see below). The schedule of procurements associated with construction also runs beyond the date of first plasma, for instance to cover costs for the DT phase fuel cycle systems.

Figure 3 shows how these expenditures (in kIUA), which are mostly dominated by procurement, are shared by the Parties, assuming the agreed sharing of costs (5/11 Europe, 1/11 each other Party), and the current agreement on procurement splitting between the Parties, based on the ITER value estimates of 2001.

The above predictions will be revised as part of the design review, and verifying of the resource-loaded schedule.



Construction Cost Expenditure Profile by Party (kIUA)

Fig. 3 Construction cost commitment profile

#### 5. Roles and Responsibilities for ITER

To make optimum use of the above limited resources, and to make ITER a success in both construction and operation, it is essential that both the ITER Organisation and the Parties, through their Domestic Agencies (DAs) share responsibility in an agreed manner. The precise nature of this responsibility sharing in the case of individual procurements is to be worked out in each case [2], but the overall arrangement planned is as follows:

- The ITER IO is responsible for
  - Planning/Design
  - Integration / QA / Safety / Licensing / Schedule
  - Installation
  - Testing + Commissioning
  - Operation
- The Parties, through their DAs are responsible for
  - Detailing / Designing
  - Procuring
  - Delivering
  - Supporting installation

Beyond that, the IO and all the Parties plus their fusion community will work together on the exploitation of ITER. The IO will coordinate and participate in these programmes (e.g. that for the test blanket modules).

# 6. Design Review

Since the design was firmly established in 2001 for the purpose of dividing the procurement, R&D has continued both in technology development and in plasma physics. A design review process [2] is therefore just beginning driven by the International Team. This will be a continuous process over the next few years, focussing first on the earliest and most influential procurements to provide a frame for later ones. It is intended that the Parties will participate in the process through involvement of their experts on specific issues. Senior management decision making will be aided by a Technical Advisory Group (TAG, see below). The review is being driven by the Project Office, through the following (initial) Working Groups (WGs):

- 1. Design Requirements and Physics Objectives
- 2. Safety Issues and Licensing
- 3. Buildings, especially the Tokamak building
- 4. Magnet System
- 5. Vacuum Vessel and its interfaces
- 6. Neutral Beams
- 7. Tritium Plant

The first WG will check whether the design requirements are consistent with the ITER objectives, and this is the entry point for information from the fusion science community through the International Tokamak Physics Activity (ITPA) to ensure this. The other groups will check that the design to be implemented conforms to its requirements.

The short-term aim is to establish a "Baseline Design 2007" where the changes to the 2001 design are either confirmed, modified or rejected and where existing design issues or the ones discovered by the WGs for the long lead items are to a large degree solved. If there are design issues which are not solvable by the working groups either due to a lack of resources or due to a large impact on the cost and schedule, these will be presented to the ITER Council with the risk to the project if they are not resolved and the resources and time needed to resolve them.

# 7. Current Focus of Work

The current schedule foresees the creation of the ITER Organisation around the end of 2006, the granting of a construction license by the end of 2008, and first plasma by the end of 2016. To maintain the momentum of this challenging schedule, in addition to preparing for and participating in the above design review, the work of the project team is now focussed on the following immediate aims:

- Clearing of the construction site and preparation for road and utility connections. The technical specification for the call for tender for site clearance is being written, with a view to launch in mid-October 2006, and site clearance taking place in January-April 2007.
- Calls for tender of superconducting strands through Domestic Agencies (planned to take place in 2006).
- Technical specifications for calls for tender for fabrication of vacuum vessel, superconducting coils, building & excavation design (expected to be finalised for essential items by the end of 2006).
- Completion of Preliminary Safety Report (submission end 2007).
- Development of a consistent Integrated Project Schedule (IPS) and Procurement schedule (first version to be ready by early 2007).

## 8. Conclusions

The Parties are aware of their budget and staffing obligations and are making progress in satisfying them. The project team is coming together in Cadarache. A design review is about to begin. In particular this will strengthen the technical and financial commitment of all stakeholders, DAs and project team members, and engender support for ITER from the fusion community at large. The key item now is to establish the ITER Organisation and to make it effective at the earliest opportunity.

## Acknowledgement

This report was prepared as an account of work undertaken within the framework of ITER Transitional Activities (ITA). These are conducted by the Participants: the People's Republic of China, the European Atomic Energy Community, India, Japan, the Republic of Korea, the Russian Federation, and the United States of America, under the auspices of the International Atomic Energy Agency. The views and opinions expressed herein do not necessarily reflect those of the Participants to the ITA, the IAEA or any agency thereof. Dissemination of the information in this paper is governed by the applicable terms of the former ITER EDA Agreement.

## 8. References

- [1] ITER Technical Basis, ITER EDA Documentation Series No 24, IAEA Vienna 2002
- [2] N. Holtkamp, "The Engineering Challenges of ITER", Paper IT/1-1, this conference