



**china eu india japan korea russia usa**

## **Welcome and Background**

***W.A. Houlberg***  
***ITER Organization***

**Integrated Modelling Technology Workshop**  
**Organised jointly by IO and CEA/IRFM**  
**Cadarache**  
**8-10 June 2011**

# Topics

---

## **Two phases in the development of the ITER IM Programme:**

- Phase 1: Infrastructure Development (2011-2020)
- Phase 2: Physics Development (2015- )

## **Contract for ITER IM infrastructure**

## **IM Strategic Objectives**

## **IM Technology Workshop objectives**

# Development of the ITER IM Programme

## Phase 1: Infrastructure Development (2011-2020)

- Design and implementation of a plasma modelling environment that addresses all anticipated Use Cases
- 3 year contract awarded to IM Design Team led by CEA (F. Imbeaux)
- Operational and tested prior to significant operation (2020)

## Phase 2: Physics Development (2015- )

- Implementation of a full range of physics models and components
- Address coupling between core, edge, SOL, divertor, wall, external systems
- Flexible implementation of a range of models from *ab initio* to 'reduced' depending on the Use Case

# Contract for ITER IM Infrastructure

## Three-year framework contract:

- Signed Dec 2010

## Consortium of several partners:

- CEA: F. Imbeaux (CR), B. Guillerminet, P. Huynh
- CRPP/EPFL: J. Lister, O. Sauter, B. Duval
- Chalmers: P. Strand
- AREVA TA (software quality procedures, lifecycle management): M. Brun

## Participation of other IO divisions:

- CODAC: L. Abadie, S. Simrock, A. Winter
- IT: J-D. Delaplagne
- Diagnostics: G. Vayakis
- H&CD: P. Thomas

## Status:

- Task Order 1 launched for Conceptual Design

# Design – Task Order 1 (Dec 2010 - Mar 2012)

## Conceptual Design – define functionalities of the ITER modelling infrastructure and technical solutions:

- Framework for integrating physics components in a plasma simulation code
- Framework for automated execution of codes for plasma reconstruction
- Programming languages
- Data model(s) for physics parameters and machine descriptions
- Software and procedures for storing, retrieving and managing physics data
- Hardware requirements for plasma modelling
- User interfaces
- Data visualisation tools
- Standards and guidelines for documentation and traceability of physical data
- Standards and guidelines for documentation and traceability of the codes and components used in a given simulation
- Collaborative development tools (for ITER Party members to participate in joint development of physics software)
- Remote data access and remote user access
- Interfaces with software from ITER Parties running on facilities outside of the IO

## Establish a timeline for development, installation, testing and the expected resource requirements of the deliverables

# IM Strategic Objectives

**(IM1) The IM Programme shall establish an integrated suite of predictive physics codes of varying complexity to describe the ITER plasma and its interactions with structures and auxiliary systems.**

- (IM1.1) ... build on the expertise of the ITER Members by adapting relevant software ...
- (IM1.2) ... build on the expertise of the ITER Members by providing links to supplementary resources
- ...
- (IM1.3) Procedures and conditions for incorporating modelling elements ...
- (IM1.4) A set of standards and guidelines shall be established ...
- (IM1.5) A set of acceptance criteria and procedures shall be established ...
- (IM1.6) A version control system shall be established ...
- (IM1.7) A regression testing programme shall be established ...
- (IM1.8) A scientific workflow management system shall be implemented ...
- (IM1.9) A website shall be developed ...

**(IM2) The IM Programme shall establish a programme to address IM application needs in cooperation with the ITER Members.**

**(IM3) The IM Programme shall develop a plan, jointly with the CODAC & IT Division, for computer hardware, software, data storage and communication needs specific to the IM Programme.**

**(IM4) The IM Programme shall develop a plan, jointly with the Diagnostics Division, for establishing a suite of synthetic diagnostics to simulate measurements.**

**(IM5) The IM Programme shall develop a plan, jointly with the Diagnostics and CODAC & IT Divisions, for establishing a suite of interpretive analysis tools to process diagnostic data into spatially and temporally resolved physics quantities.**

**Being addressed by: IO IM, IO IM and Design Team, IM Technology Workshop**

# IM Technology Workshop Objectives

## Address a subset of IM Technologies related to:

- Use Cases
- Frameworks/Workflows
- Data Structures, Descriptions, Code/Component Interfaces
- Multi-scale Physics and Large Scale Computing
- Automated Reconstruction
- Plant System Integration

## Focus presentations and discussion on:

- Strengths and weaknesses of the technologies, extensions in progress
- Long term viability in a changing computing environment
- Types of application but avoid details of physics results
- Adaptability to ITER Use Cases
- Lessons learned, e.g.:
  - Easily adaptable vs manpower intensive
  - Robustness vs fragility

**Constructive discussion is critical**