Status and Plans for the US Contributions to ITER

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U.S. ITER Project Office

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Outline

• Highlights of the International ITER Project
• International Project Activities
• US ITER Project Scope
• Organization of ITER and US ITER
• US ITER Project Schedule
• Risk Management
• FY ’06 Expectations
• Summary
Highlights of the International ITER Project

• We have a site: Cadarache, France
  – From 12/2003 until 6/2005, EU/JA negotiations were the focus
  – JA withdrew its site offer in the context of:
    • 10% of EU’s 50% of in-kind contributions (hardware and staff) to be provided by JA at EU expense
    • EU support for a qualified Director General nominee
    • EU/JA partnership on elements of a Broader Approach

• We have a Director General Nominee: Ambassador Kaname Ikeda
  – Nuclear engineer, JA science/technology/space program leader, diplomat

• We have resumed discussions and negotiations on the ITER Joint Implementing Agreement

• India was requested to join as a full ITER partner
Topics for the ITER Joint Implementing Agreement

- Management guidelines --- Agreed 10/05
- Procurement systems guidelines --- Agreed 10/05
- Legal aspects – tentative agreement 12/05
- Council decision-making - tentative agreement 12/05
- Resource management - tentative agreement 12/05
- Intellectual property - tentative agreement 12/05
- Staffing regulations – some questions remain
- Annexes to the Agreement
  - Use of the resources “saved” by the possible entry of a new partner
  - Procurement Allocation Revisions
International Project Activities

- The project is completing R&D and design work prior to construction

- The Naka and Garching co-centers will close (as co-centers) and activity will shift to Cadarache in 2006
  - ~12 team members will work in Cadarache starting in January 2006
  - Waves of other staff will arrive ~June-December 2006

- The ITER Organization staff will be selected starting in 2006
  - Job position descriptions disseminated by the IT/IO to parties
  - Parties respond with candidates where appropriate
  - DG/IO selects staff, to be supported by their parties as IO employees/secondees
  - In exceptional cases, the DG can hire staff outside this normal arrangement

- The DG, working with the IT and parties, will develop the ITER Organization’s structure, policies and procedures, etc.
  - Much will be enacted provisionally prior to the JIA coming into force
U.S. Provisional “in-kind contribution” Scope (2003):
Being Refined for Entry of New Party and to Reduce Project Risk

- 4 of 7 Central Solenoid Modules
- Steady-state power supplies
- 15% of port-based diagnostic packages
- 44% of ICRH antenna + all transmission lines, RF-sources, and power supplies
- Start-up gyrotrons, all transmission lines and power supplies
- Blanket/Shield 10%
- Roughing pumps, standard components
- Tokamak exhaust processing system
- Cooling for divertor, vacuum vessel, …
- Pellet Injector
## US ITER Major Elements of Scope (March 2005)

### US ITER Project Scope Proportions

<table>
<thead>
<tr>
<th>WBS</th>
<th>Description</th>
<th>% of Total</th>
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</thead>
<tbody>
<tr>
<td>1.1.1</td>
<td>Magnet Systems</td>
<td>23%</td>
</tr>
<tr>
<td>1.1.2</td>
<td>Blanket/Shield</td>
<td>4%</td>
</tr>
<tr>
<td>1.2.1</td>
<td>Cooling Water Systems</td>
<td>11%</td>
</tr>
<tr>
<td>1.3.1</td>
<td>Vacuum Pumping and Fueling System</td>
<td>5%</td>
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<tr>
<td>1.3.2</td>
<td>Tritium Plant Exhaust Processing</td>
<td>3%</td>
</tr>
<tr>
<td>1.4.1</td>
<td>Steady State Electrical Power Network</td>
<td>3%</td>
</tr>
<tr>
<td>1.5.1</td>
<td>Ion Cyclotron System</td>
<td>12%</td>
</tr>
<tr>
<td>1.5.2</td>
<td>Electron Cyclotron</td>
<td>8%</td>
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<tr>
<td>1.5.3</td>
<td>Diagnostics</td>
<td>7%</td>
</tr>
<tr>
<td>1.6</td>
<td>Project Support</td>
<td>7%</td>
</tr>
<tr>
<td>1.7.1</td>
<td>IT Support (cash and secondees)</td>
<td>17%</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>100%</td>
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US Support to the International Team

• Scope:
  – Staff support negotiated at 456 person-years (PY)
    • For ITER Central or Field Teams
    • 180 professional person years (84 at ITER site, 96 in Field Teams)
    • 276 support person years (84 at ITER site, 192 in Field Teams)
  – Cash contribution for installation and common site expenses; with in-kind contributions, completes US commitment to ITER value
How ITER will be Organized

ITER Organization

Council

- Science and Technology Advisory Committee
- Management Advisory Committee
- Director-General (DG)
- Auditors

Staff (professionals + support staff)

Central Team

- Field Team (for construction phase)
- Field Team
- Field Team

Domestic Agency

Supporting Services

- Contracts
  - Support for Project Management, Computer Network, Technical works, etc.

Host country
Activities of the US ITER Project

• US ITER Project Office/Domestic Agency was established in July 2004

• Pre-CD-1 DOE/SC “Lehman Review” in March 2005
  – Reviewed draft US project execution plan, acquisition strategy, etc.
  – Address the cost range including contingencies and risk management
  – Ready for CD-1 pending DOE independent cost review planned for late FY’ 06
Activities of the US ITER Project (cont’d)

• Development of the FY06 work plan
  – President’s FY06 budget request: $6M (Prep) + $3.5M (OPC) + $46M (TEC)
  – Appropriated FY06 budget request: $6M (Prep) + $3.5M (OPC) + $16.1M (TEC)
    • Consistent with readiness to proceed, reduced due to ITER delays
  – FY06 tasks under review
    • Delayed by Continuing Resolution (Appropriations Bill now passed)
    • US seeking agreement on in-kind procurement allocations that reduce risk

• Preparation of the Team
  – Project Office solicited expressions of interest for staff candidates
  – Project Office is preparing solicitations for personnel and team selections

• Preparation for the DOE/SC and OECM reviews (April, Summer 2006)
The Project Issued a Solicitation of Expressions of Interest

- To explore interest in positions on the USIPO, the USIPO requested expressions of interest in US ITER positions:
  - Chief Scientist
  - Chief Technologist
  - Project Engineer
  - Magnet Team Leader/Support
  - Blanket/Shield Module Team Leader/Support
  - Diagnostics Team Leader/Support
  - ICH Team Leader/Support
  - ECH Team Leader/Support
  - Tritium Team Leader/Support
  - Vacuum/Fueling Team Leader/Support
  - Electric Power Team Leader/Support
  - Cooling Water Team Leader/Support

- 230 responses were received by the deadline
- The USIPO is using the responses in our planning of procurements
- We expect to issue personnel actions and team-procurement actions later this year
Based on International and Domestic Project Status, the US Critical Decision Schedule Has Been Refined

<table>
<thead>
<tr>
<th>CD-0</th>
<th>Approve Mission Need</th>
<th>2005 (A)</th>
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<tr>
<td>CD-1</td>
<td>Approve Preliminary Baseline Range</td>
<td>2006</td>
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<tr>
<td>CD-2</td>
<td>Approve Performance Baseline</td>
<td>2007</td>
</tr>
<tr>
<td>CD-3</td>
<td>Approve Start of Construction</td>
<td>2007</td>
</tr>
<tr>
<td>CD-4</td>
<td>Approve Start of Operations (Project Closeout)</td>
<td>2013</td>
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US ITER Schedule (March 2005)

Critical Decision Milestones

<table>
<thead>
<tr>
<th>FY05</th>
<th>FY06</th>
<th>FY07</th>
<th>FY08</th>
<th>FY09</th>
<th>FY10</th>
<th>FY11</th>
<th>FY12</th>
<th>FY13</th>
<th>FY14</th>
<th>FY15</th>
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</thead>
<tbody>
<tr>
<td>CD-0</td>
<td>CD-1</td>
<td>CD-2</td>
<td>CD-3A</td>
<td>CD-3B</td>
<td>CD-4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mission Need</td>
<td>Alt Select &amp; Cost Range</td>
<td>Baseline Approval</td>
<td>Start Long Lead Proc</td>
<td>Start of Fabrication</td>
<td>US Project Closeout</td>
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Research & Development

Conductor R&D Complete
- Winding, HT, VPI Qualification Complete
- Tritium Plant R&D Complete
- Decision on Antenna Concept
- Port Interfacing Systems R&D Complete

Design

CS Module Design Complete
- Pipe Chase Design Complete
- ICH Antenna Design Complete
- Pellet Injector Design Complete
- Phase II SSEPN Design Complete
- RGA System Design Complete

Fabrication & Procurement

Start Conductor Strand Fab
- CW Drain Tanks Shipped to IT
- CS Module D Fab Complete
- ECH Transmission Line Fab Complete
- Tritium Plant EPS Factory Test Complete
- First Wall & Shield Fab Complete
- CS Final Acceptance Test Complete
- Pellet Injector Shipped to IT

First Wall & Shield Fabrication Complete
- CS Module D Fab Complete
- ECH Transmission Line Fab Complete
- Tritium Plant EPS Factory Test Complete
- First Wall & Shield Fabrication Complete
- Pellet Injector Shipped to IT

Conductor Fab Complete
- Pellet Injector Shipped to IT

CW Lower Pipe Chase Shipped to IT
- CW Upper Pipe Chase Shipped to IT

CD-3B Start of Fabrication

CD-3A Start Long Lead Proc

CD-2 Baseline Approval

CD-1 Alt Select & Cost Range

CD-0 Mission Need

CD-4 US Project Closeout
Risk Management Under Way

- Risk management principles established in Preliminary PEP
  - Builds on lessons-learned from other collaborative projects (including SNS, NCSX)
  - WBS managers will identify risks and develop/implement mitigation plans, US ITER Project Office manages mitigation effectiveness

- Risks identified bottoms-up:
  - Structured method considered technical maturity, cost/schedule, likelihood/consequences

- Project contingency estimate considers risk-based assessments

- Initial mitigation strategies include:
  - R&D and prototyping
  - Early industrial involvement in fabrication planning
Many US ITER Risks Derive from ITER Responsibility for Design and Integration

- **Technical**
  - Designs shared with other Parties not mature (Blanket, Pellet injector…)
  - Some technical issues (i.e., conductor jacket material) unresolved due lack of ITER staff (recent dialogue indicates some improvement)

- **Cost**
  - ITER planned design activity has slipped, may require Parties to help recover (US ITER preliminary cost range includes added design)
  - Comprehensive design review anticipated by Director General
  - Complexities of International involvement (exchange rates, interfaces, change integration and approval…) (ITER Agreement, prioritize management systems input thru US secondees)

- **Schedule**
  - ITER Project schedule requires updating
  - ITER schedule delays (site, senior staff) may be dragging US beyond 2013

- **Management**
  - ITER procedures, processes, and staff are needed for procurement package approvals
  - Parties (include US) scope remains provisional until ITER Agreement
Expectations for FY ‘06

• International Organization
  – Selection of Director General, management team and key staff
  – Establishment of management arrangements and roles/responsibilities
  – Review and key decisions on the design
  – Finalization of procurement allocations

• US Project Activity
  – Advancement of the R&D and designs for US in-kind contributions
  – Achievement of Lehman Review, OECM review, and Critical Decision 1
  – Selection of team leaders and design-performers in most areas of contribution

• Linkages to the Physics Research Community
  – Selection and activity of the Chief Scientist on the US ITER Project Team, emphasizing bi-directional linkages
  – Engagement of the US Burning Plasma Organization in planning and execution of Physics Tasks and positioning for US Burning Plasma Research on ITER
Bottom Lines…

• The International ITER Project is moving toward construction (site selection and activation, DG, near finalization of International Agreement)

• The ITER Organization and party roles are being refined in light of possible entry of a new partner, of attempts to improve project effectiveness, and to reduce costs

• The US ITER project scope is being finalized and the Project is engaged in the DOE project management process, with emphasis on cost-reduction and risk management

• Research in science and technology, facilitated by the US BPO, is key to success of the design and positioning for ITER research
  – Design issues: materials, disruptions and ELMs, plasma control tools
  – Research issues: identification and extrapolation of hybrid and steady-scenarios to ITER and arguments for optimum mixes of heating and current-drive tools are needed
US ITER Project is Ready to Proceed as ITER
Uncertainties are Resolved

• DOE 413.3 requirements and intent met for CD-1:
  – Integrated Project Team is established
  – CDR and Acquisition Strategy identify ITER and US ITER MIE as preferred design
    alternative and approach to meet the mission need
  – Acquisition Strategy minimizes US risk thru fixed-price, best-value fabrication
    procurements, clear closeout criteria, strong central management of domestic
    participants and up-front risk planning
  – Preliminary PEP contains collaborative management tools/approach
  – Preliminary cost estimate range is consistent with the maturity of the design and
    risks
  – Ready to continue with preliminary design following final scope allocations

• Preliminary schedule meets known ITER needs (but these needs may be
  changing)

• Risk management in progress, many risks to the US project are from non-US
  sources

• Plans and activities for preparing the US baselines are identified, aggressive,
  and depend on budget and ITER site, management decisions