US ITER Project
Perspective of the US Test Blanket Module Activities

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Foci: Meeting US TMB goals through ITER

The ITER Mission

Tritium and Fluence Facts and Impressions

Integrating the TBM and the ITER Project

DOE O413.3 and M413.3

Actions
Testing Tritium Breeding is part of the ITER mission

• **ITER’s Mission:**
  - “demonstrate the scientific and technological feasibility of fusion power for peaceful purposes”
  - “test tritium breeding module concepts that would lead in a future reactor to tritium self-sufficiency, the extraction of high grade heat, and electricity production”
  - “Provision should be made for low-fluence functional tests of blanket modules to be conducted early in the experimental programme. Higher fluence nuclear tests will be mainly dedicated to DEMO-relevant blanket modules in the above flux and fluence conditions.”

• Parties see the TBM activity as outside the ITER construction project and the ITER construction budget [ref. P4 meeting]

• However, integration of the ITER construction activities and the TBM activities, both international and domestic, is recognized as necessary

• **Action:**
  - Negotiators to address the coordination of the TBM activities with ITER constructions
  - Domestic teams and governments to determine consistent scopes, budget, and schedules
  - TBM domestic teams to work with the IT/IO and the DAs on coordination
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- Actions
Tritium consumption and availability issues

• The 2001 ITER FDR estimates:
  – First 10 years (0.09 MW-years/m^2): ~7kg of Tritium “consumption”
  – Total ITER lifetime (0.3 MW-years/m^2): ~16kg of Tritium “consumption”
  – Inventory: ~2kg
The ITER Tritium Plant is essentially a small chemical processing plant

- ~ 0.1 gram of Tritium burned each 100 seconds
- ~ 25 grams of Tritium recycled each 100 seconds
Tritium consumption and availability actions

- **Action items for assessment:**
  - Determine if an extensive breeding blanket in the second 10 years of ITER operation is necessary from the perspective of tritium availability
  - Address interfaces/areas that are prudent from the perspective of tritium co-deposition
    - First-wall system and issues of tritium co-deposition
    - Tritium-processing system
    - Test Blanket Module
    - [Rapid retrieval from any possible liquid-Li surface?]
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A range of integrations are appropriate

- **Technical integration**
  - Frame, services/manifolds/etc.
  - Sharing to increase effectiveness and minimize costs
  - Multi-party arrangements for shared configurations

- **Project integration**
  - International project
    - to specify interfaces, standards, …
    - to perform appropriate assurance activities
  - Domestic TBM projects
    - to comply with international requirements/specifications
    - to establish effective organizations, processes and roles, and to exploit synergies with the ITER Project Domestic Agencies
    - to comply with rules such as export controls, etc.

- **Action:**
  - Parties to define scopes, sharing and roles
  - Parties to arrange effective integration between the ITER project (international and domestic) and the TBM activities
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Actions
The US TBM will be subject to DOE O413.3

• The DOE order and manual are aimed “to provide Department of Energy (DOE) project management direction for the acquisition of capital assets that are delivered on schedule, within budget, and fully capable of meeting mission performance and environmental, safety, and health standards.”

• They specify formal procedures for critical decisions
  – CD-0, Approve Mission Need
  – CD-1, Approve Preliminary Baseline Range
  – CD-2, Approve Performance Baseline
  – CD-3, Approve Start of Construction; and
  – CD-4, Approve Start of Operations or Project Closeout

• At a cost of $100M (including design, fabrication, …), the rigor will be significant

• Action: The TBM should define its project plan, including mission need, scope and conceptual design, early enough to enable domestic and international decision-making
## Project Acquisition Process and Critical Decisions

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<td>Actions Authorized by Critical Decision Approval</td>
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<td>• Proceed with conceptual design using program funds</td>
<td>• Allow expenditure of PED funds for design</td>
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<td>• Request PED funding</td>
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<td>• Conceptual Design Report</td>
<td>• Review of contractor project management system</td>
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<td>• Preconceptual planning</td>
<td>• Preliminary Project Execution Plan and baseline range</td>
<td>• Final Project Execution Plan and performance baseline</td>
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<td>• Mission Need Independent Project Review</td>
<td>• Project Data Sheet for design</td>
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Lessons learned from the US Contributions to ITER Project

- Never underestimate the 413.3 requirements and activity durations
  - DOE process involves not only DOE/SC but also the Office of Engineering and Construction Management

- In principle, all supporting R&D and design could be swept into the project cost

- Note the linkage between the CD-schedule and the budget cycle
  - E.g., OMB desires a CD-2 baseline in Fall of “year N” for requesting the “year N+2” budget request
TYPICAL PROJECT PHASES CORRELATE WITH THE FEDERAL BUDGET PROCESS

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- Federal Budget Cycle
- PED Fund Pool

Project Phases

Preproject Planning
- Strategic Planning
- Mission Need Planning

Conceptual Design
- Submit BR for PED FYBY+1 Fund Pool
- Conceptual Design Report
- BR for Long Lead Procurement (partial CD-3)

Preliminary Design
- Start Design with PED Funds
- Continue Design with PED Funds

Final Design
- Submit BR for New Construction

Construction
- Start Construction

CD-0
- Approve Mission Need
CD-1
- Approve Preliminary Baseline Range
CD-2
- Approve Performance Baseline
CD-3
- Approve Start of Construction
CD-4
- Approve Start of Operations
Lessons learned from the US Contributions to ITER Project

• **Actions:**
  – Develop the costs and schedules for a range of scopes and roles, to enable responsible domestic decision-making and international planning
  – Recognize that a design-to-cost approach may be mandated domestically, even while the international scope flexibility will be limited
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- Develop the costs and schedules for a range of scopes and roles, to enable responsible domestic decision-making and international planning
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