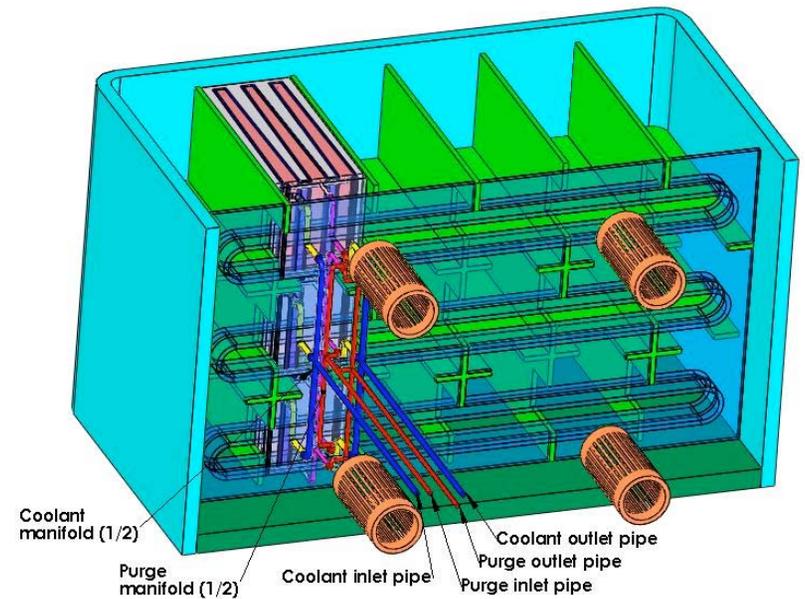
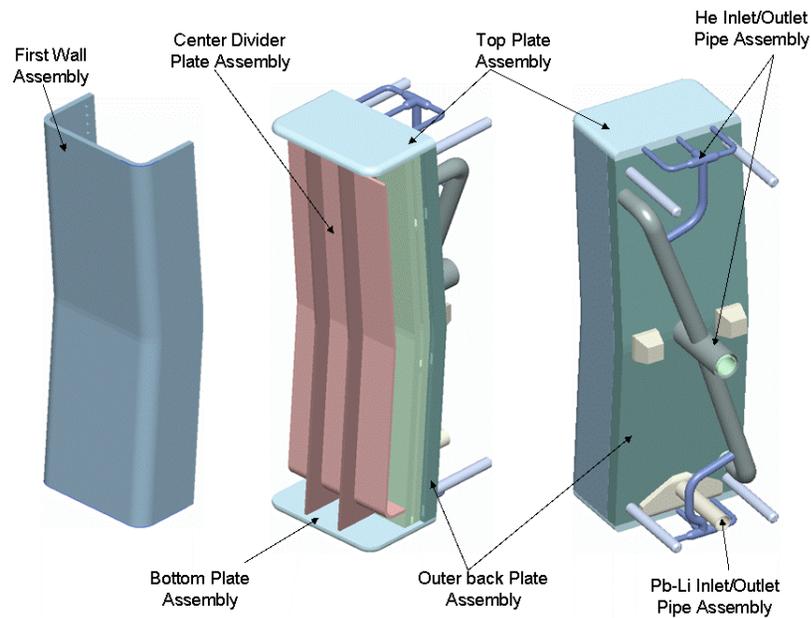
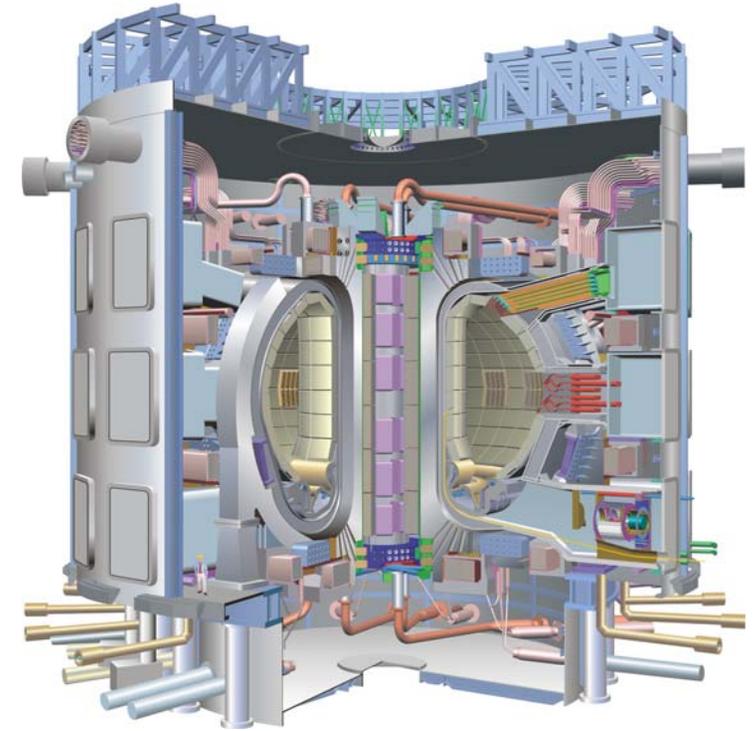
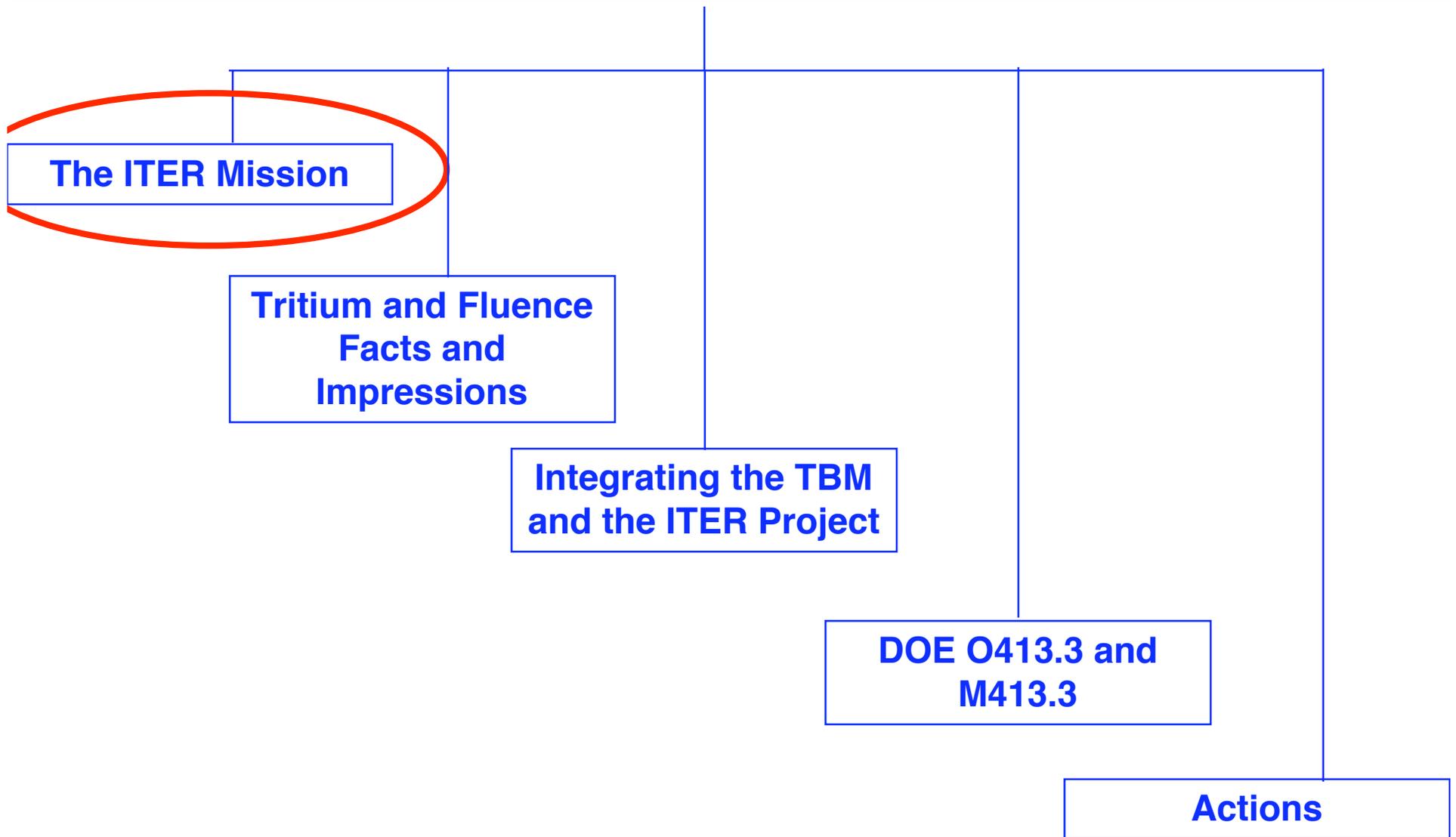


US ITER Project Perspective of the US Test Blanket Module Activities

Ned Sauthoff
August 10, 2005



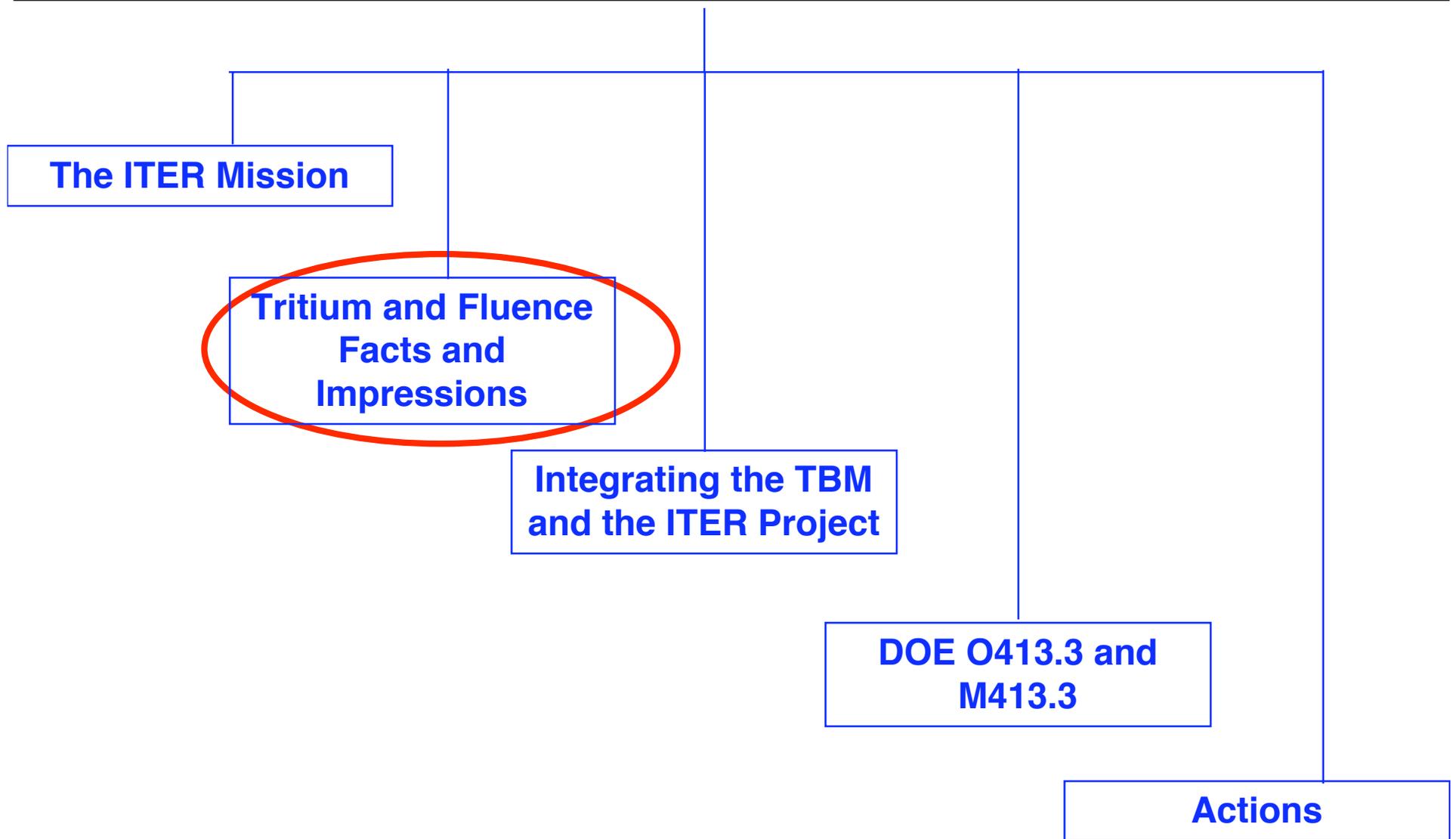
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Testing Tritium Breeding is part of the ITER mission

- **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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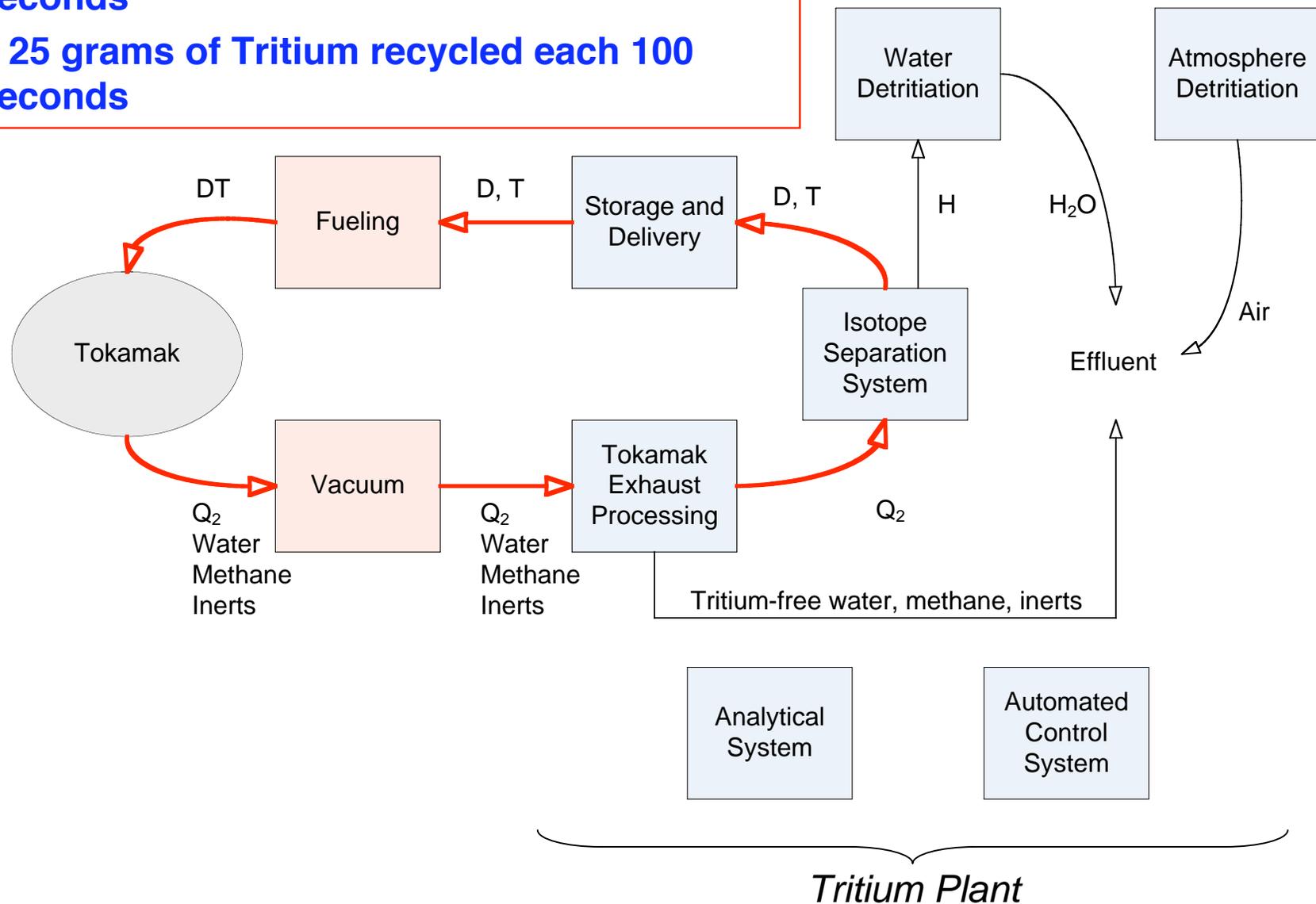


Tritium consumption and availability issues

- **The 2001 ITER FDR estimates:**
 - First 10 years ($0.09 \text{ MW-years/m}^2$): $\sim 7\text{kg}$ of Tritium “consumption”
 - Total ITER lifetime (0.3 MW-years/m^2): $\sim 16\text{kg}$ of Tritium “consumption”
 - Inventory: $\sim 2\text{kg}$

The ITER Tritium Plant is essentially a small chemical processing plant

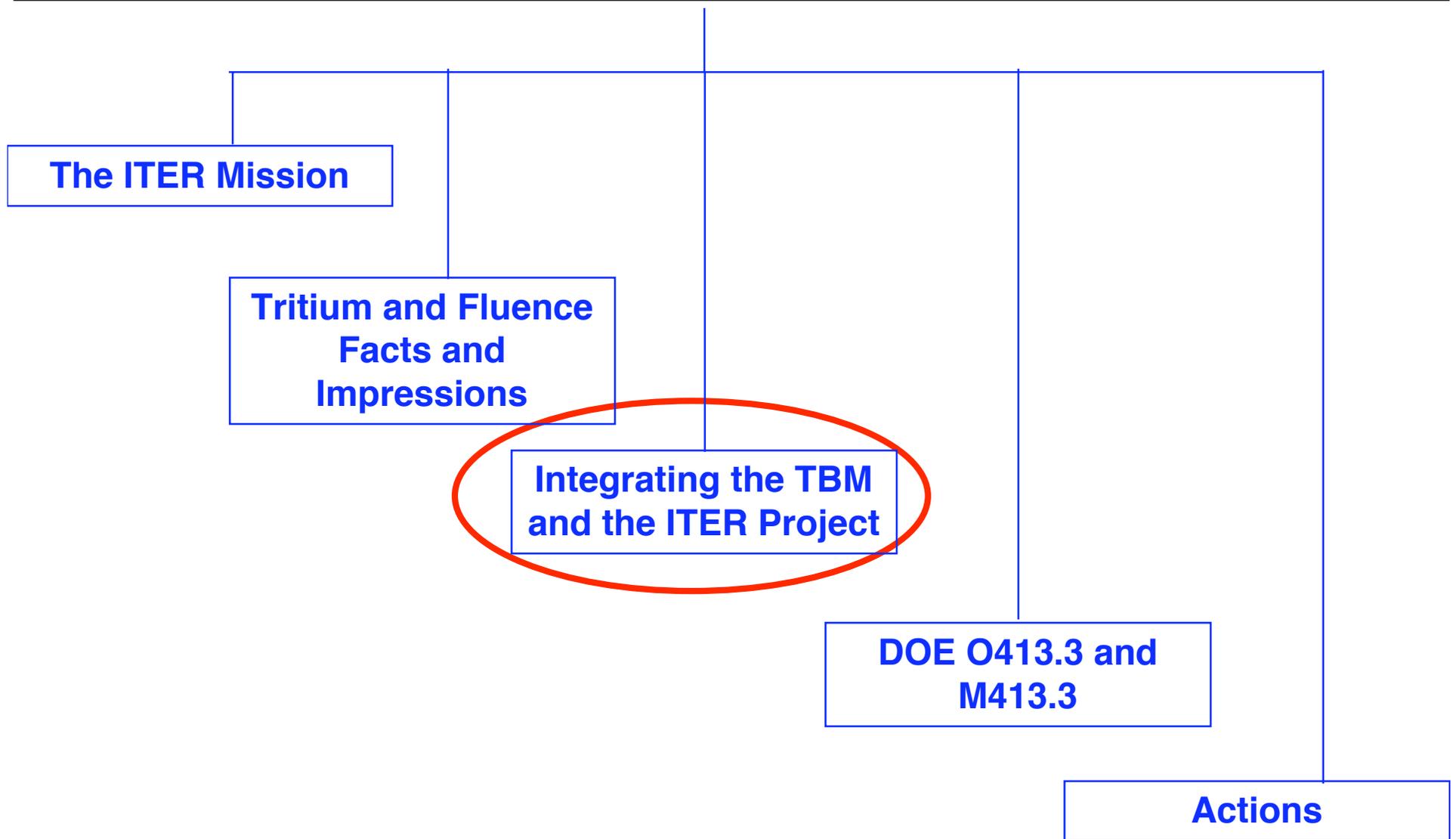
- ~ 0.1 gram of Tritium burned each 100 seconds
- ~ 25 grams of Tritium recycled each 100 seconds



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
 - 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

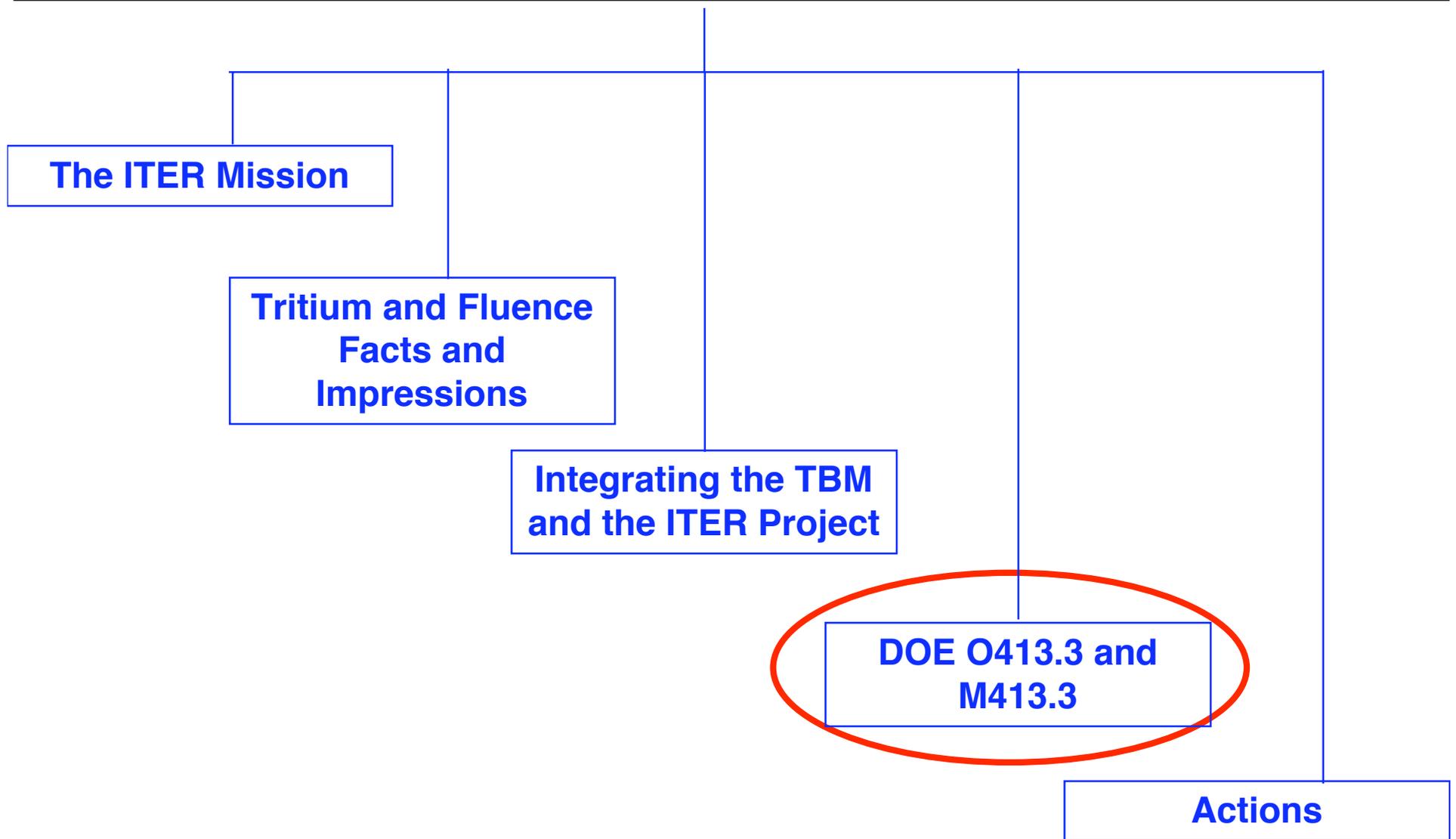
- **Project integration**

- 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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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

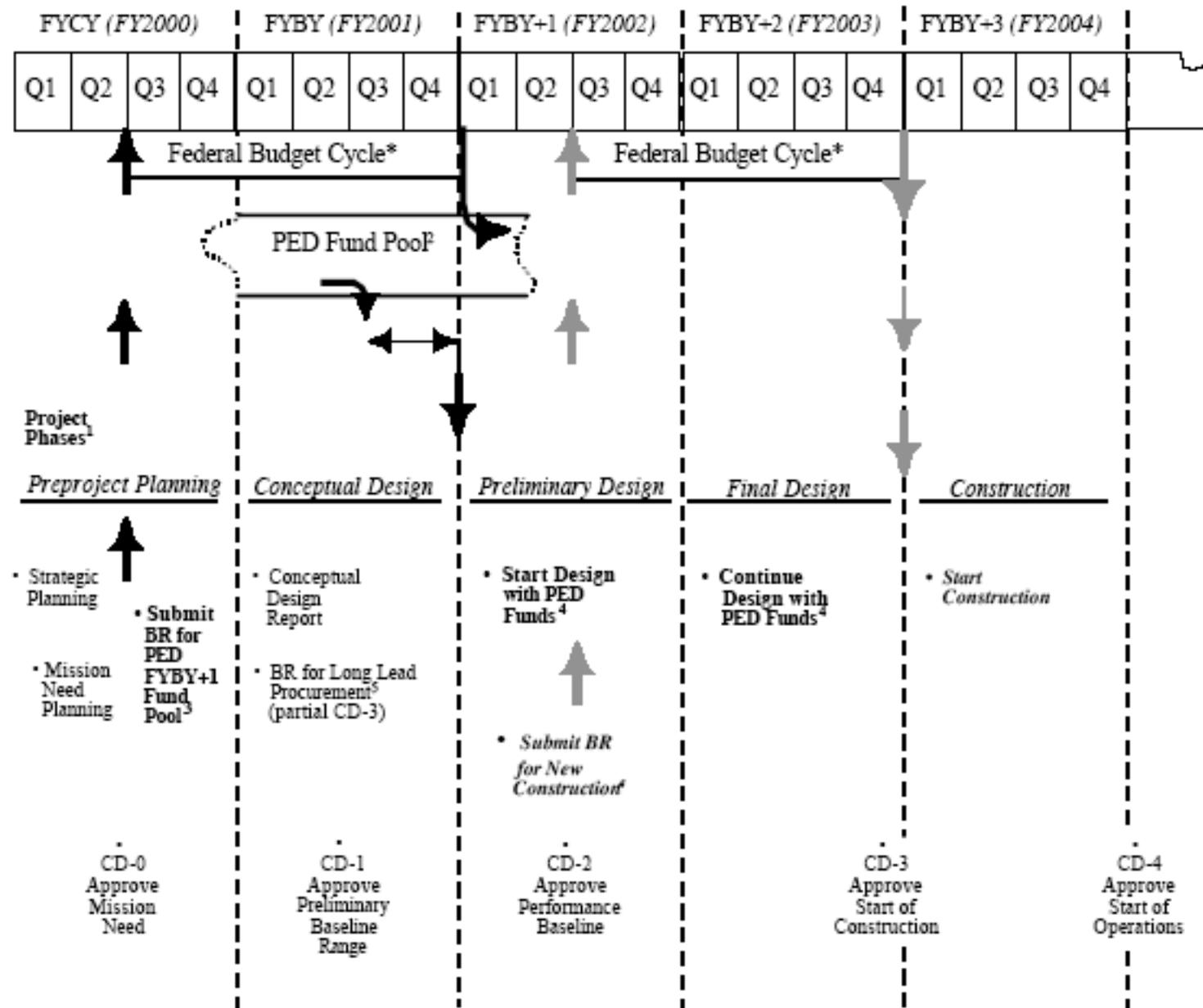
Project Planning Phase		Project Execution Phase			Mission
Preconceptual Planning	Conceptual Design	Preliminary Design	Final Design	Construction	Operations
• CD-0	• CD-1	• CD-2	• CD-3	• CD-4	
Approve Mission Need	Approve Preliminary Baseline Range	Approve Performance Baseline	Approve Start of Construction	Approve Start of Operations or Project Closeout	

CD-0	CD-1	CD-2	CD-3	CD-4
Actions Authorized by Critical Decision Approval				
<ul style="list-style-type: none"> • Proceed with conceptual design using program funds • Request PED funding 	<ul style="list-style-type: none"> • Allow expenditure of PED funds for design 	<ul style="list-style-type: none"> • Establish baseline budget for construction • Continue design • Request construction funding 	<ul style="list-style-type: none"> • Approve expenditure of funds for construction 	<ul style="list-style-type: none"> • Allow start of operations or project closeout
Critical Decision Prerequisites				
<ul style="list-style-type: none"> • Justification of mission need document • Acquisition Strategy • Preconceptual planning • Mission Need Independent Project Review 	<ul style="list-style-type: none"> • Acquisition Plan • Conceptual Design Report • Preliminary Project Execution Plan and baseline range • Project Data Sheet for design • Verification of mission need • Preliminary Hazard Analysis Report 	<ul style="list-style-type: none"> • Preliminary design • Review of contractor project management system • Final Project Execution Plan and performance baseline • Independent cost estimate • National Environmental Policy Act documentation • Project Data Sheet for construction • Draft Preliminary Safety Analysis Report • Performance Baseline External Independent Review 	<ul style="list-style-type: none"> • Update Project Execution Plan and performance baseline • Final design and procurement packages (**) • Verification of mission need • Budget and congressional authorization and appropriation enacted • Approval of Safety documentation • Execution Readiness Independent Review 	<ul style="list-style-type: none"> • Operational Readiness Review and acceptance report • Project transition to operations report • Final Safety Analysis Report <hr/> <p>After CD-4</p> <p><u>Closeout</u></p> <ul style="list-style-type: none"> • Project closeout report

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

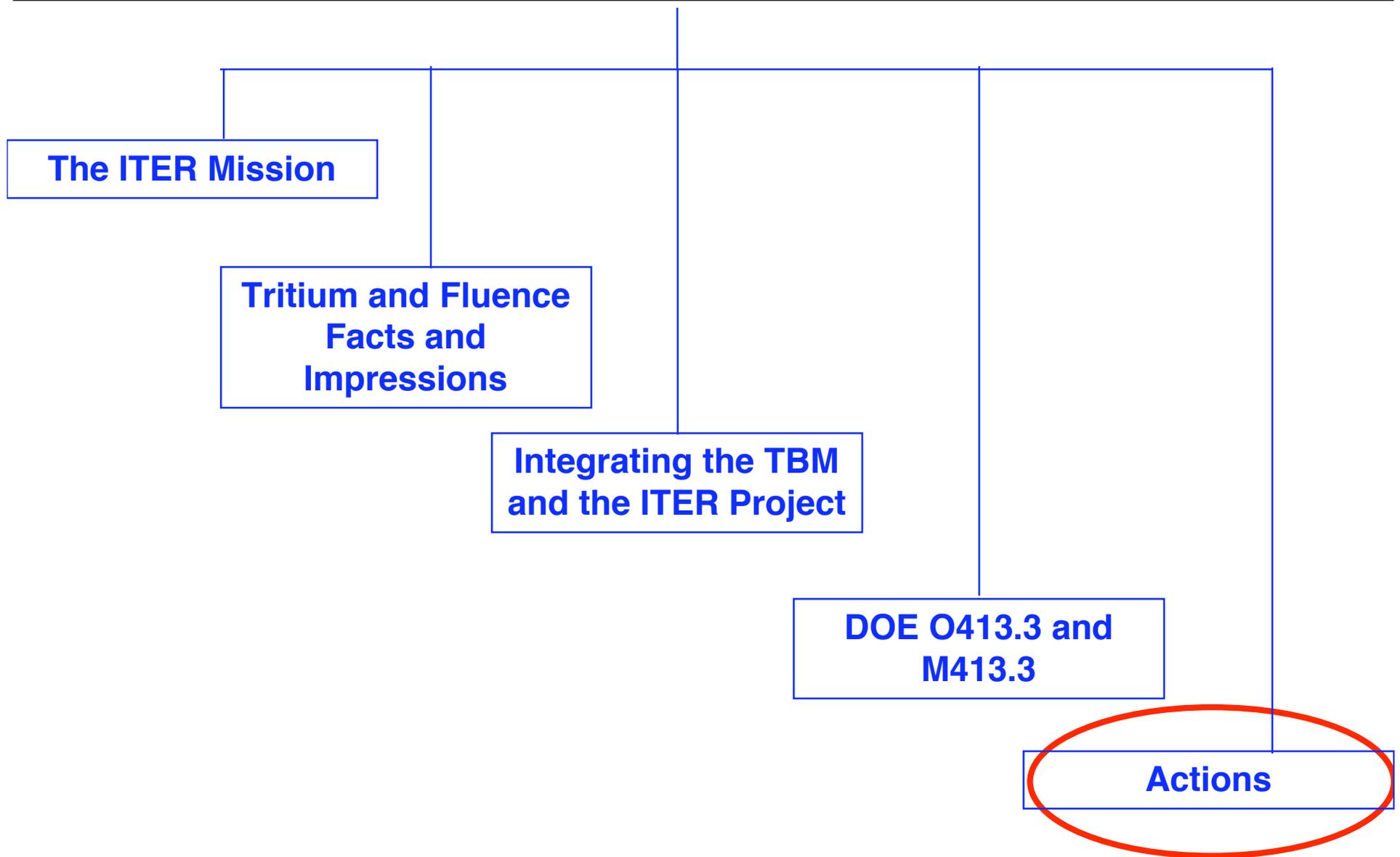


Lessons learned from the US Contributions to ITER Project

- **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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Action items

- **Negotiators to address the coordination of the TBM activities with ITER constructions**
- **Domestic teams and governments to determine consistent scopes, budget, and schedules**
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- **Determine if an extensive breeding blanket in the second 10 years of ITER operation is necessary from the perspective of tritium availability**
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 - First-wall system and issues of tritium co-deposition
 - Tritium-processing system
 - Test Blanket Module
 - [Rapid retrieval from any possible liquid-Li surface?]
- **Parties to define scopes, sharing and roles**
- **Parties to arrange effective integration between the ITER project (international and domestic) and the TBM activities**
- **The TBM should define its project plan, including mission need, scope and conceptual design, early enough to enable domestic and international decision-making**
- **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**