

# Overview of Advance Design White Paper

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Virtual Laboratory for Technology Meeting

June 23, 1998

OFES Headquarters, Germantown

# Program Elements

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- **Next-step device (burning plasma experiment) design studies**
- **Fusion application and Test Facilities design studies**
- **Development pathway analysis**
- **Strategic planning and forecasting -- role of fusion energy in a sustainable global energy strategy.**
- **Safety and environmental Design Studies**

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## **Mission:**

**Design of a burning plasma experiment which reveals the science of burning plasmas and demonstrate the scientific and technological feasibility of fusion energy.**

## **Strategic Pathway:**

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- **Develop lower cost ITER options**  
**needs (technical and financial)**

## **Examples of Recent Accomplishment:**

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## **ITER construction agreement)**

- **International agreements on a low cost design, on a host site, and on management and cost sharing**

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**Successful construction permit and licensing review in the host country.**

## **FY99 Priorities:**

- **Support JCT on developing low-cost options**

# Fusion Application & Test-Facilities Design

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## Mission:

- **Design of commercial facilities for all confinement concepts to assist major program evaluations.**
- **Fusion application studies continue assessment of supply, exploration of other non-electric application.**
- **Design of fusion test facilities, such as neutron sources, define pathways.**
- **Examples of Recent Accomplishment:**
- **ARIES designs**

# Fusion Application & Test-Facilities Design

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## Strategic Pathway:

- **Through self-consistent design and trade-off among physics and technology constraints, optimum goals are set and high-leverage areas identified which in turn guide the physics and technology R&D.**
- **Studies are performed at varying level of detail and emphasis:**
  - **Scoping studies for “Concept Exploration” concepts**
  - **Conceptual design to guide R&D for “proof-of-principle” concepts**
  - **Conceptual design for concept optimization for “proof-of-performance” concepts.**
- **Non-electric application help gain new clients (specially near-term).**

# Fusion Application & Test-Facilities Design

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## Deliverables by 2005:

- **Advanced power-plant studies of tokamaks and alternatives (including IFE) as new information become available or a concept enters proof-of-principle phase.**
- **Conceptual design of advanced neutron sources for non-electric applications as well as fusion development.**
- **Design studies of large-output fusion devices for hydrogen production (or co-generation).**

## FY99 Priorities:

- **Conceptual design of advanced neutron sources**
- **Evaluate potential of fusion for hydrogen production.**

# **Role of Fusion in a Sustainable Global Energy Strategy**

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## **Mission:**

**Assess the role of fusion energy in a long-term vision of a sustainable global energy strategy, taking into account the portfolio of energy options available.**

## **Strategic Pathway:**

- **Include a range of scenarios to deal with future social, economic, and environmental conditions such as limit on greenhouse gases.**
- **Determine how fusion fits given fusion's environmental and economic characteristics.**
- **Determine the goals and requirements for fusion energy through examination of portfolio of fusion concepts and options.**

# Role of Fusion in a Sustainable Global Energy Strategy

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## Deliverables by 2005:

- **Assessment of role of fusion in a sustainable global energy strategy.**
- **Communication of the results to national policy makers, scientific and engineering societies, Congress, the Administration, and the general public.**

## FY99 Priorities:

- **Initiation of the study.**

# Development Pathway Analysis

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## Mission:

**Develop and apply methodologies for assessing the cost, risk, and schedule impact of different approaches to fusion development.**

## Strategic Pathway:

- **For each concept, identify the critical issues and a sequence of R&D steps needed to reach a competitive end-product.**
- **Develop methodology to incorporate factors such as technical uncertainties and the size and the cost of the need facilities.**

# Development Pathway Analysis

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## Deliverables by 2005:

- **A formalism for objective discussion, evaluation, and selection among various proposed development paths based on cost versus risk/benefits.**

## FY99 Priorities:

- **Identify a lead contractor/individual to begin to assemble a team to prepare the methodology.**

# Safety Design

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## Mission:

**Demonstrate the safety and environmental potential of fusion through early integration and iteration of S&E requirements in the design activity, focused S&E R&D to reduce key uncertainties, and state of the art S&E analysis to understand integrated behavior of a fusion facility.**

## Strategic Pathway:

- **Update, validate and verify safety analysis codes with experimental data and modeling from R&D program.**
- **Investigate recycling/reuse approaches to minimize rad-waste.**

## Examples of Recent Accomplishment:

- **ITER Safety Design, DOE order on licensing of fusion facilities.**

# Safety Design

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## **Deliverables by 2005:**

- **Comprehensive safety analysis tools capable of analyzing near-term and advanced designs.**
- **Assessment of the recycle/reuse potential of fusion material.**
- **Extension of 10CFR61 waste-disposal criteria to fusion-relevant isotopes.**

## **FY99 Priorities:**

- **Support ITER design effort**
- **Initial investigation of recycle/reuse potential of fusion material.**