

FUSION ENERGY OVERVIEW

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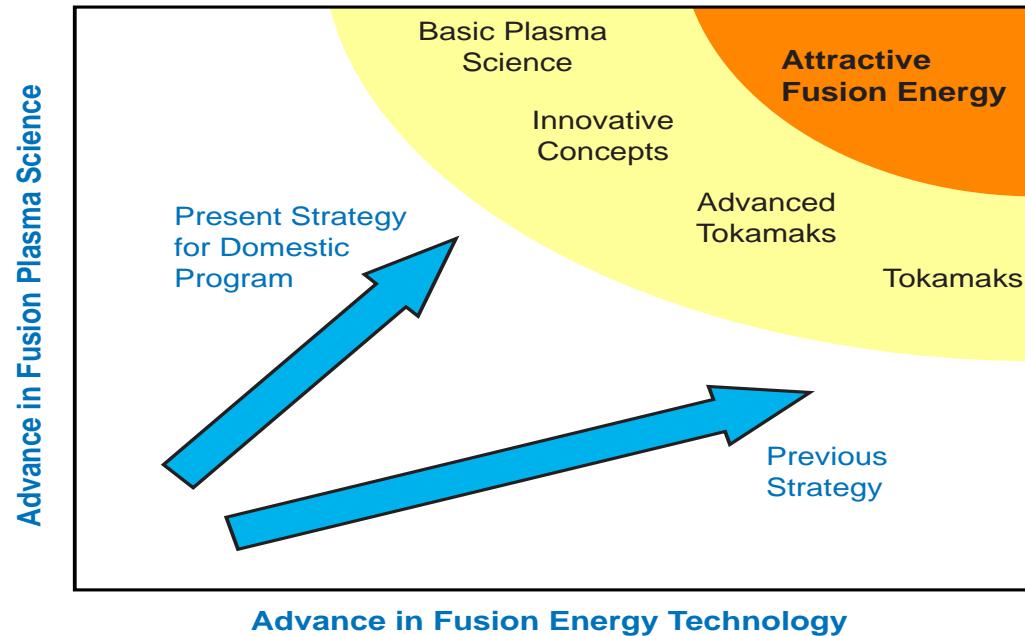
The Roadmap to Fusion Energy

A Portfolio Approach

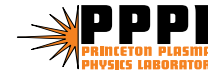
**Briefing for Congressional Staff
by Fusion Program Leaders**

January 1999

New Fusion Program Strategy



PPPL#98GR026



- Portfolio of **innovative** concepts, including inertial fusion energy
- Broader **scientific** areas of inquiry

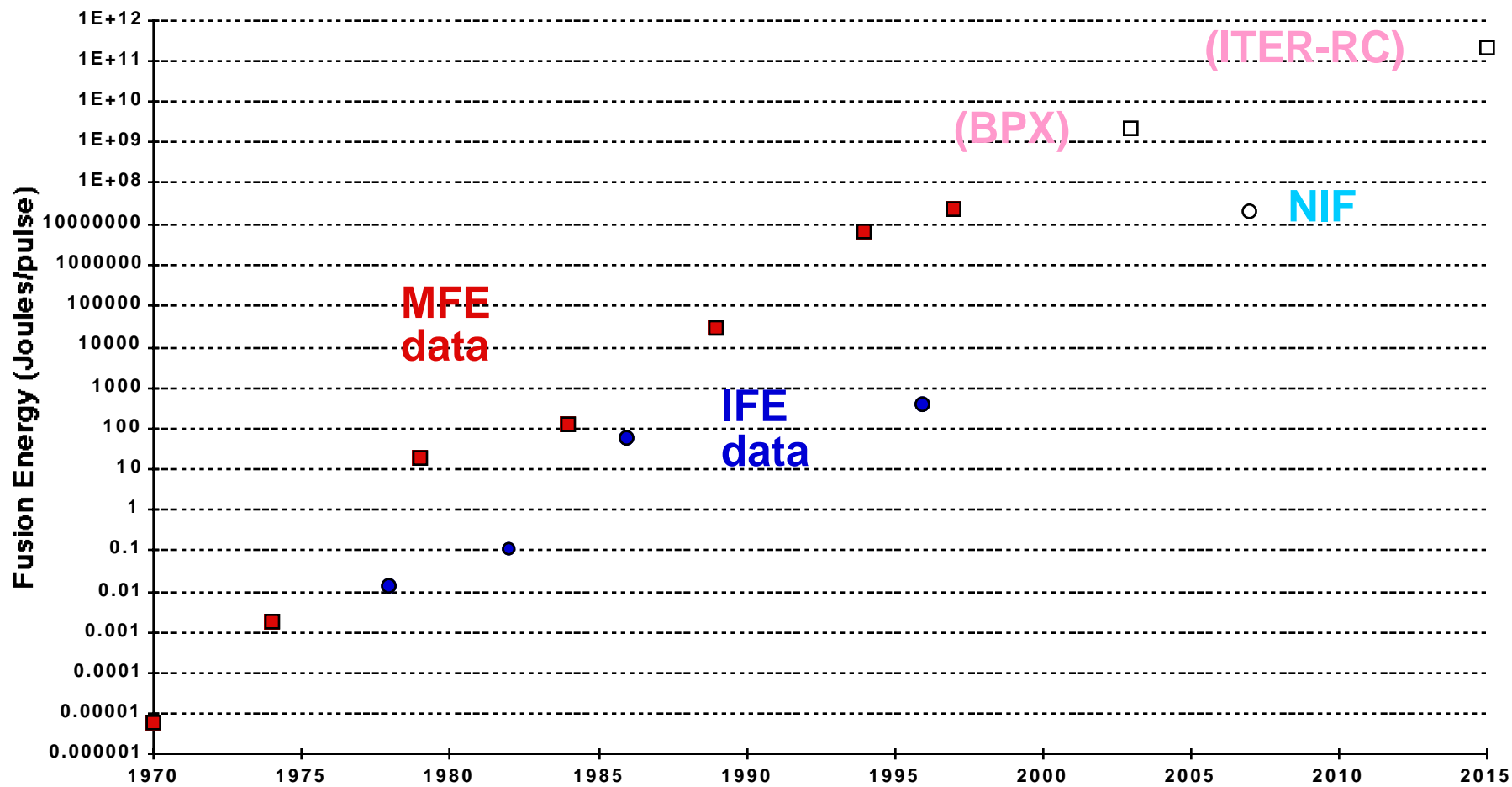
Why Fusion Energy?

- **Abundant fuel, available to all nations**
Deuterium and lithium
- **Environmental advantages**
No carbon emissions
Low radioactivity
- **Can't blow up, can't melt down**
< 5 minutes of fuel in plasma
- **Low risk of nuclear materials proliferation**
- **Concentrated relative to solar, wind, etc.**
Minimal land use
- **Not subject to daily, seasonal or regional weather variation**
No need for massive energy storage
No need for long distance transmission

Three Key Questions About Fusion

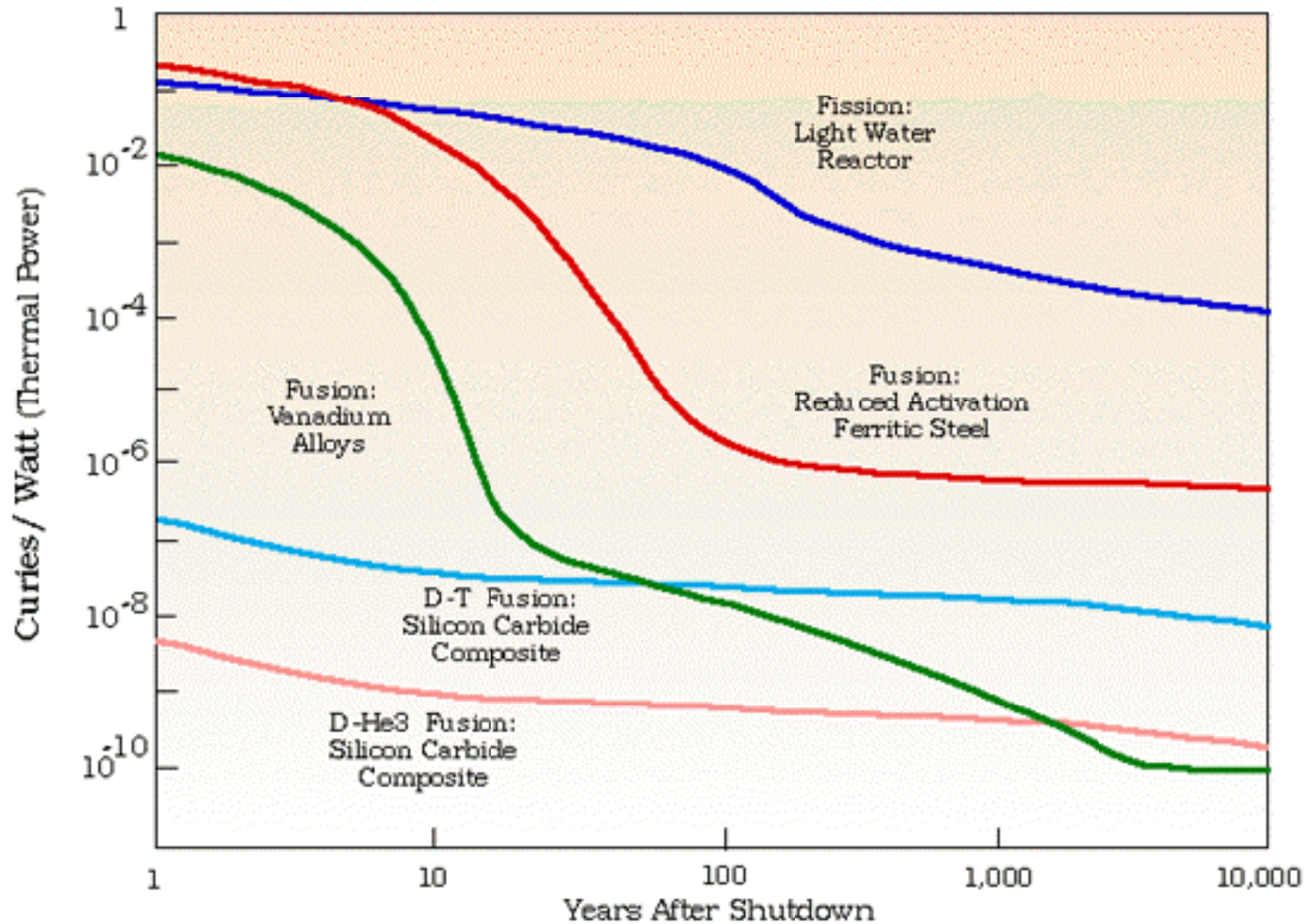
- **Can significant amounts of energy be made from fusion?**
- **Is fusion environmentally attractive?**
- **Are the fusion development path and the ultimate product affordable?**

Progress in Fusion Energy



Environmental Attractiveness of Fusion

Comparison of Fission and Fusion Radioactivity after Shutdown



Economic Attractiveness of Fusion

- **5-10 cents/kW-hr should be achievable with today's best concepts (MFE & IFE)**
- **Issues Include:**
 - Confirmation of scientific and engineering assumptions
 - Materials qualification

Advanced innovative concepts, in both MFE and IFE, are less certain – but may lead to more attractive fusion systems, so are an important part of the portfolio.

Three Key Questions About Fusion

- **Can significant amounts of energy be made from fusion?**

Significant amounts of energy have already been made from fusion – the main issue now is to develop an attractive fusion power system.

- **Is fusion environmentally attractive?**

Fusion will be clean – materials development and qualification must be pursued.

- **Are the fusion development path and the ultimate product affordable?**

Fusion will be affordable – innovative concepts may lead to even lower costs.

A Portfolio Approach to the Fusion Roadmap Is Recommended

- **A broad portfolio of concepts should be maintained at varying stages of development in both MFE and IFE, governed by a rigorous review process.**
 - Maximizes probability of finding the best solutions at the lowest overall cost.
 - Maximizes spin-offs to the Nation's science and technology base.
 - Prepares the Nation to take a major step in fusion energy development in the early 2000's.
- **This new fusion roadmap provides the programmatic basis for increased support for fusion energy research.**