

Global Nuclear Energy Partnership (GNEP)



American Nuclear Society



June 5, 2006



Vic Reis
Senior Advisor
Department of Energy

Outline



- What is the Global Nuclear Energy Partnership (GNEP)?
- Foreign Comments & Response
- National Nuclear Strategies      
- Alternative Strategies – (MIT, Garwin, UCS)
- GNEP Strategy & Technology
- Summary - The Nuclear Crisis

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What is GNEP?



This morning, I want to speak to you about one part of this initiative: our plans to expand the use of safe and clean nuclear power. Nuclear power generates large amounts of low-cost electricity without emitting air pollution or greenhouse gases.



....my Administration has announced a bold new proposal called the **Global Nuclear Energy Partnership**. Under this partnership, America will work with nations that have advanced civilian nuclear energy programs, such as France, Japan, and Russia. Together, we will develop and deploy innovative, advanced reactors and new methods to recycle spent nuclear fuel. This will allow us to produce more energy, while dramatically reducing the amount of nuclear waste and eliminating the nuclear byproducts that unstable regimes or terrorists could use to make weapons.

President George W. Bush
Radio Address: February 18, 2006

GNEP Has Two Simultaneous Goals



GNEP Goals

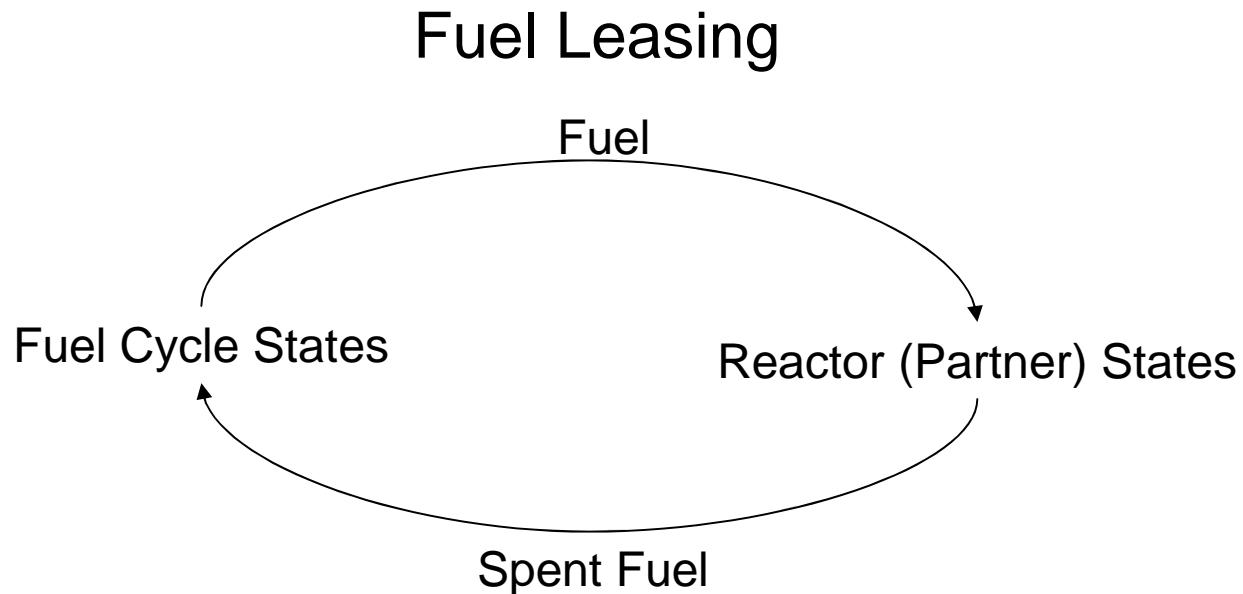
Lots of Nuclear Power
(1000 ~2000 GWyr by 2050)

Reduced Proliferation Risk

GNEP Principles:

- Global Issues require global solutions
- Spent Fuel is an **asset** to be managed – not a waste.

Key Non-proliferation Element of GNEP is Fuel Leasing



GNEP Fuel Leasing Principles:

- Encourage expansion of nuclear power
- Should make “commercial” sense
- Consistent with Nuclear Non-Proliferation Treaty

Suggestions for Fuel Leasing

EI Baradei



10/16/03

First, it is time to limit ..the production of new material through reprocessing and enrichment, by agreeing to restrict these operations exclusively to facilities under multinational control.

Third, we should consider multinational approaches to the management and disposal of spent fuel and radioactive waste



CARTER, KANTER, PERRY and SCOWCROFT **The New York Times** 12/22/03

The key is to draw a distinction between the right to a peaceful civilian nuclear power program and the right to operate a closed fuel cycle.. those countries seeking to develop nuclear power to generate electricity would agree not to manufacture, store or reprocess nuclear fuel



Pres Bush NDU Speech: *New Measures to Counter WMD*, 2/11/04

The world's leading nuclear exporters should ensure that states have reliable access at reasonable cost to fuel for civilian reactors, so long as those states renounce enrichment and reprocessing



Some References on Fuel Leasing



- 1) Choi & Isaacs “Toward New Nuclear Regime” LLNL report 2002?
- 2) Deutch, Kantor, Moniz, Poneman “ Making the World Safe for Nuclear Energy”
Survival Vol 46 , Winter 2004/05
- 3) Reis, Crozat , Choi & Hill “Nuclear Fuel Leasing, Recycling and Proliferation:
Modeling a Global View.” *Nuclear Technology* May 2005

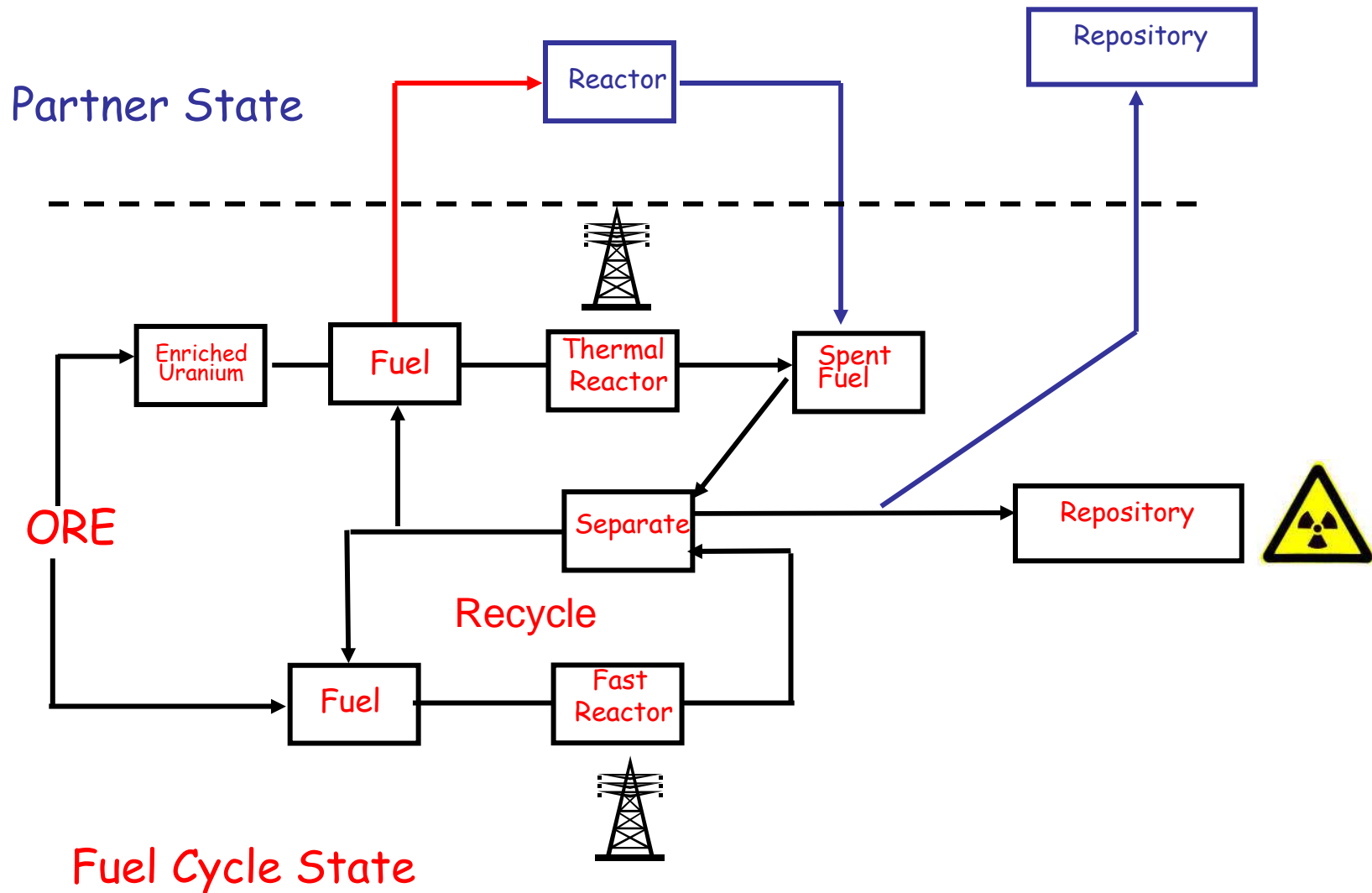


H. Bethe

“The Necessity of Fission Power” *Scientific American* 1976.

“An important additional safeguard would be to prevent the proliferation of nuclear chemical-processing plants since it is from those plants rather than from reactors that fissionable material could be diverted. A good proposal is that the chemical processing be centralized in plants for an entire region... **Another approach would be to have the country supplying the reactor lease the fuel to the customer country with the requirement that the used fuel be returned**” .

Possible Fuel Leasing Configuration



GNEP Process Just Beginning



Countries Approached by U.S. to be possible Fuel Cycle States

France – active follow-up

Japan – active follow-up

United Kingdom (In midst of Government Energy Study)

Russia – active follow-up

China - follow up May 22-23, 2006

~ 100 Countries briefed at International Atomic Energy Agency

Science Attaches briefed in DC:

Russia, UK, France, **China**, Japan, S. Korea, Canada, Italy, Switzerland, Finland, Germany, Australia, South Africa, Netherlands, Brazil, Argentina, Indonesia, Turkey, Greece, Croatia, Norway, Nigeria, Israel, Viet Nam

Detailed Discussion with Canada, South Korea

Open to discussions with all interested states.

International Response Positive

Public Responses related to GNEP



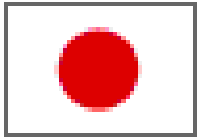
President Jacques Chirac (Jan 2006)

'I have decided to launch, as of now, a concept within the French Atomic Energy Commission (CEA), for a prototype fourth-generation reactor that will enter into service in 2020. Naturally, this will be in association with industrial or international partners who would like to be involved'.



President Vladimir Putin

ST. PETERSBURG, January 25 (RIA Novosti) - Global infrastructure should be established to give all interested countries access to nuclear energy with reliable guarantees that the nuclear non-proliferation regime will be observed, President Vladimir Putin said Wednesday. Putin said Russia was ready to build an international center "to offer nuclear fuel cycle services, including [uranium] enrichment under the control of the IAEA".



February 7th 2006

Japan's view on the United States' Global Nuclear Energy Partnership (GNEP)

The Government of Japan welcomes the United States' new initiative to enhance the worldwide development and expansion of nuclear power generation while ensuring nuclear non-proliferation.

It is particularly noteworthy that this initiative indicated clearly the orientation of the US nuclear policy towards the promotion of spent fuel recycling in order to increase the energy efficiency and reduce the volume of radioactive waste.

The Government of Japan will study further this initiative with a view toward identifying the potential areas of cooperation.

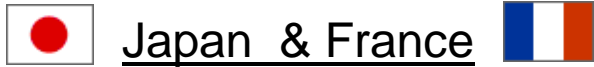
Cabinet Office
Ministry of Foreign Affairs
Ministry of Education, Culture, Sports, Science and Technology
Ministry of Economy, Trade and Industry

GNEP Approach Consists of Multiple Elements



- “Harmonize” Country Policies and Strategies
 - Common Vision
 - Compatible Country Strategies
 - Develop Cooperative Programs
 - Scientific Research
 - Technology Demonstrations
 - Personnel Exchange
 - Develop Fuel Cycle Regime
 - Commercial Deals
 - Fuel Banks
 - Interim Storage
- } Build on Generation 4, AFCI
Current bi-lateral & multilateral agreements.

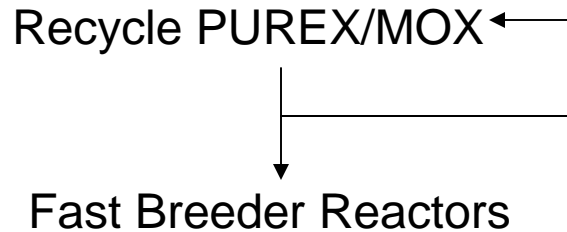
Current National Strategies



Japan & France

Maintain LWR
Export LWR

Interim Storage



Disposition =
Spent Fuel -(U +Pu)

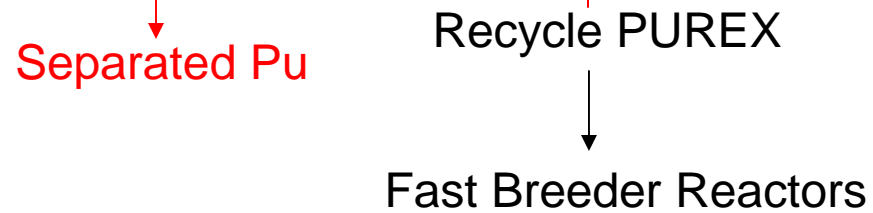
- Issues:
- Disposition,
 - Cost of FBR



Russia

Expand LWR
Export LWR

Interim Storage (international)



Disposition =
Spent Fuel -(U +Pu)

- Infrastructure
- Disposition,
- Cost of FBR

Current National Strategies



China

Expand LWR (a lot)

Interim Storage

Recycle PUREX



Fast Breeder Reactors

Disposition =
Spent Fuel $-(U + Pu)$

- Infrastructure
- Disposition,
- Cost of FBR



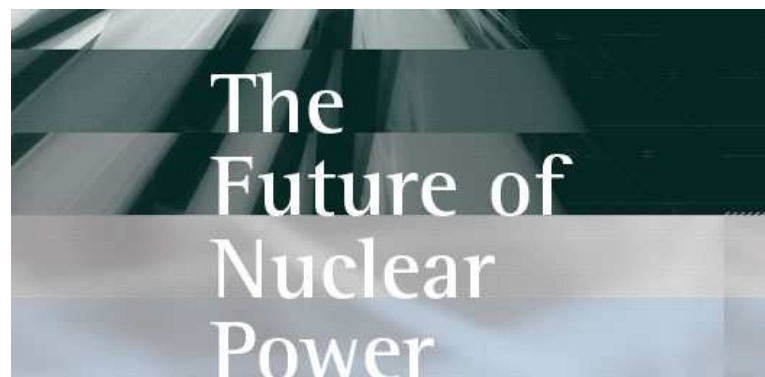
UK

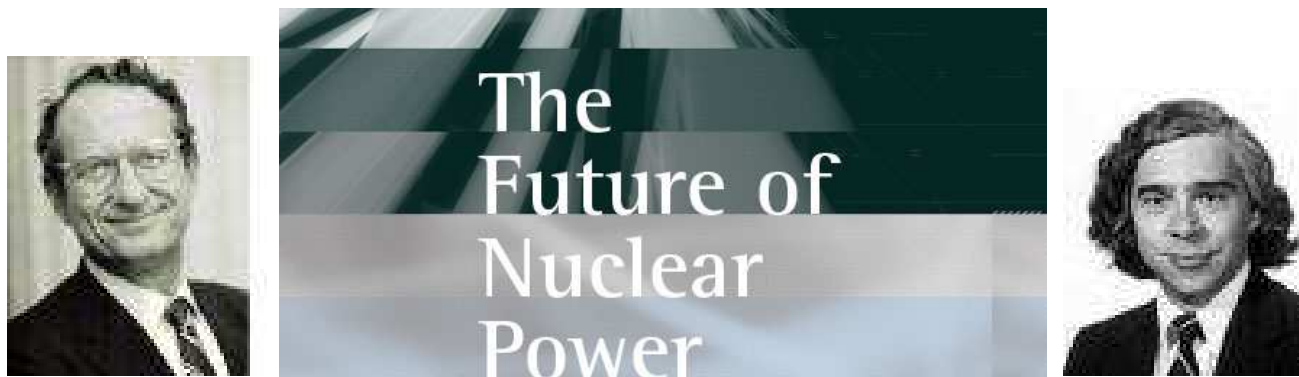
Await Energy Study

In his speech at a CBI dinner last night, Blair said nuclear plants were back on the agenda “with a vengeance” in the bid to tackle climate change and dependence on unreliable fossil fuel supplies.

17th May 2006

Alternative (NGO) Nuclear Power Strategies





MIT RELEASES INTERDISCIPLINARY STUDY ON "THE FUTURE OF
NUCLEAR ENERGY"

*Professors John Deutch and Ernest Moniz Chaired Effort to Identify
Barriers and Solutions*

for Nuclear Option in Reducing Greenhouse Gases

July 29, 2003

Washington, D.C. – A distinguished team of researchers from the Massachusetts Institute of Technology (MIT) and Harvard released today what co-chair Dr. John Deutch calls "the most comprehensive, interdisciplinary study ever conducted on the future of nuclear energy."

The report maintains that "The nuclear option should be retained precisely because it is an important carbon-free source of power."

MIT Study Recommended Strategy



Bottom Lines (Deutsch)



Expand LWR - production tax credits

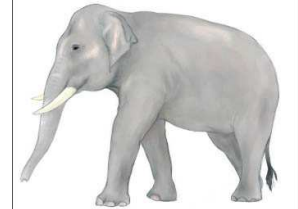
Interim Storage

R&D on recycle (especially simulation)

Disposition = Spent Fuel

Yucca Mountain/Deep Bore Holes

1. Nuclear Power essential as a tool to alleviate global warming
2. Will need government support to get nuclear re-started: finance
3. **No need to recycle now ~ decades away**
4. Begin Fuel Leasing Regime



Alternative NGO Nuclear Strategies



Garwin

UCS

Expand LWR

Expand Search for U
(seawater)

No Recycle
Anywhere

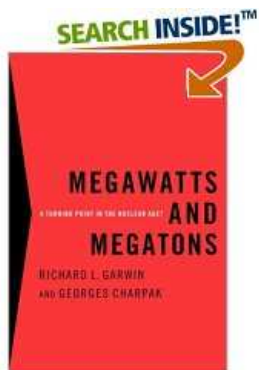
Interim Storage – 100 years

Research on Fast Reactors

(Likes Fuel Leasing)

Disposition:
Spent Fuel
Competitive Commercial
Mined Repositories


http://www.ucsusa.org/global_warming/





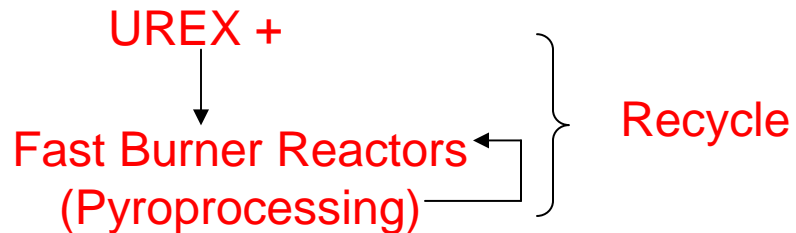
Proposed GNEP Strategy for U.S.



MIT Study 

Expand LWR → NP-2010/Energy Policy Act
Export (L)WR → Small Reactors

Spent Fuel Management



No separated Plutonium
Little Transuranic Waste

Disposition =
Spent Fuel - (U+C/S+ Actinides)
Yucca Mountain (1)



AFCI
Gen 4

Burt Richter

Issues With US GNEP



Cost of Separation

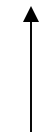
Transuranic Fuel

Cost of Burner Reactor



Demonstrations

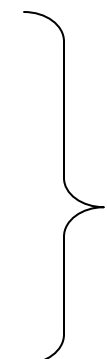
Robust R&D



(Especially Simulations!)

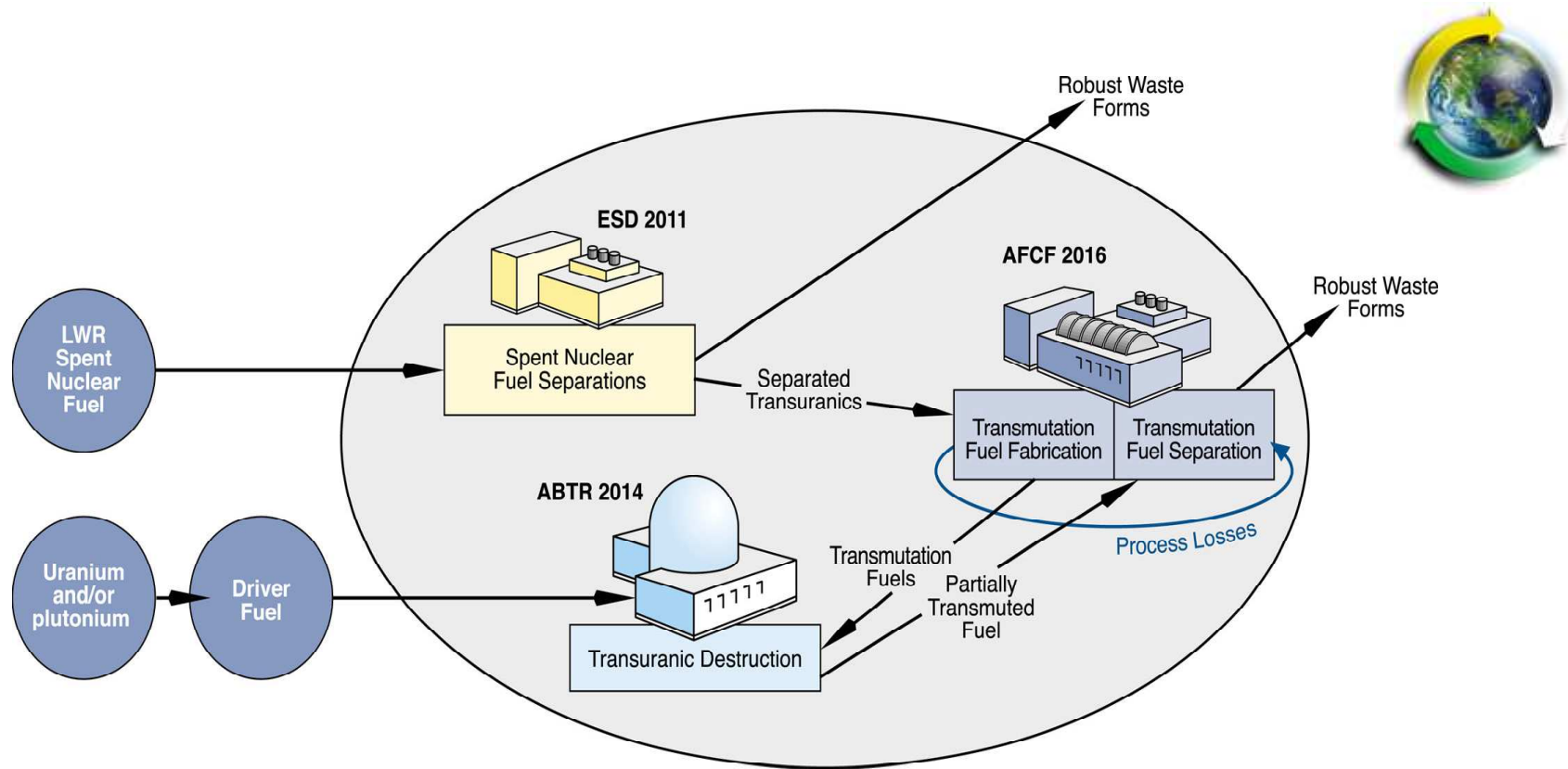
An Integrated Approach:

- Domestic/International
- DOE: NE/RW/SC/NA
- DOE Labs (9)
- Industry
- Universities



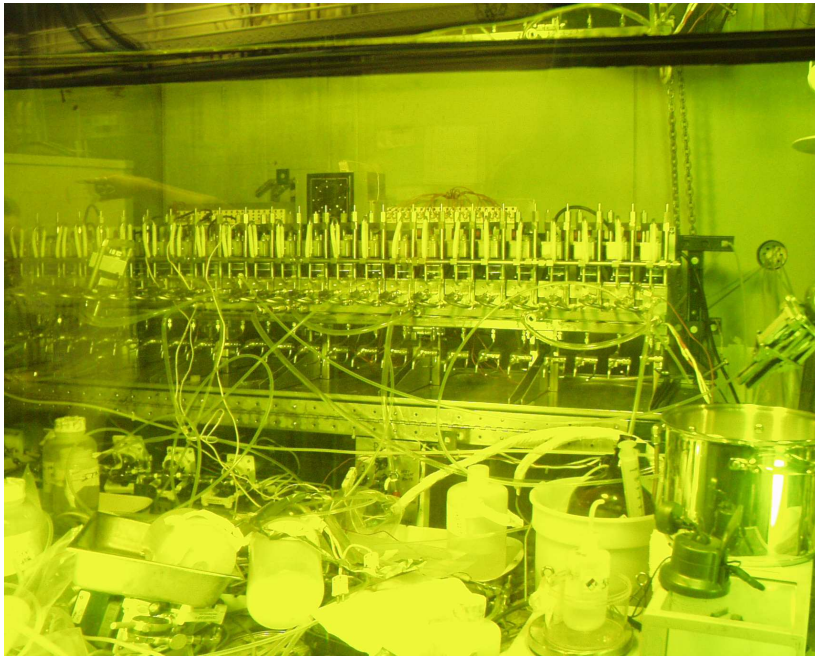
A DOE Leadership
and Management
Challenge

Proposed U.S. GNEP Technology Demonstration Facilities



Available for Cooperative Research

Separation Technology Based Upon Centrifugal Contactors

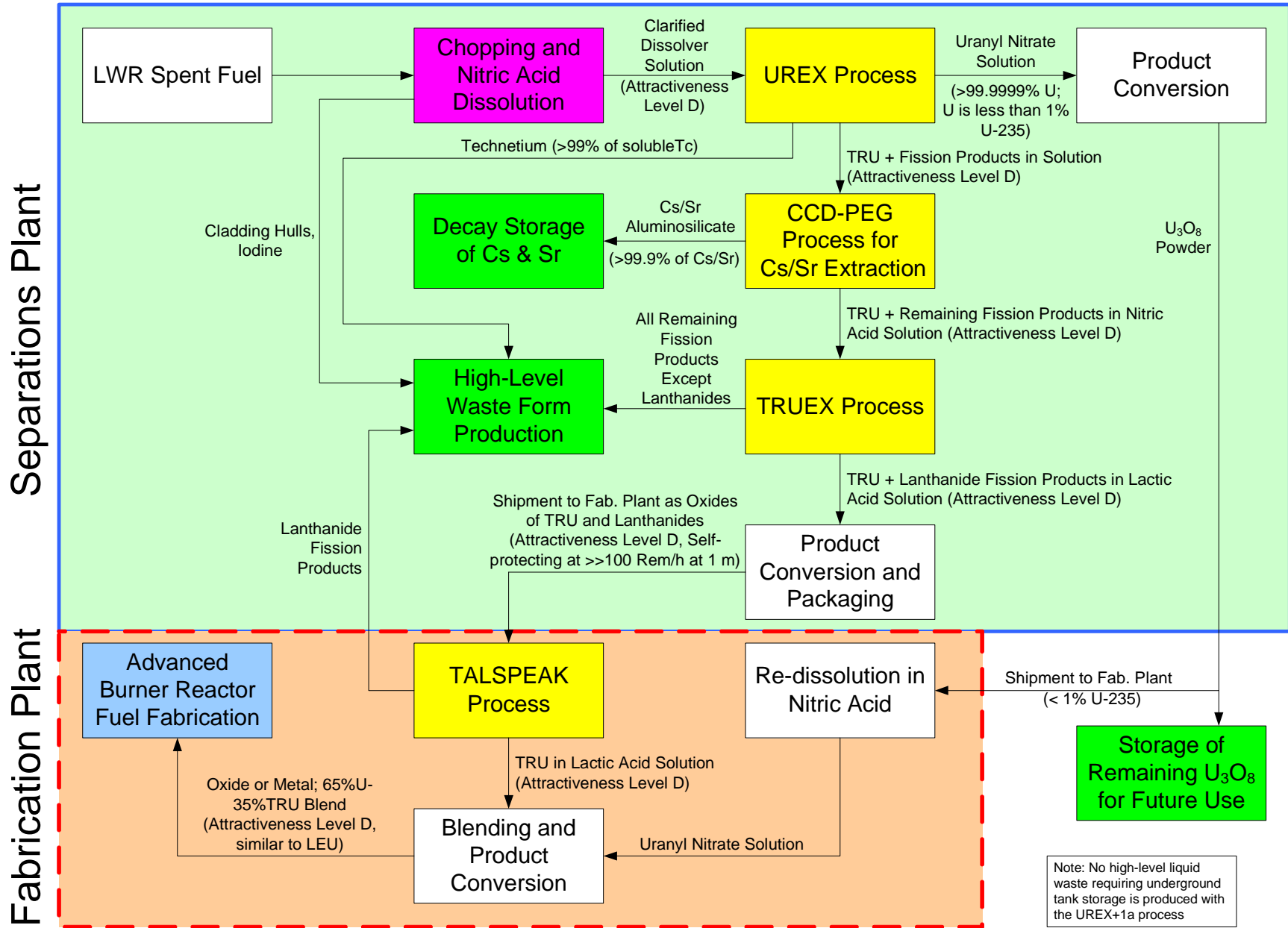


24 stage 2-cm Centrifugal Contactor
in Hot Cell

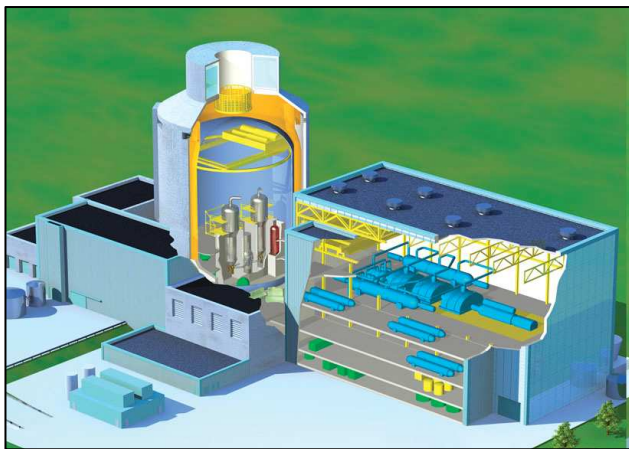


- Continuous
- Flexible
- “No” liquid waste

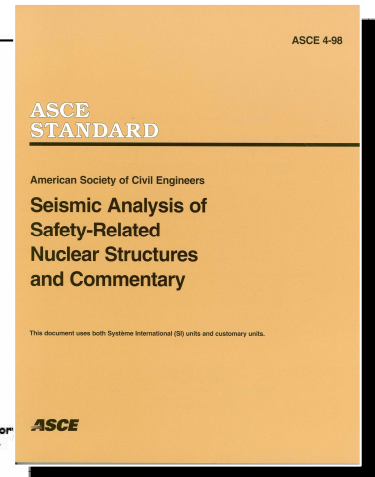
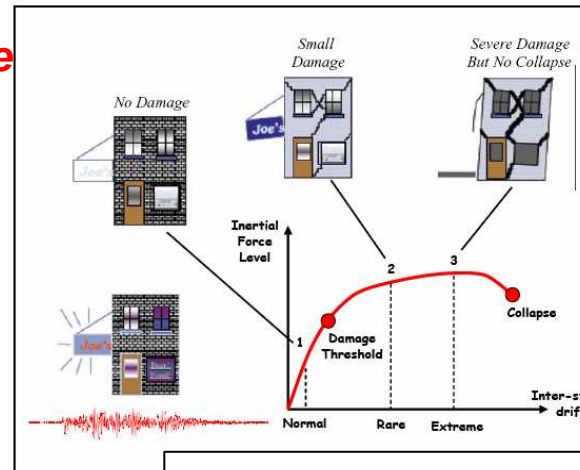
GNEP Advanced Separations: UREX+1a



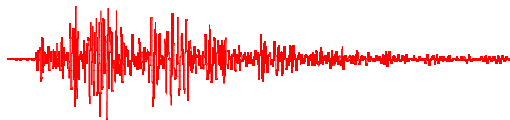
Potential Collaborations on Earthquake Safety related topics for Nuclear Power systems - U.S./Japan



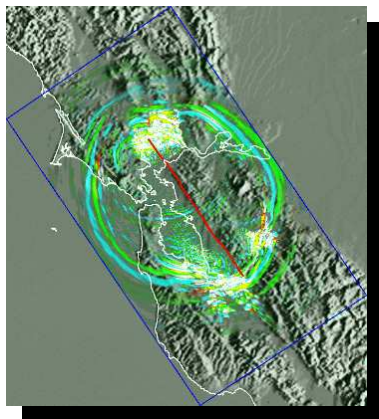
Performance Based Design



$$P_F = \int P(PO|HAZARD)d(HAZARD)$$



Advanced Simulations



Technology Validation



U.S. Base Isolators



Japan's E-Defense

Global Nuclear Energy Partnership – Role of United States



To the making of these fateful decisions, the United States pledges before you--and therefore before the world--its determination to help solve the fearful atomic dilemma--to devote its entire heart and mind to find the way by which the miraculous inventiveness of man shall not be dedicated to his death, but consecrated to his life.

Dwight D. Eisenhower “Atoms for Peace” December 8, 1953



A time for action!

行動を伴わない構想は夢であり
構想の無い行動は悪夢である。



日本の格言

A vision without action is a dream,
Action without vision is a nightmare
Japanese Proverb

“ For glory gives herself only to those who have always dreamed of her.”

“You have to be fast on your feet and adaptive or else a strategy is useless.”

Charles de Gaulle



Global Nuclear Energy Partnership



水漲船高

When the tide rises, boats float higher



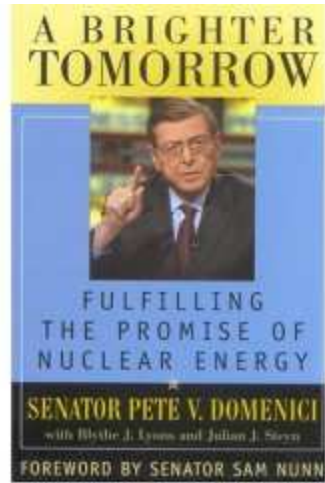
Admiral Zheng He

To have friends coming in from afar, how delightful!

有朋自远方来，不亦乐乎！



GNEP: Role of United States



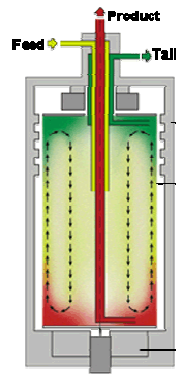
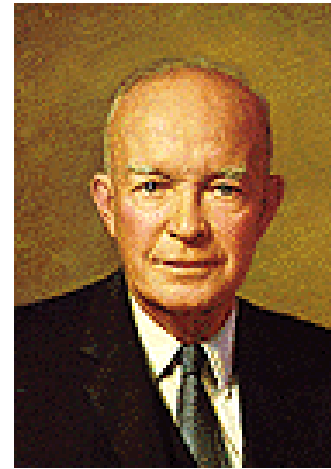
Provide Leadership

Summary: Nuclear Energy is in a Crisis

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Danger

Opportunity



Nuclear Technology will always be in crisis

GNEP represents a unique opportunity for international leadership, shaping the future, an organizing principle for 21st century civilization - "Atoms for Peace!"