

# ***USNRC Fuel Cycle Information Exchange***



## **The Global Nuclear Energy Partnership**

### **Program Overview**

**Buzz Savage  
GNEP Fuel Cycle R&D Director  
Office of Nuclear Energy**

**June 12, 2007**



# Outline

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- GNEP Vision, Goals and Objectives
- GNEP Domestic Plan Elements
- GNEP International Plan Elements
- Conclusion

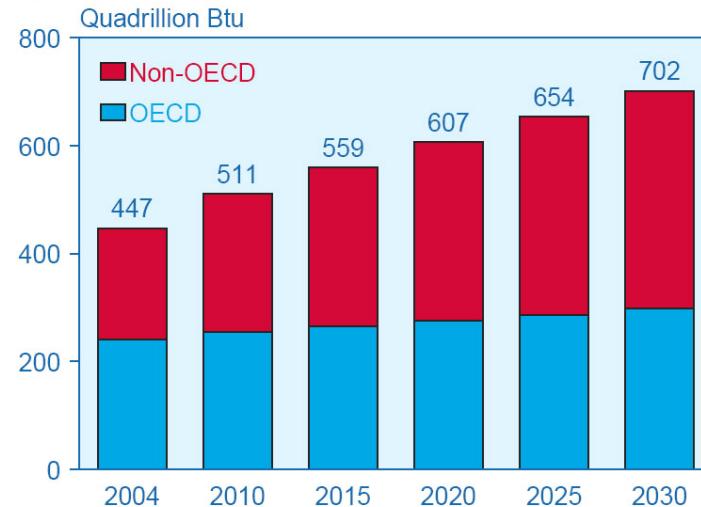




# The amount of energy the world will need is enormous

- World market energy consumption to increase by 57% through 2030
- Total energy demand in non-OECD countries will increase by 95 % compared to 24% in OECD.
- Uncertainty of supply and price of natural gas and volatility of oil
- Challenge of lowering greenhouse gas emissions and mitigating global warming

World Marketed Energy Consumption by Region, 2004-2030



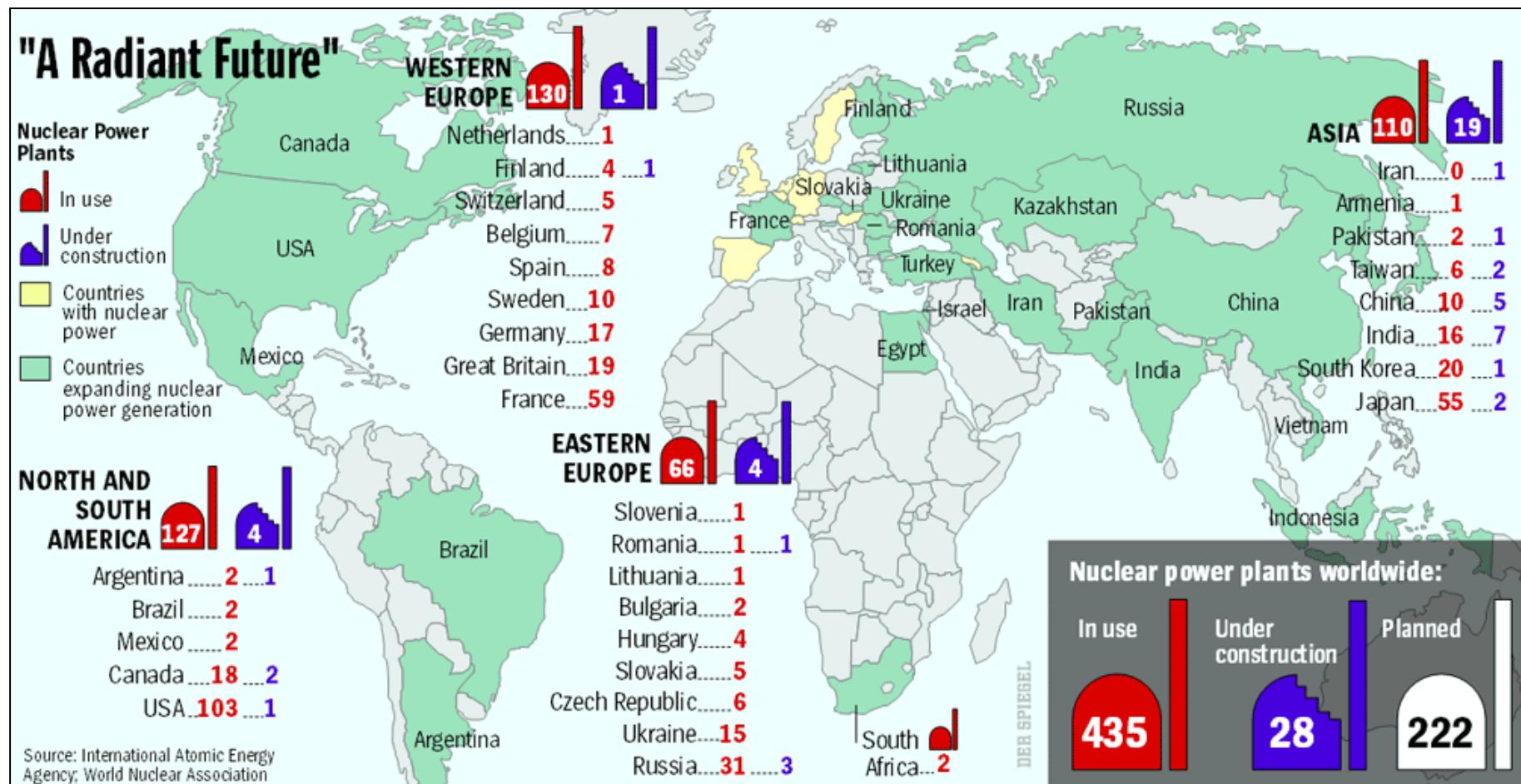
Sources: 2004: Energy Information Administration (EIA), *International Energy Annual 2004* (May-July 2006), web site [www.eia.doe.gov/iea](http://www.eia.doe.gov/iea). Projections: EIA, System for the Analysis of Global Energy Markets (2007).

*The world is turning increasingly to nuclear energy for sustainable energy development .*





# Global Expansion of Nuclear Power is Underway; Doubling of Demand Expected by 2050



June 12, 2007

<http://www.spiegel.de/international/spiegel/0,1518,460011,00.html>

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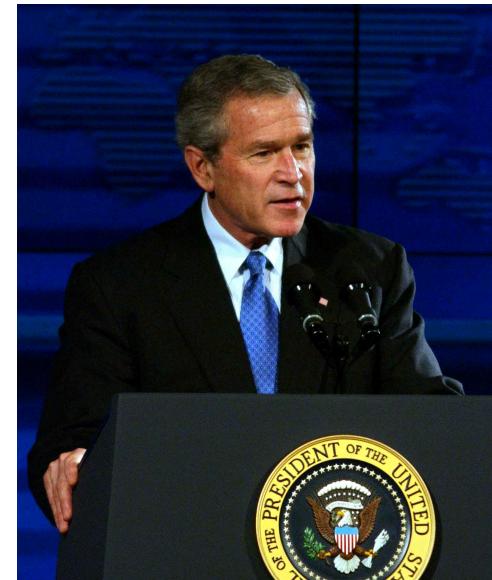
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# Global Nuclear Energy Partnership launched in February 2006

- GNEP is part of the President's Advanced Energy Initiative
  - GNEP proposed to establish the foundation for safe and secure expansion of nuclear energy in the U.S. and worldwide
  - President's FY 2007 budget proposed \$250M. \$167.5M authorized
  - FY 2008 budget proposes \$405M, including \$10M for development of advanced safeguards technologies



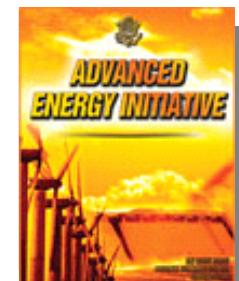
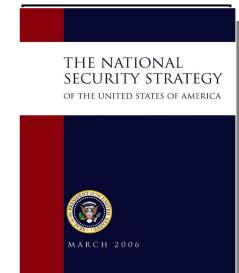
*“...my Administration has announced a bold new proposal called the Global Nuclear Energy Partnership...we will develop and deploy innovative, advanced reactors and new methods to recycle spent nuclear fuel.”*





# GNEP is a Strategy to Support Civilian Nuclear Power Expansion Worldwide

- **Expand use of nuclear power**
- **Minimize nuclear waste**
- **Develop and deploy recycle technology**
- **Develop and deploy advanced recycling reactors**
- **Establish reliable fuel services**
- **Support grid-appropriate exportable reactors**
- **Enhance nuclear safeguards technology**



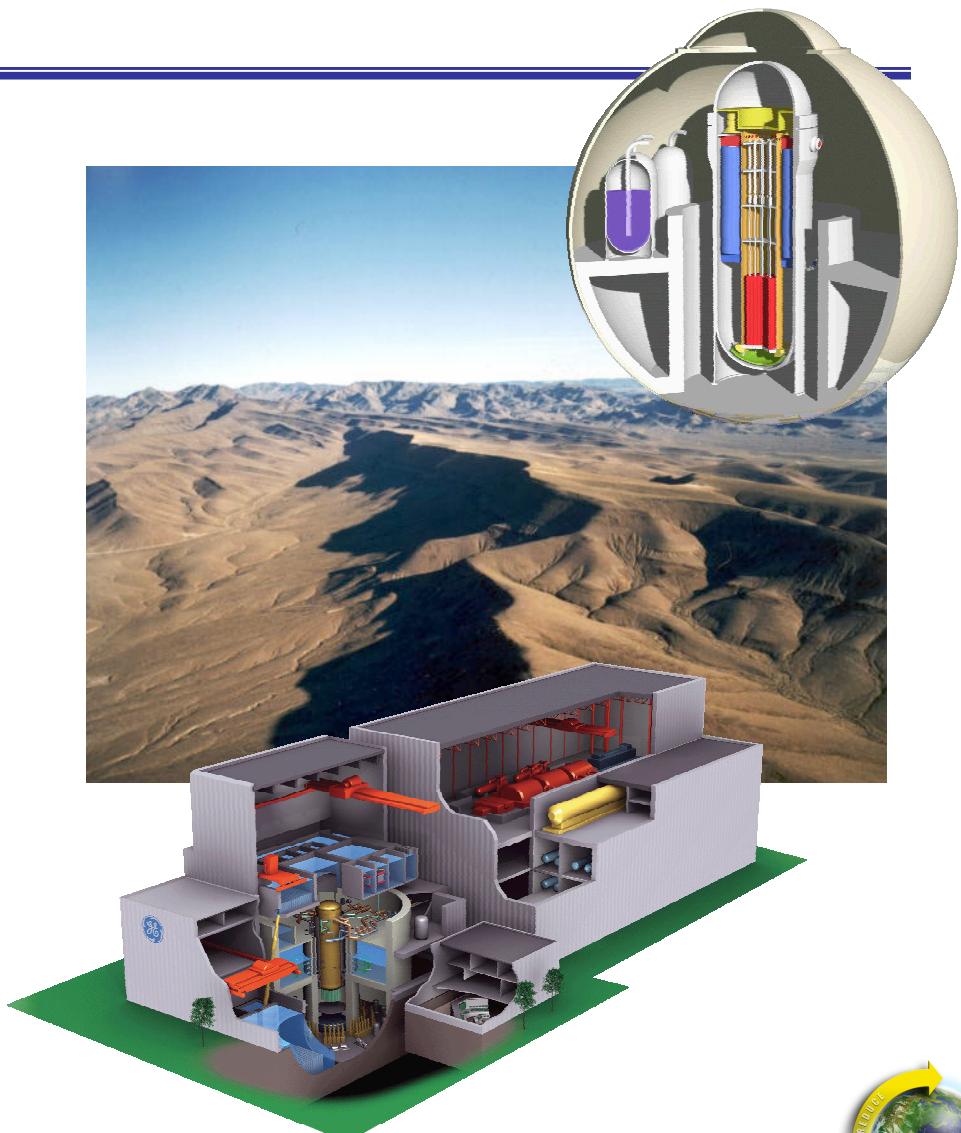
*The goal of the Global Nuclear Energy Partnership (GNEP) is the expansion of nuclear energy for peaceful purposes worldwide in a safe and secure manner that supports clean development without air pollution or greenhouse gases, while reducing the risk of nuclear proliferation. - GNEP Statement of Principles*





# Elements of GNEP support global expansion of nuclear power

- Continue work to encourage new nuclear plants in the U.S.
- Advanced proliferation resistant technologies for recycling spent nuclear fuel
- Advanced reactors that consume transuranic elements from recycled spent fuel
- Reliable international fuel supply
- Enhanced nuclear safeguards technologies
- Advanced exportable reactor technologies





## Key Elements of the U.S. Nuclear Energy Strategy Include Domestic Efforts:

- Expand nuclear power to help meet growing energy demand in an environmentally sustainable manner.
- Develop, demonstrate, and deploy advanced technologies for recycling spent nuclear fuel that do not separate plutonium, with the goal over time of ceasing separation of plutonium and eventually eliminating excess stocks of civilian plutonium and drawing down existing stocks of civilian spent fuel. Such advanced fuel cycle technologies will substantially reduce nuclear waste, simplify its disposition, and help to ensure the need for only one geologic repository in the United States through the end of this century.
- Develop, demonstrate, and deploy advanced reactors that consume transuranic elements from recycled spent fuel.





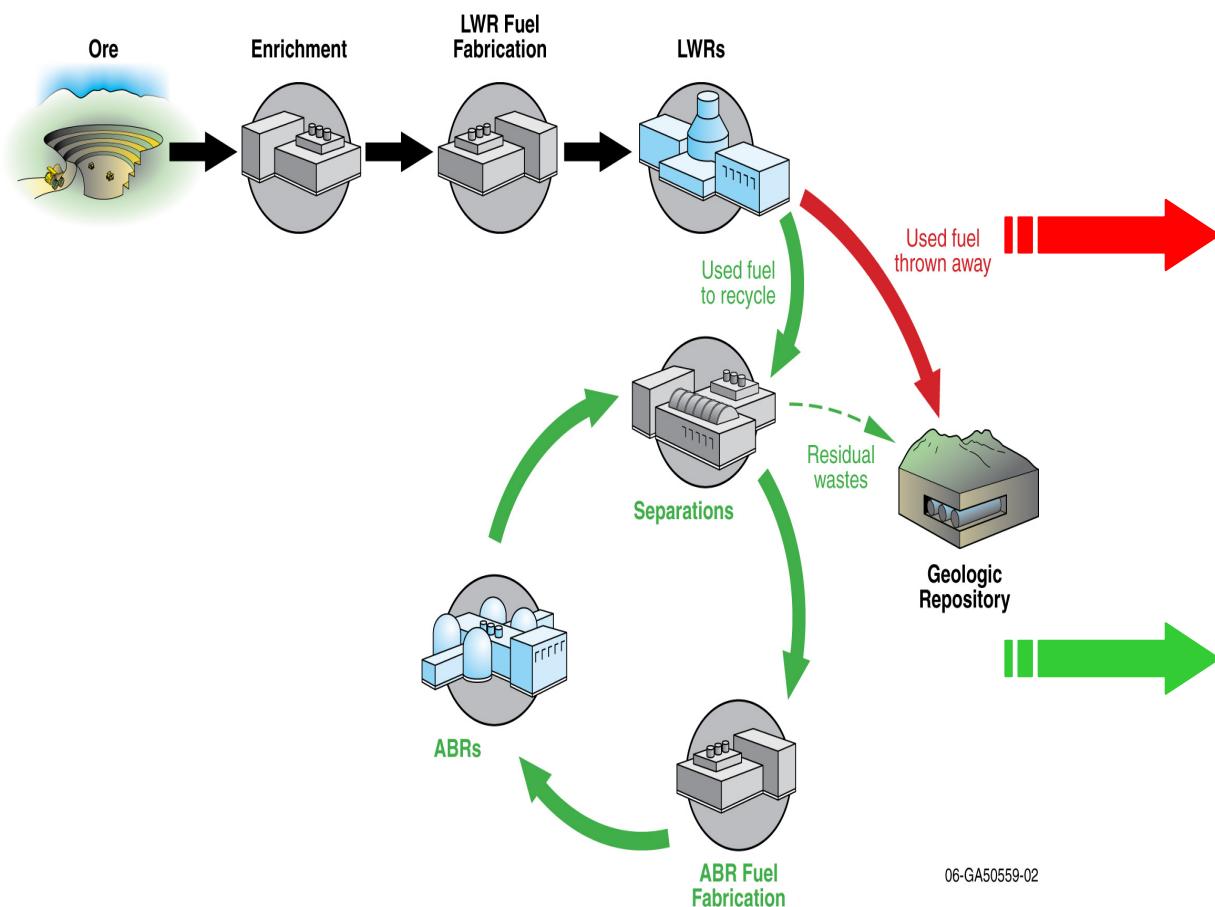
# The GNEP Strategic Plan Calls for Specific Actions Supported by an Appropriate Management Structure

- Obtain input from U.S. and international industries and governments on how best to bring the needed GNEP facilities into being, what technology and policy issues must be resolved, and what business obstacles must be overcome.
- Develop a detailed GNEP technology roadmap for demonstrating solutions to the remaining technical issues in order to support commercial GNEP facilities. Inform and adjust this roadmap with input received from industry, international partners, and the policy community.
- Pursue industry participation in the development of conceptual design and other engineering studies that support both a nuclear fuel recycling center and an advanced recycling reactor.
- Prepare a programmatic GNEP Environmental Impact Statement.
- No later than summer 2008, prepare a decision package for the Secretary of Energy to proceed with a government-industry partnership to build a nuclear fuel recycling center and a prototype advanced recycling reactor





# Potential for Large Domestic Waste Management Benefit of Recycle



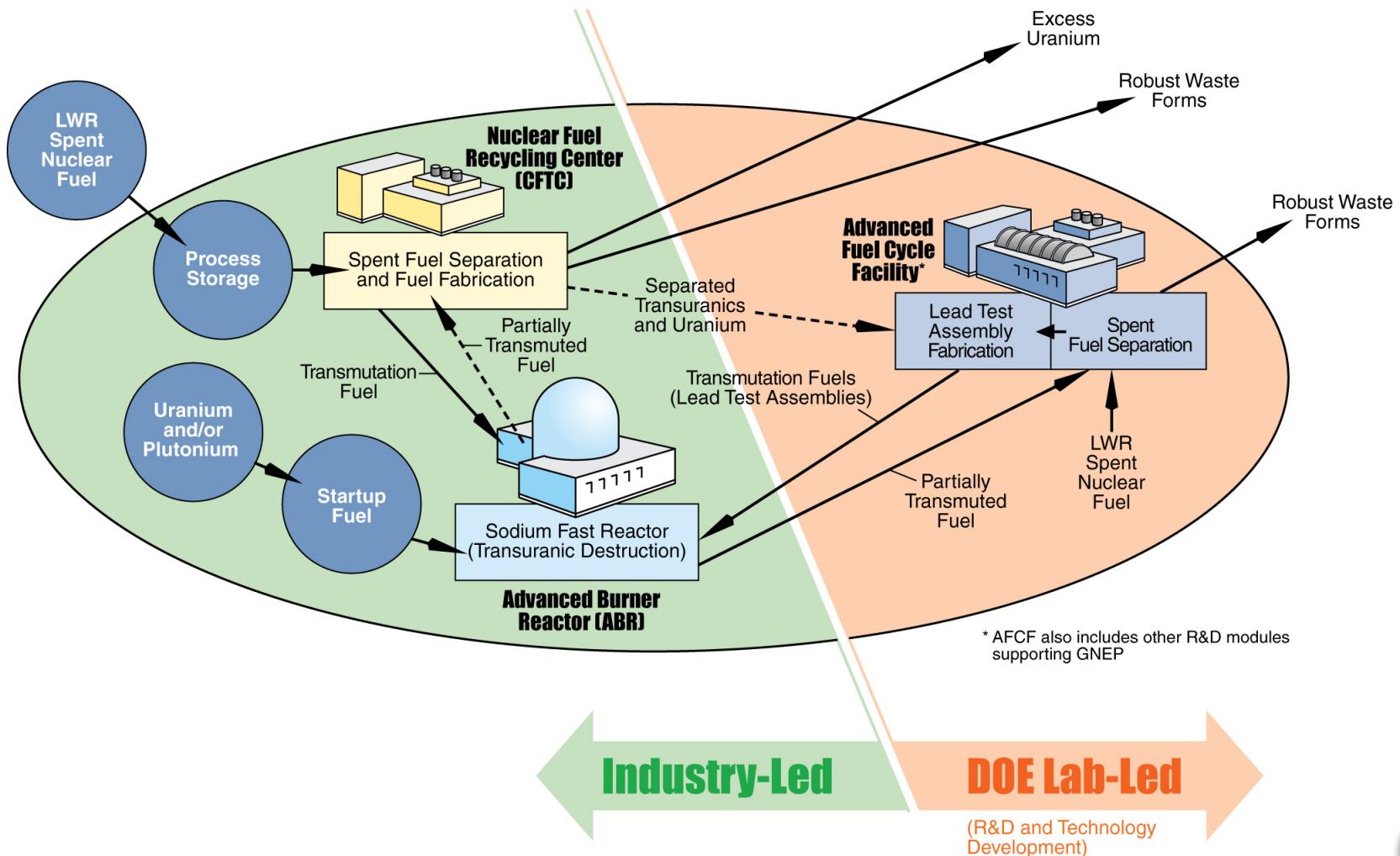
**Once-Thru  
Requires multiple  
repositories by 2100**

**GNEP Recycle  
May need only one  
repository thru 2100**





# Industry participation is critical to success of domestic program



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11





## Industry to lead GNEP technology deployment studies

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- Scoping studies at 11 sites completed earlier this year. Reports available on our website, [www.gnep.energy.gov](http://www.gnep.energy.gov)
- Funding Opportunity Announcement issued to Industry in May 2007 requesting proposals for deployment studies to address:
  - Business plan
  - Technology development roadmap
  - Conceptual design studies
  - Communications plan
- 3-6 awards totaling \$60M anticipated by September 2007
  - Integrated technical and business approaches to receive preferential consideration
  - Initial reports to be completed by January 2008





# The GNEP Plan Requires Industry Supported by Technology Development

- The current plan is to have commercial-scale fuel recycling and demonstrate the closed fuel cycle in the U.S. as early as possible (2020 - 2025)
  - Building commercial-scale prototypes of recycling and fast reactor facilities will require Technology Development
    - *Industry led design and construction, operation*
    - *Laboratory led work to close technology gaps in fuel cycle knowledge and to develop and transmutation fuel*
    - *Expect NRC to license both facilities*
- Supporting this approach requires both Technology Development and R&D, led by the DOE national laboratories
  - Technology Development will support work needed for design and construction of ABR, CFTC, and AFCF
  - R&D focus on longer-term activities supporting fuel-cycle development and implementation





# GNEP is Placing Effort on Work to Inform a mid- 2008 Secretarial Decision

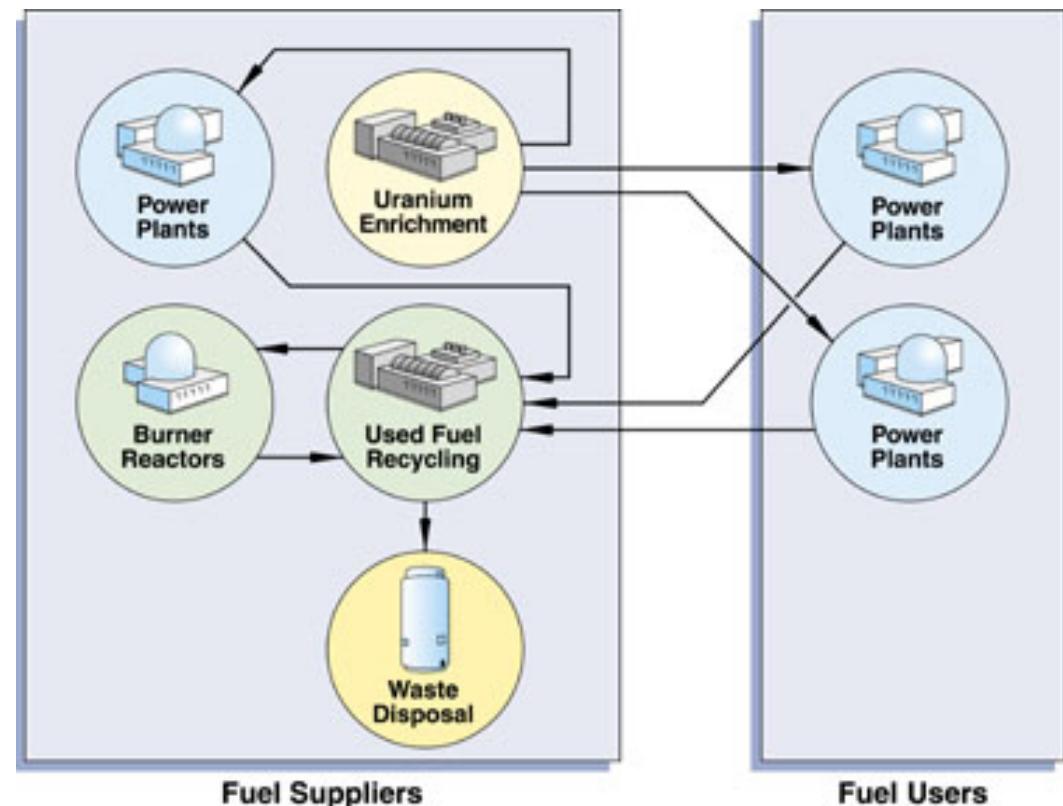
- **Decision could take several forms, some options might be:**
  - Continue R&D only
  - Engineering scale demonstration facilities and supporting R&D
  - Commercial scale facilities with Technology Development and supporting R&D
- **Engage industry to provide:**
  - Conceptual Design Studies to give Cost, Scope, Schedule, and Risk for ABR and CFTC
  - Required technology development
  - Business Plan
- **AFCF must provide Cost, Scope, and Schedule information**
- **Technology Demonstration plan and industry input must be integrated to develop technology roadmap**





# Key International Elements of GNEP Augment and Support Nonproliferation Efforts

- Establish supply arrangements among nations for reliable fuel services to avoid the need for enrichment and reprocessing technologies.
- Develop, demonstrate, and deploy advanced, proliferation resistant nuclear power reactors
- Develop, in cooperation with the IAEA, enhanced nuclear safeguards
- Over time, promote ending separation of plutonium, eventually eliminating excess stocks of civilian plutonium





# GNEP International Engagement and Partnership Development Activities

- Engaged with advanced fuel cycle countries, reactor and candidate reactor countries since February 2006 GNEP announcement.
  - (e.g., Russia, China, France, UK, Japan, South Korea, Canada, Australia, Germany, Argentina, Brazil, Indonesia, Philippines, Ukraine, Nigeria, Ghana, South Africa, Vietnam, Malaysia, Poland, Bahrain, Jordan, Mexico).
- US and 5 other supplier nations proposed a reliable fuel supply initiative at the IAEA in September 2006.
- Developed and circulated Statement of Principles for GNEP
- US, Japan, France, Russia, and China with UK and IAEA observers met in Ministerial meeting with the Secretary of Energy on 5/21/2007 in DC to state commitment to GNEP





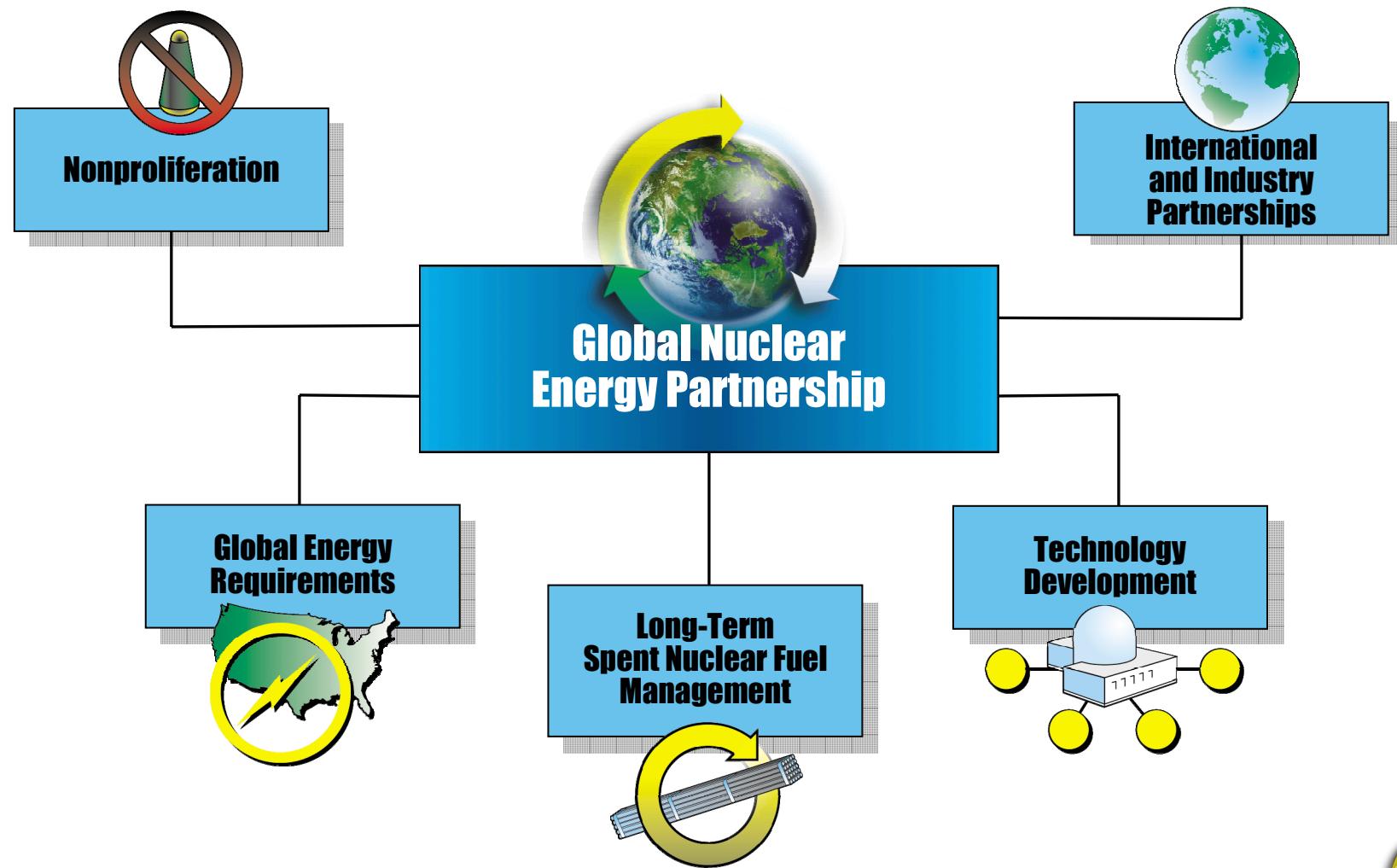
# International Technical Cooperation

- **US-Russia Action Plan submitted to Presidents Bush and Putin Dec 2006**
  - Advanced nuclear fuel cycle cooperation technical meetings underway
- **US-Japan Nuclear Energy Action Plan finalized in April 2007**
  - **Key Areas:** GNEP R&D, construction of new nuclear power plants, assured fuel supply, cooperation with other countries
- **US-France Action Plan (currently being drafted)**
- **US-South Africa Nuclear Energy R&D Agreement (Ready for signature)**
- **US-Indonesia MOU (currently being negotiated)**
- **Other possibilities: China, UK**
- **Other relevant technical cooperation:**
  - I-NERIs with France, Japan, South Korea
  - Advanced fuels and fast reactor collaborations under the Generation IV International Forum
  - INPRO





# GNEP is Addressing the Complete Nuclear Fuel Cycle



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18





# Conclusion

- International support for GNEP is strong and moving forward
- Significant effort over the next year
  - Programmatic Environmental Impact Statement underway that examines technologies and locations for siting the technologies
  - Industry deployment studies to be launched this year
  - National laboratories will help respond to key technology challenges
  - Conceptual design for advanced fuel cycle research facility in progress
- Moving to a closed fuel cycle is a natural evolution for the U.S. and is necessary

