

The Global Nuclear Energy Partnership (GNEP) and Nonproliferation



Buzz Savage

*Associate Deputy Assistant Secretary for Fuel Cycle Technology
Office of Nuclear Energy
U.S. Department of Energy*

June 24, 2008



Outline

- **The Global Nuclear Energy Partnership Program**
 - GNEP Program overview
- **GNEP International Program**
 - Focus on Reliable Fuel Services
- ***U.S. GNEP Safeguards Campaign***

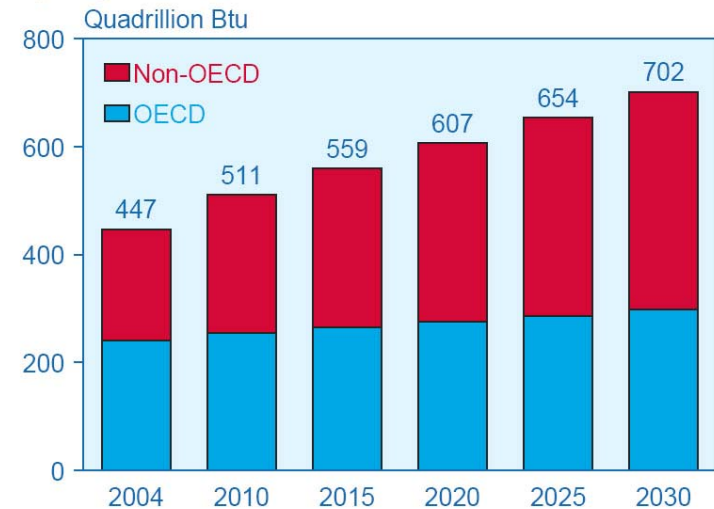




World energy demand is growing substantially, especially in developing nations

- World energy consumption is predicted by the Energy Information Administration to increase by 57 percent through 2030.
- Total energy consumption in non-OECD countries will increase by 95 percent compared to 24% in OECD.
- Supply and price of natural gas and volatility of oil prices add uncertainty to their use.
- Mitigating global climate change requires lowering greenhouse gas emissions.

World Marketed Energy Consumption by Region, 2004-2030

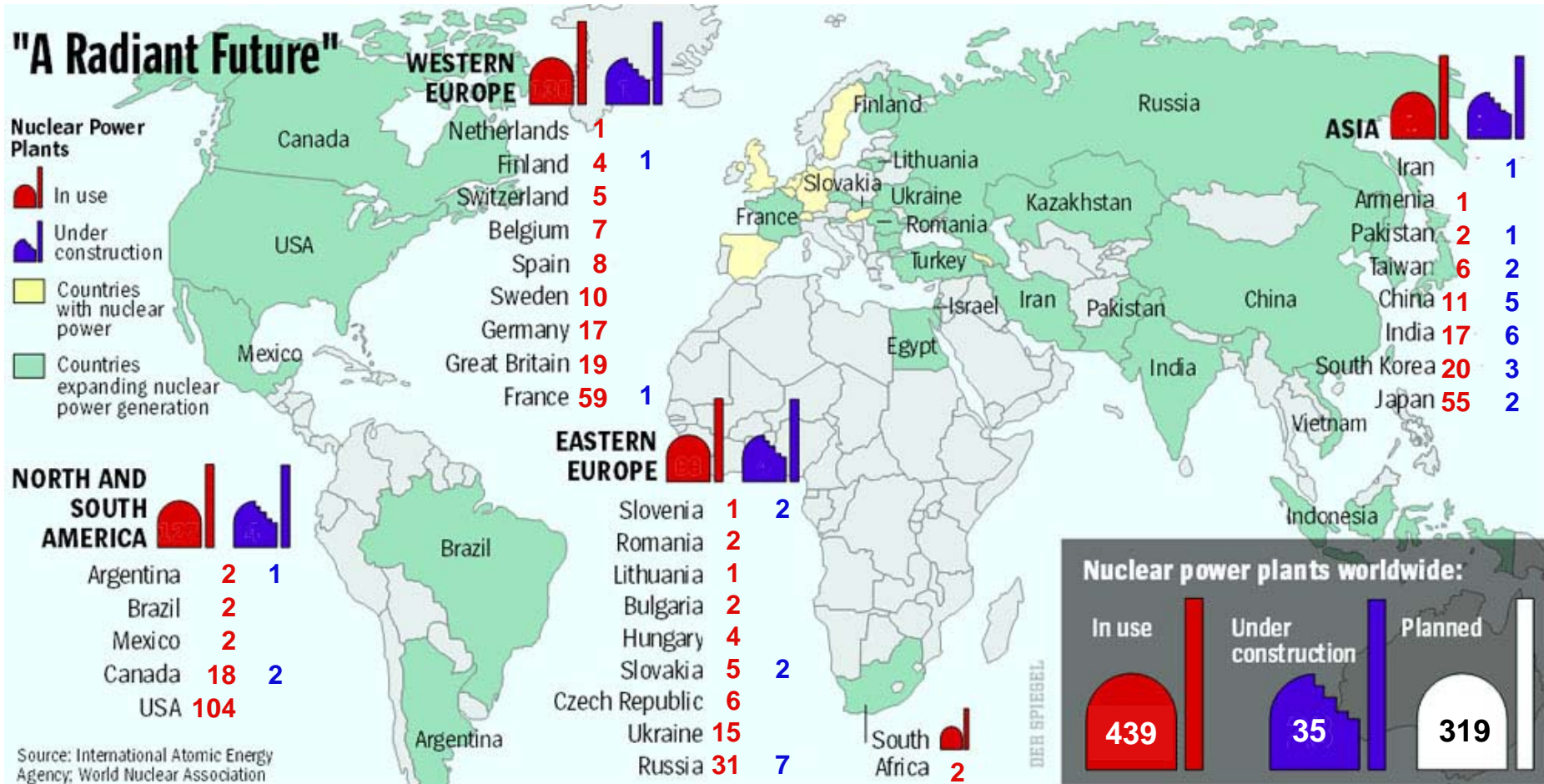


Sources: **2004:** Energy Information Administration (EIA), *International Energy Annual 2004* (May-July 2006), web site www.eia.doe.gov/iea. **Projections:** EIA, *System for the Analysis of Global Energy Markets* (2007).





International expansion of nuclear power to help meet the energy demand is underway



<http://www.spiegel.de/international/spiegel/0,1518,460011,00.html> (updated WNA 4/17/2008)





Global Nuclear Energy Partnership launched in February 2006

- GNEP is part of the President's Advanced Energy Initiative
 - Expanded the Advanced Fuel Cycle Program to include development of facilities to demonstrate technologies developed at national laboratories
 - AFCI/GNEP FY 2007 funding was \$167.5M
 - FY 2008 funding was \$181M
 - FY 2009 request is \$301.5M



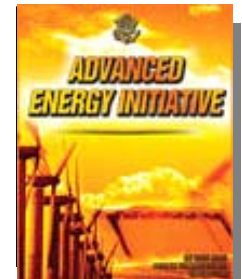
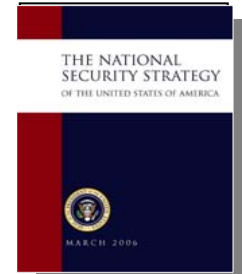
"...my Administration has announced a bold new proposal called the Global Nuclear Energy Partnership...we will develop and deploy innovative, advanced reactors and new methods to recycle spent nuclear fuel."





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 recycle 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





GNEP Statement of Principles

- Expand nuclear power to help meet growing energy demand in a safe and sustainable manner.
- In cooperation with the IAEA, continue to develop enhanced nuclear safeguards and ensure nuclear energy systems are used only for peaceful purposes.
- Establish international supply frameworks to enhance reliable, cost-effective fuel supplies to the world market while reducing the risk of nuclear proliferation by creating a viable alternative to acquisition of sensitive fuel cycle technologies.
- Develop, demonstrate, and in due course deploy advanced fast reactors that consume transuranic elements from recycled spent fuel.
- Promote the development of advanced, more proliferation resistant nuclear power reactors appropriate for the power grids of developing countries and regions.
- Develop and demonstrate, inter alia, advanced technologies for recycling spent nuclear fuel with a long term goal of ceasing separation of plutonium and eventually eliminating stocks of separated civilian plutonium.





A Global Partnership - 21 Member Nations



GLOBAL NUCLEAR ENERGY PARTNERSHIP Structure



June 24, 2008

GNEP Nonproliferation-JAEA International Forum

8





GNEP Partners, Candidate Partners and Observers

GNEP Partners

1. Australia
2. Bulgaria
3. Canada
4. China
5. France
6. Ghana
7. Hungary
8. Italy
9. Japan
10. Jordan
11. Kazakhstan
12. Lithuania
13. Poland
14. Republic of Korea
15. Romania
16. Russia
17. Senegal
18. Slovenia
19. Ukraine
20. United States
21. United Kingdom

GNEP Observers

1. International Atomic Energy Agency (IAEA)
2. Generation IV International Forum (GIF)
3. Euratom

Candidate Partner and Observer

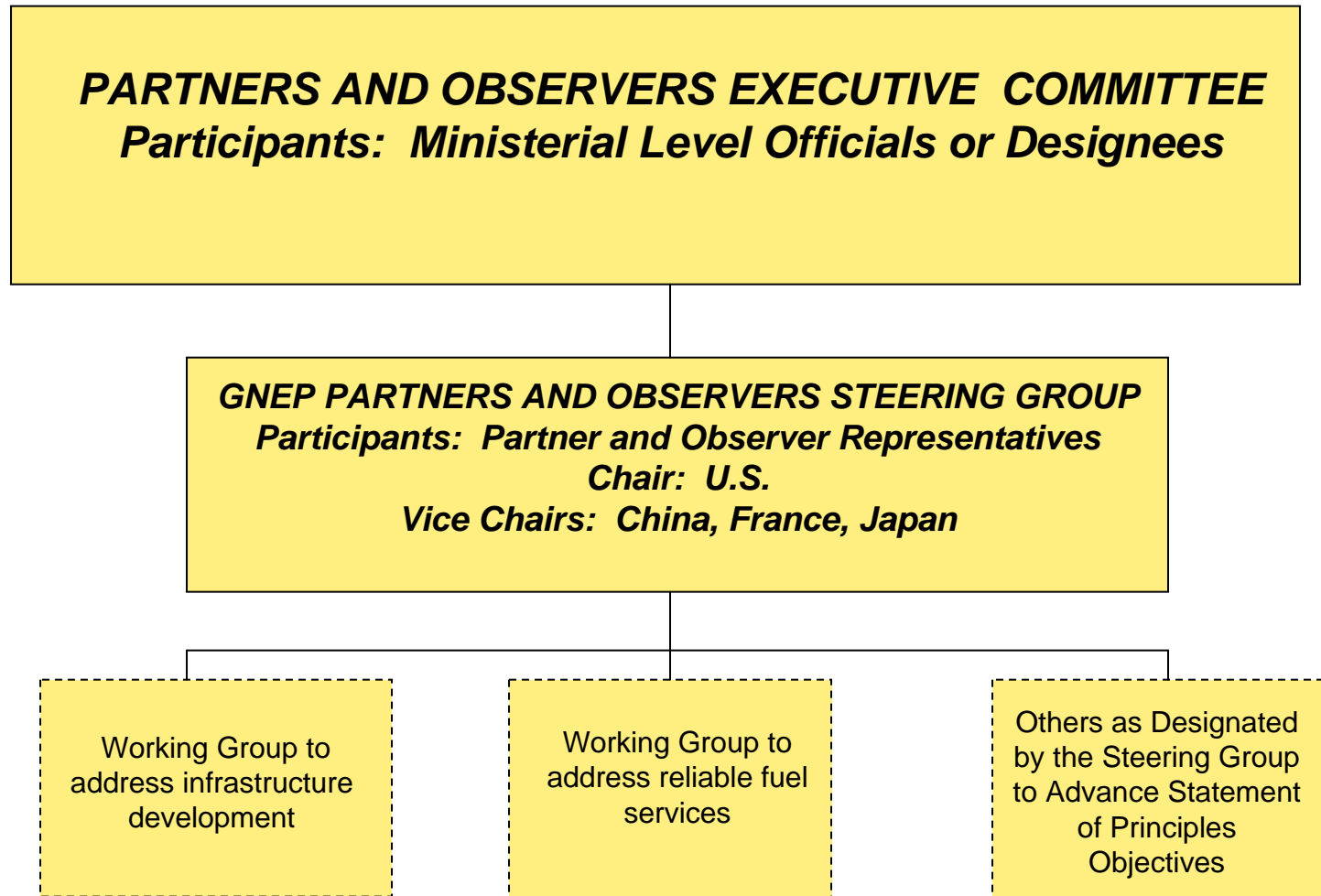
Countries

1. Argentina
2. Belgium
3. Brazil
4. Czech
5. Egypt
6. Finland
7. Germany
8. Libya
9. Mexico
10. Morocco
11. Netherlands
12. Slovakia
13. South Africa
14. Spain
15. Sweden
16. Switzerland
17. Turkey



GLOBAL NUCLEAR ENERGY PARTNERSHIP

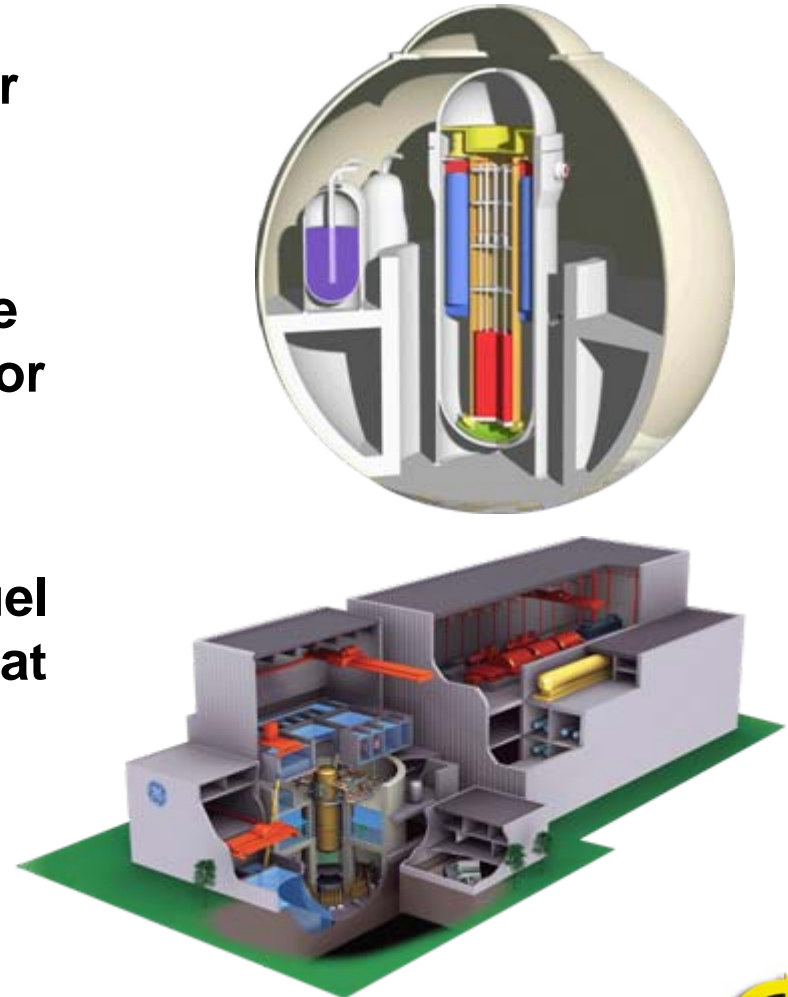
Structure





GNEP will support safe and secure expansion of nuclear power worldwide through work to:

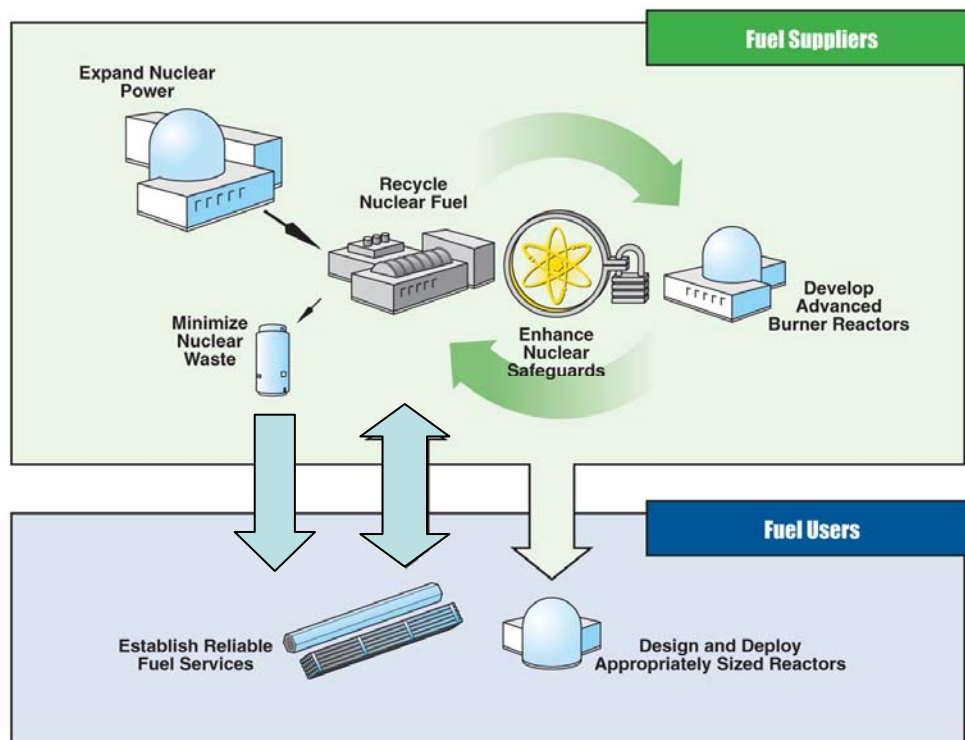
- Facilitate the global deployment of commercial-scale light water nuclear power reactors through responsible stewardship arrangements.
- Develop and deploy grid-appropriate reactors for States that individually or regionally cannot incorporate or support commercial-scale reactors.
- Establish a framework for reliable fuel supply and spent fuel disposition that provides a way for States to implement nuclear power without developing national enrichment or reprocessing services.





The key nonproliferation benefit of GNEP will come from providing reliable fuel services

- **Fuel Suppliers:** Operate reactors and fuel cycle facilities, including fast reactors to transmute the actinides from used fuel into less toxic materials
- **Fuel Users:** Operate reactors, lease and return fuel
- **IAEA:** Provide safeguards and fuel assurances, backed up with a reserve of nuclear fuel for states that do not pursue enrichment and reprocessing



GNEP makes diversion and misuse of fissile materials more difficult, more costly, and acquisition of sensitive fuel cycle technologies more difficult to justify as part of a peaceful nuclear program





Reliable Nuclear Fuel Supply

- **GNEP Reliable Nuclear Fuel Services Working Group**
- **U.S. presented an assured fuel supply as a cornerstone of GNEP to over 100 nations at an IAEA Special Event in September 2006.**
- **U.S. and 5 other supplier nations proposed the reliable fuel supply initiative at the IAEA.**
- **U.S. declared an international nuclear fuel reserve to support the reliable fuel supply in event of disruptions**
- **U.S. appropriated \$50M for an international fuel bank with the IAEA**
- **Other cradle-to-grave fuel service concepts being examined, including an International Advanced Recycle Reactor and an International Fuel Center**





THE GLOBAL NUCLEAR ENERGY PARTNERSHIP: PROGRESS BEING MADE BY THE PARTNERS

➤ **Second GNEP Steering Group Meeting Held in Jordan May 14-15, 2008**

- Very successful meeting. Partnership now well established. 28 countries and 3 international organizations attended.

➤ **Key Outcomes**

- Infrastructure Development Working Group (IDWG). Significant progress already made.
 - ❖ Bilateral and multilateral feasibility studies;
 - ❖ Identification of highest priorities and greatest challenges (e.g., human resources, financial mechanisms and business planning development);
 - ❖ Plan to integrate industry; and
 - ❖ Establishment of a resources library.
- Reliable Nuclear Fuels Services Working Group (RNFSWG). Significant progress also made. Initial focus has been on baselining Partner views with respect to fuel services (supply and take-back) via a survey that asks each GNEP Participant to specifically describe what they believe reliable fuel services means to them and what they believe are the barriers to achieving such services.
 - ❖ Focus will now be on ways to enhance current fuel supply arrangements and steps to address back end challenges.
 - ❖ Discussions will also be started on regional fuel centers and related concepts.





GNEP - U.S. Safeguards Campaign Mission Statement

- **The safeguards campaign mission is to ensure that the domestic GNEP facilities fully meet requirements under DOE, NRC, and IAEA regulatory frameworks; thereby assuring that nuclear materials have not been diverted or misused.**
- **This mission is enabled by technology development to advance safeguards state-of-the-art.**
- **The safeguards campaign is one component of the GNEP nonproliferation vision, including**
 - Reducing spread of enrichment and reprocessing technologies
 - Draw down of civil stores of separated plutonium
 - Assured fuel supply
 - Advanced safeguards





Objectives of the U.S. GNEP Safeguards Campaign

- **Provide research and technology development in support of both industry and laboratory led facilities**
- **Provide experts to GNEP facility design teams**
- **Integrate domestic and international safeguards requirements**
- **Facilitate communication with domestic regulators (DOE, NRC) and with IAEA (via NNSA)**
- **Cooperation with partner states to advance state of the art in safeguards technology (with NNSA)**
- **Strong university participation to help train next generation of safeguards and nonproliferation professionals**

The safeguards campaign will add to the technical foundation of the GNEP vision of strengthening the nonproliferation regime as an integral part of the global expansion of nuclear energy





U.S. GNEP Safeguards Campaign



Research and technology development needs

- **Advanced measurement techniques and approaches**
 - Direct measurement of spent fuel, Pu in presence of minor actinides, electrochemical processing, bulk and flowing samples (active and passive)
 - Expansion of neutron balance concept
 - Advanced x-ray, gamma-ray, alpha spectroscopy
- **Nuclear physics and chemical data**
 - Gaps exist, reduce uncertainties/increase confidence, enabling for new measurement approaches
- **Process monitoring**
 - Online chemical analysis, radiation monitoring, other (flows, pH, etc.)
 - Trend, diversion analysis
- **Safeguards analysis and modeling, information technology**
 - Safeguards performance and optimization, data protection and authentication
 - Instrumentation design including basic materials science
 - Facility, site, regional analysis
- **Safeguards envelope**
 - Putting it all together to enable real time knowledge extraction of facility operation

Apr 9, 2008

GNEP Mid-Year Meeting

7





Next Steps

- **Focus on concrete next steps for the working groups;**
- **Ensure complimentary and synergistic efforts with IAEA and other entities;**
- **Identify and address the major barriers to further enhancement of global nuclear fuel services, including the back-end;**
- **Focus on near-term infrastructure development cooperative efforts;**
- **Work closely with industry to carry out activities, where appropriate;**
- **Seek additional opportunities that GNEP may be in position to address; and**
- **Continue to inform the public, stakeholders and the international community about GNEP and its objectives.**

FOR MORE INFORMATION ON GNEP:

- www.gnep.energy.gov
- www.gneppartnership.org

