Overview of Multilateral Approaches in Nuclear Fuel Cycle

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Nuclear Fuel Cycle

- Uranium Production
- Uranium Enrichment
- Reprocessing of Spent Fuel
- Spent Fuel Storage and Disposal

INPRO Dialogue Forum on Nuclear Energy Innovations: Multilateral Approaches to Sustainable Nuclear Energy Deployment – Institutional Challenges
MLA in Nuclear Fuel Cycle

• ~60 potential entrant countries considering nuclear power

• Concerns raised about the expansion of sensitive fuel cycle technology

• Not practical for each countries to develop the nuclear fuel cycle technology

MLAs offer a potentially useful contribution to meeting prevailing concerns about assurances of supply and non-proliferation
Uranium Production

- Sufficient uranium resources have been identified to meet demand and uranium production is planned to increase
  - Need to help future uranium supply to be reliable by information sharing and networking

- IAEA Regional TC Projects
  - Africa RAF3007
    - Strengthening regional capabilities for uranium mining, milling and regulation of related activities (29 MS)
  - Latin America RLA 3010
    - Regional upgrading of uranium exploration, exploitation and yellowcake production techniques taking environmental problems into account (9 MS)
Uranium Enrichment

• The existing market has been operating reliably
  • Urenco (UK-Germany-Netherlands)
  • IUEC (Russia-Kazakhstan)

• IAEA signed with Russia to establish LEU reserve at Angarsk
  • Mar. 29, 2010
  • 120 tonnes in the form of UF₆ ($250 M)

• NTI/IAEA Fuel Bank is pending

MS would be able to benefit from the additional security of LEU supply
Reprocessing of Spent Fuel

• Eurochemic (1957-1974)
  • Historical multinational example by NEA (13 countries)

• Commercial market for reprocessing service by UK, France and Russia

• HLW from reprocessing of foreign spent fuel should be returned to the country of origin
  • Disposal of HLW from foreign SNF is forbidden
Multilateral Cooperation in SNF Recycling R&D

- DUPIC: Direct Use of spent PWF fuel in CANDU
Multilateral Cooperation in SNF Recycling R&D

- Actinide reCycling by SEParation and Transmutation
  - funded by the seventh Framework Program (FP7) of the European Commission (Euratom - Fission).
  - 2008 - 2012 (4 years)
  - in cooperation with IAEA

- R&D is open to the multinational/regional cooperation
Spent Fuel Storage

• No international market for SF storage services

• Technical, Economic and Institutional Aspects of Regional Spent Fuel Storage Facilities, (TECDOC-1482, 2005)

• Storing spent fuel in a few safe, reliable, secure facilities could enhance safeguards, physical protection and non-proliferation benefits

• The political and public acceptance issues are real and difficult to address
International Fuel Cycle Initiatives

• Global Nuclear Energy Partnership (GNEP), 2006 (USA)
  • envisages the development of comprehensive fuel services, including fuel leasing while maximizing non-proliferation benefits.

• The International Framework of Nuclear Energy Cooperation (IFNEC)
  • Cradle to Grave (CTG) concept
  • Reliable global commercial services
  • Comprehensive fuel supply, spent fuel management and disposal services
International Fuel Cycle Initiatives

- Global Nuclear Infrastructure Initiative, 2006 (Russia)
  - envisages international nuclear fuel cycle service centres (INFCCs) as joint ventures financed by other countries.
  - enrichment, reprocessing & storage, training and R&D

VVER SFAs from Bulgaria and Ukraine (and Hungary) are transferred to “MCC” Krasnogorsk

International Uranium Enrichment Center

Multi-purpose Pyro Complex (MPC)

Multifunctional Fast Test Reactor (MBIR)
Recent Discussion/Recommendations

**International Conference on SFM (31 May-4 June 2010)**
- Multilateral solutions for storage, reprocessing and disposal would greatly help smaller countries with small amounts of spent fuel and waste, limited resources, and, sometimes, small land areas.

**Recommendations from TWGNFCO (8-11 June, 2010)**
- More attention should be given to regional cooperation in the back end of the fuel cycle.
- IAEA should encourage newcomers to prepare a long-term strategic plan of spent fuel management.
Fuel Leasing Options

• MIT Report (2010) recommended,
  • The US and other nuclear supplier group countries should actively pursue fuel leasing options for countries with small nuclear programs, providing
    • financial incentives for forgoing enrichment,
    • technology cooperation for advanced reactors,
    • spent fuel take back within the supplier’s domestic framework for managing spent fuel,
    • and the option for a fixed term renewable commitment to fuel leasing.

Newcomers consider the assured take-back as the most attractive option, as yet few are willing to provide the leasing service.
• In the front end of nuclear fuel cycle
  ➔ reliable commercial market mechanism is working and the IAEA fuel bank will provide additional assurance of supply

• In the back end of nuclear fuel cycle
  ➔ No remarkable progress has been made while many initiatives being proposed including GNEP(IFNEC), GNPI, etc.