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Office of Nonproliferation and
Verification Research and Development

UF_6 Cylinder Identification Workshop Summary

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Next Generation Safeguards Initiative (NGSI)(NA-21)

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Workshop Goal

- Continue discussions on identifying longer term R&D needs for cylinder identification
- Share and document information from various stakeholders on lifecycle of UF_6 cylinders
- Generate *needs* document articulating stakeholder requirements for identifying UF_6 cylinders

Future Challenges

- **More pressure on Domestic and International Safeguards resources**
  - **Expansion of nuclear power**
  - **Globalization of nuclear fuel cycle**
  - **Reporting requirements**
  - **Implementation of the additional protocol**
  - **State level assessments**
  - **Financial pressures**

Background

- Acquisition of weapons grade material is generally recognized as most difficult proliferation step
- Misuse of uranium in UF_6 form is especially troublesome
  - Enrichment based on commercial technologies and facilities
  - Dissemination of centrifuge technology through illicit networks

UF_6 Cylinders

- **Inter, intra-plant shipments of UF_6 through the nuclear fuel cycle**
  - **48Y cylinders**
    - *Natural uranium or tails (depleted) material*
    - *Contain approximately 8450 kg*
    - *Annual shipments of 9100 per year*
  - **30B cylinders**
    - *Low enriched uranium*
    - *Contain approximately 1500 kg*
    - *Annual shipments of 6600 per year*
- **Global inventory of cylinders is larger**
  - **U.S. DOE's inventory of depleted UF_6 cylinders exceed 57,000**

Reporting Requirements

- **IAEA tracks UF_6 material inside cylinders**
  - **nuclear material accounting,**
  - **inspections,**
  - **and NPT transit matching of shipments with receipts.**
- **Material in a cylinder**
  - **reported at individual cylinder level**
    - *batch with an identification number*
    - *some facilities report the serial number on the cylinder for identification*
  - **currently no tracking of cylinders**
    - *no requirements for cylinders to poses unique numbers or identifiers*

2009 Study on Tracking Cylinders for Nonproliferation Community

- **Following benefits from registration and global monitoring of all UF_6 cylinders:**
  - **Ensure proper processing, shipment and delivery**
  - **Improve safeguards and industrial efficiency**
    - *automating accounting for inventory and shipment manifests*
  - **Enhance safeguards effectiveness**
    - *enabling more timely detection of potential cylinder misuse and diversion*
    - *Deters use of unregistered cylinders to conceal undeclared production or diversion of UF_6*
  - **Support IAEA State-level assessments and global information analysis to verify nuclear material commerce and cylinder shipments between States**

2009 URENCO Workshop

- Concluded need for an industry standard cylinder identification (ID) system for UF_6 cylinders.
- Recognized need for global standard
  - unique ID numbering
  - systematic and permanent way of marking the ID on the cylinders
  - automated methods of reading cylinder IDs
- Fundamental for tracking of cylinders and for the accounting of uranium contained within them

2010 NA22/NA24 Workshop for Global Monitoring of UF_6 Cylinders

- 5 year program plan was established
  - Proof-of-concept demonstration of monitoring system
  - Recognized the need for leveraging existing technologies
- Options could be presented through longer-term R&D
  - Follow-on workshop was planned
  - March 8-9, 2011 Sandia National Laboratories, Albuquerque, NM

March 2011 Workshop Attendees

- **By invitation**
  - **Industry (AREVA, GE Hitachi Nuclear Energy, URENCO, Uranium Disposition Services, USEC, Westerman, Advanced Process Technology Systems, LLC)**
  - **IAEA**
  - **DOE**
  - **National Laboratories**

March 2011 Workshop Format

- **Day 1-Presentations**
  - **Industry**
    - *Lifecycle of cylinders*
    - *Operational and environmental conditions*
    - *Identification needs and practices*
  - **IAEA**
    - *Tracking needs and practices*
- **Day 2-Working Groups**
  - **Define the "what" of identifier not "how"**

2011 Workshop Outcomes

- **Value in a consistent identification scheme**
  - **Stakeholders applications varied**
    - *Operators- inventory and process control*
    - *Safeguards- inventory and location verification*
  - **IAEA expressed that identifier be**
    - *Tamper-indicating*
    - *Authenticated*
- **Long life expectancy of cylinders so identifier must be**
  - **Durable**
  - **Robust**
  - **Technologically resilient**

Outcome

- **Increased understanding between various stakeholders**
  - **Needs of broader community**
  - **Recognized how single identification system could improve overall**
    - *Effectiveness*
    - *Efficiencies*
- **Provided information useful in determining longer term research needs and goals**