Regulatory Aspects of Plutonium Disposition in the U.S. and in Russia

American Nuclear Society 2003 Winter Meeting
November 19, 2003

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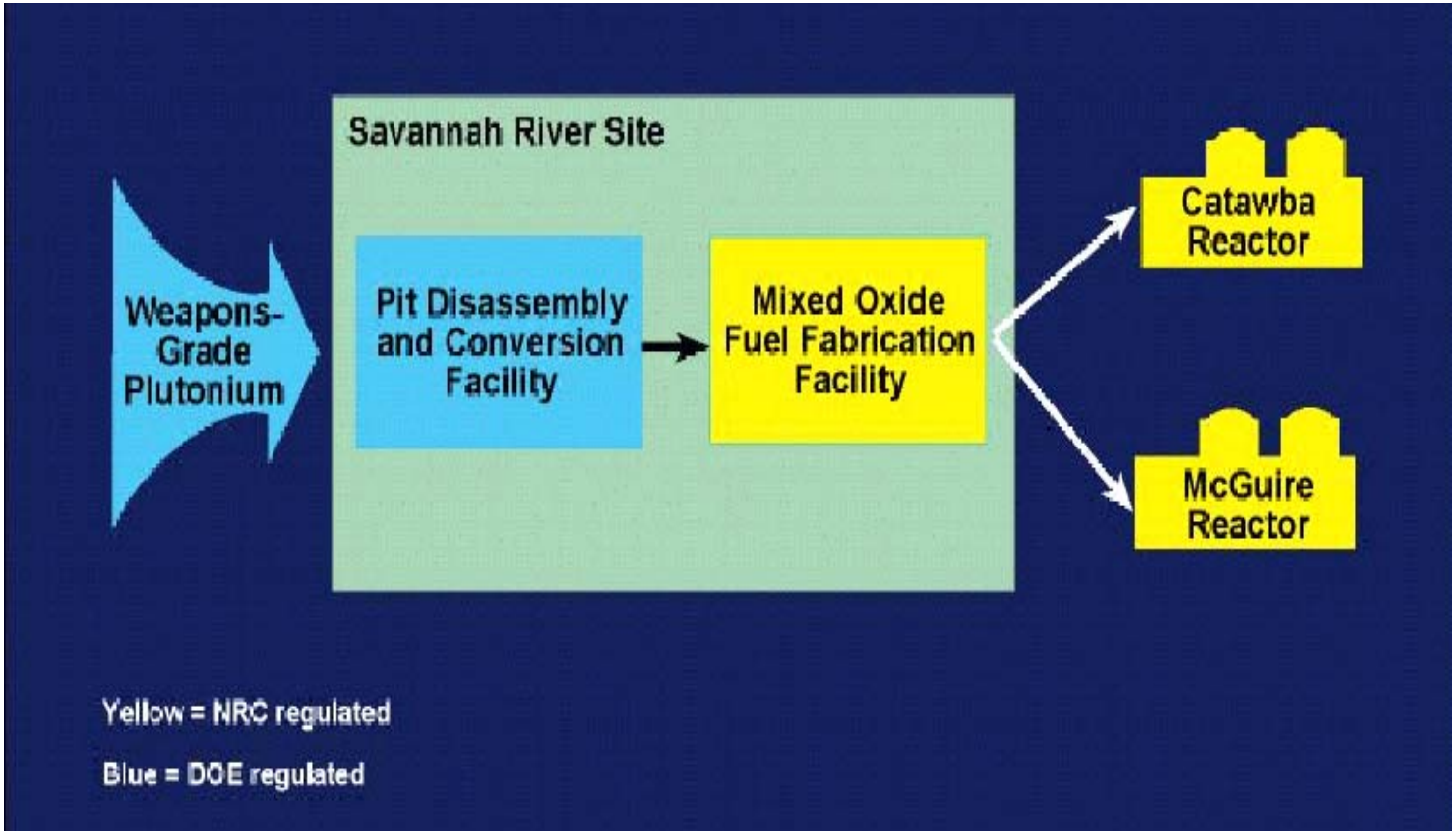
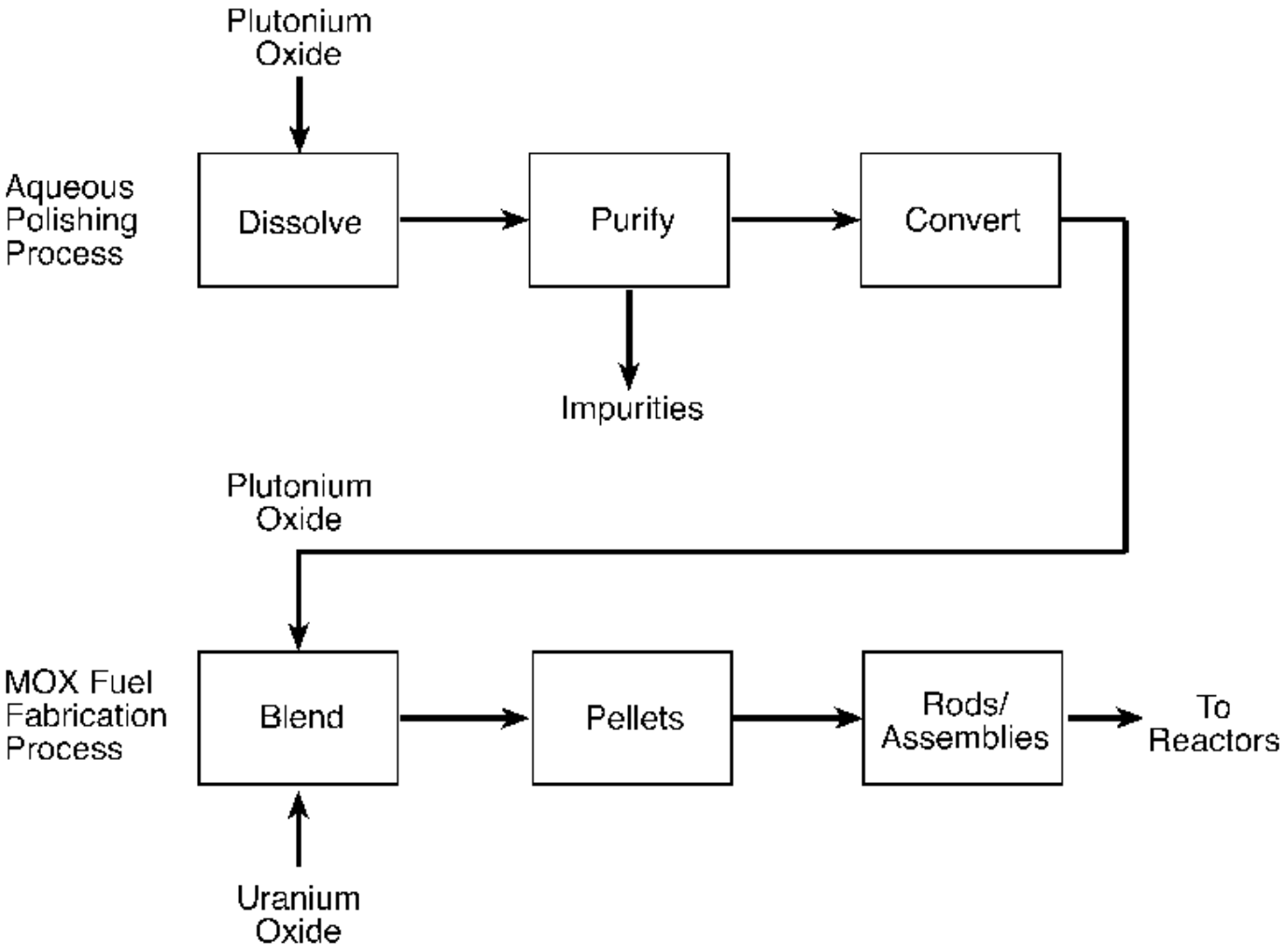
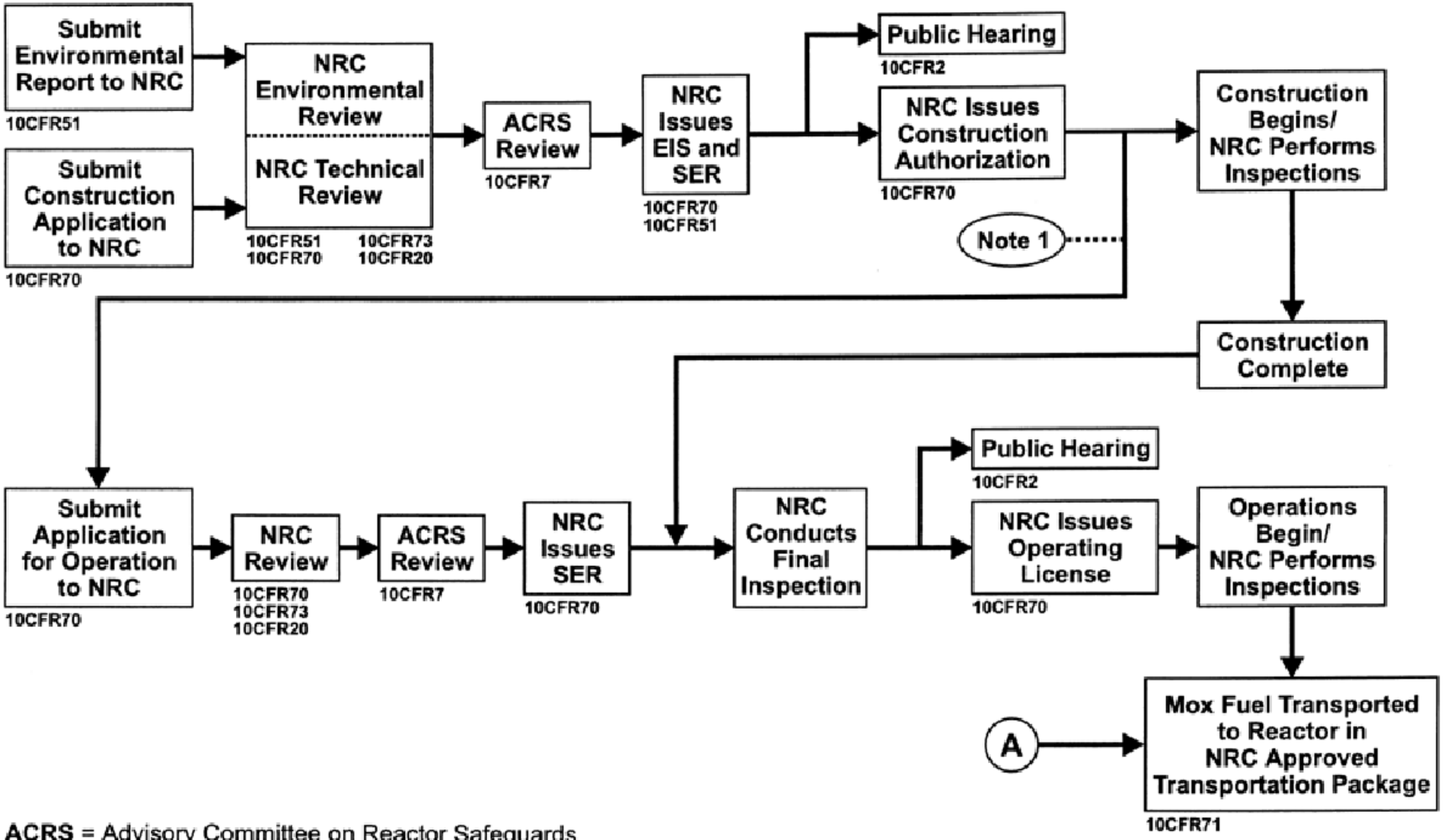
NRC Role in Regulating Mixed Oxide Fuel



U.S. MOX Fuel Facility Process



LICENSING PROCESS FOR MOX FUEL FABRICATION FACILITY



ACRS = Advisory Committee on Reactor Safeguards
EIS = Environmental Impact Statement
SER = Safety Evaluation Report
10CFR70 = Title 10 of the Code of Federal Regulations, Part 70

NOTE 1:
It is expected that application for operation will be submitted after construction is authorized but it can be submitted at any time.

NRC Approvals Needed for U.S. MOX Fuel Facility

- **Two approvals needed for plutonium facilities:**

Construction - Construction Authorization

Operation - License to possess and use special nuclear material

U.S. MOX Fuel Regulations

- 10 CFR 20 - Standards for Protection Against Radiation
- 10 CFR 50 - Domestic Licensing of Production and Utilization Facilities
- 10 CFR 51 - Environmental Protection
- 10 CFR 70 - Domestic Licensing of Special Nuclear Material
- 10 CFR 71 - Packaging and Transportation of Radioactive Material
- 10 CFR 73 - Physical Protection
- 10 CFR 74 - Material Control and Accounting

U.S. MOX Fuel Facility Guidance

- **NUREG-1718, Standard Review Plan for the Review of an Application for a Mixed Oxide (MOX) Fuel Fabrication Facility**

- **NUREG/CR-6410, Nuclear Fuel Cycle Facility Accident Analysis Handbook**

U.S. MOX Schedule

- Received Environmental Report 12/19/00
- Received Construction Authorization Request (CAR) 2/28/01
- Issued draft Safety Evaluation Report (SER) for construction 4/30/02
- Received revised Environmental Report 7/11/02
- Received revised CAR 10/31/02

U.S. MOX Schedule

- Issued draft Environmental Impact Statement (EIS) 2/28/03
- Issued draft SER for construction 4/30/03
- Issue final EIS – TBD
- Issue final SER – TBD
- Issue Record of Decision and construction licensing decision - TBD

NRC Involvement in International Aspects of the MOX Program

- **Member of US-Russian Special Working Group on Regulatory Matters in Plutonium Management and Disposition**

- **Assistance to RF Gosatomnadzor - Russian regulator**

NRC Assistance to Russian Regulator RF Gosatomnadzor

- Review Federal level fuel facility regulations being developed
- Workshops to convey results of NRC review of the US MOX facility
- Standard Review Plan development

Risk-Informed Regulations for Fuel Cycle Facilities 10 CFR Part 70

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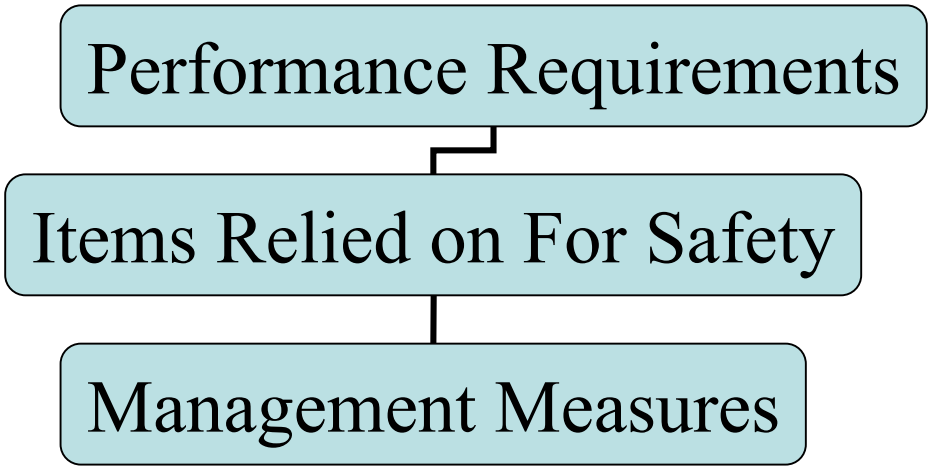
Risk-Informed Regulations and Guidance

- 10 CFR Part 70 revised September 2000
- NUREG-1520 “Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility” March 2002
- NUREG-1718, “Standard Review Plan for the Review of an Application for a Mixed Oxide (MOX) Fuel Fabrication Facility” August 2000
- NUREG-1513 “Integrated Safety Analysis Guidance Document” May 2001

10 CFR Part 70, Subpart H Applicability

- Nuclear fuel fabrication facilities and new enrichment facilities.
- Uranium fuel fabrication facilities
  - Framatome (Richland)
  - Framatome (Lynchburg)
  - Westinghouse
  - Global
  - NFS
  - BWXT
- MOX
- Future uranium enrichment facilities

10 CFR Part 70 Regulatory Concept



10 CFR 70.61 Performance Requirements

	Highly Unlikely	Unlikely	Not unlikely
High Consequence Publ Dose > 25 rem Worker Dose > 100 rem	Acceptable	Not Acceptable	Not Acceptable
Medium Consequence Publ Dose 5 - 25 rem Worker Dose 25 -100 rem Env releases > 5000 Tbl 2	Acceptable	Acceptable	Not Acceptable
Low Consequence Publ Dose < 5 rem Worker Dose < 25 rem	Acceptable	Acceptable	Acceptable

Integrated Safety Analysis (ISA)

A systematic analysis to identify facility and external hazards and their potential for initiating accident sequences, their likelihood and consequences, and the items relied on for safety. Integrated means joint consideration of, and protection from, all relevant hazards, including radiological, nuclear criticality, fire, and chemical.

Frequency/Likelihood

Categories: unlikely and highly unlikely

Likelihood categories can be quantitative or qualitative

In general:

- **Highly Unlikely means approximately 1E-5/yr or less**
- **Unlikely means a higher, wider range**
  - **approximately 1E-2 to 1E-5/yr**

Further discussed in guidance (NUREG-1718 and NUREG-1520)

Receptors

- **Worker**
  - **includes MFFF facility worker**
- **Public**
  - **outside the controlled area boundary**
- **Environment**
  - **for intermediate radiological consequences only**

Items Relied on For Safety (IROFS)

Structures, systems, equipment, components, and activities of personnel that are relied on to prevent potential accidents at a facility that could exceed the performance requirements in 10 CFR 70.61 or to mitigate their potential consequences.

Management Measures

- **Measures applied to IROFS to assure that IROFS are available and reliable when needed**
  - **configuration management**
  - **training**
  - **quality assurance**
  - **audits**
  - **incident investigations**
  - **maintenance**
  - **procedures**

Submittals Recieved

- April 2001 – The six operating Part 70 licensees submitted, for NRC approval, an ISA Plan describing
  - ISA approach
  - processes to be analyzed
  - schedule for completing the analyses for each process
- By August 2002, the NRC had approved the ISA Plans

Submittals Required

- October 18, 2004 - In accordance with the ISA Plan, licensees are required to
  - complete a site-wide ISA
  - correct all unacceptable performance deficiencies
  - submit a site-wide ISA Summary for NRC approval

Submittals Received

- One site-wide ISA Summary
- ISA summaries for new processes
- Partial site ISA

ISA Workshop Issues
(September 23-24, 2003)

- Focus of reviews
- Baseline design criteria
- Natural phenomena
- Standard Review Plan
- Choice of items relied on for safety

ISA Workshop Issues
(Continued)

- Nuclear criticality safety
- Chemical safety
- Interim staff guidance
- Priority of reviews

Backup Slides

10 CFR 70.61 - Performance Requirements

- Accident sequence must be ‘highly unlikely’ if

  - worker
  (1) 1 Sv (100 rem) or more
  (2) chemical-caused fatality

  - public (outside ‘controlled area’)
  (1) 250 mSv (25 rem) or more
  (2) greater than 30 mg soluble uranium intake
  (3) irreversible chemical injury

10 CFR 70.61 - Performance Requirements (cont.)

- Accident sequence must be ‘unlikely’ if

  - worker
  (1) more than 250 mSv (25 rem) but less than 1 Sv (100 rem)
  (2) irreversible chemical injury

  - public (outside ‘controlled area’)
  (1) greater than 50 Sv (5 rem) but less than 250 mSv (25 rem)
  (2) chemically-induced transient illnesses

  - environment (outside ‘restricted area’)
  (1) conc. > 5000 times 10 CFR 20 App B Table 2 value

Likelihoods

- Qualitative
  - large safety margin
  - low failure rate
  - preference of controls (passive, active, administrative)
  - high level of QA
  - short surveillance interval
  - redundancy
  - independence

- Quantitative
  - section 3.4.3.2(9) and Table 3.A-6 of NUREG-1520 (SRP) provides quantitative guidelines for high- and intermediate-consequence accident sequences
  - these are based on less than 1 major fuel cycle event in 100 years