# The United States of America's Presentation

Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management

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### **Content of Presentation**

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### Scope of Waste Management in the U.S.

#### Large, Diverse Civilian and Defense Nuclear Program

- ★ 100 operating civilian nuclear power plants
- ★ 71 licensed and/or operating independent spent fuel storage installations
- 21,000 licenses for medical, academic, industrial, and general uses of nuclear materials
- ★ 21 operating uranium recovery sites (NRC licensed)
- 14 operating fuel cycle facilities (U conversion, U enrichment, and fuel fabrication)
- 4 operating and 4 closed commercial Low-Level Waste(LLW) licensed disposal facilities
- ★ 4 sites with stored High-Level Waste (HLW) (2 of the sites currently store vitrified HLW canisters)
- ★ 1 geologic repository for DOE TRU defense waste
- ★ 17 operating DOE LLW (includes mixed LLW) disposal facilities
- ★ Large DOE legacy waste cleanup program
- ★ 67 U mill tailings disposal cells under long-term stewardship

### **Overview of U.S. Regulatory Framework**



# **NRC's Regulatory Environment**

 Atomic Energy Act (AEA) of 1954, as amended, and Energy Reorganization Act of 1974

Mission: To license and regulate the Nation's civilian use of radioactive materials to protect public health and safety, promote the common defense and security, and protect the environment.

#### **How the NRC Regulates**



### NRC's Regulatory Environment (cont'd): Agreement States Program

### Enacted in 1959

- ★ Recognizes interests of States to regulate atomic energy
- Provides a mechanism for transfer and discontinuance of certain NRC authority; Reserves certain areas for NRC to regulate
- ★ Establishes cooperative program
- \* Provides for coordination in development of standards
- ★ Regulates about 19,000 licensees
- All active commercial LLW disposal sites are in Agreement States

# **EPA's Regulatory Environment**

EPA exercises regulatory authority over spent fuel and radioactive waste through three primary statutes

- AEA gives EPA authority to establish generally applicable standards for radiation in the general environment
- The Resource Conservation and Recovery Act (RCRA) gives EPA authority over hazardous chemical waste, including the hazardous portion of mixed wastes
  - States can be authorized by EPA to conduct the hazardous waste program
  - Some RCRA landfills accept radioactive waste on a case-by-case basis
- The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) gives EPA authority to conduct cleanups at contaminated sites, including those affected by radionuclides
- EPA also acts in response to specific statutory direction, such as its Waste Isolation Pilot Plant (WIPP) oversight role and Yucca Mountain environmental standards

# **DOE's Regulatory Environment**

- ★ DOE operates its facilities within a complex regulatory environment, which includes other U.S. Federal agencies and States for hazardous materials
  - The AEA provides DOE authority for self-regulation of Spent Nuclear Fuel (SNF) and radioactive waste at DOE sites
  - Some commercial SNF for which DOE has custody is stored under NRC issued licenses

### **Questions Raised on U.S. National Report**

★ U.S. received a total of 93 questions on the U.S. National Report

★ 11 Main topics (80% of questions) covered:

ΤΟΡΙϹ	QUANTITY	%
BLUE RIBBON COMMISSION, SPENT FUEL STORAGE/DISPOSAL & YUCCA MOUNTAIN	22	24%
LOW LEVEL WASTE, LOW ACTIVITY WASTE, PART 61 RULEMAKING & BRANCH TECHNICAL		
POSITION	18	19%
DECOMMISSIONING	7	8%
INDEPENDENT SPENT FUEL STORAGE		
INSTALLATIONS	7	8%
WASTE ISOLATION PILOT PLANT	4	4%
FUKUSHIMA	4	4%
DISUSED SEALED SOURCES	3	3%
HANFORD LIQUID WASTE	2	2%
MIXED OXIDE FUEL	2	2%
CONTINUED STORAGE RULE	2	2%
<b>GREATER THAN CLASS C LOW LEVEL WASTE</b>	2	2%

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### Major Themes from the 4<sup>th</sup> Review Meeting

#### Management of disused sealed sources

- Safety implications of very long storage and delayed disposal of spent fuel and radioactive waste
- International cooperation in finding solutions for the long-term management and disposal of different types of radioactive waste and spent fuel
- Progress in implementing lessons learned from Fukushima accident-in particular regarding strategies for spent fuel management

# NRC's Management of Disused Sealed Sources

- ★ NRC Program with Agreement States
- **Conference of Radiation Control Program Directors (CRCPD)**
- Background
- CRCPD is a non-governmental professional organization dedicated to radiation protection with primary membership made up of radiation professionals in State and local government
- Broad involvement with radiation control issues radioactive material, environmental and emergency preparedness
- Administers and coordinates the removal of unwanted radioactive material and sources

### NRC's Management of Disused Sealed Sources (cont'd)



Submitted by: The Chairman of the U.S. Nuclear Regulatory Commission On Behalf of: Radiation Source Protection and Security Task Force

#### **Radiation Source Protection & Security Task Force**

- Background
  - Important vehicle for advancing issues related to domestic security of radioactive sources
- ★ Update Since Last Review Meeting
  - Latest report published in August 2014
  - Three main topical areas in report:
    - Advances in the security and control of radioactive sources
    - Status of the recovery and disposition of radioactive sealed sources
    - Progress in the area of alternative technologies

#### Future Initiatives

- Report included 3 new recommendations with regard to risk-significant sources
- Implementation Plans

NRC's Safety Implications of Very Long Storage and Delayed Disposal of Spent Fuel and Radioactive Waste

### **Continued Storage Rule**

- ★ In June 2012, U.S. Court of Appeals vacated the 2010 Waste Confidence Rule
- In August 2012, Commission suspended issuance of nuclear reactor or independent spent fuel storage installation licenses until the NRC addressed the court remand
- NRC evaluated environmental impacts areas with continued storage in 20 different areas
- NRC issued NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," in September 2014
- ★ New rule approved on August 26, 2014 (effective on October 20, 2014)

NRC's Safety Implications of Very Long Storage and Delayed Disposal of Spent Fuel and Radioactive Waste

### Yucca Mountain License Application Review - Status

- NRC staff completed the safety evaluation report in January 2015 (NUREG-1949)
- In March 2015, NRC published a Federal Register Notice indicating intent to develop a supplement to DOE's environmental impact statement
- NRC staff expects to complete the supplement to the environmental impact statement in early 2016



### International Cooperation in Finding Solutions for the Long-Term Management and Disposal of Different Types of Radioactive Waste and Spent Fuel

#### Background

Cooperation with Japan on spent fuel management and decommissioning

#### ★ Update Since Last Review Meeting

- NRC collaborated with regulatory authorities, technical support organizations and waste management organizations bilaterally on a wide range of nuclear safety and security topics
  - Held bilateral meetings on spent fuel management
  - Hosted foreign assignees
  - Participated in multilateral consultancies on spent fuel management and decommissioning
  - Supported decommissioning workshops

#### Future Initiatives

Continue cooperation on spent fuel management and decommissioning <sup>15</sup>

NRC's Progress in Implementing Lessons Learned from Fukushima Accident-in Particular Regarding Strategies for Spent Fuel Management

NRC's efforts to apply Fukushima lessons-learned to non-NPP portion of nuclear fuel cycle

#### **\*** Background

- Following the March 11, 2011, accident at the Fukushima Dai-ichi nuclear power plant in Japan, NRC developed near-term and longerterm actions
- One of the longer-term actions -NRC to assess the applicability of the lessons learned from the accident to non-operating power reactors and non-reactor facilities
- Shortly after the accident, NRC performed limited assessments to ensure no immediate safety concerns were found

# NRC's Progress in Implementing Lessons Learned from Fukushima Accident-in Particular Regarding Strategies for Spent Fuel Management (cont'd)

# U.S. efforts to apply Fukushima lessons-learned to non-NPP portion of nuclear fuel cycle

#### ★ Update Since Last Review Meeting

- NRC has more fully evaluated issues and possible actions related to other NRC-licensed materials, devices, and facilities
- The assessment included the following Joint Convention areas: (1) spent fuel storage and transportation; (2) LLW disposal facilities; (3) uranium recovery facilities and uranium mill tailings; and (4) decommissioning reactors and complex materials facilities
- Event scenarios were considered and these included seismic, flooding, high winds and fires

#### Preliminary Assessment

 The overall conclusion of the preliminary assessment is that existing regulatory processes sufficiently protect the public health and safety

### EPA's Progress in Implementing Lessons Learned from Fukushima Accident-in Particular Regarding Strategies for Spent Fuel Management

#### Enhancing the capabilities of the national RadNet monitoring system

- Additional locations for fixed monitors
- Technology upgrades for real-time monitoring and data management
- Improving laboratory methods, training, mobile laboratory capabilities
- **Revision and update of 1992 Protective Action Guides (PAG) Manual** 
  - Provides guidance to state and local officials for emergency situations
  - Updated dosimetry, guidance for KI and food
  - References to DOE Operational Guidelines for worker/public exposures
  - Addresses late phase cleanup and waste management
  - Drinking water PAG still under consideration

**★** Efforts to include waste management in emergency response planning

- Tools and technical studies to support decision making
- Exercises and workshops to improve preparedness

# Other Areas: The Concentration Averaging and Encapsulation Branch Technical Position (CA BTP)

#### **\***Background

- The NRC regulations, 10 CFR 61.55(a)(8), allows averaging over volume or weight of waste
- CA BTP provides acceptable methods that can be used to perform concentration averaging of LLW; Constrains "hot spots" in LLW
- Originally issued in 1983, extensively revised in 1995 and 2015
- Several reasons for 2015 revision

#### **\*** Update Since Last Review Meeting

 Revised CA BTP was issued on February 25, 2015, Federal Register Vol. 80, No. 37, 10165

**★**Future Initiatives

Implementation of the CA BTP

# **Other Areas: 10 CFR Part 61 Rulemaking**

#### **\***Background

- Amend regulations that govern LLW disposal facilities to require new and revised site-specific performance assessment and to permit the development of criteria for LLW acceptance based on the results of these analyses
  - Ensure LLW streams that are significantly different from those considered in the current 10 CFR Part 61 rule can be disposed of safely (for example, depleted uranium)
  - Increase the use of site-specific information to ensure performance objectives are met
- Published for public comment on March 26, 2015 (<u>https://federalregister.gov/a/2015-06429</u>)

#### ★ Path Forward

- 120 day comment period ends on July 24, 2015
- Final rule to Commission approximately 12 months after comment period ends

### **Other Areas: New LLW Disposal Facility**

#### **\*** Background

In 2012, Waste Control Specialists, LLC (WCS) opened the only new commercial facility in the U.S. licensed to dispose of LLW in the past 30 years

#### ★ Update Since Last Review Meeting

Compact waste facility (CWF)

 9 million cubic feet of disposal capacity for nuclear power plants and other commercial generators

- Authorization for disposal of depleted uranium
- Federal waste facility (FWF)
  - 26 million cubic feet of disposal capacity for DOE



# Other Areas: Increased Interest in Spent Fuel Interim Storage

### Letters of Intent

- In February 2013, the Eddy-Lea Energy Alliance, in New Mexico submitted its notice of intent to the NRC to seek a license for a consolidated used nuclear fuel storage facility
- In February 2015, Waste Control Specialist (WCS), LLC announced it had submitted its notice of intent to the NRC to seek a license for an ISFSI

# **Other Areas: Decommissioning Planning Rule**

### ★ Background

- Applies during the entire life cycle of a facility
- Minimizes introduction of residual radioactivity

#### ★ Update Since Last Review Meeting

- Rule made effective in December 2013.
  - Monitor, survey and sample site
  - Enhance financial assurance requirements to support remediation

### **★** Future Initiatives

 Evaluation of the implementation of the Decommissioning Planning Rule

# Other Areas: Integrated Regulatory Review Service (IRRS)

### **\*** Background

 Further improve the effectiveness of the safety regulatory framework by reviewing the US NRC's progress in response to the IRRS 2010 mission recommendations or suggestions

### **★** Updates Since Last Meeting

- Follow up mission in February 2014
- Areas for follow up from 2010 IRRS mission
- Topical Module on the Regulatory Lessons Learned from the Fukushima Dai-ichi accident

### ★ Path Forward

 Developing a consolidated rulemaking and corresponding guidance in order to facilitate the orderly transition from operation to decommissioning

### **Department of Energy Joint Convention Scope**



# Major Themes from the 4<sup>th</sup> Review Meeting and Other Topics

- Management of disused sealed sources
- Safety implications of very long storage and delayed disposal of spent fuel and radioactive waste
- International cooperation in finding solutions for the long-term management and disposal of different types of radioactive waste and spent fuel
- Progress in implementing lessons learned from Fukushima accident-in particular regarding strategies for spent fuel management
- Other topics based on your questions: WIPP recovery update, greater-than-class C waste disposal, DOE cleanup initiatives and Hanford Waste Treatment Plant

### DOE's Approach to Radiological Security

★ In a post 9/11 environment, more emphasis was placed on the security of radioactive sources in the U.S. DOE's strategic approach helps prevent the use of radiological material for malicious acts.

#### **★** Strategic approach:

- **Protect** radioactive sources used for vital medical, research, and commercial purposes
- <u>**Reduce</u>** the global reliance on radioactive sources through replacement with viable non-isotopic alternative technologies</u>
- <u>**Remove</u>** and dispose of disused radioactive sources that do not have a commercial disposition pathway</u>

### **Efforts to Protect All Category 1 Devices**

### 2014 Nuclear Security Summit Category 1 Commitment

- ★ U.S. and 23 other countries pledged to secure all IAEA Category 1 radioactive sources within their territory by 2016
  - In the U.S. there are approximately 465 buildings with Category 1 devices
  - Over the past 8 years, the radiological facility security enhancement program has completed security enhancements at 300 of the 465
  - The U.S. plans to address the remaining 165 on an accelerated basis
  - Current outreach and engagement with the remaining sites to encourage participation in the effort





### DOE's Code of Conduct Guidance on the Management of Disused Radioactive Sources

### **★** Scope - with the provisions of the Code of Conduct

- Assist States to improve the safety and security of disused radioactive sources
- Applies to all radioactive sources from the stage of initial production to final disposal
- Being pursued as supplementary guidance, at a similar level as the Import/Export Guidance

### ★ Benefit

- Over 120 Member States have made a political commitment
- This document would provide much-needed general guidance on the actions that Member States should take to meet their political commitment, prior to acquisition of a source, to ensure that radioactive sources are safely and securely managed when they reach the end of lives

# DOE's Spent Fuel and High-Level Waste Management

# ★ 2012 – Blue Ribbon Commission on America's Nuclear Future

- Chartered to recommend a new strategy for managing the back end of the nuclear fuel cycle
- ★ 2013 Administration's Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste
  - Endorsed key principles underpinning the Blue Ribbon Commission's recommendations
- ★ 2015 Presidential Memorandum Related to Disposal of Defense High-Level Radioactive Waste
  - DOE announced a path forward for defense waste, and a parallel path for storage and disposal of commercial spent fuel



# DOE's Spent Fuel and High-Level Waste Management

### ★ DOE will undertake

- Planning for a defense-only repository
- Moving forward with planning for interim storage of commercial spent fuel
- Moving forward with a consent-based siting process for both types of facilities



# DOE's Used Nuclear Fuel Disposition R&D Program

- Mission Identify alternatives and conduct scientific research and technology development to enable storage, disposal, and transportation of used nuclear fuel and wastes generated by existing and future nuclear fuel cycles
  - Provide a sound technical basis for the assertion that the U.S. has multiple viable disposal options
  - Increase confidence in robustness of generic disposal options
  - Evaluate feasibility of deep borehole disposal concept
  - Conduct R&D for extended storage, particularly for high burn up fuels
  - Plan for large-scale transport of spent nuclear fuel





# DOE's Multinational Approaches to the Back End of the Fuel Cycle

### **★**2012 – Joint Convention Fourth Review Meeting

 United States proposed that multinational approaches be considered as an option for the back end of the fuel cycle

### ★ 2013 – Joint Convention Topical Meeting on Multilateral Approaches to the Back End of the Fuel Cycle

 Meeting facilitated discussion of the challenges involved in multinational approaches

### ★ 2015 – Joint Convention Fifth Review Meeting – Open Ended Working Group

 United States is proposing that Contracting Parties address the potential for multinational approaches in their consideration of, and planning for, the management and disposal of SNF or radioactive waste



# US Efforts With Respect to Japan Recovery from Fukushima

#### **US-Japan Bilateral Commission on Civil Nuclear Cooperation**

- ★ Established April 30, 2012 in Washington, DC
- ★ Co-chaired by DOE and Japan Ministry of Foreign Affairs
- ★ Collaborative Working Areas
  - Nuclear security;
  - Civil nuclear energy research and development;
  - Safety and regulatory issues;
  - Emergency management; and
  - Decommissioning and environmental management.

### The U.S.-Japan Decommissioning and Remediation Fukushima Recovery Forum

- ★ Led by US Department of Commerce
- ★ Hosted by JETRO in cooperation with MOE and METI



# DOE's Waste Isolation Pilot Plant (WIPP)

- **★** Located in Southeastern New Mexico
- ★ Waste disposal occurs 2,150 feet below the surface in mined bedded salt formation
- ★ Salt has been stable for hundreds of millions of years, easy to mine, and closes in on the waste to entomb it forever
- Facility composed of surface facilities for receiving and handling waste and support, underground disposal facilities, and 4 shafts
- ★ WIPP is authorized to dispose of Defense TRU waste



### **Recap of the Incidents at WIPP**

### February 5th Truck Fire:

- ★ All operations at the repository ceased following salt haul truck fire in the WIPP underground.
- Accident Investigation Board (AIB) Report issued March 13, 2014

### February 14th Radiological Incident:

- ★ A continuous air monitor detected airborne radiation in the underground.
- WIPP's ventilation system automatically switched to high-efficiency particulate air (HEPA) filtration mode when airborne radiation was detected
- Underground and the WIPP mine remains in filtration mode at this time.
- AIB Report, Phase I issued April 24, 2014
- ★ AIB Report, Phase II issued April 15, 2015





# DOE's WIPP Recovery Update

### **Key Steps toward Resumption of Operations**

- ★ Nuclear Safety Basis
- Safety Management Program
  Revitalization

### Underground Restoration

- Soot cleaning of electrical panels
- Re-Establish Degraded Equipment
- Fire Protection
- Maintenance and Ground Control
- Radiological Roll-back
- ★ Panel 6, Panel 7, Room 7 Closure
- Interim Ventilation and Supplemental Ventilation Modifications





# **Other Questions: Greater-than-Class- C LLW (GTCC)**

★ The LLW Policy Amendments Act of 1985 assigned to the Federal Government the responsibility for disposal of GTCC LLW resulting from NRC-licensed activities

★ DOE is evaluating disposal options for GTCC LLW and DOE "GTCC-like" LLW, which does not have a current disposal option

- GTCC LLW and GTCC-like LLW represent relatively small volume (~400,000 ft3), but high activity
- Less than 10% of total volume currently in storage; most waste will not be generated for several decades





# Other Questions: GTCC Disposal Alternatives Evaluated

### Final GTCC EIS anticipated in 2015

- ★ No Action
  - Current storage/management practices
- Geologic Repository
  - At WIPP

#### Boreholes

At Hanford, Idaho National Laboratory (INL), La Alamos National Laboratory (LANL), Nevada National Security Site (NNSS), WIPP Vicinity, and generic commercial location in Region IV (west)

#### ★ Trenches

 At Hanford, INL, LANL, NNSS, Savannah River Site (SRS), WIPP Vicinity and generic commercial location in Regions II and IV (southeast and west)

#### ★ Vaults

 At Hanford, INL, LANL, NNSS, SRS, WIPP Vicinity, and generic commercial location in Regions I-IV (northeast, southeast, midwest, and west)



# Other Questions: Status of DOE Cleanup Initiatives



# Other Questions: Hanford Waste Treatment Plant Status

- World's largest radioactive waste treatment facility for DOE
- Will process and stabilize radioactive and chemical wastes currently stored at Hanford site.
- Legal agreements exist between DOE and the State of Washington to complete and start WTP by 2019 and reach an average 70 percent operational capacity by 2022.
- Technical issues related primarily to the handling of high-solid content waste streams mean dates cannot be met and the agreement will need to be modified.





U.S. focus on safety of spent fuel and radioactive waste management

- **★** Robust independent legal and regulatory infrastructure
- Through examination of lessons learned from the Fukushima Accident
- Commitment to enhanced participation and continuous improvement in the Joint Convention review process

