



U.S. DEPARTMENT OF
ENERGY



Office of Environmental Management : Establishing Strategic Partnerships

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Waste Management 2011
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EM Environmental Management

safety ❖ performance ❖ cleanup ❖ closure

www.em.doe.gov

EM Mission

“Complete the safe cleanup of the environmental legacy brought about from five decades of nuclear weapons development, production, and Government-sponsored nuclear energy research.”



- Largest environmental cleanup effort in the world *originally* involving 2 million acres at 108 sites in 35 states
- Operating in the world's most complex nuclear waste regulatory system
- Safely performing work in challenging environments involving some of the most dangerous materials known to man
- Solving highly complex technical problems with transformational technologies
- Supporting other continuing DOE missions and stakeholder partnerships



EM Environmental Management

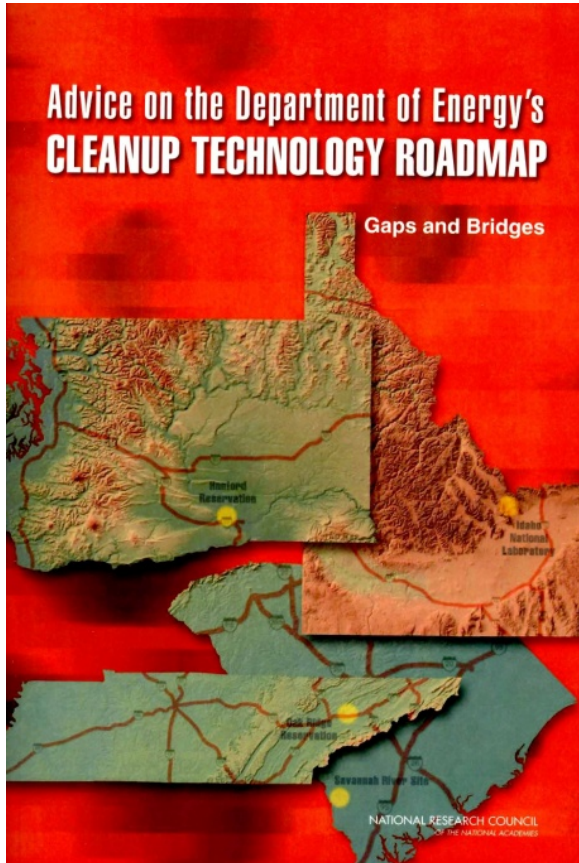
safety ❖ performance ❖ cleanup ❖ closure

EM Top-Level Goals

- **Safety**
 - **Ensure the safety and health of the public and the workers and protect the environment**
- **Compliance and cleanup scope**
 - **Perform work in accordance with 37 compliance agreements with state and federal regulatory agencies**
- **Project Management**
 - **Improve construction project performance**
- **Footprint Reduction**
 - **Reduce the active area and number of sites**
- **Science and Technology**
 - **Use science and technology development to decrease the life cycle cost and period of execution of the EM program**



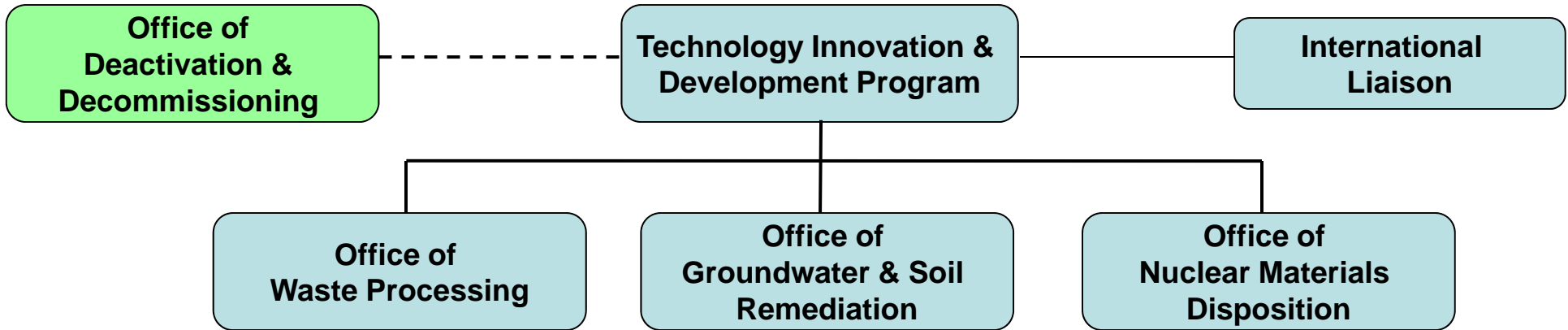
National Academy of Science (NAS) Study



- DOE-EM commissioned NAS study in 2007
- In 2009, NAS published: “*Advice on the Department of Energy’s Cleanup Technology Roadmap, Gaps and Bridges*”
- NAS recommended that DOE EM focus technology development work on:
 - Waste Processing
 - Groundwater and Soil Remediation
 - Spent Nuclear Fuel and Surplus Nuclear Material
 - Facility Deactivation and Decommissioning
- DOE EM restructured the technology development program to focus on *transformational* technologies in the program areas identified in the NAS study

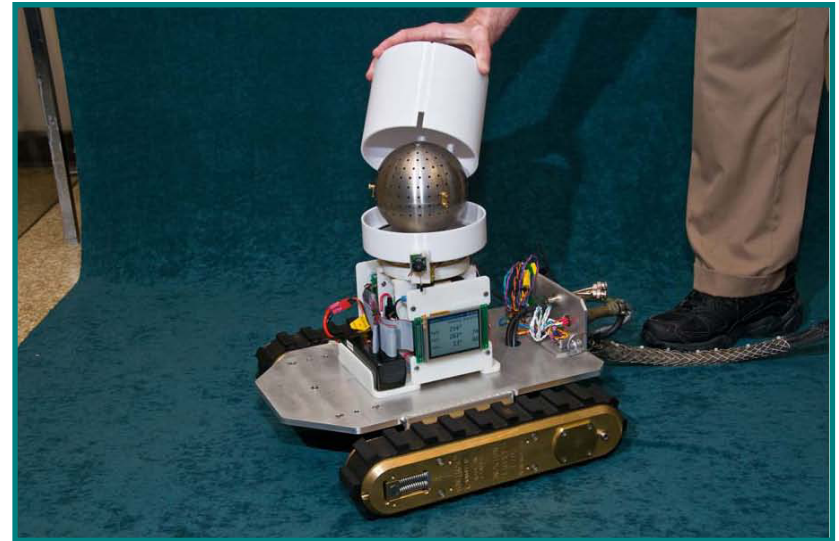


Office of Technology Innovation & Development



Program Strategy

- Integrated Transformational and Applied R&D
- Leveraging
- Communication
- Technical Assistance and Peer Reviews



RadBall™

*in Position and Orientation Determination System (PODS)
on remote-controlled robot*

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EM-30 International Cooperative Program

Ana M. Han (EM-30)



- Mission
 - The mission of the EM International Program is to foster international cooperation in addressing environmental and waste management issues leading to the reduction of technical, financial, and programmatic risks for EM
- Strategy
 - Study waste management, groundwater and soil, D&D, and SNF/SNM challenges of mutual interest
 - Focus cooperation on EM's accelerated closure mission
 - Align with EM Technology Roadmap and Five Year International Program Strategic Plan
 - Leverage International expertise and experience
 - Promote the sharing of lessons learned with leading international scientists
 - Be an effective mechanism to coordinate national laboratory, university, and industry activity at an international level

“Scientific progress is seldom made by a lone explorer working in seclusion.”
— Secretary Chu



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EM International Partnerships

safety • performance • cleanup • closure

United Kingdom

- Nuclear Decommissioning Authority (NDA)/Sellafield
- NuVision Engineering (NVE, formerly AEA Technology)



France

- Commissariat à l'Énergie Atomique (CEA)



Russia

- Khlopin Radium Institute (KRI)
- SIA Radon Institute
- Rosatom
- Nuclear Safety Institute
- Russian Academy of Sciences (RAS)
- DOE-Moscow



South Korea

- Nuclear Engineering and Technology Institute (NETEC) – Cold Crucible Induction Melter (CCIM)
- US-Korea Joint Standing Committee Meetings on Nuclear Energy Cooperation (JSCNEC)
- US-Korea Energy Dialogue meeting
- Korea Institute of Nuclear Safety (KINS)
- Korea Hydro and Power (KHNP)



Australia

- Australian national nuclear research and development organization (ANSTO)

Ukraine

- International Radioecology Laboratory (IRL)



Hungary

- Memorandum of Understanding (MOU) with Hungarian counterparts



China

- Peaceful Uses of Nuclear Technology (PUNT)



Japan

- US-Japan Nuclear Energy Action Plan (JNEAP)
- Japan Nuclear Fuel Limited (JNFL)/Rokkasho
- U.S.-Japan Science Mission



International Multilateral Organizations

- International Atomic Energy Agency (IAEA)
- The Organization for Economic Co-operation and Development / Nuclear Energy Agency (OECD/NEA)

International Conferences/Workshops

- International Conference on Environmental Remediation and Radioactive Waste (ICEM'10)
- Waste Management 2010
- Cold Crucible Induction Melter (CCIM) Workshop
- Bilateral Workshop on Nuclear Fuel and High Level Waste Management

International Programs

- The International Framework for Nuclear Energy Cooperation (IFNEC)
- Global Threat Reduction Initiative (GTRI)

International Program

Challenges

- Identify waste management, soil and groundwater, D&D, and SNF/SNM challenges of mutual concern
- Being an effective mechanism in coordinating national laboratory, university, and industry activity at an international level
- Expand collaborative technology development with international partners through a focus on transformational solutions

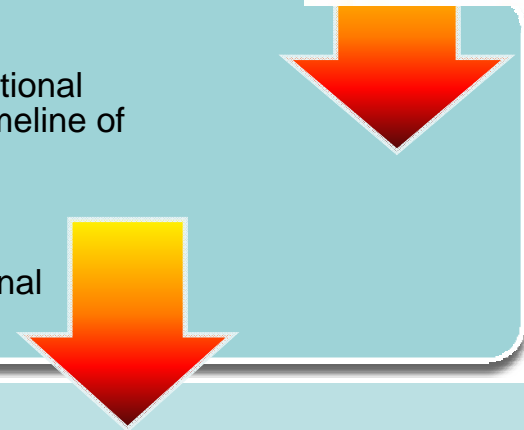


Possible Solutions

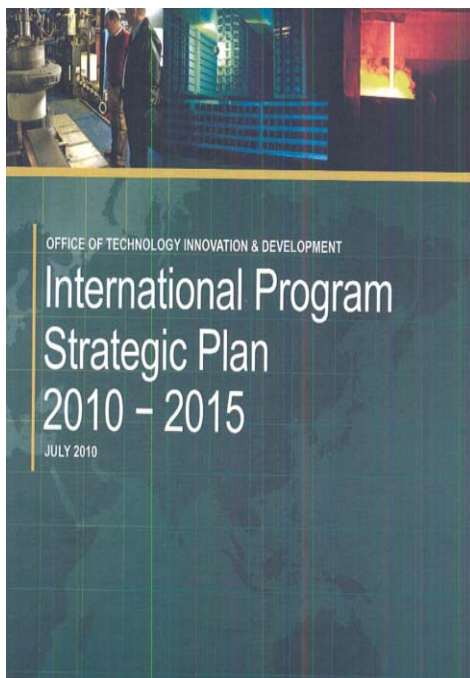
- Promote the sharing of lessons learned by leveraging national and international expertise and experience that have the potential to reduce the cost and timeline of the EM cleanup mission
- Align with EM Technology Roadmap and Multi-year Program Plan
- Increased key international collaborative relationships
- Establish and maintain strong international cooperative ties with international organizations (i.e. IAEA, NEA)

Benefits

- Beneficial relationships with leading international scientist can contribute to transformational technology innovation and development
- Making the International Program an effective mechanism that produces tangible results in the cleanup efforts
- Being recognized as a world know expert in waste management and environmental issues



Office of Technology Innovation & Development International Program Strategic Plan 2010-2015



Strategic Approach: Leverage World-Wide Expertise, particularly in the EM-30 focus areas

Objective: Contribute to the advancement and deployment of technologies/practices to meet identified environmental & waste management needs

The Strategic Plan identifies collaborative opportunities in various nations and international organizations (i.e. IAEA, NEA).

Scientific progress is seldom made by a lone explorer working in seclusion."

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EM International Program- Interface with International Organizations

- **EM maintains strong international cooperative ties with the IAEA Waste Safety and Waste Technology Sections, examples:**
 - Represented US on IAEA's International Waste Technology Steering (2002-2007) and chaired 2008 session (current representative is John Cochran of SNL).
 - Chaired technical meetings at IAEA on environmental restoration and repository safety (2007-2009)
 - Participated in IAEA-led international workshops/conferences, most recent on waste disposal (Korea-2008), sealed source management (Thailand-2008), and scrap metal recycling (Spain-2009)
 - Organizing international conference on environmental restoration of uranium sites planned for May-2009
 - Continues to provide technical expertise as consultants to IAEA on technical and safety documents, recently contributing to performance assessment guides, environmental restoration, decommissioning, mixed waste and waste management data reporting (2010).
- **DOE-EM is participating in, and collaborating with the IAEA International Decommissioning Network (IDN) to exchange ideas, lessons learned, methods and technologies to improve decommissioning performance**
 - In addition to participation in IDN meetings, EM has assisted IDN startup and development and has
 - Provided a series of D&D training videos; monthly information from our Richland ALARA Center; and access to our newly developed Knowledge Management Information Tool website
 - IDN has provided a review copy of their newly developed Innovative and Adaptive Technologies in Decommissioning of Nuclear Facilities
 - EM planning on attending the IAEA meeting to discuss the progress made and path forward for the International Decommissioning Network (May 3- June 2, 2011)



EM International Program- Interface with International Organizations

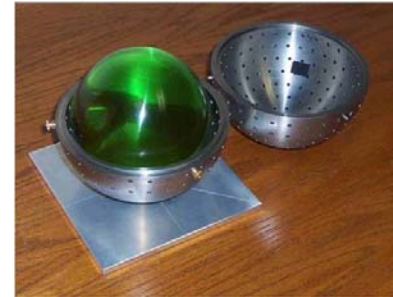
- **EM actively participates in the OECD/NEA meetings, including:**
 - **The OECD/NEA RWMC– Annual technical meeting on radioactive waste management, March 2011 in France**
 - **EM submitted the “Act of Adhesion” to participate in the OECD- Working Party on D+D (WPP)/CPD**
- **EM leads the U.S. government’s technical implementation of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (Joint Convention)**
 - **DAS, Frank Marcinowski co-chairs the Executive Steering Committee with the State Department**
 - DOE, EPA, and NRC provide technical expertise, EM has the lead within DOE and chairs the technical working group
 - Produced the Third U.S. National Report (3-year cycle) in October 2008
 - Leads the technical experts on the US delegation
 - **EM provides leadership for the Review Meetings of the Parties . EM representatives have actively participated in the May 2009 and plans to participate in the May 2012 meeting at IAEA Headquarters in Vienna, Austria**



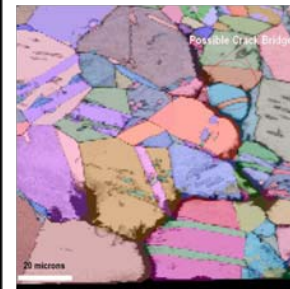
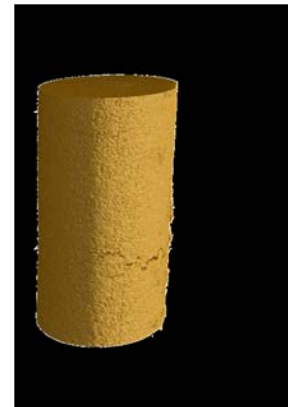
United Kingdom

Plutonium Storage
Spent Fuel Storage
Nuclear facility life management and materials degradation
Waste form chemistry
Tank retrieval technologies
Deactivation and Decommissioning technologies

- Extensive fuel cycle expertise in the UK
- Waste Processing
 - Waste form development
 - Tank retrieval
- Spent Fuel Handling and Storage
- Facility Life Management and Materials Degradation
- Pu storage
- D&D technologies
- Remote monitoring for groundwater remediation



Radball™ for contamination characterization



In-situ characterization of stress corrosion cracking in steels



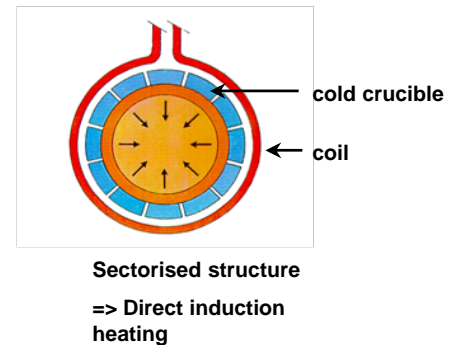
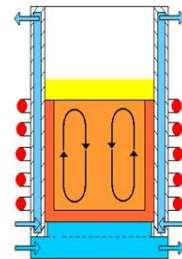
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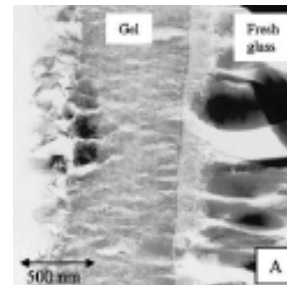
France

Waste processing Melter technologies
Long term performance of waste forms
Deactivation and decommissioning technologies

- Extensive expertise and experience throughout nuclear fuel cycle
- Waste Processing
 - Melter technology development
 - Waste form chemistry
 - Long-term waste form performance
- D&D
 - Decontamination methods (gels, foams, emulsions)
 - In-situ methods
- Groundwater and soil
 - Performance assessments
 - Modeling
- Opportunities for cost-shared R&D?



Cold Crucible Technology



Characterization of Leached Glass



CEA developed decontamination gel



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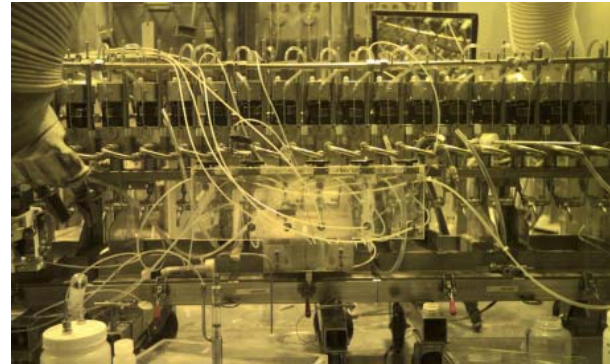
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Russia

Studies of contaminant transport processes to support modeling and simulation
Waste processing technologies

- Extensive history of U.S./Russian collaboration on waste management and environmental remediation
- Waste Processing
 - Separation technologies
 - Melter technology development
 - Waste form development
- Groundwater and Soil Remediation
 - Modeling
 - Radionuclide transport



Radionuclide separations testing



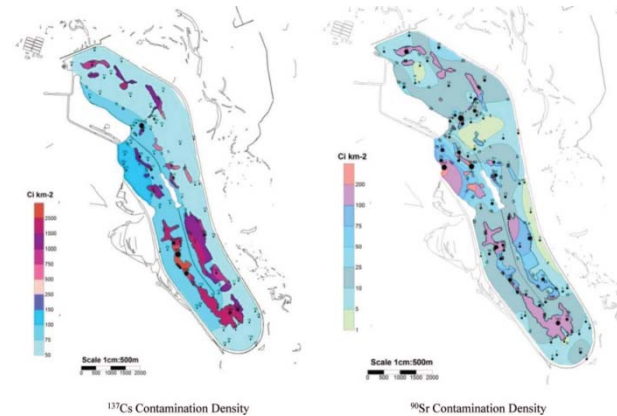
Crucible induction melter testing



Ukraine

Radionuclide distribution and migration in soils and groundwater Performance Assessment

- Significant environmental remediation R&D has resulted from the Chernobyl accident
- Groundwater and Soil Remediation
 - Radionuclide distribution and migration
 - Performance assessment methodologies
 - Large-site cleanup
- D&D
 - Site characterization
 - In-situ technologies



Radionuclide distribution in the Chernobyl Cooling Pond



D&D and entombment of reactor #4 at Chernobyl

Moving Forward : The EM International Program

Continue collaborative research with current partners and continue to identify new opportunities with new partners

- DOE-EM is pleased with the current progress and results

Statement of Intent (SOI) signed between DOE-EM and the UK NDA

- Information and technical exchanges are underway under all of EM-30's Program Offices
 - Technology Readiness Assessments and Maturation Plans
 - Glass formulation and vitrification technology
 - Nuclear materials and facility life management
 - D&D
 - Groundwater & Soil Remediation

Interface with other DOE offices

- DOE's NE on Fuel Cycle Research and Development efforts with Japan; NNSA's GTRI and China PUNT activities; Work with SC and international partners in EM's ASCEM initiative, etc.



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Moving Forward: The EM International Program

Interface with other U.S. agencies

- Department of State's Joint Standing Committee on Nuclear Energy Cooperation and Consultations in S&T

International agencies

- IAEA, OECD/NEA

International agreements

- Similar to SOI with the UK; Hungary MOU on information exchange on storage systems for spent nuclear fuel

International Conferences

- Waste Management; ICEM Japan

Engage with International Visitors at EM and Foreign Sites

- Rosatom Hanford Visit; Korea del visit; IAEA meeting at WIPP; etc.

International Program has been successful and looks to expand



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For More Information

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