Update on Office of Civilian Radioactive Waste Management (OCRWM) Science and Technology Program

Presented to:
Nuclear Waste Technical Review Board

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Outline

• Background
• Science & Technology (S&T) Program Attributes
• Organization
• Funding and Performer Profiles
• Targeted Thrusts
• Advanced Technologies
• Reviews
• What’s Next?
Background

- Third update to the Board since program inception
- Program is now institutionalized with a formal structure
- Fully integrated yet distinct from Yucca Mountain Project (YMP) design, analysis, and regulatory activities
- Funding trend is positive
- Senior management is committed to program
S&T Program Mission and Drivers

• Mission
  – “Provide advanced science and technology to continually enhance our understanding of the repository system and to reduce the cost and schedule for the OCRWM mission.”

• Drivers
  – Reduce costs
  – Enhance understanding
  – Keep current with nuclear industry best practices
Distinction Between S&T and YMP Activities

OCRWM Program

Science & Technology Projects
- Enhance understanding of science supporting the repository system
- Identify/develop new technologies and/or approaches
- Demonstrate feasibility of new technology/approaches
- Not required for regulatory compliance

Repository System Investigations
- Engineering and design
- Site modeling and analysis
- Late stage prototyping
- Work within NRC regulatory purview

Coordination
OCRWM (RW) Office of Science and Technology and International (OST&I) Organization
Targeted Thrust Concept

- Targeted on key applied research initiatives to support overall OCRWM mission
- Leadership provided by internationally recognized experts from national laboratories and academic institutions
- YMP representatives assure coordination and integration with Project’s activities
- OST&I manager designated for each thrust
- Additional thrusts may be developed as other initiatives are identified
OCRWM S&T Program Funding

- Advanced Technologies
- Materials Performance
- Natural Barriers
- Radionuclide Getters
- Source Term

Fiscal Year

2003 2004 2005

Millions

0 2 4 6 8 10 12 14 16 18 20

Department of Energy
Office of Civilian Radioactive Waste Management

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Current Targeted Thrusts

**TARGETED THRUSTS**

**Materials Performance**
- J. Payer (CWRU)
- P. Russell (ORD)
- J. Walker (OST&I)

**Natural Barriers**
- G. Bodvarsson (LBNL)
- W. Boyle (ORD)
- D. Duncan (USGS/OST&I)

**Radionuclide Getters**
- H-N. Jow (SNL)
- R. Moore (SNL)
- S. Mattigod (PNNL)
- D. Barr (ORD)
- D. Duncan (USGS/OST&I)

**Source Term**
- R. Ewing (UM)
- M. Peters (ANL)
- J. Summerson (ORD)
- A. VanLuik (ORD)
- R. Finch (ANL/OST&I)
Materials Performance Targeted Thrust

- Objective - enhance the understanding of material corrosion performance and explore technical enhancements
- Corrosion processes in thin films, particulates, and deposits
  - Effects of moisture on corrosion performance of metals
- Evolution of corrosion damage by localized corrosion
  - Initiation, propagation, and arrest phenomena particularly for crevice corrosion of metals
- Evolution of the environment on metal surfaces
  - Moisture content, distribution, and chemical composition on metal surfaces
Natural Barriers Targeted Thrust

- Objective - enhance the understanding of natural system processes and explore technical enhancements

- Unsaturated Zone Processes
  - Nature and distribution of flow paths
  - Seepage
  - Matrix diffusion/sorption
  - Episodicity
  - Drift-shadow effect

- Saturated Zone Processes
  - Matrix diffusion
  - Dilution and sorption
  - Plume characteristics in saturated zones
  - Non-oxidizing environments in saturated zones
Source Term Targeted Thrust

- Objective - enhance the understanding of the release mechanisms of key radionuclides from spent nuclear fuel (SNF) and explore technical enhancements

- Engineered materials and radionuclide sequestration
  - Corrosion effects on chemistry and radionuclide release processes

- Secondary alteration phases
  - Effects of environment on the formation, evolution, and radionuclide incorporation

- Matrix dissolution
  - Oxidation and dissolution of SNF and evolution of surface conditions
Radionuclide Getters Targeted Thrust

- **Objective** - Development of new materials for radionuclide absorbers or adsorbers (getters)
- **In-package getters**
  - Nanoporous and mesoporous materials
- **In-drift getters**
  - Tailored minerals, metal oxides, double layer hydroxides
- **Getter manufacturing and systems analysis**
  - Scale-up, fabrication, and implementation
FY 2005 Targeted Thrust New Starts

• Natural Barriers
  – Unsaturated zone near-field processes
  – Saturated zone processes

• Source Term
  – Secondary alteration phases and radionuclide release
  – International source term programs for collaboration on understanding release of key radionuclides
FY 2005 Advanced Technologies Activities

- Advanced Welding for Waste Package Closure
- Advanced Waste Package Materials and Fabrication
- Advanced Understanding of Seismic Hazard
- Advanced Remote Material Handling/Robotics Technologies
- Advanced Tunneling Technology
Review Process

- **Project selection reviews**
  - Conducted by Advanced Technologies and Targeted Thrusts to develop funding recommendations to OST&I management

- **Advanced Technologies and Targeted Thrust Program Reviews**
  - External subject matter experts provide technical assessments

- **S&T Programmatic Evaluation Panel**
  - 7-member, external, senior-level panel reviews overall program to provide guidance on program direction and investment strategy
What’s Next?

- Funding
- Integration & Transitioning Projects
- Prioritization
- Public Outreach/Communications
BACKUP SLIDES
OCRWM S&T Program Funding

FY 2005 ($K) = $19,835

- Advanced Technologies, $6,305, 31%
- Materials Performance, $3,140, 16%
- Natural Barriers, $4,350, 22%
- Radionuclide Getters, $1,500, 8%
- Source Term, $4,540, 23%

FY 2004 ($K) = $17,300

- Materials Performance, $3,855, 22%
- Natural Barriers, $6,284, 36%
- Source Term, $3,415, 20%
- Radionuclide Getters, $1,715, 10%
- Advanced Technologies, $2,031, 12%

FY 2003 ($K) = $1,700

- Advanced Technologies, $500, 29%
- Source Term, $300, 18%
- Radionuclide Getters, $300, 18%
- Natural Barriers, $600, 35%
OCRWM S&T Program Performers

FY 2005 S&T Performers ($K) = $19,835
- DARPA, $2,625, 13%
- National Labs & USGS, $5,828, 30%
- New Starts, $8,560, 44%
- Universities, $2,822, 14%
- Industry, $4,000, 21%

FY 2003 S&T Performers ($K) = $1,700
- Industry, $200, 12%
- National Labs & USGS, $1,500, 88%

FY 2004 S&T Performers ($K) = $17,300
- Industry, $300, 2%
- DARPA, $1,128, 7%
- Universities, $2,660, 15%
- National Labs & USGS, $13,212, 76%