U.S. DEPARTMENT OF ENERGY

Environmental Management Office of Technology Innovation and Development

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Acting Office Director

Groundwater and Soil Remediation

July 2010

MISSION

Transform science and innovation into practical solutions for environmental clean-up.

VISION

Through leadership in integration, collaboration and communication, we will accelerate environmental clean-up and reduce costs.

USDOE Environmental Management
Office of Technology Innovation and Development

Business Model for the Office of Technology Innovation & Development

- **Integrate** parallel baseline activities, when necessary, to smooth the "seams" between each stage of technology innovation and development and implementation to provide systems-based approaches and reduce technical uncertainty for highly complex challenges within the complex
- **Collaboration** between regulators, stakeholders, field offices, contractors, scientists and engineering to develop defensible systems plans with clearly identified plans for technical and programmatic risks to reduce the cost, risk, and timeline for mission success
- **Communication** with the field offices and contractors to identify appropriate risk-based end states and develop scientific and technical understanding and tools required to implement viable solutions that are critical to mission success, with shared risk and success

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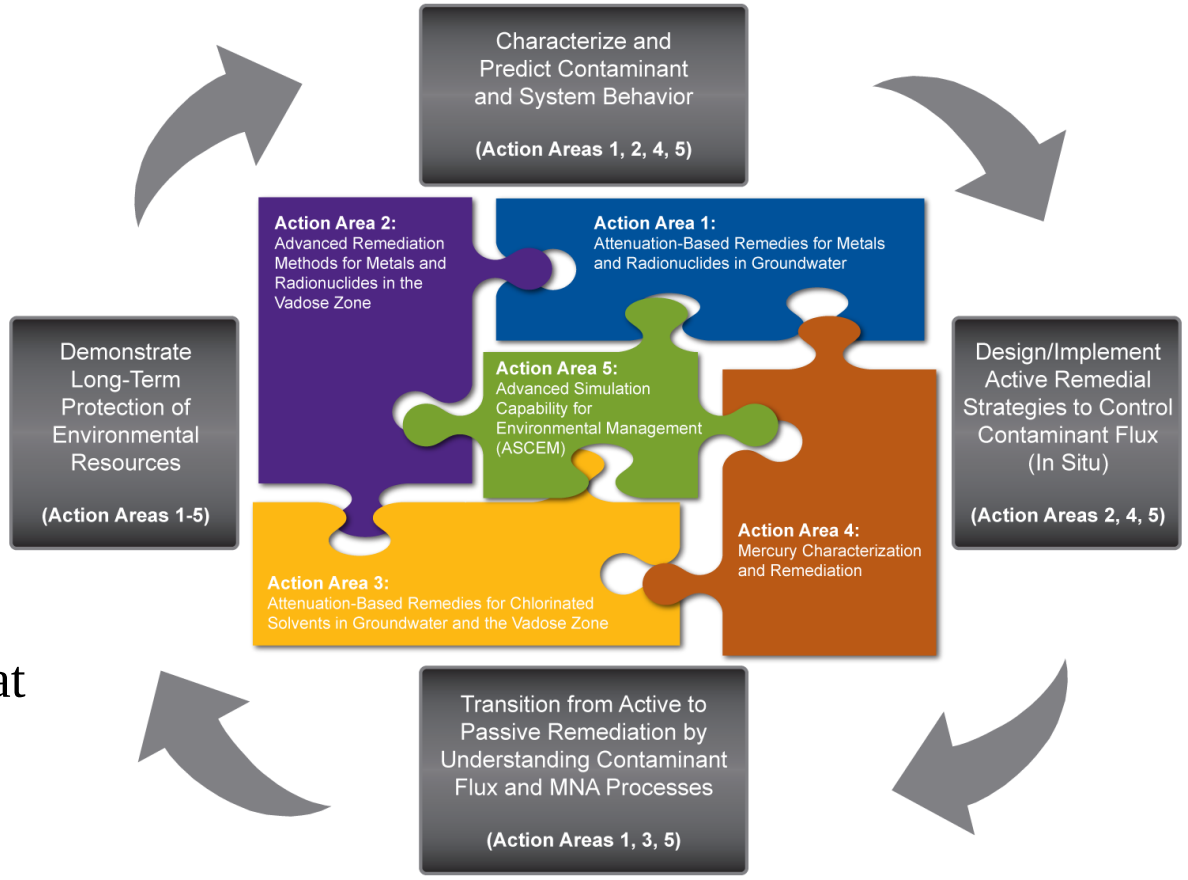
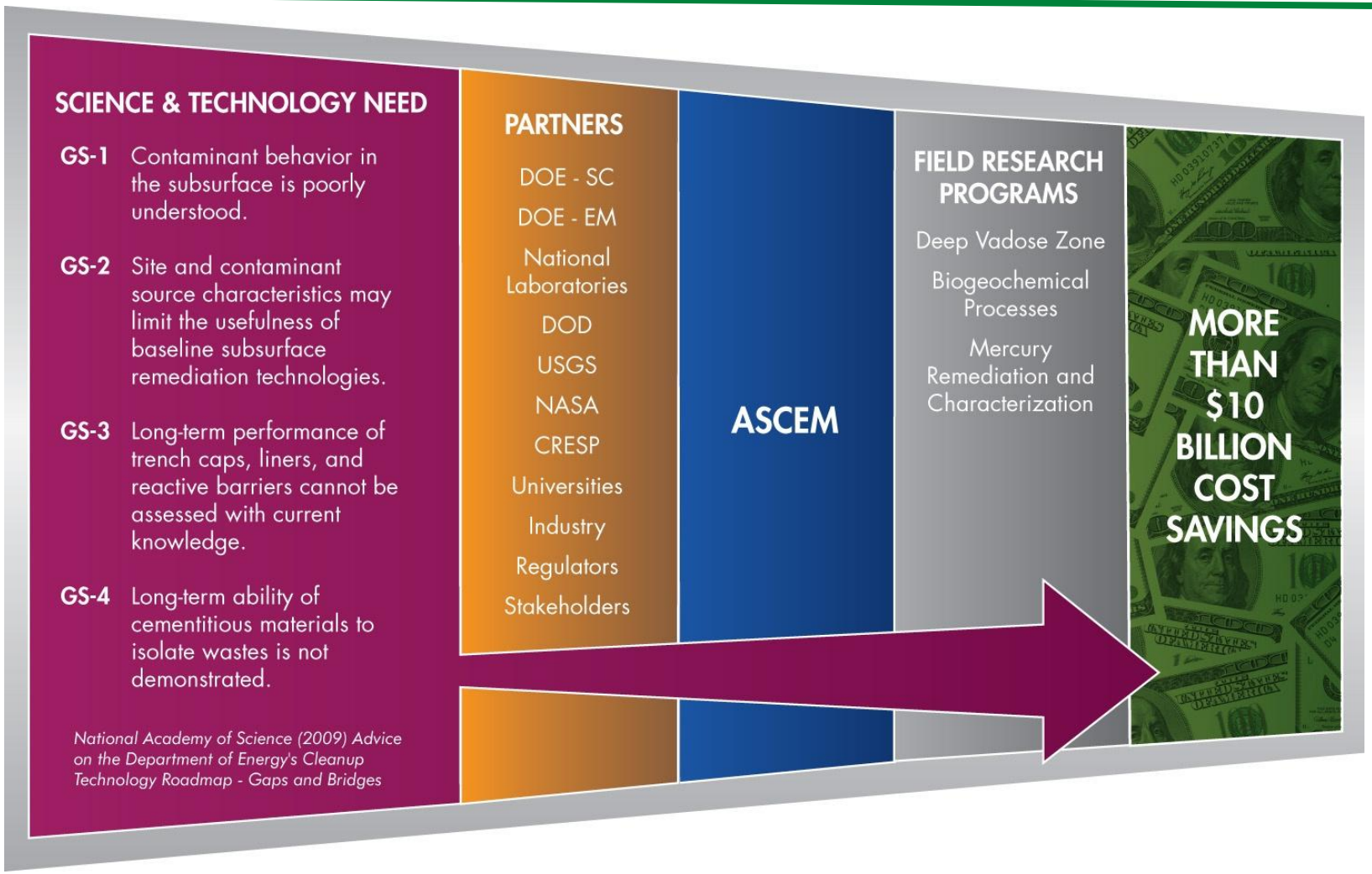
Groundwater and Soil Remediation Program

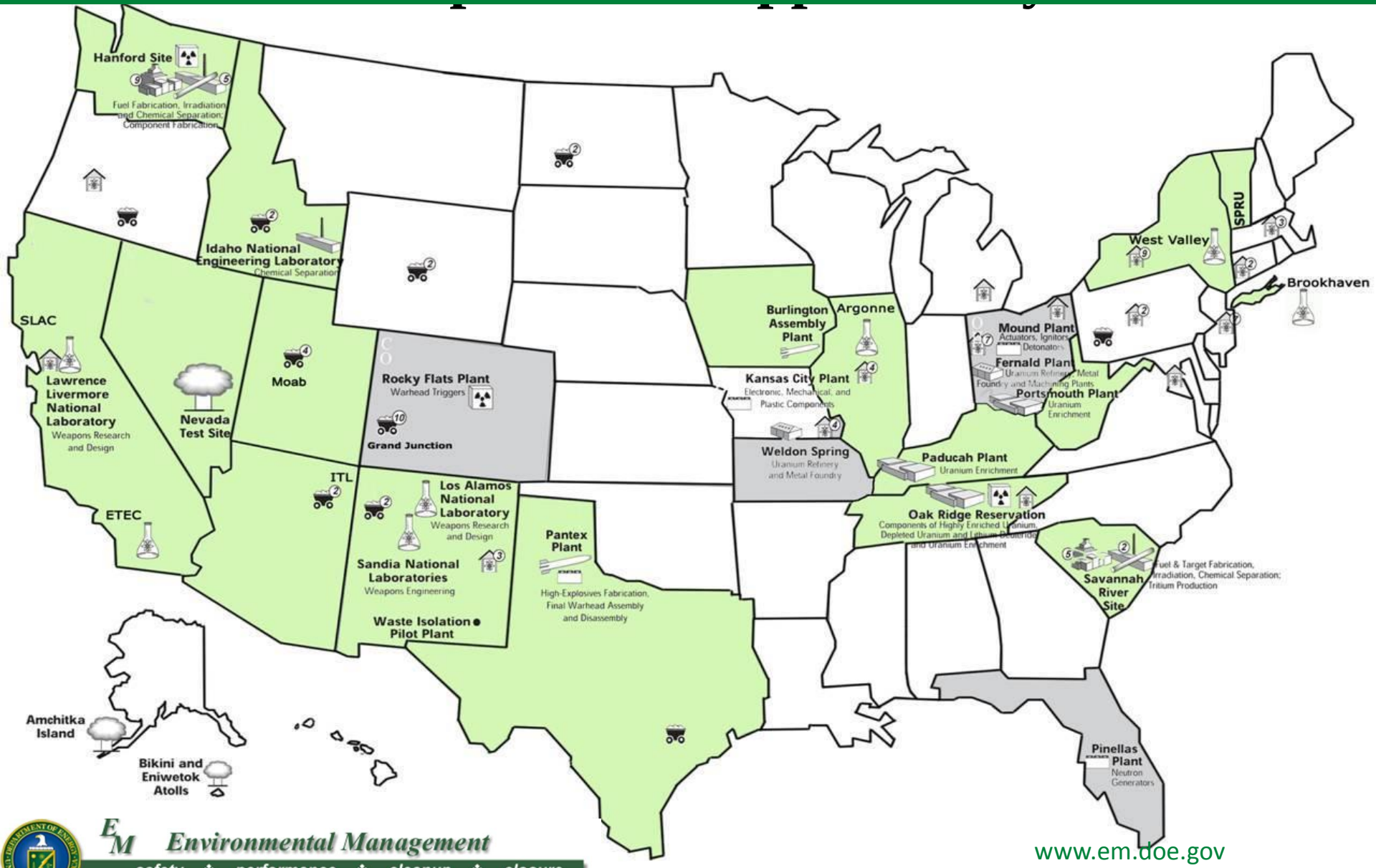
- Deep Vadose Zone-Groundwater Applied Research Program at the Hanford Site
- Biogeochemical Processes for Applied Subsurface Science Program at Savannah River
- Mercury Remediation and Characterization Program at Oak Ridge



Reducing the EM Footprint



EM Remedial Technologies and Approach: Complex-wide Applicability



EM Environmental Management

safety ❖ performance ❖ cleanup ❖ closure

www.em.doe.gov

Deep Vadose Zone Applied Research Program

Needs and Opportunities	Subsurface Biogeochemical Research Program	EM-32 Groundwater and Soil Remediation	Applied Site Operations (Direct)	Applied Contractor (Indirect)	Outcomes	Impact
1. Understand: Biogeochemical and hydrogeologic processes controlling contaminant movement to set attainable and verifiable remediation goals **2. Predict:** Conceptual and numerical models support accurate prediction of fate and transport of contaminants in the DVZ **3. Control:** Contaminant flux from vadose zone to groundwater and surface water **4. Monitor:** Real-time optimization of remedial strategies and detection of early warnings for remedial action	**70.1.1.1** Investigate redox chemistry of ^{99}Tc and U **70.1.1.2** Evaluate biogeochemistry of microbial isolates toward ^{99}Tc and U under microaephilic conditions **70.1.1.3** Characterize intragrain microscopic transport processes of U and ^{99}Tc **70.1.2.1** Develop predictive models to understand fate and transport of ^{99}Tc and U **70.1.3.1** Provide scientific underpinnings for in-situ remediation approaches or natural attenuation **70.1.4.1** Provide cost effective and long-term monitoring	**32.1.1.1** Geochemical and hydrodynamic characterization of field site **32.1.1.2** Characterize effects of geochemical and hydrodynamic heterogeneities on ^{99}Tc transport in remedial strategies **32.1.2.1** Develop numerical model to simulate remedial strategy performance and implementation for in-situ stabilization of U and ^{99}Tc **32.1.2.2** Develop an Advanced Simulation Capability for Environmental Management (ASCEM) **32.1.3.1** Evaluate the physical and chemical processes controlling the efficacy of reactive gas and foam-based delivery of remedial amendments **32.1.4.1** Develop advanced geophysical and natural marker monitoring approaches that allow characterization of subsurface heterogeneities, controlling and induced properties across-scale at a high enough spatial resolution, and over a large enough spatial extents, to enable accurate in situ assessment of remedial actions in DVZ environments	**1.1.1.1** Geochemical and hydrodynamic characterization of field site **1.1.2.1** Develop baseline conceptual and numerical model to evaluate impact to groundwater **1.1.3.1** Support and provide input to field testing of technologies developed through EM-32 **1.1.4.1** Contaminant plume and remedial action monitoring through routine environmental sampling	**2.1.1.1** Provide baseline characterization for use in conjunction with basic and applied research data **2.1.2.1** Develop conceptual models and apply numerical models to support CERCLA and RCRA efforts **2.1.2.2** Develop and apply numerical models to support design of DVZ treatability tests **2.1.3.1** Identify source-control alternatives that provide an appropriate range of remedial options and information to support comparison of alternative technologies **2.1.3.2** Implement DVZ treatability test plan to evaluate specific remedial technologies for ^{99}Tc and U (e.g., desiccation, reactive gas, and foam-delivery) **2.1.4.1** Collect monitoring data through existing programs as baseline information for use in evaluating alternative methods	• Updated biogeochemical conceptual model to predict the transport and fate of ^{99}Tc and U contamination in DVZ • Scientific and technology information to support RCRA/CERCLA fate and transport assessments of long-term performance for remedial alternatives • Advanced remedial strategies that effectively treat metal and radionuclide contaminants in low permeability zones and complex heterogeneous environments to mitigate the flux to groundwater and meet remedial goals • Monitoring capabilities that can refine subsurface DVZ performance and impact on subsurface systems	Contribute to the $10 Billion life-cycle cost associated with groundwater and soil remediation across DOE complexes

Assumptions and External Factors

- Funding is available at the start of each fiscal year and budgets meet or exceed projections
- Staffing levels remain relatively stable
- Leverage the resources of other DOE offices, government agencies, and industry programs to address DOE needs
- Maintain expertise and resources necessary to address EM's long-term needs – field test facilities and information archives to develop detailed conceptual understanding and site models to guide remedial actions and support DOE's long-term stewardship planning