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## **The Environmental Management Core Laboratories - A Collaborative Effort to Enhance Cleanup**

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**Abstract** – *Acknowledging that the magnitude and diversity of the critical issues facing the DOE-EM cannot be addressed by a single institution, the Laboratory Directors established the EM Core Laboratories. This collaborative network ensures that the best available resources are addressing environmental quality issues through the introduction of critical new science and technology. Based upon the Top-to-Bottom Review, the EM program is shifting the focus of its cleanup efforts to accelerate schedules to reduce cost and the most significant risks. To facilitate this acceleration, the Office of Science and Technology has restructured their research and development program towards two new thrusts, Closure Site Support and Alternatives Development, are aimed at the high priority needs to support the re-baselined cleanup program. The EM Core Laboratories are well positioned to ensure the successful implementation of this new direction.*

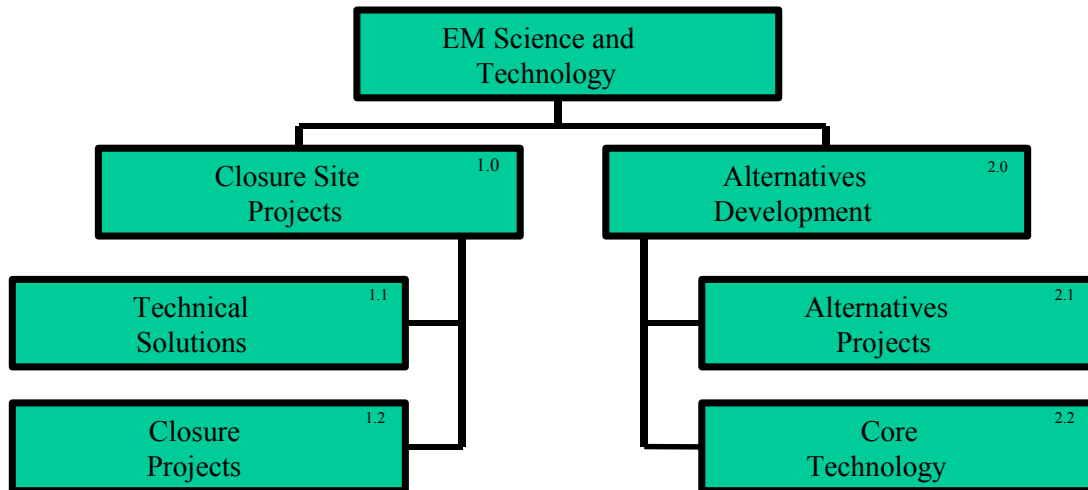
### **I. INTRODUCTION**

The Department of Energy's (DOE) Office of Environmental Management (EM) is responsible for cleanup of the radioactive, chemical, and other hazardous waste left after 50 years of United States production of nuclear weapons. This is the largest environmental management program in the world, with an estimated life cycle cost over \$200 billion. The EM cleanup mission faces many difficult scientific and technical challenges such as tritium in groundwater, disposition of high level waste, shipment of transuranic wastes to the Waste Isolation Pilot Plant, deactivation and decommissioning thousands of radioactively contaminated structures, and environmental restoration cleanup.

EM has recognized the need for scientific and technical innovation in the EM program to address these challenges. EM's research and development (R&D) spans basic science to application and deployment. EM's investments in science and technology (S&T) are driven by the need to reduce high life-cycle cleanup costs (closing the gap between projected life cycle costs and expected budgets); to reduce environmental, safety and health risks; and to provide solutions to intractable problems.

EM is in the process of streamlining and focusing its science and technology program. Following the Top-to-Bottom Review<sup>1</sup>, the Assistant Secretary for EM (EM-1) charged the sites to review and re-baseline their cleanup projects to accelerate cleanup schedules. In December 2001) EM-1 directed<sup>2</sup> the Office of Science and Technology (OST) to reorient the S&T program toward two new strategic "thrusts" to focus the program on high priority needs to support the re-baselined EM cleanup program. In response to that direction the OST developed a plan<sup>3</sup> describing how the S&T program would be streamlined and focused on the two new thrusts and how the program would operate to fulfill this new approach.

The plan outlines the operation of the streamlined OST to serve the two thrusts. Thrust 1, Closure Site Support, is to provide technical solutions (formerly called technical assistance) and closure projects to "closure sites" (defined as the DOE facilities whose primary mission has been completed or terminated or activities are aimed at reducing footprint or mortgage. The largest closure sites at present are the Fernald site in Ohio and the Rocky Flats site in Colorado) to ensure effective site closure is met. Thrust 2, Alternatives Development, pursues alternatives to high-cost, high-risk baseline activities and includes support for core technologies that are essential to the EM mission. The OST Work Breakdown Structure for this is shown in Figure 1.



**Figure 1. Work Breakdown Structure for EM Science and Technology**

## II. INNOVATIVE APPROACH

Solving EM's need for science-based decisions and actions to support accelerated cleanup requires the committed resources of an integrated system or network working collaboratively and synergistically to employ the best resources available, whether from DOE's laboratories, universities, or private industry. To facilitate this integrated approach, eight DOE laboratories have signed a Memorandum of Understanding (MOU) that designates a system of Environmental Management Core Laboratories (or Core Labs). These Core Labs will pool their science and technology resources to tackle environmental issues in a coordinated fashion rather than as individual laboratories. Through this effort, the labs are providing a corporate commitment and support for a common and meaningful national EM agenda.

The effort to unite these laboratories was led by the Idaho National Engineering and Environmental Laboratory (INEEL); DOE's lead environmental management laboratory. In addition to the INEEL, other laboratories involved include Los Alamos National

Laboratory (LANL), National Energy Technology Laboratory (NETL), Oak Ridge National Laboratory (ORNL), Pacific Northwest National Laboratory (PNNL), Environmental Measurements Laboratory (EML), Savannah River Technology Center (SRTC), and the Radiological and Environmental Sciences Laboratory (RESL). The MOU provides the foundation for the collaborative network and identifies four areas of cooperation:

- Provide leadership and commitment to support the EM agenda for cleanup and long-term stewardship
- Develop recommendations for long-range programmatic direction
- Strengthen the scientific credibility for DOE's cleanup-stewardship decisions
- Provide input for future facility planning and development

The INEEL, in its role as the EM Lead Laboratory, leads and facilitates the Core Labs' activities.

### III. CURRENT ACTIVITIES

The Core Labs initially identified three key areas of focus for their efforts:

1. *National Vadose Zone Science and Technology Initiative* – the goal of this effort is to assist DOE in developing and implementing a new R&D initiative that will:
  - Provide a sound and defensible scientific understanding of chemical, radiological and heavy metal contaminant transformation and movement in the vadose zone
  - Reduce the uncertainty in both conceptual and mathematical predictive models for contaminant movement
  - Provide an improved risk basis for water resource protection, remediation, and stewardship decisions
2. *Next Generation Regulations for WIPP* – the goal of this effort is to evaluate the needs for, and frame a path to, an improved regulatory framework for the Waste Isolation Pilot Plant. The desired outcome is to reduce the life-cycle cost of disposing TRU waste

and ensure environmental protection and public safety through improved regulations.

3. *Science-Based Decisions: Rethinking the OST Portfolio* – the goal is expand and enhance the role of science in improving decision-making for EM by providing a mechanism to deliver appropriate technical information and rationale to EM's high stakes decisions, providing a basis for redressing "default decisions", and creating a knowledge basis for DOE to move away from a default compliance posture.

Initial efforts on each of these areas have been completed and is being evaluated to ensure that they fully support the strategic direction currently being taken by the OST. The Core Labs have been fully engaged with OST in their planning efforts to ensure that the resources of these national laboratories are prepared to support the S&T necessary for the accelerated cleanup mandated by EM-1. The Core Labs assisted in the development of the Action Plan and strategic planning on how EM R&D can best work with the sites to accelerate cost effective cleanup. The approach being used by the Core to ensure their effective support to the sites and the overall EM cleanup mission is portrayed in Figure 2.

### EM Core Labs Role

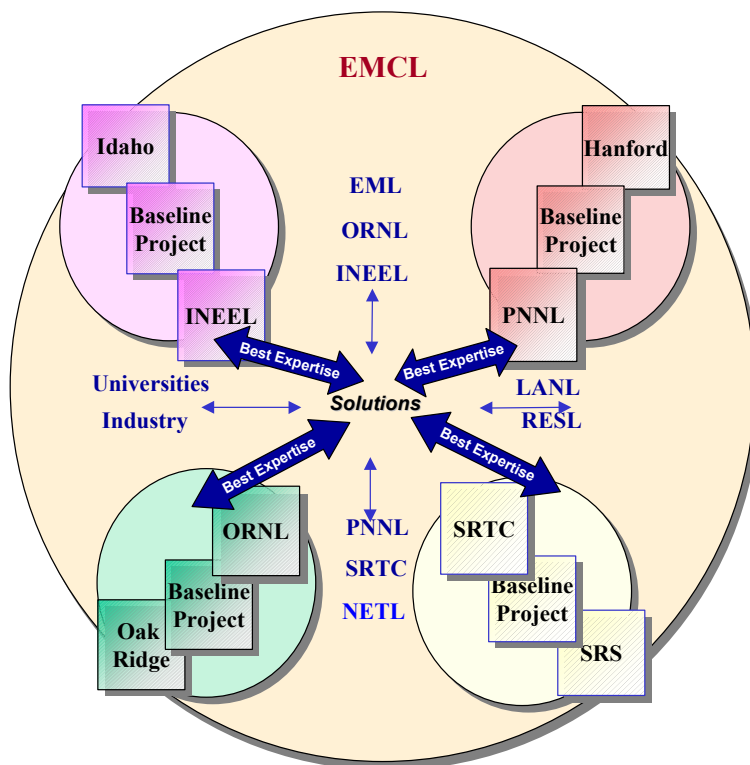


Figure 2. Role of the EM Core Laboratories

The Core Labs works with their associated sites, universities, and the private sector to ensure that the best expertise is applied to results in an accelerated cleanup program reducing the most urgent environmental risks and in a cost-effective manner.

#### IV. FUTURE ACTIVITIES

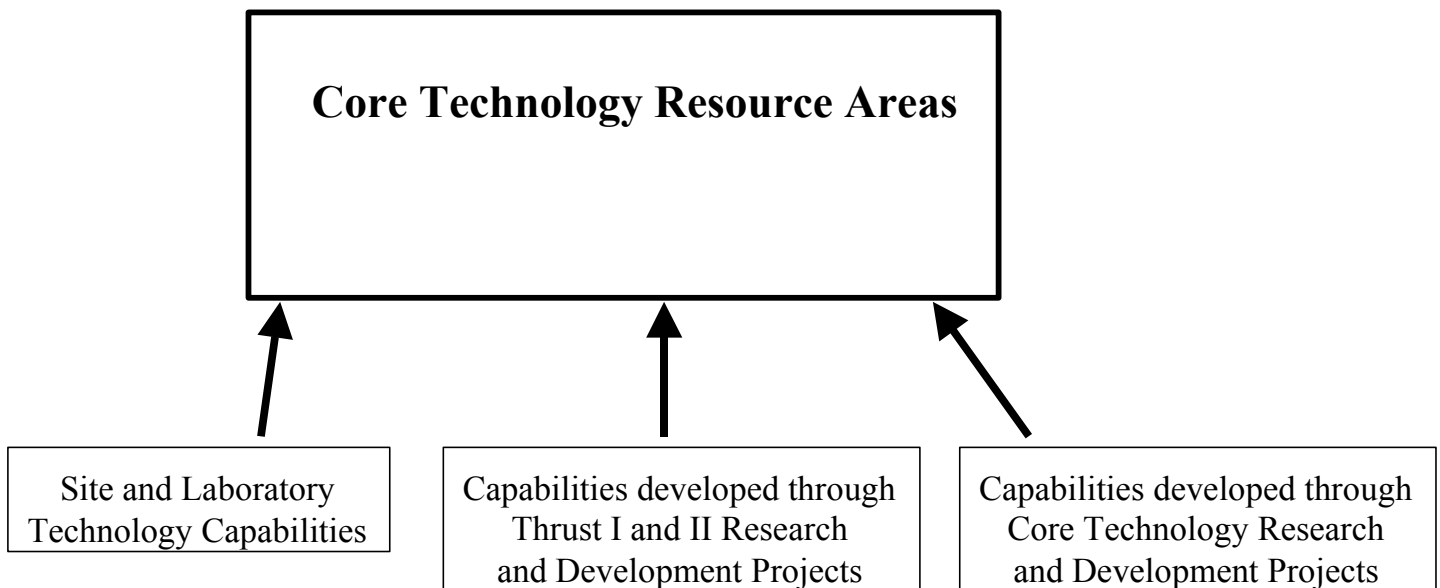
The Core Labs, working with the OST, has outlined roles that they could fill to enhance the overall effectiveness of the new direction for EM's S&T programs, including:

- Serve as a clearinghouse for the technical solutions (WBS 1.1) requests to ensure quick response to site needs is met
- Integrate Thrust 2 project requests with the research and development programs
- Expand Core Labs to include additional site operational personnel and provide independent review of Site Closure Project (WBS 1.2) and/or Alternative Projects (WBS 2.1) for technical adequacy and relevancy

In addition to the activities described above, EM has recognized that there are several core technical capabilities (WBS 2.2) that are critical to the future success of the cleanup program. These core elements include:

- Characterization, monitoring, and modeling
- Contaminant fate and transport predictions
- Robotics and remote systems
- Decontamination and decommissioning
- Separations and stabilization
- Waste reduction and minimization
- Waste immobilization
- Risk-based decision making

These core capabilities will be necessary to support the gamut of needs from Closure Site Support to Alternatives Projects. They are comprised of the research and development intellectual capital that supports the EM cleanup mission as well as the specific R&D activities performed by the cadre of environmental management science and technology subject matter experts. The primary objective of this function is to develop and retain this subject matter expertise as a readily available resource. The source of where these core technology resources are developed/ retained is shown in Figure 3.



**Figure 3. S&T capabilities that comprise a Core Technology Resource Area come from multiple sources**

## **V. CONCLUSION**

The EM Core Labs have demonstrated collaboration and level of cooperation unprecedented in the EM laboratory system. The Core Labs and their unified approach to ensuring that the best science and technology is being applied to the EM cleanup-stewardship mission have demonstrated significant progress. As EM budgets continue to tighten, innovative approaches like this will be paramount to ensuring successful completion of the EM cleanup-stewardship mission.

## **VI. ACKNOWLEDGEMENTS**

We stress that we are only spokespeople for the Core Labs team. The team member laboratories appeared

earlier in the text (section II) and we gratefully acknowledge their contributions to this important effort.

## **VII. REFERENCES**

1. DOE-EM, "A Review of the Environmental Management Program," Top-to-Bottom Review Team, February 4, 2002
2. DOE-EM, "Office of Environmental Management Science and Technology Program," December 14, 2001
3. DOE-EM, "New Directions in Science and Technology for Environmental Management Action Plan," February 13, 2002, draft