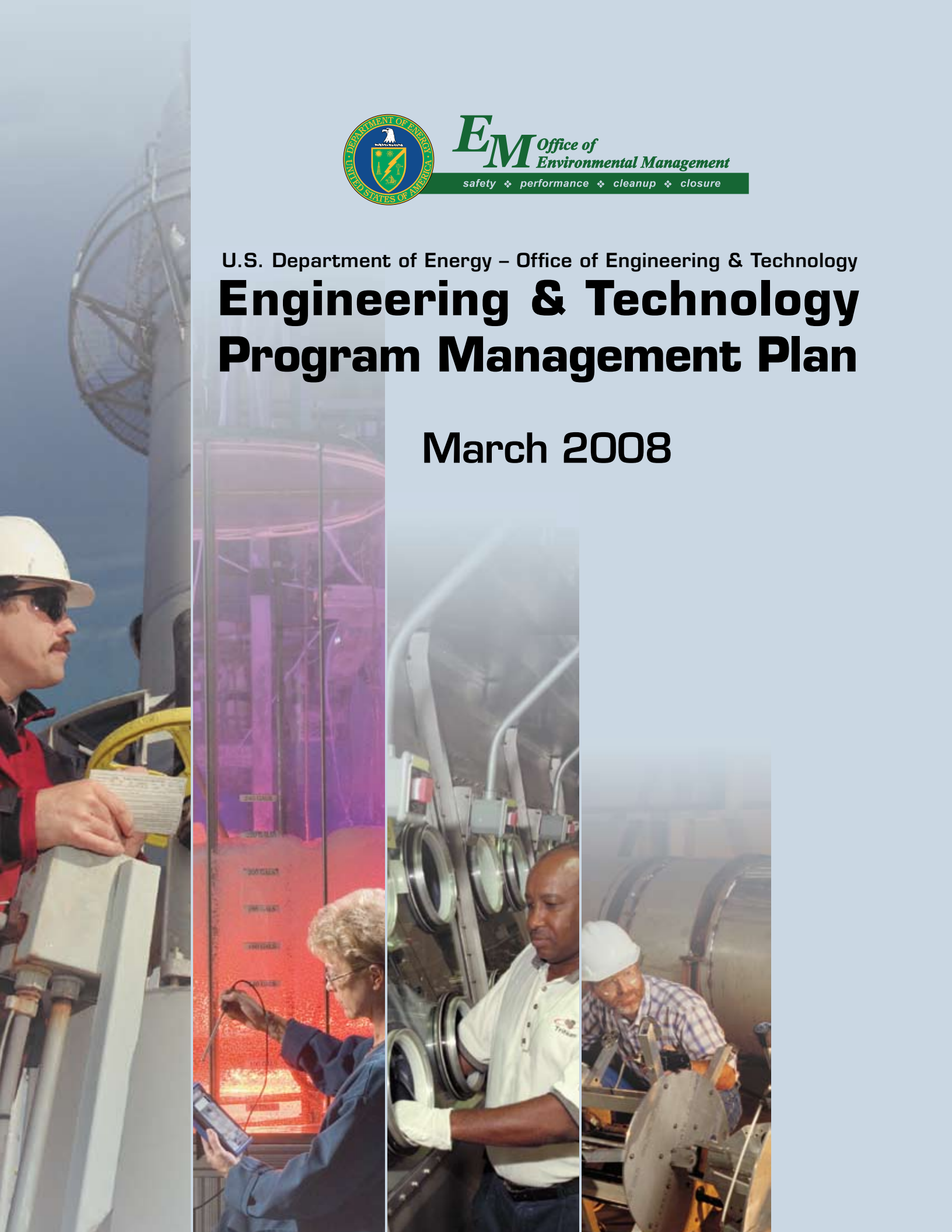**Office of**
Environmental Management

safety ❖ performance ❖ cleanup ❖ closure

U.S. Department of Energy – Office of Engineering & Technology

Engineering & Technology Program Management Plan

March 2008

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U.S. Department of Energy
Office of Engineering & Technology

Engineering & Technology Program Management Plan - March 2008

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List of Acronyms

ARTDD — Applied Research and Technology Development and Deployment
CO   — Contracting Officer
COR   — Contracting Officer's Representative
DAS   — Deputy Assistant Secretary
DEAR   — Department of Energy Acquisition Regulation
DOE   — U.S. Department of Energy
EM   — Office of Environmental Management
ES&H   — Environment, Safety, and Health
E&T   — Engineering and Technology
FAR   — Federal Acquisition Regulation
FOIA   — Freedom of Information Act
GAO   — General Accounting Office
GPRA   — Government Performance and Results Act
IG   — Inspector General
ISMS   — Integrated Safety Management System
NAS   — National Academy of Science
NEPA   — National Environmental Policy Act
OET   — EM, Office of Engineering and Technology
OMB   — Office of Management and Budget
QA   — Quality Assurance

U.S. Department of Energy
Office of Engineering & Technology

Engineering & Technology Program Management Plan - March 2008

1.0 Introduction

The Office of Engineering and Technology (OET), part of the U.S. Department of Energy's (DOE's) Office of Environmental Management (EM), manages the EM Engineering and Technology Applied Research and Technology Development and Deployment Program (Program). The Program conducts applied research and technology development, demonstration and deployment. The goal of this Program is to identify vulnerabilities and to reduce the technical risk and uncertainty of EM's cleanup programs and projects. To meet this goal, it provides advanced research results, alternative technical approaches, as well as innovative technologies and systems.

This Engineering and Technology Applied Research and Technology Development and Deployment Program Management Plan (Management Plan) describes how the OET manages applied research and technology development and deployment activities to support the overall EM mission priorities. This document also reflects OET's ongoing drive to enhance efficiency and effectiveness in its business management practices, and to ensure that its mission is integrated within the overall EM Program.

1.1 Purpose and Scope

This Management Plan provides a high-level description of OET's Applied Research and Technology Development and Deployment (ARTDD) mission, vision, and strategies; a description of key management functions, systems and activities; and a discussion of OET's interfaces within the EM Program. Further, it describes OET's managerial approach to program planning, formulation, execution, and evaluation activities. This document's primary audience is EM Headquarters, the Communities of Practice, and other participants involved in the Program. In addition, both DOE and non-DOE individuals and groups who interact regularly with OET programs should find it useful in understanding the program. It will be updated, as needed, to reflect OET management improvements, changes, and overall DOE and EM issues affecting the Program.

The Management Plan will be used in conjunction with the Engineering and Technology Roadmap to manage and execute the Program. The Roadmap will be used to guide the Program through identifying the technology gaps that exist in the current program, and strategies with funding proposals to address the gaps.

The Management Plan is consistent with the EM Five Year Plan for 2008 – 2012 and other EM strategic and technical planning documents. The Management Plan is a lower tier document to EM-level strategic and technical planning documents.

The Management Plan is not intended to replace EM-level management plans or procedures; however, lower-level procedures, planning and implementation documents applicable to particular Program processes should be consistent with the approach outlined in this document.

1.2 Document Description

The *Management Plan* is organized into the following sections:

Section	Content
Section	**Content**
1. Introduction	Description of document's purpose and scope
2. Mission, Vision, and Strategies	Discussion of these specific concepts and how they relate to EM's mission
3. Management Structure	Description of the *Program's* organization, functions and systems
4. Process Overview	Highlights the key activities involved in the *Program*
5. Environmental, Safety and Health, and Quality Compliance	Outline of *Program* compliance requirements
6. Communications	Summary of communication approaches

U.S. Department of Energy - Office of Engineering & Technology

2.0 Mission, Vision, and Strategies

The *Program* provides a range of engineering and technology resources and capabilities, from applied research through technology development and demonstration, needed to deliver engineering and technological enhancements to optimize cleanup performance. The *Program* offers greater insight leading to technology design changes that will reduce technical risk and uncertainty, improve safety performance, and enhance the efficiency and/or cost effectiveness.

2.1 Mission

To Identify Vulnerabilities and to Reduce the Technical Risk and Uncertainty of EM Programs and Projects

The Office of Engineering and Technology's Applied Research and Technology Development and Deployment mission is to improve the performance of environmental cleanup projects over their entire life cycle from planning to disposal, through targeted investments which identify, advance, develop, and implement the best engineering concepts, technologies, and practices. The Office of Engineering and Technology works to reduce total cleanup costs by promoting cross-site integration and standardizing best technical practices, solutions, and processes. The Office of Engineering and Technology maintains a cadre of subject matter experts that work to reduce planning, design, construction, and maintenance and operation costs, provide innovative transition to state-of-the-art, beneficial research and technology development and deployment, and to leverage lessons learned and feedback.

2.2 Vision

The Office of Engineering and Technology's Applied Research and Technology Development and Deployment initiatives will provide the engineering foundation, technical assistance, new approaches, and new technologies that contribute to significant reductions in risk (technology, environmental, safety, and health),

cost, and schedule for completion of the EM mission. The Office of Engineering and Technology provides the highest level of interdisciplinary engineering consultation, guidance, expertise, and continuity in the organization.

2.3 Principles

The Office of Engineering and Technology manages the program based on these key principles:
- Utilizing sound project management practices;
- Focused development of cost-effective transformational technologies to address high-risk areas to reduce costs and technical uncertainties, and to improve performance;
- Integration across all EM program areas;
- Utilizing existing technologies and information from other programs (e.g., DOE Program Offices, national laboratories, academia and other Federal Agencies) to the extent practical;
- Self assessment using the best available resources (including National Academy of Science (NAS) studies, and structured External Technical Reviews) to identify technology needs and issues and to develop programs to address these risks; and
- Tracking/trending of progress through disciplined performance measures, including the use of Technology Readiness Assessments and External Technical Reviews.

- Value each individual, their personal health and safety, and proactively work together toward safety excellence.
- Value the innovative and creative abilities of our people and their sense of ownership and accountability.
- Encourage and cultivate collaboration and teamwork.

These principles provide the foundation for organizing and managing the *Program* to meet its mission and vision.

2.4 Strategies

The purpose of the *Program* is to create a logical case and vision for federal government investments in technology development and deployment, technical assistance, and applied research. To accomplish the mission and vision and achieve a comprehensive, integrated approach to developing and providing engineering and technology initiatives, EM has established a number of strategic goals. These strategic goals will help ensure investments are focused on providing the engineering and technology enhancements that EM managers can introduce to optimize performance of the EM mission:

- **Results Oriented** – Activities will be focused on: 1) reducing technical and safety risks in current site baselines; 2) reducing costs by accelerating cleanup; and 3) anticipating and providing early awareness of alternative technologies and practices for disposal pathways that are subject to uncertain regulatory outcomes.
- **Integrated with the EM** – Activities will be linked to program goals, and it is expected that financial accountability will transfer from engineering and technology funding to the EM field offices / projects as technologies mature and move toward implementa-

tion. The *Program* will provide expert assistance through demonstration.
- **Comprehensive in Scope** – Activities will cover a wide range of engineering and technology (i.e., applied research to technology development to technology demonstration leading to technology deployment).
- **Credible Decision Process** – Processes used to establish priorities, set program and project direction, allocate funding, and select project teams are based on a clear set of criteria and are applied in an open, transparent manner.

In addition to the above, OET will also emphasize the following management strategies:

- **Coordinate and Collaborate** with EM Field Offices / Projects – OET activities will be coordinated with the field offices / projects and a collaborative relationship will be established from project planning and execution to the transfer of results and products for implementation. End users will be engaged from the initiation of the technology development effort.
- **Integrate with the Vendor Community** – Planning for technology development, demonstration, and implementation will be carried out early in the process. For technologies that will be demonstrated through the commercial market, potential vendors are enlisted early and become partners in development.
- **Employ Sound Business Practices** – OET will conduct applied research and advanced technology activities in a way that ensures the greatest possible return from the investment of funds, time, and human resources. Technology alternatives, technical assistance, and applied research activities must deliver a return on

investment and be compatible with existing facilities and infrastructure at the sites.

• **Engage Engineering and Technology Review Groups** – OET will engage engineering and technology review groups, including among others, the National Academies, to keep them informed of *Program* plans, activities, and results; and to engage these groups in assessing the *Program*. OET will reach out to the international radioactive environmental management community for identifying new technologies and for collaboration opportunities to advance progress with *Program* initiatives.

• **Lessons Learned and Best Practices** – The planning, execution and deployment of OET activities will include the evaluation of lessons learned and best practices. These inputs will be drawn from experience within EM, other DOE organizations, academia, and the vendor community.

3.0 Management Structure

OET will work in close collaboration with EM field offices / projects to identify key engineering and technology initiatives. The project line organizations are responsible for implementing the operating baseline for cleanup while the Program is chartered to investigate advances that may ultimately become part of the baseline.

To improve the leveraging of information amongst the various organizations, OET is using the concept of "community of practice". This concept has been defined as follows:

> *"A group of people who share a common interest in a subject or problem and who collaborate over an extended period to share ideas, fund solutions, and build innovations." (Wikipedia)*

3.1 Overall Organization

Management of *Program* sponsored work is distributed among organizational components in a way that places the authority and responsibility for specific activities at the lowest appropriate management level. The organizational components include the OET Headquarters organization, and the Communities of Practice (participants from the national laboratories, academia and industry). The *Program* clearly assigns authority and responsibility to appropriate levels consistent with the existing DOE/EM organizational structure:

- Headquarters is responsible for policy development, guidance, funding decisions, program analysis/oversight, setting priorities, and reporting;
- Each Community of Practice is responsible for planning, directing, and managing the implementation of activities within their respective program area;
- Each Community of Practice is accountable to the Federal Initiative Manager responsible for the program area;
- Each Participant Organization is responsible for implementing its assigned work scopes; and

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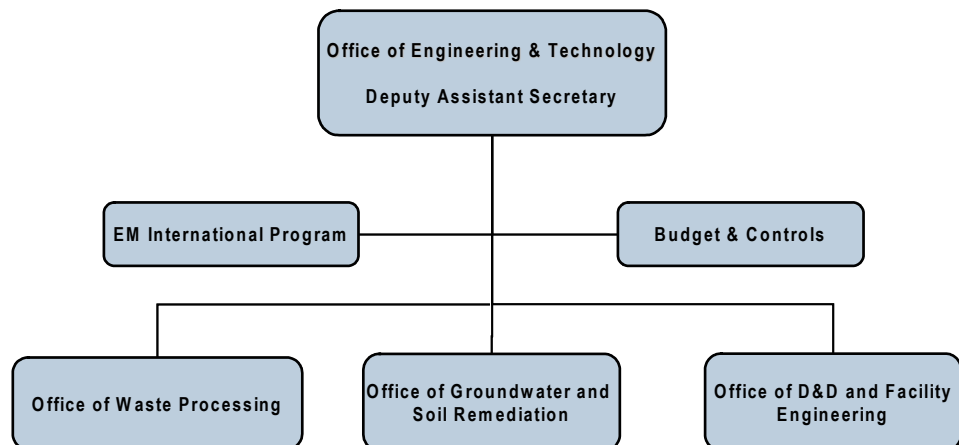
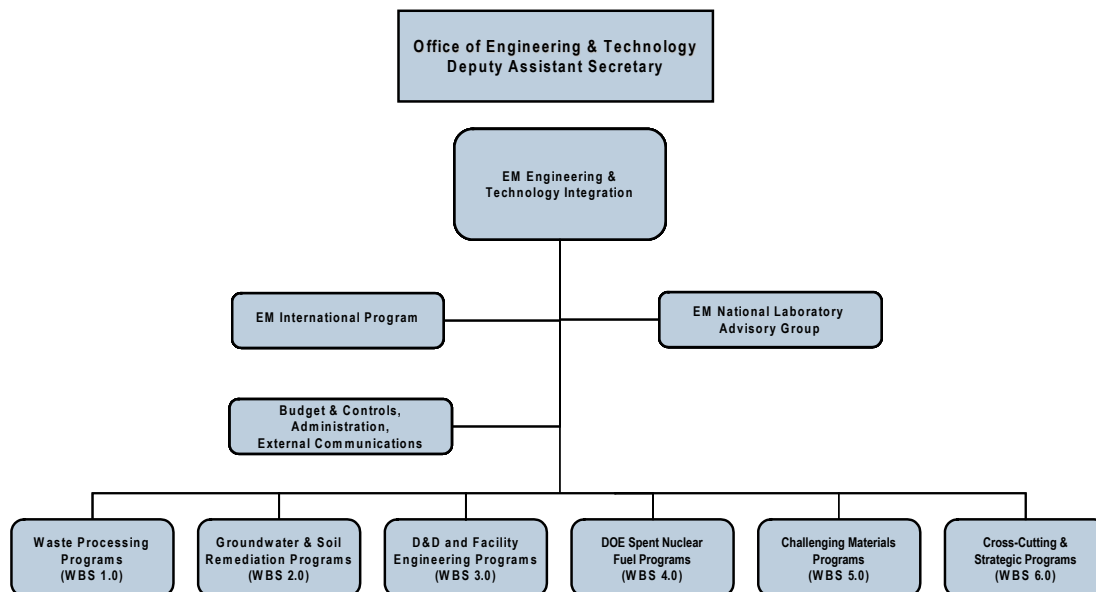*Figure 1. Headquarters Organization*

Figure 2. Communities of Practice Structure

- In certain circumstances there may also be specific tasks that will be co-managed by OET Headquarters and field personnel.

The *Program* has six primary organizational functions: waste processing; groundwater and soil remediation; deactivation and decommissioning, DOE spent nuclear fuel, challenging materials, and facility engineering; and cross cutting and strategic programs.

Figures 1 and 2 show the structure of the *Program*.

3.2 Headquarters Organization

The Headquarters organization, as the organization responsible for the Program, sets and articulates clear goals to assure that all parties have a clear understanding of the near and long-term objectives. The Headquarters management activities of policy development, guidance, budget development and funding allocations, program analysis/oversight, priority setting, and reporting are accomplished through a traditional DOE organizational structure with a management team approach

The principal functions of the Office of Engineering and Technology Deputy Assistant Secretary (DAS) for implementing the *Program* are to:

- Manage overall activities
- Implement functions described in this Management Plan
- Implement the Engineering and Technology Roadmap
- Assure the coordination of all *Program* operations.

The Headquarters Team is expected to cultivate and manage an array of crosscutting networks, including for example, inter office teams spanning EM, DOE, and other agencies, and to facilitate efforts and better integrate the *Program* with the EM's sites, projects, systems and approaches.

The Headquarters E&T Team ensures that applied research and technology development is managed and executed in accordance with DOE requirements by:

- Sponsorship of *Program*
- Identify the Federal Initiative Manager for the activities in the Roadmap. The Federal Initiative Manager is responsible for establishing program direction and oversight of the activity.

- Establishing EM ARTDD policy, guidance and requirements
- Performing management oversight of all engineering and technology work accomplished by the *Program* - sponsored entities using Communities of Practice as a "field" resource
- Managing and resolving issues regarding security, environmental permitting, policy, and intergovernmental relations, and interfacing with EM sites and projects when appropriate
- Serving as an advocate for ARTDD in part by representing the value of ARTDD investment to stakeholders and other interested organizations, including Congress
- Prioritizing *Program* technical responses to meet EM goals and objectives
- Avoiding redundancy in the portfolio of *Program* initiatives
- Approving program plans and distributing funds
- Reporting *Program* performance
- Ensuring EM technology opportunities are identified and communicated to senior EM management
- Communicating the results of *Program* initiatives and the potential benefits of specific enhancements
- Tracking successes and lessons learned and best practices
- Preparing and maintaining information relevant to the *Program*
- Strengthen governance and promote standardization
- Participate on baseline reviews and acquisition review boards
- Provide technical assistance and technology transfer to EM programs and projects

3.3 Communities of Practice

In general, *Program* initiatives are managed and executed by Communities of Practice with direction from the Federal Initiative Manager. The Communities of Practice are organized by major program areas (i.e., Waste Processing, Groundwater and Soil Remediation, D&D and Facility Engineering, DOE Spent Nuclear Fuel, Challenging Materials, and Integration and Cross-Cutting Initiatives) and are responsible for the management of the relevant activities. Community of Practice Leaders (Leaders), working with the Federal initiative Managers, are responsible to ensure investment in a balanced portfolio to meet both near and long-term enhancement opportunities, and support of OET and EM mission goals. The Leaders may delegate responsibilities to other program participants making up the Community of Practice with the understanding that the Leaders are held accountable by *Program* management for the overall Team's performance. The Leaders are the primary point-of-contact with OET and the Federal Initiative Manager regarding the program area's activities. The Leaders position is a rotational position, and the assignments will be 18 to 24 months in duration.

The Communities of Practice:
- Manage and coordinate the work that is accomplished by multiple performers within the program area
- Interface with site and project customers to develop technical programs that are responsive and relevant to EM
- Prepare Annual Performance Plans
- Construct and prioritize work activities for out-years of the *Program*
- Prepare and execute the program according to multi year plans
- Support *Program* budget requests
- Conduct competitive solicitations whenever feasible
- Ensure independent peer reviews are conducted of work performed
- Monitor quality assurance-related ac-

tivities of any technical initiatives in which quality assurance requirements are imposed
- Conduct and report reviews of activities under their purview
- Transfer results to EM site and project end users
- Publish research results in peer-reviewed publications and periodic reports on the progress of the Team
- Interface with other DOE and federal agencies, and commercial vendors to improve EM performance and to share OET knowledge
- Work with other agencies to leverage available funding to gain efficiencies for all agencies.

3.4 *Program* Participant Organizations

EM will be assisted in carrying out the *Program* by the Savannah River National Laboratory (SRNL). SRNL will pull together teams from the other national laboratories, universities, private sector entities, and others to provide support to EM. These Program Participants:
- Manage and perform scopes of work, monitor performance, and take appropriate corrective actions to ensure contractual requirements are met
- Provide support in the identification of vulnerabilities in the completion of the EM mission goals.

- Provide quality assured products in accordance with cost and schedule requirements
- Report costs, schedules, and progress per contract requirements
- Provide support and input to strategic plans, cost/schedule improvements, reviews, *Program* reports and communications, and international program as requested
- Elevate issues requiring the Office of Engineering and Technology attention to the Leaders
- Maintain an awareness of work being sponsored by other DOE and federal programs that could be leveraged to meet EM goals and objectives.

3.5 Engineering & Technology Program Roles and Responsibilities

Roles and responsibilities of the OET Headquarters Management Team and the Communities of Practice/Program Participants must be well defined for this distributed and collaborative management approach to be successful. Table 3.5.1 depicts the major roles and responsibilities for the key organizations making up the *Program*.

Table 3.5.1 Engineering and Technology Program Organizational Roles and Responsibilities

1. Program Planning, Organization, and Management *Covers the functions associated with program planning, organization, and management. Includes organizational structure, strategic and program planning, development of policies and procedures, and resource management.*		
	Office of Engineering and Technology	**EM Field/Project Offices**	**Initiative Development Teams/Program Participants**

	Office of Engineering and Technology	EM Field/Project Offices	Initiative Development Teams/Program Participants
Organization	• Establish the *Program* organizational structure including the organizational roles, responsibilities, authority, and accountability for key program functions. • Implement the *Program* organization.	• Establish, document, and communicate roles, responsibilities, authority, and accountability of project personnel assigned to participate in the *Program*. • Designate a Project Liaison for each Community of Practice to collaborate in identifying *Program* opportunities.	• Establish, document, and communicate roles, responsibilities, authority, and accountability of participant personnel.
Strategic and Program Planning	• Confirm mission and establish strategic objectives. • Establish upper tier milestones. • Integrate and compile strategic and program plans. • Sponsorship of *Program*	• Establish and communicate project recommendations for *Program* priorities, performance objectives, and performance metrics. • Review strategic, program and project plans.	• Support development of strategic and program plans. • Develop initiative plans. • Plan and schedule work and implement plan to meet performance objectives and performance metrics.
Policies and Procedures	• Establish requirements and policies for execution and governance of *Program*. • Interface on policy issues with senior management, other EM offices, other DOE offices, outside agencies, and stakeholders. • Resolve policy issues elevated by program participants.	• Support policy development. • Develop and implement *Program* procedures if necessary. • Elevate issues requiring management attention.	• Develop and implement participant policies and procedures to meet *Program* requirements. • Elevate issues requiring management attention.
Resource Planning	• Allocate DOE personnel resources for *Program*. • Issue staffing and training guidance. • Implement training for personnel in OET.	• Allocate project personnel resources to support *Program*.	• Manage resources and execute contracts within approved cost and schedule. • Define and implement training program for participant personnel.

2. Procurement and Contract Management

Covers all activities associated with procurement of materials, supplies, and services for the E&T Program. Includes acquisition planning, procurement, and contract management functions.

	Office of Engineering and Technology	Communities of Practice/Program Participants
Acquisition Planning and Procurement	• Implement EM overall acquisition policy and expectations consistent with Federal Acquisition Regulation (FAR) and Department of Energy Acquisition Regulation (DEAR). • Conduct monitoring of participants. • Serve as federal Contracting Officer's Representatives (CORs).	• Procure services and supplies within designated procurement limits and authority. • Serve as technical monitors. • Plan and perform work in accordance with contract requirements. • Propose and provide input on DOE-proposed contract provision changes. • Evaluate technical direction and guidance against contract requirements and notify Contracting Officer (CO) and OET management of issues that could require a potential change in work scope. • Report cost, schedules, and progress per reporting requirements.

3. Budget and Financial Management

Addresses E&T Program budget development, funds management, and other financial management issues.

	Office of Engineering and Technology	Communities of Practice/Program Participants
Budget Development and Management	• Set programmatic priorities and issue budget formulation guidance early in budget cycle. • Review budget requests. • Develop OET budget. • Defend budget during interactions within DOE, and with the Office of Management and Budget (OMB) and the Congress. • Issue initial budget guidance and approve prioritized work scope, consistent with the budget. • Allocate appropriated budget and provide funding guidance. • Review Community of Practice financial reports and take management actions as appropriate. • Interface with other DOE Programs (e.g. SC and NE) to direct funding to Initiative Teams.	• Develop work planning input as directed. • Implement a system to manage available funds within budgets and estimate-at-completion forecasts. • In consultation with OET, recommend cost/schedule improvements where appropriate. • Support OET interactions on funding issues. • Develop, maintain through baseline management, and execute multi-year annual work plans. • Report financial accounting results to OET.

4. Program Monitoring and Control		
Covers activities associated with the process controls; establishing, monitoring, and reporting program objectives and performance.		
	Office of Engineering and Technology	**Communities of Practice/Program Participants**
Performance Objectives	• Establish *Program* performance objectives and performance metrics. • Develop and implement long-term performance goals and annual performance goals. • Collect timely and credible performance information. • Direct independent reviews of the *Program* by technical experts as appropriate.	• Assist in development of performance objectives and metrics. • Conduct activities to meet performance objectives and performance metrics. • Monitor to ensure compliance with policies and procedures. • Provide input to the *Program* long-term goals and annual performance goals. • Commit to and work toward the annual and long-term *Program* goals. • Conduct independent peer reviews, and document for OET management. • Support independent reviews of the *Program*.
Baseline Control	• Support policy requiring development and maintenance of a program baseline. • Conduct program reviews and monitor key performance indicators for program. • Provide periodic reports on initiative performance to Headquarters.	• Report on technical, cost, and schedule performance and variances per contract requirements. • Provide "early alert" reports to Federal Initiative Manager and the OET DAS on emerging issues and trends. • Maintain required records to document and track scope, cost, and schedule baseline changes. • Manage technical, cost, and schedule performance to established baselines. Identify and perform corrective actions where necessary. • Provide periodic reports on initiative performance to OET.
Program Monitoring and Reporting	• Ensure compliance with policies and procedures. • Implement accounting policy and support audit activities. • Provide *Program* input to EM Annual Report. • Provide *Program* input for DOE Performance and Accountability Report.	• Implement accounting policy and support audit activities. • Support development of EM Annual Report. • Support development of DOE Performance and Accountability Report.

5. External Communication and Stakeholder Involvement Programs		
Includes communications with parties external to the program, including members of Congress; Federal, State, and local government; Indian Tribes; the technical community; the public and other stakeholders. Includes outreach, public information, and stakeholder involvement as well as institutional and intergovernmental programs.		
	Office of Engineering and Technology	**Communities of Practice/Program Participants**
Communications	• Implement EM Director's policies for communications. • Support EM Communications in responding to news media inquiries on the *Program* and activities. • Represent OET at DOE and other technical conferences and meetings. • Report to EM Director on interactions with EM Communications regarding *Program* media inquiries and advise about emerging media issues.	• Support DOE external communication and stakeholder involvement programs in accordance with EM Director's policies. • Advise OET about emerging media issues. • Provide analysis to address media inquiries as requested. • Support public affairs activities such as meetings and development of press releases and displays/exhibits for the public. • Support external communication and stakeholder involvement programs. • Disseminate research results in peer-reviewed publications, laboratory reports, professional presentations, etc. in accordance with EM policies and procedures.
Institutional and Intergovernmental	• Establish budget and priorities for institutional and intergovernmental activities.	• Support institutional and intergovernmental activities as requested.

6. International		
Covers all interactions and supporting activities associated with the EM International Program.		
	Office of Engineering and Technology	**Communities of Practice/Program Participants**
International Interfaces	• Develop/manage International Program by providing programmatic direction, developing requirements and representing EM in international activities and foreign visits.	• Support International Program through identification of technical collaborative opportunities to address OET technology needs. • Identify opportunities for international collaboration by leveraging and teaming with expertise and unique facility capabilities in the international environmental management community to support OET programmatic needs in *Program* initiatives. This includes leveraging past work performed by international institutions (e.g., data mining for past work efforts) and performing new, targeted work scopes to address OET technology needs. • Strengthen international partnerships that foster advancement of scientific frontiers and accelerate the progress of science across borders. • Manage collaborative working relationships involving international institutions and DOE national laboratories. • Continually monitor international efforts in environmental management technology development and deployment to identify collaborative opportunities.

3.6 *Program* Interfaces

3.6.1 Scope Boundaries: EM – Other DOE Offices

The development, implementation, and execution of EM's investments in applied research are accomplished through partnerships between the EM Program, DOE's Office of Science (SC or Science), Office of Civilian Radioactive Waste Management (OCRWM), Office of Nuclear Energy (NE) – including the Global Nuclear Energy Partnership (GNEP) - other Federal agencies, National Laboratories, private industry, and academia. OET ARTDD investments are focused on applied research that will move to technology demonstration. The Office of Science's support to EM is for very

long term, early stage, and basic research in a number of disciplines that intersect EM's program, e.g. subsurface science, actinide chemistry, advanced computational modeling, etc. OCRWM and NE/GNEP investments tend to be more applied in nature; principal areas of overlap between these offices and EM include development of new waste forms, separations chemistry and approaches, and waste form performance assessment. The Communities of Practice will coordinate their respective activities with relevant activities sponsored by Office of Science, OCRWM, NE/GNEP, and other relevant Federal and non-Federal organizations in order to leverage investments and accelerate progress. Figure 3 provides an illustrative example of the interface relationship between OET and the Office of Science.

3.6.2 External Interfaces

The *Program* has several interfaces external to the program to allow the program to complete its mission. Figure 4 provides a summary of the primary external interfaces.
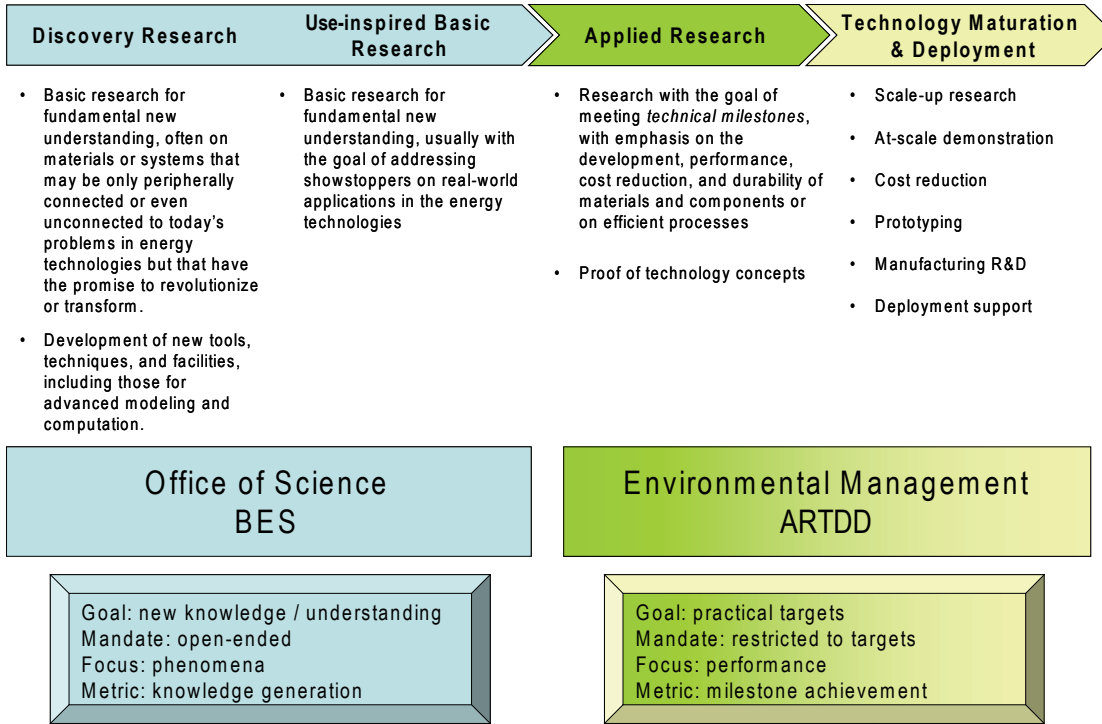

Discovery Research	Use-inspired Basic Research	Applied Research	Technology Maturation & Deployment
• Basic research for fundamental new understanding, often on materials or systems that may be only peripherally connected or even unconnected to today's problems in energy technologies but that have the promise to revolutionize or transform. • Development of new tools, techniques, and facilities, including those for advanced modeling and computation.	• Basic research for fundamental new understanding, usually with the goal of addressing showstoppers on real-world applications in the energy technologies	• Research with the goal of meeting *technical milestones*, with emphasis on the development, performance, cost reduction, and durability of materials and components or on efficient processes • Proof of technology concepts	• Scale-up research • At-scale demonstration • Cost reduction • Prototyping • Manufacturing R&D • Deployment support

Office of Science BES

Goal: new knowledge / understanding
Mandate: open-ended
Focus: phenomena
Metric: knowledge generation

Environmental Management ARTDD

Goal: practical targets
Mandate: restricted to targets
Focus: performance
Metric: milestone achievement

Figure 3. Interface Between OET and Office of Science
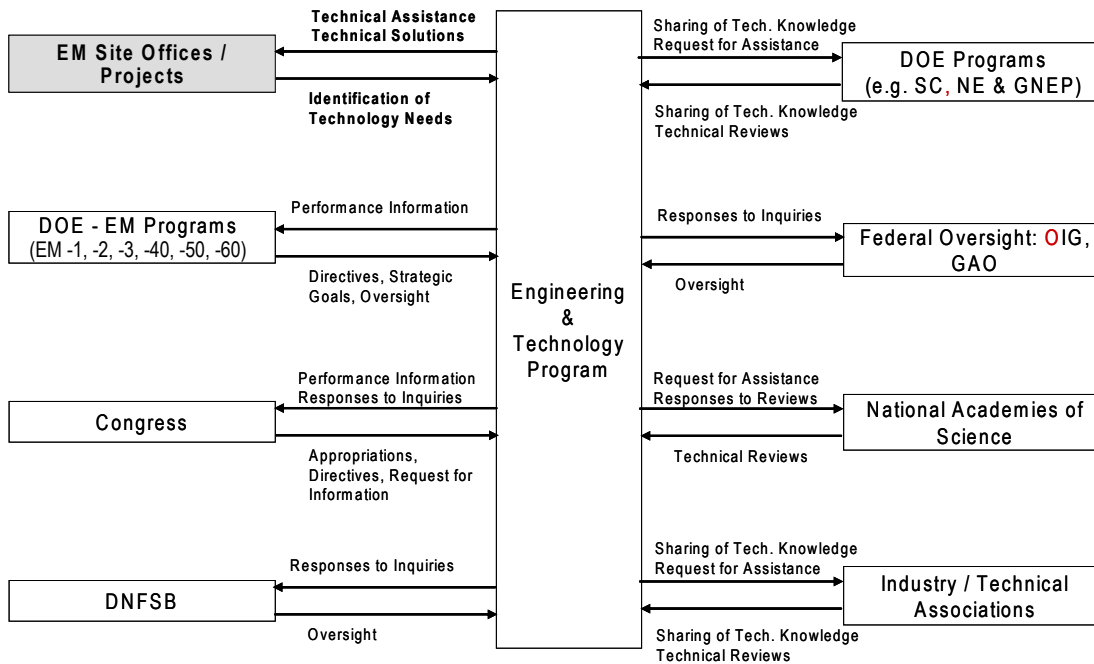

Figure 4. Program External Interfaces

4.0 Process Overview

OET has adopted systems engineering and technology roadmapping as key tools in its approach to managing the program. The systems engineering approach provides the foundation for EM program decisions and implementation that are technically defensible and cost-effective, and that satisfy stakeholders and regulators. Technology roadmapping provides a methodology to define and focus engineering and technology investments and activities to provide the maximum benefit to the EM program.

The development and execution of EM's engineering and technology investments use a four-step process with a feedback loop comprised of 1) planning, 2) formulation, 3) execution, and 4) evaluation. These four steps are briefly described in the following sections. Independent assessment, a critical component of managing engineering and technology activities, is an integral part of the program.

4.1 Program Planning – Defining the Program

Program planning involves identifying areas in which engineering and technology activities can yield substantial reductions in risks, cost or schedule for completion of the EM mission; or significant enhancements in our understanding of cleanup processes leading to risk reduction, cost savings and schedule acceleration.

Data Collection and Analysis

The first step is the identification of areas in which engineering and technology initiatives are warranted. Input from the EM field offices / projects and technical staffs are essential to accurately define and validate these potential areas.

In order to provide effective integration and operation of the site projects and Headquarters activities, EM utilizes an iterative process, schematically shown in Figure 6, for ensuring that resources are
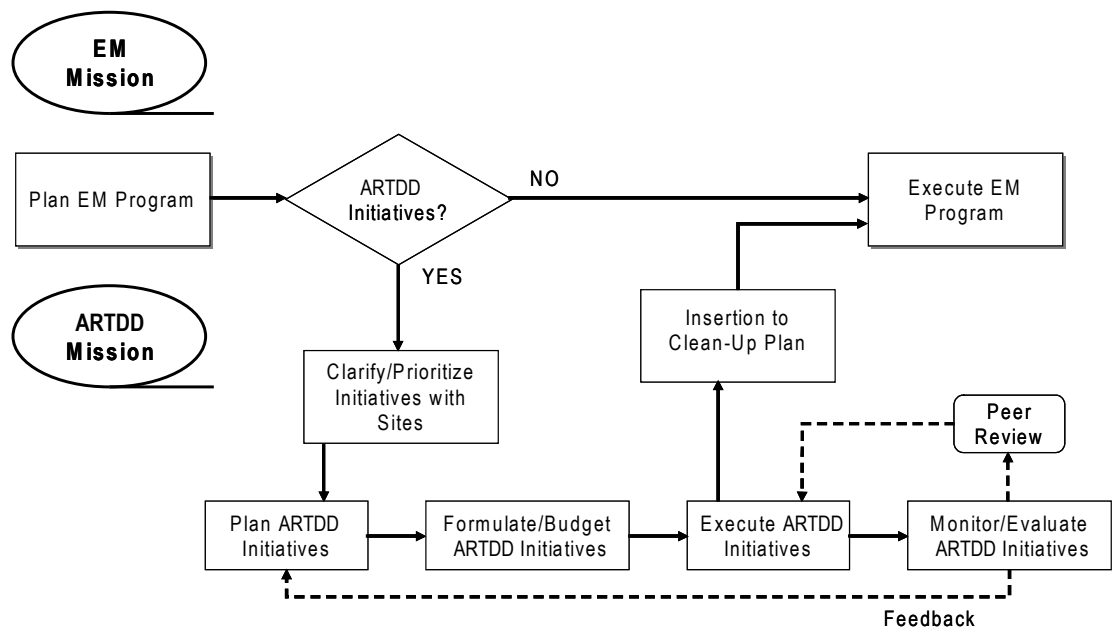
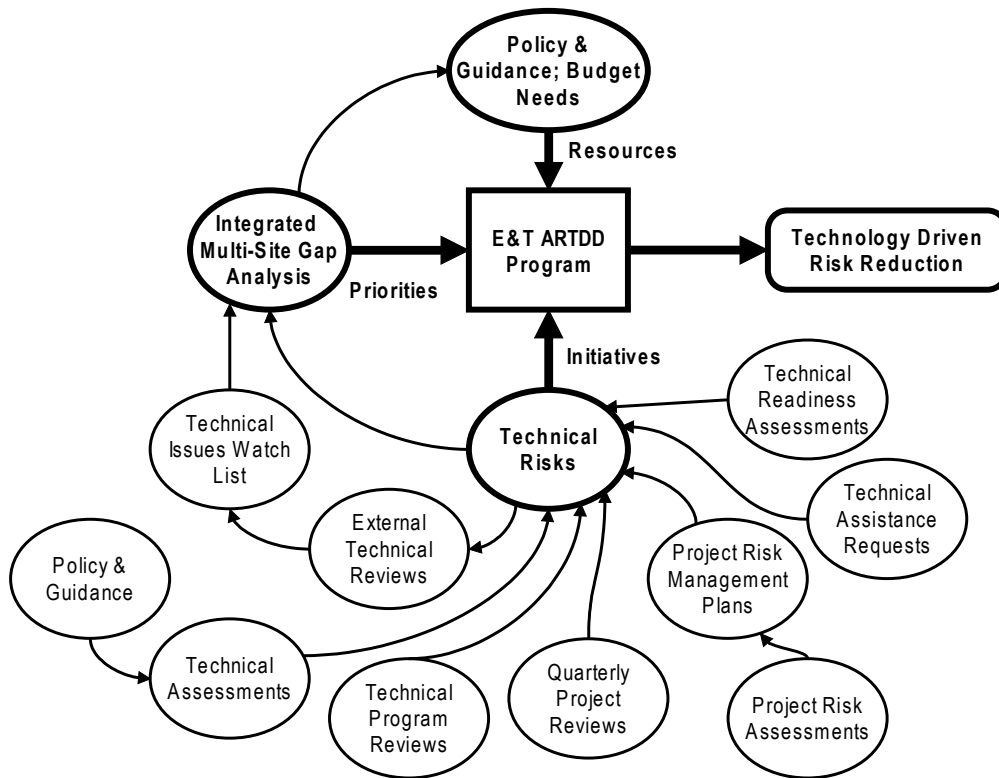Figure 5. ARTDD's Integration with EM Mission

Figure 6. Engineering and Technology Program Integration

provided to address the most pressing technology risks and those that provide the biggest 'return on investment' across the EM mission areas.

The iterative process is essential given the reality that many of the projects being managed by EM are essentially 'first-of-a-kind.' It is anticipated that as the projects execute their assigned functions, additional strategic initiatives may be identified.

Program initiatives are derived from the following information sets:

• Field Office / Project / Initiative Teams Technical Staff Analyses – provide information on the priority, the timing, (including potential deployment/implementation schedule), gaps in technology needs, technical risks, vulnerabilities to meeting lifecycle objectives, and the technical detail associated with a potential enhancement.

• Information from Reviews and Assessments – gathered from external technical reviews, reviews of technology maturity, risk management plans, results of technical assistance, workshops, and other venues used to supplement information within EM.

• EM Corporate Advisory Boards – new approaches and initiatives identified and developed by EM Corporate Advisory Boards, such as the High Level Waste Corporate Board.

• EM Risk and Cost Reduction Processes – initiatives identified by Office of Environmental Management teams evaluating improvements in cost and schedule, reductions in radiological dose to workers and releases to the environment.

These information sets provide insight as to the size (costs and pervasiveness) and complexity of the technical issues facing EM. They also identify when the enhancement could be implemented, and the impact of implementing it.

Technical Response Development

A proposed approach to an *Program* initiative is called a *technical activity*. Technical activities are developed through dialogue among the EM technical staffs, Communities of Practice (including lead organization and participants). OET works closely with field offices/projects and Communities of Practice to identify and document specific initiatives. EM field offices/projects also designate an individual Project Liaison for each Community of Practice to collaborate with the Team in identifying the specific initiatives that may support system optimization. Figure 7 depicts the typical levels that organizations are involved in the E&T Program.

The Communities of Practice prepare a technical activity document for each proposed initiative. These are in the format of a proposed statement or scope of work that includes a description of specific initiatives and associated budget and schedule. The technical activities are assigned to an element of the *Program's*

Work Breakdown Structure (WBS). The WBS is used as a tool to manage the work scope. The current WBS is in the Appendix. Annual and longer-term milestones and performance measures, including decision points ("off ramps") are identified for each of the initiatives. Information from the technical activities is then summarized in a multi-year planning template for each of the Communities of Practice. These documents are then provided to OET for review and prioritization.

The preparation of the technical activity includes the integration of the specific *Program* investment with the corresponding EM field office / project, an essential ingredient for successful implementation. It is through this process of integration that joint planning is done to ensure budgets are adequate to support the development efforts, schedules line up with technology insertion points, and the EM field offices / projects have plans for the financial resources and technical support.

Finally, ongoing *Program* investments are evaluated at key decision points, to

WBS Description		OET Office	Federal Initiative Mgr	Field Office / Project	Initiative Team	
					Leader	Participants
1.0.0. Waste Processing Programs	Program	OD	X		X	
1.1.0. Improved Waste Storage Technology	Strategic Initiative	Federal Program Lead	X	X	X	X
1.1.1. Develop Improved Monitors to Enhance Waste Storage	Initiative		X	X	X	X
1.1.1.1 Activity A Monitors	Activity					X
1.1.1.2 Activity B Monitors	Activity					X

Figure 7. Engineering and Technology Program Organizational Involvement Level

determine if an effort should be continued or if an alternate strategy should be adopted. EM field office / projects technical staffs are involved in these initiative evaluations to ensure continued commitment to implementation.

4.2 Formulation – Prioritizing the Program to Maximize Returns

The complexity and duration of the EM mission, combined with budget constraints and regulatory changes, require the *Program* to carefully prioritize and sequence its initiatives. These same factors drive a continuous effort within EM to rank and prioritize *Program* investments. The prioritization process is iterative and integrative, beginning at the specific WBS level within the Community of Practice and progressing to higher levels and greater breadth. Technology development needs are developed by the Communities of Practice through dialogue among the EM Corporate Advisory Boards and technical staffs, interfacing with the Field Offices and the input from the Community of Practice. Prioritization factors will be based on the strategic objectives and mission of EM and OET ARTDD. The criteria will consider: 1) technical, safety and environmental risk reduction, 2) cost/schedule reduction potential (lifecycle and annual), 3) technology maturity, 4) initiative relevancy to near term and strategic objectives, 5) technology insertion points, 6) initiative cost and schedule, 7) applicability to multiple sites, 8) innovation, and 9) potential for knowledge transfer.

The prioritization efforts are used to assist in decision-making and are the basis for out-year budget requests. OET prepares a final prioritized list of proposed initiatives received from the Communities of Practice. This listing is then finalized and approved as part of the EM budget development and approval process. This priority list is the basis for the congressional budget request for EM's ARTDD investment portfolio.

OET will prepare the *Program* budget based on guidance issued from the EM Deputy Secretary. Guidance includes funding targets and requirements for each office and program. OET then issues guidance to the Communities of Practice including funding targets, strategy and performance goals, and format requirements. Communities of Practice are kept informed of budget status and may be called upon to support responses to questions from the EM Director, the Department, OMB, or Congress.

4.3 Program Execution and Implementation – Making It Work

The final steps in the program development process are to make the planned investments in engineering and technology and then to ensure that the results are used. Performance measures are developed for the overall *Program* as well as for the Communities of Practice based on guidance provided by the OET DAS.

Program Execution

Each fiscal year, Congress provides EM with funding for the *Program*. These funds are allocated according to the integrated priority list. As a result, a set of work activities is authorized. OET will authorize the Communities of Practice to work on specific activities through the approval of scopes as specified in the DOE planning and budget system.

In general, a significant fraction of the investment portfolio is applied to the con-

tinuation of existing work scope, because many engineering and technology activities are multi-year efforts. However, when new work scope is to be initiated, as a general management approach, the work is announced and competed. This competition ensures that the best talent is brought to bear on EM's ARTDD initiatives. The requests for proposals are conducted through either targeted or broad solicitations depending on work scope. That is, new science efforts are generally broadly announced to the larger, technical community, while near term technology demonstration opportunities, requiring a more rapid response, may be targeted toward a narrower audience.

Changes in technical activities will be reviewed with the Communities of Practice Lead and the Federal Initiative Manager associated with the activity. The need for approval of the change by OET staff, beyond the Federal Initiative Manager, will be determined by the impact on the scope, cost and schedule outlined in the authorization document.

Program Implementation

Implementation of engineering and technical developments is the driving force behind EM's ARTDD investments. To meet the EM's strategic goals and mission, the investment portfolio must continue activities to reduce risk and enhance the performance of cleanup programs.

In general, the Communities of Practice will use national laboratories, other federal agencies, commercial entities, and universities in performing the funded applied research. These applied research activities will potentially provide data, new or enhanced models, or analysis algorithms that could enhance next-generation models, subject to a future baseline change decision when adequate information – technical, cost, schedule –

becomes available. The Communities of Practice will work with other agencies, laboratories, academia and commercial entities to leverage other development work that could benefit the EM program. Implementation for applied technologies will primarily take place through contracts with technology developers to perform the technology work. Initiatives are competed within the private sector, universities, or, in those instances where unique facilities are required, among the laboratories or other federal agencies. Generally, multiple contract awards are made for a phased performance period. Initial awards will be to develop proof of principle, followed by a feasibility phase, and a third stage for actual demonstration. Depending on the confidence in successive development activities, the cost and the schedule, further down-selections may be made at each successive phase. In certain instances where an organization has unique capabilities, the work may be a sole source award. Each contract has specific deliverables and off ramps at critical points to determine whether there is significant improvement over the baseline technical approach.

Even if technology developers and OET/EM field offices work closely together to develop new technology, there is no guarantee that the technology will win in a competitive procurement. The technology must stand on its own merits, be cost effective, and offer significant and desired advantages over other approaches without introducing unacceptable technical and managerial risk.

4.4 Review and Evaluation – Ensuring a Quality and Focused Program

OET staff will conduct periodic program reviews to monitor performance measures and progress towards meeting

strategic goals and objectives. In addition to these program reviews, reviews by internal and external reviewers will be conducted. Internal and external review by peers is generally recognized in the engineering and technology community as important to sound decision making. Reviews by independent peers are widely used to evaluate research proposals and to assess the productivity and progress of ongoing work. These reviews present an opportunity to enable the EM technical staffs to ensure that the technologies being supported can be implemented. Reviews create the foundation for program and project evaluation. Results of these reviews will support EM reviews of cleanup programs and projects. The purposes of OET reviews are to secure knowledgeable counsel on the attributes of an ongoing or proposed activity and to document both the review and the actions taken in response to the review. OET reviews are conducted at four distinct levels: 1) corporate reviews, 2) programmatic reviews, 3) initiative selection reviews, and 4) external technical reviews. In addition to reviews of the Program, OET personnel participate on baseline and acquisition review boards evaluating technology readiness and uncertainty.

While the exact goals and methods of different levels of review vary, certain attributes are consistently important in all reviews:

- Importance of the activity being addressed and the approach's cost versus benefit and performance compared to baseline
- The technical merit of the proposed enhancement (i.e., whether it is excellent engineering or technology)
- Provision of an enhancement that represents significant improvement over baseline

- Opportunity for the reduction risk (safety, environmental, project, program)
- Opportunity for dramatic improvement in performance
- Readiness of a technology to advance to a later development stage
- Avoidance of redundancy
- Feasibility and likelihood of technical and economic success
- Performance record of the proposing or implementing institution and investigators.

Reviewers are briefed in advance regarding the purpose and criteria against which initiatives are to be evaluated. In addition to these attributes, reviewers are expected and encouraged to address additional issues deemed pertinent to the overall program.

Reviews are founded upon principles of engineering and scientific ethics and conform to a set of basic guidelines:

1. Reviewers should have recognized expertise in the subject matter and experience in the area being reviewed.
2. Reviewers must be free from any direct interest in the outcome resulting from decisions that draw upon their advice or comments. In addition, integrity on the part of the reviewers is demanded to ensure that they not improperly use information contained in confidential or privileged documents.
3. Individual members of review teams and specific review comments are matters of record and are generally to be made available, but the identity of reviewers making particular comments is strictly confidential.
4. Review comments and recommendations are formally directed to the next higher level of authority than the one being reviewed. For example, reviews of specific initiatives are reported to Community of Practice management whereas reviews of the

Communities of Practice themselves are reported to the OET DAS.

5. Reviewers do not have authority for making decisions and are not responsible for actions based on their reviews. Such authority and responsibility belong to the appropriate Federal Program Manager and OET management.

OET requires all reviews culminate in written documentation. Program and line managers consider information acquired from reviews in selecting or continuing initiatives for funding, in developing new areas of investigation, and in evaluating programmatic progress. Such information is also used to document the progress and productivity of OET programs in reports to DOE senior management, Congress, and the public.

Corporate Reviews

Periodic corporate reviews address issues of broad program importance and help guide the *Program* in addressing areas of greatest significance to EM and DOE. Reviews conducted by the National Academies, for example, generally span the breadth of the program and deal with issues of broad significance.

DOE Corporate Advisory Boards, such as the EM High-Level Waste Corporate Board, will review Program initiatives to ensure the integration with disposition activities across the Department and to assess impacts to the environmental cleanup mission.

Programmatic Reviews

Communities of Practice carry out periodic programmatic reviews to evaluate technical and administrative management aspects of initiatives. Programmatic reviews are conducted and play an important role in the annual budget cycle. Reviews combine the attributes of independent technical evaluation, programmatic status reviews, and forward-looking vision. Each Community of Practice conducts reviews according to consistent general guidelines adapted to its goals and methods.

Initiative Selection Reviews

Community of Practice and OET managers use initiative selection reviews to assist in determining which initiatives to support. Although initiative selection reviews are similar for proposed initiatives at all maturity stages, reviews for applied research differ slightly from reviews for technology development and demonstration. Funded initiatives with a period of performance in excess of three years will require a specific initiative review at the end of the third year of performance. This will entail an updated proposal for review prior to continuation of the work beyond a three-year period.

External Technical Reviews

An External Technical Review (ETR) assesses technical bases, appropriateness of technology, technology development, and technical risk identification and handling. These are independent reviews of technical scope conducted by OET. The results of ETRs enable OET to assess technical risk associated with projects and assist the field office / project in developing strategies for reducing the technical risk. Further, ETRs bolster assurance that technical issues have been thoroughly addressed and thereby support bases for critical decision approvals.

Technology Readiness Assessments

Technology Readiness Assessments (TRAs) are measures used by some U.S. government agencies (most notably the U.S. Department of Defense [DoD] and National Aeronautics and Space Administration [NASA]) and pri-

vate industry to assess the maturity of evolving technologies prior to incorporating them into systems or subsystems. The primary purpose of using TRAs is to help management in making decisions concerning the development and transitioning of technology. The objective of TRAs is to provide a common understanding of technology status and are useful for risk management, making decisions concerning technology funding, and making decisions concerning the transition of technology from paper to laboratory to final application. TRAs can also provide structure for fruitful in-depth discussions of technology status between technology developers, designers, and project managers.

5.0 Environmental, Safety and Health, and Quality Compliance

All work performed with *Program* funding complies with applicable environmental, safety and health, and quality assurance DOE directives and other appropriate requirements. Individuals involved with the development of technologies for the *Program* will ensure:

- EM Program policy, expectations, and performance metrics for an Integrated Safety Management System (ISMS) are implemented,
- All technology development activities are reviewed for their potential to enhance safety and environmental protection,
- Technology development work is performed in a manner that is safe for the workers and the public, and protects the environment,
- The technologies resulting from *Program* funding are demonstrated and

implemented in a safe and environmentally acceptable manner, and
- Work will be stopped if a clear and present safety danger exists.

All organizations performing *Program* work requiring a quality assurance program will develop and maintain one in accordance with EM requirements. Appropriate and applicable quality assurance, safety and health, and environmental compliance requirements should be incorporated by reference into contracts and subcontracts.

6.0 Communications

OET manages the *Program* that incorporates efforts at multiple locations. OET also functions within a Congressional budgetary setting where clear, accurate and credible communications are vital to a program's success. The communication of OET's annual strategy, themes and messages, implementation approach, schedule, and audience-specific detail will align with the Office of Environmental Managements communication policies.

OET communicates its plans and accomplishments to foster cooperation and collaboration between and among its key constituencies— EM field offices/projects, Communities of Practice, participants, regulators, Congress, other government agencies, Headquarters and field management, vendors, and stakeholders. Proactive and innovative communications ensure an understanding of the *Program* initiatives, and ultimately the cost-effective achievement of EM's mission. OET has a communication strategy that:

- Establishes an effective information network
- Fosters effective communications
- Encourages collaborative efforts
- Provides the right information in the right format at the right time to the right audience.

Implementing the communication strategy is the responsibility of a Headquarters led team. Communication products such as reports, periodic research highlights, brochures, etc. are produced by either Headquarters or the Communities of Practice; however, in the latter case, it is the responsibility of the Communities of Practice to support the overall communication strategy and to coordinate the production and distribution of communication products with Headquarters.

7.0 Appendices

1. *Program* Major Annual Activities and Roles
2. *Program* Work Breakdown Schedule

Appendix 1 – *Program* Major Annual Activities and Roles

Activity	EM	EM-20	COP	PART	1ST QUARTER FY			2ND QUARTER FY			3RD QUARTER FY			4TH QUARTER FY		
					Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Planning Activities (budget Year + 1)																
Identify new ARTDD Initiatives	?	√	?	?												
Selection/Prioritization of new Initiatives	?	√	?													
Prepare Technical Responses			√	?												
Update Five-Year Program Plans (FYP)			√													
Submit FYP			√													
Corporate Review Budget (CRB) Call	√															
Submit Draft CRB		√	?													
Final CRB	√	?														
Receive Secretary's (S-1) Budget Decision	√															
Submit Office of Management and Budget (OMB) Budget	√															
Formulate Activities (Budget Year)																
Receive OMB Passback	√															
Prepare Congressional Request	√	?														
Submit Congressional Budget Request	√															
Congressional Hearings and Appropriations	√	?														
Congressional Appropriations	√															
Draft Annual Performance Plan (APP)			√	?												
Review Draft APP		√														
Submit Final APP			√													
Execution Activities (Current Year)																
Selection of new ARTDD Initiative program performers			√													
Fulfill commitment made in APP		√	√	√												
Manage and coordinate work		√	√	√												
Provide communication products		√	?	?												
Evaluation Activities (Current Year)																
Business Reviews		√	?													
Programmatic reviews (peer reviews) as required			√	?												
ARTDD Annual Review		√														

EM = Office of Environmental Management
EM-20 = Office of Engineering & Technology
ARTDD = Applied Research & Technology Development & Deployment
COP = Community of Practice
Part = Program Participants
√ = Lead/Major Role

Appendix 2 – *Program* Work Breakdown Structure

WBS Element	Title
1.0.0	**Waste Processing Programs**
1.1.0	Improved Waste Storage Technology
1.2.0	Reliable & Efficient Waste Retrieval Technologies
1.3.0	Enhanced Tank Closure Processes
1.4.0	Next-Generation Pretreatment Solutions
1.5.0	Enhanced Stabilization Technologies
2.0.0	**Groundwater and Soil Remediation Strategic Initiatives**
2.1.0	Improved Sampling & Characterization Strategies
2.2.0	Advanced Predictive Capabilities
2.3.0	Enhanced Remediation Methods
3.0.0	**Deactivation & Decommissioning (D&D) and Facility Engineering Strategic Initiatives**
3.1.0	D&D Planning Activities
3.2.0	Adapted Technologies for Site-Specific and Complex-Wide D&D Applications
4.0.0	**DOE Spent Nuclear Fuel**
4.1.0	Improved SNF Storage, Stabilization and Disposal Preparation
5.0.0	**Challenging Materials**
5.1.0	Enhanced Storage, Monitoring and Stabilization Systems
6.0.0	**Integration and Cross-Cutting Initiatives**
6.1.0	Enhanced Long-Term Performance Evaluation & Monitoring
6.2.0	Improved Packaging of Spent Fuel, TRU Waste and Nuclear Materials
6.3.0	Planning & Integration
6.4.0	Communications

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