Project Baseline Summary Report

Data Source: **EM CDB** Report Number: **GEN-01b**

Operations/Field Office: **Idaho** Print Date: **3/10/2000**

Site Summary Level: **Idaho National Engineering and Environmental Laboratory** HQ ID: **2008**

Project **ID-LRP-101-PC / Environmental Engineering and Science Center (S/PC)**

General Project Information

Project Description Narratives

Purpose, Scope, and Technical Approach:

Definition of Purpose: It is estimated that the total cost of the Environmental Management (EM) program's mission will be between $190 billion and $350 billion over a 75-year period. This estimate will continue to grow as new EM needs and issues are examined, unless solutions are found for existing as well as future problems. EM will benefit by a change to its approach in addressing complex needs, in order to reduce the cost and accelerate the pace of cleanup. Through better coordination between sites, use of "breakthrough management" and use of new technologies, this reduction and acceleration can be realized. The purpose of the Environmental Engineering and Science Center (EESC) is to house technology development and science programs planned to reduce risks and costs to DOE and its contractors, and to study post-2006 DOE environmental issues and problems. Programmatic risk from legacy cleanup activities in the DOE complex appears in various forms, including worker/human exposure, environmental, and equity issues such as compliance and agreement adherence. Projected benefits of the EESC are to improve scientific understanding of long-term DOE environmental impacts, improve operational safety, lower cleanup costs, and deliver new, cost-effective treatment and technical solutions and alternatives to our most serious environmental cleanup problems. The EM Integration effort has identified six waste problem areas (ER, HLW, LLW, MLLW, SNF, and TRU), with 2,930 waste disposition elements at 37 sites across the DOE complex which will need to be addressed before cleanup can be completed.

DOE technology requirements will become more complex with time, and the long-term impacts of our current cleanup strategies are not well understood. The INEEL has established an approach to reduce the long-term risks and costs associated with the more complex problems. Part of this strategy involves increasing relevant research activities. The EESC will support the technical performance of the current EM baseline, resolve any remaining technical issues that will prevent final closure of EM cleanup efforts, and transition the INEEL from site cleanup to the multi-program missions of the DOE long-range plans as the EM lab.

The EESC will focus on developing technology capabilities and research activities based on analysis and logical grouping of needs identified by the Site Technology Coordinating Groups across the DOE complex. The research activities, which focus on crosscutting base science themes, include 1) Contaminant Transport by Selective Mass Transport Agents, 2) Chemistry of Environmental Surfaces, 3) Materials Dynamics, 4) Characterization Science, and 5) Computational Simulation of Geo-mechanical and Geo-chemical Systems. The activities were designed to be multidisciplinary in nature and to be mutually supportive. The research activities (either separately or in combination) support a number of ongoing and emerging long-term areas of importance to DOE-EM. By focusing EESC technology and science programs on complex-wide needs that can be tested at a single site in "engineered environments," major environmental themes will be addressed in their entirety. Instead of focusing on a single need or activity, integrated needs and activities will be developed into an environmental theme, which will address several related issues and needs. The EESC will proceed further than only addressing current problems and risks. The EESC will be used for innovative research development, working on complex and long-term issues before they become critical, and working on problems that reach across the environmental scale, not only post-Cold War problems.

The ESCC will provide data, technologies, and facilities for:

· Development of alternatives to high-risk activities

Project Description Narratives

· Development of new/innovative technical approaches

· Analysis of technical alternatives

· Rapid testing and deployment of low cost/cost effective technological solutions

· Demonstration of techniques and processes aimed at waste and risk elimination/reduction through long-term environmental stewardship.

Definition of Scope: Currently, over 600 DOE waste, facility, and programmatic needs have been identified in the DOE complex. Thirty-two percent of the issues related to the complex's needs are technology based, making technology issues the largest problem within the complex. In addition, an activity that has been frequently overlooked in the past within DOE is the stewardship of public lands and the avoidance of creating additional environmental insult through current and future DOE practices and programs.

The EESC will provide a center for research, development, and demonstration of science and technology related to waste treatment and contamination countermeasures. An important part of the EESC will be a National Environmental Information nexus to achieve collaborative, multi-site participation among the DOE complex, private industry, and universities. This nexus will provide for the real-time communication and data links that will allow work intensive collaboration between researchers at the EESC and researchers working with larger quantities of actual waste at the INEEL's site facilities. The EESC will allow needs managers and solution providers a single place where the problem managers can see progress, verify approaches, and work with actual waste and processes to obtain quantifiable results.

Undersurface Environmental Sciences Center - The EESC will house laboratories for research and development aimed at the characterization, monitoring, and remediation of contaminants in groundwater and fractured media. Environmental fate and transport of contaminants in the geological subsurface are major themes of the INEEL Core Competencies. This issue of long-term, post-closure monitoring is critical to DOE-EM in the execution of its mission. Environmental restoration (ER) makes up 41% of the issues and barriers within the DOE complex. As we proceed with individual site assessment and cleanup, this percentage will increase.
In complex-wide EM Integration environmental remediation workshops, the subsurface vadose needs have been identified as complex-wide roadmapping issues and as technology development issues. Specific problems include removal of tritium from groundwater, development of innovative alternatives to pump and treat technologies, understanding fate and transport of pollutants, and numerous other issues associated with the vadose zone at the various DOE sites. The DOE decision to use subsurface disposal sites such as WIPP and Yucca Mountain mandates a long-term need for significant capability to model, predict, measure, and verify a large number of subsurface processes relevant to waste storage on extremely long time scales.

A subsurface laboratory capability will provide DOE with the systems required for research and development in deep subsurface environments. The EESC will support systems to simulate shallow to deep subsurface environments characterized by ambient to high pressures, subfreezing to high temperatures, and differing chemical and fluid-saturation conditions. The DOE, other federal agencies, and university, international, and private researchers will be able to evaluate biological, geological, chemical, and physical interactions in "engineered environments." Such entities can develop and validate simulation models that can be used to predict problems and responses in natural systems at a fraction of the cost of equivalent field

Project Description Narratives

experiments.

Transuranic (TRU) Waste - The EESC will house laboratories to test and reproduce environments for demonstration of remote technologies for characterization, assay, and transportation of mixed TRU waste. The issues related to mixed TRU waste reach across the DOE complex and encompass 10 major generation and storage sites, including the INEEL, and 24 small-quantity sites. In an analysis of the issues and needs related to TRU waste, 10% of the barriers pose a significant problem in the complex, as defined in the DOE Paths to Closure Report, 1998. These TRU waste sites have submitted a set of needs with a technology risk score of 3 or higher, indicating that the technological risk is high.

Due to packaging restrictions for the Transuranic Package Transporter (TRUPACT)-II, 20 to 40% of the TRU waste currently stored at 34 DOE and non-DOE sites is not transportable in its current package configuration. The major issues resulting from the TRUPACT-II restrictions are related to gas generation. Through the use of the planned EESC "engineered environments," DOE researchers can obtain the data needed to revise the TRUPACT-II payload plan, and they will have the facilities to modify the payload packaging and handling process for both contact-handled and remote-handled TRU waste.

Spent Nuclear Fuel (SNF) - The National SNF Program and INEEL SNF programs have submitted Science and Technology Needs with a technology risk score of 3 or higher to the Office of Science and Technology (OST, EM-50). The EESC will house nondestructive assay (NDA) and nondestructive examination (NDE) development capabilities for mockup and transport for deployment at SNF storage sites. The SNF program within DOE will continue to grow as commercial and foreign SNF is managed by DOE. Of the barriers facing the SNF programs, 22% are based on facility limitations, and 15% are based on inadequate technologies; both issues will be examined at the EESC.

The Needs Management System (NMS) requires NDA and NDE capabilities for storage canister deterioration, water detection in storage canisters, and fissile material content in SNF. A limited amount of canister examination is occurring at Argonne National Laboratory-West (ANL-W). This limited capability will be insufficient to meet the Idaho Settlement Agreement for removal of all SNF from wet storage by the year 2023. The EESC sensors facilities will help fill this gap.

Research and development for the INEEL SNF programs is occurring at the INEEL Research Center, at ANL-W, and at the Idaho Nuclear Technologies and Engineering Complex. Robotic work is also occurring in Idaho Falls facilities. To obtain the most value from these individual activities they must be integrated before completing the transfer of SNF from wet to dry storage. The EESC will accommodate surrogate, mockup robotic development in one location.

Energy Research - An example of a specific needed capability is that of "engineered environments" or "engineered ecosystems" as mesoscale test systems. Such test systems can play a critical role in simulating real world environments, providing data difficult or impossible to obtain from the real world environment or on natural geological time scales. These mesoscale test systems also represent an important intermediate point in understanding the scaling factors needed to transition scientific understanding of lab-scale processes to those actually present in the real world on the geological scale.

An example of the use of an engineered environment is based on the outcome of two national workshops held earlier in the year and the DOE Office of Fossil Energy (DOE-FE) publication, "A Strategy for Methane Hydrates Research and Development." It identifies the need to "construct a laboratory with high pressure, low temperature cells to produce and study hydrates formation and dissociation." Methane hydrates, which are crystalline solids

Project Description Narratives

that are stable in the ocean floor sediments at water depths greater than 1,000 feet, may be a significant source of energy for the United States. The EESC will provide a location for the scale-up facilities to demonstrate and validate research results prior to field applications. The EESC will give DOE the confidence and insights of intermediate testing with intermediate-size laboratory systems.

Technical Approach:

The laboratory space at the EESC will provide the infrastructure to support specialized features, such as test beds and regulated environmental chambers, for addressing environmental technology needs. Testing and concurrent engineering needs will be accommodated in this space. The EESC will contain approximately 92,000 square feet of multidisciplinary technology development area (laboratory space), with approximately 55,000 square feet of utility and services support space.

Science and technology developed through a systems-based environmental stewardship (SBES) will help provide data on complex problems. This will help validate solutions before full-scale application of the technologies. In addition, SBES-developed technologies will make available performance data to demonstrate why, and how well, a technology works by providing state-of-the art lab space for innovative, multidisciplinary research and development. The EESC will facilitate implementation of the SBES.

In addition to providing co-location facilities within the 44,000 square feet of nexus integrated office and conference facilities, the EESC will also provide "virtual participation" capability to remote technical and program experts who would be unable to be physically co-located at the facility, but who are needed to assist in solving the environmental problems being addressed. The EESC will foster the integration and synergism of the organizations involved in the solution to the environmental problem.

The EESC will be able to electronically access and distribute, in real time, the technical data necessary for integrated product teams to effectively resolve problems. The distribution of technical data must include all outside organizations directly and indirectly involved in the technology area. The necessary electronic linkages, connections, and working environment needed to implement the SBES methodology drive the requirements for the EESC's nexus communication system.

Project Status in FY 2006:

The EESC project will be constructed and fully operational by the end of FY 2004. Technological activities currently under development at different facilities will be tested and operational by 2006 within the EESC, producing the first generation of active technology solutions.

Post-2006 Project Scope:

Activities that will be scheduled after 2006 will focus on long-range technology needs, DOE's environmental stewardship, and DOE's mission enhancement. The integration of needs and technology opportunities into the technical planning for the EESC will be based on system engineering basics: define the requirements (problems and needs), functional analysis (what and why), synthesis of a process (how), and evaluate and define the system components (solution).

Project End State

Project Description Narratives

By the time the EESC has arrived at its projected useful life of 30 years, it will have been instrumental in assisting DOE in achieving at least three desirable end states and will remain a useful structure that will not require decontamination prior to sale or reassignment for other purposes. The first end state is to maintain the technical performance of the current EM baseline. The second end state is to resolve any remaining technical issues that will prevent final closure of EM cleanup efforts, both at the INEEL and complex-wide. The third end state is to support INEEL in its continuing multi-program missions for the DOE.

Cost Baseline Comments:

A conceptual cost estimate was prepared based upon the conceptual design. The estimate is based on a "bottoms up" approach, with the exception of the mechanical and electrical work, which is based on a parametric approach. Contingency is included in the estimate in accordance with guidelines specified in the INEEL Cost Estimating Guide.

Safety & Health Hazards:

The cleanup of nuclear and chemical environmental waste sites and facilities are by their very nature of a high technical risk. The EESC will reduce the technical risks by providing validated technical and cost performance data to program, project, and government decision-makers. These decision-makers can take action to avoid cost and schedule overruns that could be caused by the potential technical failure of the proposed cleanup technologies and result in failure to meet the Settlement Agreement signed by DOE and former Governor Batt of Idaho. The EESC will help INEEL determine technical risk by validation and verification of critical detection, treatment, and control technologies that crosscut the complex.

The reduction in risk will be accomplished by expanding the use of SBES methodology to address the concerns raised in the Defense Nuclear Facility Safety Board (DNFSB) 1994 report. This methodology was introduced through the EM Integration effort at the INEEL in 1995 and was formalized through a memorandum of understanding between the INEEL and DOE in 1996.

Safety & Health Work Performance:

Safety basis documentation for the operation of the EESC will be prepared per DOE Orders. The EESC will limit its radiological inventory to maintain a non-nuclear facility status. The EESC nexus will be used to integrate EESC operations with the INEEL site facilities, such as hot shops, where work will be performed using waste that is beyond the radiological inventory of the EESC. It is anticipated that the hazard classification for the EESC will be "other industrial," following DOE-EM-STD-5502-94, "Hazard Baseline Documentation," which provides guidance for classifying facilities.

Since the scope of hazards to be addressed in this technology development, integration, and testing is so broad, individual risk assessment to the public and environment are not practicable at this time. All work at the INEEL is performed using an Integrated Safety Management (ISM) approach. This ISM approach will be used to address the hazards associated with providing (constructing) the EESC and operating it for its assumed 30-year life. The hazards associated with design, construction, and testing of the EESC are those normally associated with the construction and testing of a structure containing complex mechanical and electrical systems.

Prior to commencing any research and/or development activity in the EESC, an independent hazard review will be conducted on each activity to ensure that all hazards are identified and controlled. The resources necessary to accomplish the work safely are provided through work package

Project Description Narratives

authorization, site Health and Safety Program requirements, and the resources allocated to the site`s safety management system. Resources are in the following functional categories: radiological safety, emergency management, fire safety, industrial hygiene, nuclear safety, occupational medicine, occupational safety, safeguards and security, performance oversight, and standards management. Safety and health resources are planned for and allocated to these categories by cost centers through the work breakdown structure.

PBS Comments:

The EESC is a key element of the INEEL's Long Range Plan and the Waste Agreement signed between the DOE and Governor Batt of Idaho. The Governor of Idaho, U. S. Senators Kempthorne and Craig and U. S. Congressman Crapo have reviewed and support the INEEL's Long Range Plan and the DOE/State of Idaho Waste Agreement. They have placed a very high priority on the INEEL Long Range Plan and the EESC as a mechanism to transition the INEEL from a nuclear weapons site requiring the cleanup and decommissioning of nuclear facilities to the DOE National Environmental Laboratory.

As part of the Idaho National Engineering and Environmental Laboratory`s core mission to provide enhanced environmental stewardship to the Department of Energy and the nation as a whole, several scoping and planning strategies have been assembled. The Department of Energy (DOE) Ten Year Plan Guidance and the Idaho National Engineering and Environmental Laboratory (INEEL) Environmental Management Ten Year Plan provide current direction for environmental management activities. DOE Ten Year Plan guidance as implemented by INEEL Environmental Management Ten Year Plan is supported by this project. The INEEL plan guidance includes the INEEL Site Technology Coordination Groups` identified needs and opportunities in support of accomplishment of the INEEL EM Ten Year Plan.

The division of the value of the facility between driver categories cannot be made because the problems to be addressed will change from year to year. Furthermore, the Systems Engineering process requires that requirements be defined and combined together and not segregated into single point solutions to single requirements.

The schedule/milestones listed in Section A.3 are those of a typical LICP modified to reflect the planned lease acquisition discussed in Section A.2.8.

The Environmental Engineering and Science Center (EESC), the Enhance INEEL Core Competencies Project, and the Derived Mission Project are the key facilities and elements needed to complete the transition of the INEEL from site cleanup to the objectives of INEEL Long Range Plan (see Project End State #3 of paragraph A.2.6).

Baseline Validation Narrative:

An independent program/project review by personnel not associated with the project will be performed.

General PBS Information

Project Validated? **Date Validated:**

Has Headquarters reviewed and approved project? No

Date Project was Added:

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General PBS Information

Baseline Submission Date:

FEDPLAN Project? Yes

Drivers:

CERCLA	RCRA	DNFSB	AEA	UMTRCA	State	DOE Orders	Other
Y	Y	Y	N	N	Y	N	Y

Project Identification Information

DOE Project Manager: P. R. TRUDEL

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Is this a High Visibility Project (Y/N):

Planning Section

Baseline Costs (in thousands of dollars)

	1997-2006 Total	2007-2070 Total	1997-2070 Total	1997	Actual 1997	1998	Actual 1998	1999	2000	2001	2002	2003	2004	2005	2006
PBS Baseline (current year dollars)	84,739	0	84,739					8,939	0	4,662	14,015	37,357	19,766	0	0
PBS Baseline (constant 1999 dollars)	78,363	0	78,363					8,939	0	4,446	13,091	34,176	17,711	0	0
PBS EM Baseline (current year dollars)	84,739	0	84,739					8,939	0	4,662	14,015	37,357	19,766	0	0
PBS EM Baseline (constant 1999 dollars)	78,363	0	78,363					8,939	0	4,446	13,091	34,176	17,711	0	0

	2007	2008	2009	2010	2011-2015	2016-2020	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050	2051-2055	2056-2060	2061-2065	2066-2070

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	2007	2008	2009	2010	2011-2015	2016-2020	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050	2051-2055	2056-2060	2061-2065	2066-2070
PBS Baseline (current year dollars)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PBS Baseline (constant 1999 dollars)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PBS EM Baseline (current year dollars)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PBS EM Baseline (constant 1999 dollars)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Baseline Escalation Rates

1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
		0.00%	2.70%	2.10%	2.10%	2.10%	2.10%	2.10%	2.10%	2.10%	2.10%	2.10%

2010	2011-2015	2016-2020	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050	2051-2055	2056-2060	2061-2065	2066-2070
2.10%	2.10%	2.10%	2.10%	2.10%	2.10%	2.10%	2.10%	2.10%	2.10%	2.10%	2.10%	2.10%

Project Reconciliation

Project Completion Date Changes:

Previously Projected End Date of Project:

Current Projected End Date of Project: 9/30/2004

Explanation of Project Completion Date Difference (if applicable):

Project changed from a fast-tracked design-build-lease facility to standard LICP.

Project Cost Estimates (in thousands of dollars)

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Project Reconciliation

Previously Estimated Lifecycle Cost (1997 - 2070, 1998 Dollars):		**Actual 1997 Cost:**	**Actual 1998 Cost:**
Previously Estimated Lifecycle Cost of Project (1999 - 2070, 1998 Dollars):	0	**Inflation Adjustment (2.7% to convert 1998 to 1999 dollars):**	0
Previously Estimated Lifecycle Cost (1999 - 2070, 1999 Dollars):	0		

Project Cost Changes

	Cost Adjustments	Reconciliation Narratives
Cost Change Due to Scope Deletions (-):		
Cost Reductions Due to Efficiencies (-):		
Cost Associated with New Scope (+):	8,939	$8,939 for FY 1999 assignment of LRP Project Closure funding. NOT PART OF LICP....
Cost Growth Associated with Scope Previously Reported (+):	69,424	Project changed from leased facility to standard LICP.
Cost Reductions Due to Science & Technology Efficiencies (-):		
Subtotal:	78,363	
Additional Amount to Reconcile (+):	0	
Current Estimated Lifecycle Cost (1999 - 2070, 1999 Dollars):	**78,363**	

Milestones

Milestone/Activity	Field Milestone Code	Original Date	Baseline Date	Legal Date	Forecast Date	Actual Date	EA	DNFSB	Mgmt. Commit.	Key Decision	Intersite
Project End	LRP-E		9/30/2004								
Project Start			10/1/1996								

Milestones - Part II

Milestone/Activity	Field Milestone Code	Critical Decision	Critial Closure Path	Project Start	Project End	Mission Complete	Tech Risk	Work Scope Risk	Intersite Risk	Cancelled	Milestone Description
Project End	LRP-E				Y						All capital funded activities complete.
Project Start				Y							PBS Baseline Start

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