THE ENVIRONMENTAL TECHNOLOGIES ACCEPTANCE (ETA) PROGRAM

Semiannual Report

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THE ENVIRONMENTAL TECHNOLOGIES ACCEPTANCE PROGRAM

INTRODUCTION

The Environmental Technologies Acceptance (ETA) Program at the Energy & Environmental Research Center (EERC) is intended to advance the development, commercial acceptance, and timely deployment of selected private sector technologies for the cleanup of sites in the nuclear defense complex as well as the greater market. As shown in Table 1, this cooperative agreement funded by the National Energy Technology Laboratory (NETL) consists of three tasks: Technology Selection, Technology Development, and Technology Verification. As currently conceived, the ETA will address the needs of as many technologies as appropriate under its current 3-year term. This report covers activities during the first 6 months of the 3-year ETA program.

TABLE 1

Summary of ETA Tasks

Task Name	Task Summary
1 – Technology Selection	
1.1 – Determination of Key Problems to Be Addressed	Using the EM Focus Area multiyear program plans, technologies that meet key needs will be matched with EERC areas of expertise. Resulting technologies will be prioritized, and relationships will be developed with Focus Area personnel and end users. A short list of site needs, industry partners, and technologies will be prepared, and the EERC will facilitate discussion concerning technology selection for ETA activities.
1.2 – Selection of Technologies	EERC personnel will assess the merits of OST-developed technologies addressing needs identified under Task 1.1 and will assess merits of other candidate technologies. Results will be submitted to the advisory group to select technologies for the ETA program.
1.3 – Development of a Technology Assistance Work plan	The EERC will develop detailed work plans based on input from end users, Focus Area personnel, and technology developers that address specific issues for the technologies selected under Task 1.2.
2 – Technology Development	
2.1 – Performance of Experiments	Experiments and/or nonexperimental development work intended to resolve technical problems and accelerate technology development. Scope of work is technology-dependent.
2.2 – Evaluation and Reporting of Results	Results will be reduced, analyzed, and communicated through a comprehensive report.
3 – Technology Verification	
3.1 – Verification Setup	The type of verification will be determined and the appropriate preliminary activities performed to facilitate successful testing.
3.2 – Verification Testing	Verification testing and associated analytical work.
3.3 – Evaluation and Reporting of Results	The results of verification activities will be described in detail in a comprehensive technology development report that will serve as an Innovative Technology Report Summary (ITRS)

ACCOMPLISHMENTS

Activities in the first 6 months of this contract are all within Task 1, Technology Selection, and include:

- Contract compliance activities.
- Efforts related to the due diligence required for selecting technologies for this program.
- Preparation of a first-year work plan including identification of technical activities for Task 2.

Contract Compliance Activities

The required contract planning and reporting documents were submitted. These included the following:

- EERC Air Quality Control Permit in response to Contract Section 2.26: Permits and Licenses.
- Hazardous Substance Plan in response to Contract Section 4.16: Hazardous Substance Plan.
- Federal Assistance Milestone Plan (Form No. DOE F 4600.3) in response to Contract Section 4.5: Federal Assistance Milestone Plan and Milestone Log.
- Environmental Information for the EERC operations submitted as a supplement to the other contract requests.

Due-Diligence Efforts (Tasks 1.1 and 1.2)

As a means of collecting information about key problems at the DOE sites, on-line information systems and DOE documents were reviewed. A summary of the primary needs at the operations offices was prepared and submitted as part of the first-quarter reporting. In addition, a review was conducted based on the needs statements for the DOE Focus Areas. Results from this review of the major problem areas from the Focus Area perspective were also summarized and included in the first-quarter report.

In order to develop a better appreciation of site needs, as part of Task 1, the EERC will be visiting selected sites to review technology needs. The first of these trips was completed by Dan Stepan and Tina Behr-Andres, who visited Rocky Flats in February. Gary Schuetz from Rocky Flats hosted a tour through the facility that focused on the state of and conditions for deactivation and decommissioning (D&D) activities there. The EERC plans to arrange similar types of visits at other DOE sites as opportunities arise.

As part of ongoing due-diligence activities, EERC personnel (Tina Behr-Andres and Thea Reilkoff) attended the Waste Management Conference in Tucson, Arizona, in February. At this

meeting, Tina Behr-Andres attended discussion forums on long-term stewardship (LTS) and talked with Don Krause, from BWXT Ohio, about the scope of work for the LTS Mound Task of this project. In addition, the exhibition hall had a notable number of first-time exhibitors that could be good candidates for future participation in ETA-based projects. Information material was distributed to interested vendors and conference participants about EERC capabilities and past projects with NETL.

First-Year Work Plan (Task 1.3)

A work plan for the first year of the project was prepared in November with the general format of a Technical Task Plan, as requested by Dr. Paul Hart. In the project's first year, the focus is on technology selection (Task 1) and accelerated technology development (Task 2). The approach for Task 1 is to choose technologies with guidance from NETL's personnel. Task 2 consists of engineering and scientific support for development of the selected technologies to resolve specific technical barriers for the associated industrial clients.

Upon the request of Ed Klunder, an addendum to the Technical Task Plan was prepared to provide specific need statements that correlate to the proposed technical activities of Task 2. This justification document was submitted in January and was approved, along with the Technical Task Plan, in February.

As specified in the ETA Year 1 Technical Task Plan, the second task includes four technical activities. These subtasks are summarized in Table 2 with narrative descriptions for each in the next section.

LTS Summary

EERC personnel participated with representatives from DOE and BWXT Ohio in the LTS kickoff meeting in Morgantown in March. Following this meeting, information about the EERC, its resources, and how it can contribute to LTS efforts was prepared and sent to Sue Smiley, LTS head at Mound, and copied to Steve Bossart and Harold Shoemaker. A site visit of Mound was requested; however, Sue Smiley declined. After the LTS plan is drafted, she plans to invite all team members for a site visit.

The EERC and Mound have become more involved in the network of LTS activities in the complex. We attended all of the LTS meetings at the Waste Management Conference and made contacts with personnel from DOE headquarters and INEEL working on LTS. Contacts for the EERC and Mound are now on INEEL distribution lists.

Although the draft LTS plan from BWXT was not available at the time of this reporting, a draft work plan for EERC involvement in LTS activities is being prepared and will be submitted in early May.

TABLE 2

ETA Year 1 Technical Task Plan

Subtask Activities	Subtask Project Manager(s)	Industrial Partners	Activity Scope
1: Long-Term Stewardship at Mound	C. Behr-Andres	DOE Mound and BWXT Ohio	Participate as a team member for the LTS initiative for the Miamisburg Environmental Management Project at the Mound plant site in Ohio
2: Photocatalytic Treatment of Hg-Contaminated Water	Dan Stepan	ADA Technologies, Denver, Colorado	Characterize and enhance a photocatalyst for aqueous Hg treatment to optimize the treatment process
3: Subcritical Water Treatment of Pb and PCB-Contaminated Paint	Steve Hawthorne	CMS Energy, Charlevoix, Michigan	Demonstrate subcritical water treatment technology as an alternative for management of orphaned contaminated paint waste from D&D activities
4: "Century Cap" for Low-Level Radioactive Waste Repositories	Melanie Hetland and Thea Reilkoff	Ecolotree, Iowa City, Iowa, and DOE Savannah River Site	Develop a "Century Cap" designed to last for hundreds of years by integrating vegetation with high-growth and transpiration rates with late-successional vegetation having similar characteristics

ADA Summary

Dan Stepan and Tina Behr-Andres visited ADA Technologies, Inc., in March. They met with Cliff Brown, President; John Lovell, Senior Scientist; and Jim Butz, Senior Research Engineer. The visit included a tour of their facility and a presentation on their activities which are primarily focused on R&D of pollution control technologies with an emphasis in Hg. The EERC presented background on its facility and their EM program work.

One of ADA's key R&D efforts is on photocatalysis for aqueous Hg treatment. The state of the technology was discussed, and it was decided that the ETA activity would focus on more detailed catalyst characterization work with the objective of optimizing the process. There are some significant opportunities to apply this process to DOE site problems, particularly at ORNL. Cliff Brown will be following up on this with his contacts at ORNL.

The approach of the ETA project with ADA is to collect, from ADA, background information on the process to date (catalyst preparation methods, testing conditions, and results) and samples of raw and a spent catalyst. Then the materials will be characterized using techniques such as XRD and SEM with EDS to determine catalyst crystallography, particle morphology, and surface composition. The product of the first phase will be to correlate catalyst performance in Hg removal with catalyst features and propose catalyst modifications to optimize the treatment process. The second phase of the project will be to prepare a modified catalyst and test it to verify that the treatment mechanisms are understood and the process is optimized. After preparing and signing a confidentiality agreement, ADA provided the EERC with a confidential draft report on the photocatalysis process from a Phase II SBIR effort for use in preparation of a work plan for this project. The work plan draft will be submitted in early May.

SCW and Paint Summary

This third project is an additional activity to demonstrate the subcritical water treatment technology developed at the EERC through previous cooperative agreement funding. There is a need to remediate increasing volumes of PCB and lead-laden paint from D&D activities. This material is difficult to dispose of because of existing permit limitations. Current low-level waste (LLW) facilities are restricted from accepting PCB and radiological mixed-waste streams. Wastes regulated under the Toxic Substance Control Act (TSCA), such as PCBs, cannot be disposed of in an LLW repository. Wastes regulated by the Nuclear Regulatory Commission cannot be disposed of with TSCA wastes. These regulatory restrictions result in a need for a technology to reduce the volume and treat the resulting orphaned wastes so that they can be managed under current regulatory requirements. Florida International University, as part of a project for NETL, is testing a chemical treatment technology to degrade this contaminated paint waste. The intention for the activity under the ETA is to test the subcritical water technology as an alternative treatment for this waste. A draft work plan is being prepared for submission in early May, and negotiations with Tracey Goble of CMS Energy are taking place to obtain a contaminated paint sample for testing.

Ecolotree Summary

This fourth project is based on the need for long-term cover systems for low-level waste disposal cells at U.S. Department of Energy (DOE) sites. DOE has a particular need to ensure that disposal facilities remain operable for hundreds of years. Ecolotree, Inc., in Iowa City, Iowa, has designed vegetative caps capable of shielding wastes from percolating water over time. Discussions with Dr. Bill Schnabel or Ecolotree have resulted in a proposed project to develop a “Century Cap” designed to last for hundreds of years by integrating vegetation with high-growth and transpiration rates with late-successional vegetation having similar characteristics.

The intent is to focus on vegetative caps for LLW repositories in humid environments (mainly SRS and possibly Mound; the locations are based on IPABS needs statements). There are demonstrated vegetative caps in arid to temperate climates, but little on humid environments. The idea is to create a larger, upper “sponge-like” layer for the cap that is desiccated by the plants

that have deeper roots. The selected plants would be indigenous and grown under conditions that approach the natural state as much as possible. The first phase of the project would have the following tasks:

- 1) Identify specific vegetative cap needs at SRS and the characteristics of the LLW repositories
- 2) Collect data on site conditions for input to a vegetative cap model (Hydrus-2D); expected duration of one field season
- 3) Model cap using Hydrus-2D; finite element, multilayer, unsaturated zone water model
- 4) Design and cost out vegetative cap for SRS

All tasks would be performed by the EERC except Task 3, which would be done primarily by Ecolotree, and Task 4 which would be a joint effort. The second phase of the project would be a prototype at SRS depending on site access logistics and the enthusiasm with which the vegetative cap design is received by SRS. The EERC is communicating with Mike Serrato of SRS about its interest in this project and providing input and access for the field activities.