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INITIAL RESULTS OF EMSP FUNDED RESEARCH TO DEVELOP INNOVATIVE TECHNIQUES FOR WASTE DISPOSAL AND LAND REMEDIATION AT DOE SITES

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ABSTRACT

This paper presents the status as of mid-1999, of the US DOE's Environmental Management Science Program, (EMSP). The EMSP is a research program designed to encourage "transformational" or breakthrough approaches needed to lead to significantly reduced long-term cleanup costs and risks to workers and to the public. This presentation answers the question "What has the Environmental Management Science Program (EMSP) accomplished since its inception in fiscal year 1995?"

Since its actual beginning in fiscal year 1996, this research collaboration between the two U.S. Department of Energy headquarter offices of Energy Research (now Science) and Environmental Management in partnership with the Idaho Operations office has invested \$224.8 million in awards supporting 274 research projects. After the first three years scientists funded through the EMSP were conducting research at 70 universities, 13 DOE laboratories, and 12 other governmental and private laboratories located in 34 states, Canada, and Australia. National laboratory funding of \$129,036,000 and research grants of \$95,716,000 comprise the total investment of \$224.8 million as of early FY 2000.

The EMSP has accomplished more than providing research dollars. The longer-term basic science program was established in response to the Congressional mandate to expand scientific and engineering knowledge in order to replace current conventional clean-up approaches, which are often costly and ineffective, with new and innovative clean-up methods. In addition to its funding role, the EMSP has established a framework to enable DOE to capitalize on its scientific research investments.

EMSP compiled and published relevant project information in July 1999, in a report entitled "*Research Accomplishments for the Environmental Management Science Program*" (1). Presently quarterly reports updated to October 1999, and January 2000, are available from the Department. An earlier report summarized program status in mid-1998 after the first national workshop. That 1998 report is entitled "*Environmental Management Science Program Workshop*" (2). All reports are available from the Department and all stress the main objective of EMSP-funded research, which is to address EM clean-up needs through the year 2070. These reports highlight information by project relative to research transfers (i.e., deployments, products, spin-off business, field tests, and continuations by others). This method of frequent status reporting is part of the program plan for implementing dissemination of research results to site problem holders. The next phase of the dissemination plan is a second national workshop to be held in Atlanta, in April 2000. The workshop will once again bring together researchers and site problem holders to share research results, research needs, and site problems. The EMSP also uses advisory groups such as the Environmental Management Advisory Board's Science

WM'00 Conference, February 27 – March 2, 2000, Tucson, AZ

Committee, the Strategic Laboratory Council, and the National Academy of Science's National Research Council to improve the quality of the program and the process for selecting proposals.

In the future the Environmental Management Science Program will continue to fund targeted research for the development of breakthrough approaches for solving DOE's environmental problems. The EMSP will continue to administer 3-year awards to DOE national laboratories, other federal laboratories, universities, industry, and non-profit organizations. These awards will support projects that will provide EM with basic research seeking fundamental data that may be critical to advancing technologies under development but not yet implemented and that generally address problems considered intractable without new knowledge.

INTRODUCTION

In FY 1995 Congress, recognizing the importance of developing innovative techniques for waste disposal and land remediation at DOE sites, authorized legislation stating that subsidized long-term research efforts were needed to inspire "breakthroughs" in areas critical to the DOE-EM clean-up mission. Having documented that need, Congress identified funding to follow through towards resolution of the perceived problems. The resultant DOE Research Program, known today as the EMSP, Environmental Management Science Program, was designed by DOE to encourage "transformational" or breakthrough approaches needed to lead to significantly reduced long-term clean-up costs and risks to workers and to the public.

The EMSP mission includes three elements as follows: Develop a targeted, long-term basic research agenda to reduce cleanup costs and risks to workers and to the public. Bridge the gap between fundamental research and needs-driven applied technology. Serve as a stimulus for focusing the Nation's science infrastructure on critical environmental problems. The continuing basic problem or charter for EMSP has been stated simply as follows: Resources and attention to longer-term basic science research are needed to reduce cleanup costs and risks.

QUESTION

Here this morning the question is asked and this paper answers:

“What has the Environmental Management Science Program (EMSP) accomplished since its inception in FY 1995?”

Since its actual beginning existence in fiscal year 1996, this research collaboration between the two U.S. Department of Energy headquarter offices of Energy Research (now Science) and Environmental Management in partnership with the Idaho Operations office has invested \$224.8 million in awards supporting 274 research projects. Grants were made for projects responding to the following need areas, also known as focus areas: Subsurface Contamination, Decontamination & Decommissioning, High Level Radioactive Waste, Mixed Waste, Nuclear Materials, Health/Ecology/Risk and Spent Nuclear Fuel. After the first three years scientists funded through EMSP were conducting research at 70 universities, 13 DOE laboratories, and 12 other governmental and private laboratories located in 34 states, Canada, and Australia.

WM'00 Conference, February 27 – March 2, 2000, Tucson, AZ

National laboratory funding of \$129,036,000 and research grants of \$95,716,000 comprised the total investment of \$224.8 million as of early FY 2000.

Figure 1 is a graphical representation of the EMSP total awards.

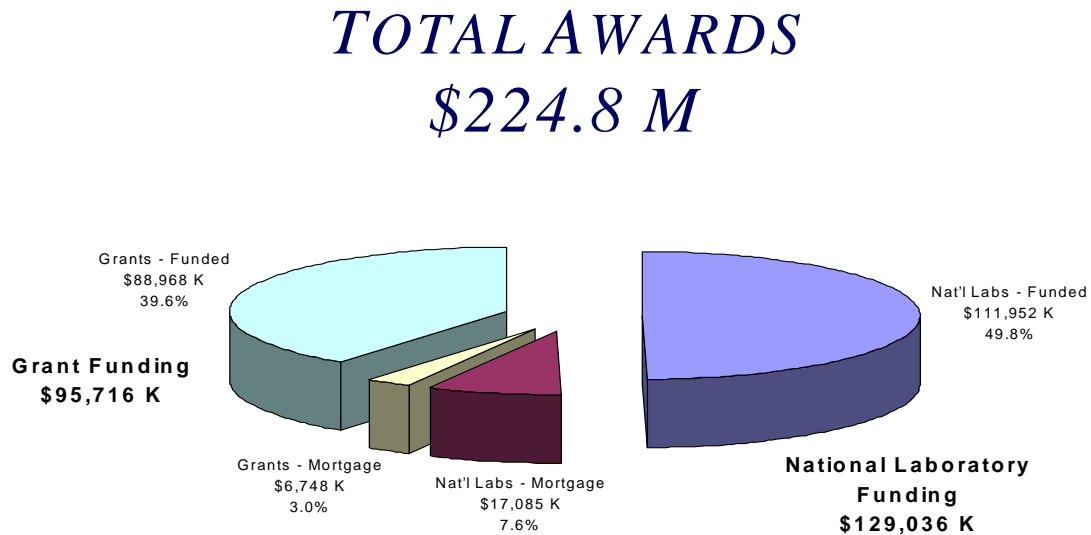


FIG. 1 –EMSP TOTAL FUNDING

The breakdown of awards by problem area is as follows:

- 113 awards in Subsurface Contamination for \$91,953K
- 22 awards in Decontamination and Decommissioning for \$18,995K
- 68 awards in High Level Waste for \$57,251K
- 32 awards in Mixed Waste for \$22,246K
- 8 awards in Nuclear Materials for \$7,882K
- 26 awards in Health/Ecology/Risk for \$22,414K
- 5 awards in Spent Nuclear Fuel for \$4,011K

Figure 2 is a graphical representation of this breakdown.

EMSP FUNDING BY EM PROBLEM AREA

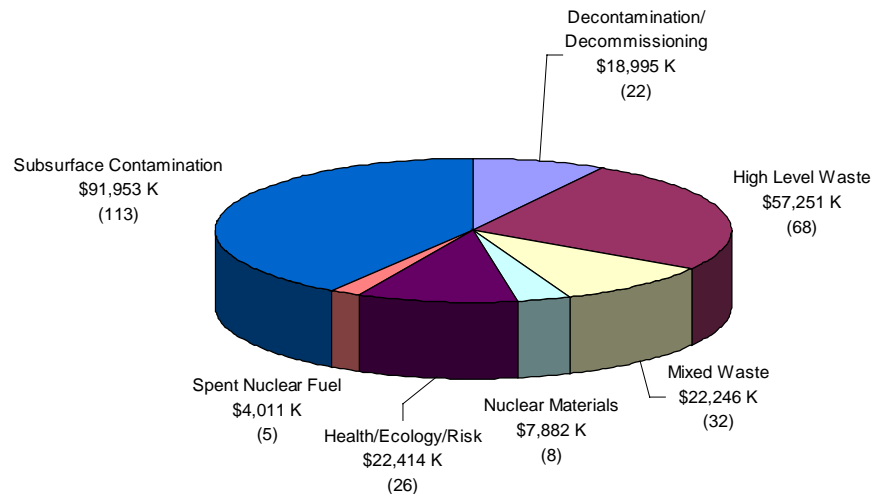


FIG. 2 –EMSP FUNDING BY PROBLEM AREA

EMSP RESEARCH ACCOMPLISHMENTS

EMSP has accomplished more than providing research dollars. The longer-term basic science program was established in response to the fore mentioned Congressional mandate to expand scientific and engineering knowledge in order to replace current conventional clean-up approaches, which are often costly and ineffective, with new and innovative clean-up methods. In addition to its funding role, EMSP has established a framework to enable DOE to capitalize on its scientific research investments.

Program success is judged based upon provided information concerning the research transition activities of the Environmental Management Science Program (EMSP). Research transitions are measures of how successfully the program has transitioned knowledge gained from research projects to other areas. These measures may be in the form of actual transfers of new knowledge or data gained through research, products, and/or processes to other areas within EM, such as Focus Areas and Crosscut Programs. Or they may be more general knowledge transfer measures found in similar research programs, such as collaborations, numbers of graduate students, peer reviewed papers and presentations, or consultations. EMSP compiled and published relevant success information in July 1999, in a report entitled "Research Accomplishments for the

Environmental Management Science Program". Information copied from that source for this presentation was the best available data as of July 9, 1999. At this present time updated report versions dated October 1999, and January 2000, are available from the Department.

EMSP Research Accomplishments Report

The EMSP Research Accomplishments report recognizes research transition activities in four categories: collaborations, graduate students, publications and presentations, and research transfers. For easy reference the research transition activities are listed by project and include project number, title, and the name of the principal investigator.

Results in summary are as follows:

Collaborations, i.e. the collaborative efforts being undertaken by EMSP projects to further research and to transfer research towards technical maturity. So far 18 collaborations have been reported. These are further categorized by type of collaboration, as follows:

- Consulting — provide advice or technical expertise
- Joint interaction — researcher and end user in joint interaction
- Mission directed — project direction provided by end user
- Researcher interaction — researcher to researcher interaction.

Graduate Students. One of the two main objectives of the EMSP is to develop a cadre of environmental scientists to meet 21st century clean-up needs. This category shows the impact that the EMSP is having on increasing the cadre of environmental researchers. The number of Post Doctoral, Graduate, and Undergraduate students are reported by EMSP project. As of July 10, 1999, 114 Post Doctoral and 209 Graduate students were known to be funded under this program.

Publications and Presentations. This report section provides a list of publications by EMSP project. Journal articles, papers, reports, presentations, posters, and media reports are considered publications for the purposes of this summary. The following table lists the totals for each of these categories. This number does not include 210 posters, which were presented, at the first EMSP National Workshop at Chicago in 1998. Table I lists numbers of these items.

TABLE I EMSP Publications

TYPE OF PUBLICATION/PRESENTATION	NUMBER OF EACH TYPE
Journal Articles	36
Papers	18
Reports	1
Presentations	22
Posters	8
Media reports	2

Research Transfers. The main objective of EMSP-funded research is to address EM clean-up needs through 2070. This report section includes research transfers (i.e., deployments, products, spin-off business, field tests, continuation by others, etc.) by project. Table II lists numbers of these items.

TABLE II EMSP Deployments

TYPE OF RESEARCH TRANSFER	NUMBER FOR EACH TYPE
Commercializations	6
Efficient Separations Program	1
Focus Areas	2
Initiatives for Proliferation Prevention	1
Field Tests	5

EMSP BENEFITS

As mentioned earlier, EMSP has established a framework to enable DOE to capitalize on its scientific research investments. These benefits will continue by following the elements of this framework as listed below:

Ensuring that funded proposals have both scientific merit and relevance to cleanup needs at sites and across the complex. EMSP's research portfolio addresses the most challenging technical problems of the Environmental Management Program related to high-level waste; spent nuclear fuel; mixed waste; nuclear materials; remedial action; decontamination and decommissioning; and health, ecology or risk (a crosscutting area).

Ensuring that the six technical problem areas and the crosscutting area are funded at appropriate levels. With each new solicitation, EMSP has an opportunity to tailor requests for proposals to equitably support its hierarchy of needs. The program has organized its 274 funded research projects within a framework that shows how the projects relate to 13 scientific disciplines, the six EM problem areas, and the 353 high-cost and high-risk projects described in the EM draft "Accelerating Cleanup: Paths to Closure" document. This exercise has helped the program determine how high-priority needs are being served through funded research and helps guide future funding decisions.

Using advisory groups such as the Environmental Management Advisory Board's Science Committee, the Strategic Laboratory Council, and the National Academy of Sciences/ National Research Council to improve the quality of the program and the process for selecting proposals.

Implementing an established plan for dissemination of research results to site problem holders. The next phase of the dissemination plan is a workshop in Atlanta in April 2000, that will once again bring together researchers and site problem holders to share research results, research needs, and site problems.

LOOKING AHEAD

"What lies ahead for the Environmental Management Science Program in FY 2000 and beyond?" you ask, and this paper answers:

WM'00 Conference, February 27 – March 2, 2000, Tucson, AZ

The Environmental Management Science Program will continue as it was chartered by Congress in 1996 to fund targeted research for the development of breakthrough approaches for solving DOE's environmental problems with less expense, on accelerated schedules, and at less risk to workers and the public. EMSP will continue to administer 3-year awards to DOE national laboratories, other federal laboratories, universities, industry, and non-profit organizations. These awards will support projects that will provide EM with basic research seeking fundamental data that may be critical to advancing technologies under development but not yet implemented and that generally address problems considered intractable without new knowledge.

MULTI-YEAR PLAN

EMSP is following an established multi-year plan with emphasis on research continuity and on insuring Focus Area participation with inputs to future solicitations. Calls currently planned are as shown in following Table III.

TABLE III EMSP Solicitations

YEAR	SOLICITATION TOPIC
FY2000	GENERAL
FY2001	D&D/HLW
FY2002	SC/MW/NM
FY2003	LTS
FY2004	D&D/HLW

BUDGETS

EMSP budget information is shown in the following table. No attempt is made to prognosticate future budgets. All past budgets are shown in Table III.

TABLE IV EMSP Budgets

YEAR	BUDGET
FY 1996	\$115 million
FY 1997	\$46 million
FY 1998	\$30 million
FY 1999	\$33 million
FY 2000	\$32 million

FOCUS AREAS

EMSP will continue to interact with the focus areas as in past to maximize benefits of research efforts. The areas of cooperation include the following:

- Input for Future Solicitations
- Participation in Relevancy Review Panels
- Mentoring for Researchers
- Workshop Participation
- Adoption of Promising Work for Product Development
- Transfer of Research Results to the User Community

EMSP & DOE-IDAHO

EMSP is a partnership between DOE Environmental Management (EM) and Science (SC). The EM role (HQ & ID) is to lead solicitation of research needs, ensure that projects apply to DOE cleanup problems and ensure that results are communicated to cleanup personnel. The SC role is to manage solicitation of research proposals, manage the scientific review process and lead technical management of research program

The DOE Idaho Operations Office at the Idaho National Engineering and Environmental Laboratory coordinates contractual details of the grants and is responsible for integrating results among researchers and DOE representatives. Results are now available on the Web (<http://www.em.doe.gov/science>) of research conducted under the first year of funding. Mechanisms are in place and continue being developed to share information with DOE site representatives and other interested stakeholders. Anyone needing data mentioned in this paper may leave the request and a business card with the author whom will reply from Idaho.

REFERENCES

1. "Research Accomplishments for the Environmental Management Science Program", U.S. DOE/EMSP, (July 1999)
2. "Environmental Management Science Program Workshop", U.S. DOE/EMSP, (July, 1998)