

Applying Information Technologies in Transitioning Research Results

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The Department of Energy-[Environmental Management Science Program](#) (DOE-EMSP) is responsible for sponsoring basic research that will lead to new and innovative methods for the cleanup of DOE's legacy waste and contaminated sites. As research efforts progress, the results need to be conveyed to end users and developers so that the scientific concepts can be used in new technologies or the new understanding can be employed to improve ongoing cleanup. By using information technology to disseminate information on EMSP funded basic science research projects, EMSP is able to reach the right audience, at minimal expense, very soon after the results are reported by the researchers.

Cleanup Need

The problem facing the [Department of Energy's](#) Environmental Management Program is that of cleaning up the radioactive, hazardous and mixed waste left after 50 years of U.S. nuclear weapons production. This is the largest environmental management program in the world.

Total life cycle costs for the Department of Energy (DOE) [Office of Environmental Management](#) (EM) to clean up these legacy wastes are estimated to be \$147 billion from 1997 to 2070. EM must store, treat, and stabilize over 300 tanks containing hundreds of thousands of cubic meters of highly radioactive wastes. EM will have to treat and dispose of approximately 167,000 cubic meters of over 1,400 different types of mixed waste (radioactive and hazardous waste) located at 37 sites in 19 states. When finished with its current scope of work, EM will have cleaned up more than 65 million square feet of buildings containing contaminated concrete, equipment, machinery, and pipes. It will also have characterized and treated more than 50 million cubic meters of soil and 5,700 ground water plumes which have contaminated over 600 billion gallons of water.

Research for New Solutions

The Environmental Management Science Program was established in 1996 in response to a mandate from Congress in the FY1996 Energy and Water Development Appropriations Act. Congress directed the Department of Energy to provide sufficient attention and resources to longer-term basic science research to ultimately reduce clean-up costs. It also directed DOE to develop a program that takes advantage of laboratory and university expertise and to seek new and innovative clean-up methods to replace current conventional approaches, which are often costly and ineffective.

The intent of the EMSP is to provide scientific knowledge that will

- revolutionize technologies and cleanup approaches to significantly reduce future costs, schedules, and risks;

- bridge the gap between broad fundamental research that has wide-ranging applications such as that performed in the Department's [Office of Science](#) and needs-driven applied technology development that is conducted in the Environmental Management's [Office of Science and Technology](#); and;
- focus the nation's science infrastructure on critical Department of Energy environmental problems.

The Environmental Management Science Program sponsors basic science research to gain foundational knowledge from which to develop improved cleanup technologies, techniques and processes as well as to provide for a better understanding of environmental management problems. Research is funded based upon its scientific merit and its relevance to high-impact EM-specific problem areas. The EMSP is currently funding 235 research projects, among 89 universities, 13 Department of Energy laboratories and 21 other governmental and private laboratories in 39 states, the District of Columbia, Canada, Australia, Russia and the Czech Republic. There are two new calls for research proposals currently in process.

Transitioning from Research Results to Cleanup Technologies

As the EMSP closes out its third year in September 1999, disseminating and utilizing the outstanding results of the initial 136 research projects is pivotal to realizing a return on the investment. These results not only support long-term solutions to EM's most difficult problems they also offer enhancements to current technologies in development or already deployed within the EM Program.

As research projects reach maturity, the research integration strategy is to transfer the results from the EMSP to appropriate stakeholders in the EM community. These stakeholders encompass not only the EM end-user community and the technology developers in the focus areas but technology developers and users in industry and the private sector. EMSP utilizes a three pronged approach in its outreach efforts.

The first facet of the strategy utilizes workshops to bring together EM problem area end-users and researchers. The objective of these workshops is to identify and encourage collaboration between researchers and potential end-users that extend beyond EMSP-funded research.

Another approach involves the dissemination of research summaries, annual reports and the final reports written by the Principal Investigators in a phased fashion as they progress through the research projects.

The integration strategy also includes publishing research findings, fostering the disposition of the mature research to other interested developers, and encouraging the EM Focus Areas and Crosscutting programs to continue the research.

Information Technologies for Results Transitioning

Information technologies will play a significant role in meeting the EMSP objective of transferring the research results to those involved in the cleanup effort. Conventional printed media and face-to-face interactions are still essential modes for communications but have limited reach. The use of electronic media can make these materials available to a much wider audience. Additionally, the use of electronic media allows EMSP to route pertinent information to those who have interest in specific problem areas. For this purpose, the use of Distributed Search Tools, Electronic Journal and Preprint Server technologies are being pursued.

One important requirement in the development of an EMSP electronic journal or pre-print server service is the ability to get needed information to the program managers as quickly as possible. To accomplish timely dissemination of information, we plan to provide a profile service that will review new entries to either of these services and notify EMSP program managers of new publications in their specific area of interest. An example of how this might work is the commercial web enabled service called PointCast (<http://www.pointcast.com/>).

Distributed Search Tools

The Environmental Science Network (ESN) is being developed to enhance the transfer and dissemination of scientific and technical information among researchers, program managers, and other participants in the EMSP. To accomplish this, ESN provides a means of identifying current Science Grants, obtaining information about specific grants, obtaining scientific and technical information on specific research areas addressed by individual grants or groups of grants, and doing general searches. The search capability can be used across a distributed collection of scientific and technical information collections for bibliographic information and/or for the full text.

ESN provides two approaches to searching and obtaining scientific and technical information. These allow the user to search by directly linking to current science grants and the topical areas of the science grants, or to search using an unrestricted query mechanism.

ESN Search- This is the default search option and searches a bibliographic database of the current science grants. Users can search by selecting one or more of the broad-level Science Areas or EM Needs Areas. Alternatively, the user can do a simple search for text. Additionally, links to other scientific collections are included with each grant citation list, or with each individual grant citation. These links will initiate a search of the collections, based upon the specific science area of the list or citation where the link was selected.

ESN Multi-Collection Search-This search option allows users to search directly against one or more of the distributed collections linked through ESN. It provides users with a check-list of data collections and a simple query for text searches. Searches performed using the multi-collection feature are performed in parallel. Because the collections offered through ESN are heterogeneous in makeup and employ different types of search engines, only a free text search capability is offered.

Electronic Journal Development

One of the principal means used, by both university and lab researchers, to make their information public, is publication in journals. The EMSP is actively involved in negotiations to bring full text of EMSP research articles to the desktop. After an analysis of where EMSP researchers were publishing their results, the EMSP, in collaboration with the [Office of Science and Technical Information \(OSTI\)](#), has begun development of an Electronic Journal prototype. We expect that within the coming year we will be able to provide a searchable citation database with embedded links to full text of articles published in [American Chemical Society \(ACS\)](#) journals. These articles will be available on a pay-per-view basis rather than by subscription. This will allow researchers and scientist to select only those articles of interest to them without having to subscribe to the journal.

Pre-Print Server

Pre-prints have long been a popular means of transferring information among researchers in many scientific communities. The number of pre-print servers has grown dramatically in recent years, however their success has, to date, been limited to only specific communities of researchers. The best known of these, in the scientific community, is probably the physics pre-print server available at the Los Alamos National Laboratory (<http://xxx.lanl.gov>). EMSP has done preliminary research into the idea of providing a pre-print service to the environmental science community and has identified key issues that need to be addressed. The first and most important of these issues is to determine whether EMSP researchers, and the environmental science and chemistry community in general, are willing to support such a service. A canvassing of EMSP researchers has just been completed. If the researchers support this service, EMSP will partner with Los Alamos National Laboratory to create a service that will be open to all.

Conclusion

As part of its sponsorship of basic scientific research directed at the environmental cleanup, the EMSP promotes the beneficial use of the scientific results from the sponsored projects. The EMSP has developed a strategy of information dissemination to meet their promotional goal that, in addition, to conventional hardcopy publications and direct interactions, includes a number of information technologies. These technologies are now being employed or are under development and hold the promise of effectively and efficiently reaching a broad audience of potential users at low cost. The planned future use of push/pull aspects within these technologies will allow EMSP to not only make the information available but, to be proactive in assuring that those with a need-to-know receive the information.