Project 3: Waste and D&D Engineering and Technology Development

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Principal Investigator:

Leonel E. Lagos, Ph.D., PMP®
Applied Research Center
Florida International University
10555 West Flagler Street, EC2100
Miami, FL 33174

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FIU | **Applied Research Center**
FLORIDA INTERNATIONAL UNIVERSITY

INTRODUCTION

This project focuses on delivering solutions under deactivation and decommissioning (D&D) in support of DOE EM-4.11 as well as IT development for environmental applications (KM-IT for EM-4.11) and waste & material management (WIMS for EM-4.22). All technology development related activities will also engage the Office of Technology Development (EM-3.2). This work is also relevant to infrastructure management activities being carried out at other DOE sites such as Oak Ridge, Savannah River, Hanford, Idaho and Portsmouth. As appropriate and within the parameters of the DOE-FIU Cooperative Agreement (CA), coordination at the proper level will occur with the sites and national laboratories involved in the project research efforts as well as with the points-of-contact at DOE HQ (e.g., HQ Project Leads, HQ Field Liaisons, Office of Technology Development, CA Technical Monitor, COR, etc.). Efforts on this project include the following tasks:

DOE EM HQ Contacts:
Genia McKinley, CA Technical Monitor, EM-3.2
Bart Barnhart, EM 4.1, Infrastructure & Disposition
Andy Szilagyi, EM-4.11, Infrastructure & D&D
Jonathan Kang, EM-4.22, Waste Disposal
Rod Rimando, EM-3.2, Technology Development
Matthew Zenkowich, SRS Field Liaison
Jeff McMillan, SRS Liaison Detail

DOE Site/Lab Contacts:
Patrick Jackson, SRS Field Office
Elizabeth Hoffman, SRNL
Mike Serrato, SRNL
Aaron Washington II, SRNL
Connor Nicholson, SRNL
Jack Musall, SRNS

FIU ARC Contact:
Leonel E. Lagos, Ph.D., PMP®
Principal Investigator, Director of Research
(305) 348-1810   E-mail: lagosl@fiu.edu

Applied Research Center
Florida International University
10555 W. Flagler St., Suite 2100
Miami, FL 33174

Task 1: Waste Information Management System (WIMS)

This task provides direct support to DOE EM for the management, development, and maintenance of a Waste Information Management System (WIMS). WIMS was developed to receive and organize the DOE waste forecast data from across the DOE complex and to automatically generate waste forecast data tables, disposition maps, GIS maps, transportation details, and other custom reports. WIMS is successfully deployed and can be accessed from the web address http://www.emwims.org. The waste forecast information is updated annually. WIMS has been designed to be extremely flexible for future additions and enhancements.

Task 2: D&D Support to DOE EM for Technology Innovation, Development, Evaluation and Deployment

This task provides direct support to DOE EM for D&D technology innovation, development, evaluation and deployment. For FIU Performance Year 8, FIU will expand its research in technology development, demonstration and evaluation in the following key areas: 1) Assist/support SRNL in addressing high priority fire resiliency, protection and safety requirements in support of the SRS 235-F D&D project and across the DOE EM complex by conducting fire testing on SRNL's innovative radiological shielding foams; 2) Identify broader applications for intumescent coating technologies to mitigate the impacts of contingency scenarios across the DOE complex; 3) Execute a phased approach for the standards development, testing, evaluation, and deployment of D&D technologies; 4) Support for an onsite demonstration of the intumescent coating; and 5) Collaborate with SRNL to initiate the development of testing protocols to

determine the impacts of fixatives on airborne release fractions (ARF) and respirable fractions (RF) under normal conditions, as well as exposure to thermal and seismic stressors.

Task 3: Knowledge Management Information Tool (KM-IT)

The Knowledge Management Information Tool (KM-IT) is a web-based system developed to maintain and preserve the EM knowledge base. The system was developed by Florida International University's Applied Research Center with the support of the D&D community, including DOE-EM, the former DOE ALARA centers, and with the active collaboration and support of the DOE's Energy Facility Contractors Group (EFCOG). The KM-IT is a community driven system tailored to serve the technical issues faced by the workforce across the DOE Complex. The KM-IT can be accessed from web address http://www.dndkm.org. During FIU Performance Year 8, FIU will focus efforts on outreach and marketing for KM-IT, expansion of the system to other EM knowledge areas, mobile native application development, content management, and data analytics.

TASK 1: WASTE INFORMATION MANAGEMENT SYSTEM

TASK 1 TECHNOLOGY NEEDS

The U.S. Government Accountability Office (GAO) published a report in 2005 that criticized DOE for their lack of life-cycle cost analysis for low level waste (LLW) and mixed low level waste (MLLW) treatment and disposal. Additionally, the National Governor's Association and other stakeholder organizations called for a "national forum" and "formal integration" of DOE waste management plans. The DOE National Low Level Waste/Mixed Low Level Waste Disposition Strategy was issued as a draft advanced copy in 2006 and discussed DOE's long-range strategy for managing and disposing LLW and MLLW. The strategy discussed in the disposition strategy document is consistent with the DOE Strategic Plan, DOE Order 435.1 Radioactive Waste Management and the corresponding DOE Manual 435.1-1 Radioactive Waste Management Manual, which requires the integration of waste projections and life-cycle waste management planning into complex-wide decisions for LLW and MLLW.

Accurate estimates of the quantity and type of present and future radioactive waste streams is critical to the development of tools to integrate the complex-wide management of LLW/MLLW treatment and disposal. To meet this need, DOE EM was tasked with developing a new complex-wide LLW and MLLW database and subsequently worked with FIU to develop, deploy, maintain, and update the system. EM collects and validates the waste forecast data from the DOE sites and then provides the data to FIU for integration and deployment. WIMS is EM's primary tool for communicating this information to local and national stakeholders and governmental groups.

In order to facilitate accelerated cleanup initiatives, waste managers at DOE field sites and at DOE headquarters in Washington, D.C., need timely waste forecast information regarding the volumes and types of waste that will be generated by the DOE sites. Waste information from all sites needs a common application to allow interested parties to understand and view the complete complex-wide picture. A common application allows identification of total waste volumes, material classes, disposition sites, and any known barriers to treatment and disposal.

The Applied Research Center (ARC) has developed a Waste Information Management System (WIMS) to receive and organize the DOE waste forecast data from across the DOE complex and to automatically generate waste forecast data tables, disposition maps, and other displayed reports. This system offers a single information source to allow interested parties to easily visualize, understand, and manage the vast volumes of the various categories of forecasted waste streams in the DOE complex.

TASK 1 DESCRIPTION

Objectives

The objective of the WIMS effort is to provide DOE and other stakeholders with the tools necessary to easily visualize and assist in understanding and managing the vast volumes of the various categories of forecasted waste streams in the DOE system and to offer a single source for this information. With this information available, decision making and achieving waste disposition goals and other EM goals will be less cumbersome and more efficient.

Benefits

The benefits of WIMS include:
- Providing a central location to access DOE waste forecast data for sites across the DOE Complex,
- Providing easy-to-use tools to view the DOE waste forecast data in various formats,
- Achieving improved efficiencies of scale when outsourcing treatment and disposal services by providing information regarding complex-wide waste streams,
- Providing information to technology vendors regarding DOE waste needs to plan future technology capabilities and capacity, and
- Sharing site-to-site resources and treatment capabilities to allow the sites to leverage capacity and expertise.

FIU PERFORMANCE YEAR 8 TASK 1 EXECUTION PLAN

Project Tasks

The successful web deployment of WIMS, complete with waste information from all DOE sites, occurred in May 2006. Individuals may visit the website (http://www.emwims.org), choose the desired DOE facility, and view the projected volumes of waste that the facility plans to treat or dispose through the year 2050. The waste forecast information may be sorted or filtered in a variety of ways and presented in a tabular format, exported to other applications such as MS Excel®, or displayed with a disposition map, a geographical information system (GIS) format, or in a printable report. The data may also be viewed in a 'reverse' format that displays the volume of forecasted wastes scheduled to arrive at a specific treatment or disposal location from any or all generation sites. WIMS has been designed to be extremely flexible for future additions and enhancements. WIMS has been labeled DOE's tool-of-choice for waste forecasting.

Waste management support across the DOE Complex includes updating and improving DOE's official internet-based, waste forecasting and transportation information technology known as the Waste Information Management System (WIMS). Waste and transportation data is updated annually and technical support is provided to the DOE sites in the use of WIMS.

The following subtasks have been identified for the WIMS task for FIU Performance Year 8:

Subtask 1.1: Maintain WIMS - database management, application maintenance, and performance tuning

- This subtask includes the day-to-day maintenance and administration of the application and the database servers. FIU will maintain the WIMS application system to ensure a consistent high level of performance. In addition, the database administrators will perform routine maintenance in order to keep the WIMS database and server in a stable condition.

- The WIMS application is also maintained on the web server by the Web Server Administrator. This administrator monitors the network and server traffic and performs changes necessary to optimize the application performance.

- In addition, as part of this subtask, FIU will provide application and database security as well as help desk support to DOE site waste managers, HQ managers, and other users who need assistance in using WIMS.

Subtask 1.2: Incorporate new data files with existing sites into WIMS

- Upon HQ request, FIU receives revised waste forecast data as formatted data files. To incorporate these new files, FIU builds a data interface to allow the files to be received by the WIMS application and imports it into SQL Server. SQL server is the database server where the actual WIMS data is maintained. Under this subtask, FIU will receive and incorporate one set of revised waste forecast data files (expected in the March 2018 timeframe). The new waste data will replace the existing previous waste data and will become fully viewable and operational in WIMS.

- Upon HQ request, FIU receives revised transportation data as formatted data files. Under this subtask, FIU will receive and incorporate one set of revised transportation data files (expected in the March 2018 timeframe). The new set of transportation data will replace the existing previous transportation data and will become fully viewable and operational in WIMS.

Subtask 1.3: Deployment of secure socket layer for WIMS

- This subtask will improve the security protocols for the WIMS application with the deployment of a secure socket layer (SSL). SSL is a standard security technology for establishing an encrypted link between a server and a client, such as a website and a browser, and allows information to be transmitted securely. This enhancement will be seamless to the users of WIMS, with the current domain http becoming https.

Project Milestones for Task 1

Milestone No.	Milestone Description	Completion Criteria	Due Date
2017-P3-M1.1	Import 2018 data set for waste forecast and transportation data	E-mail notification to DOE	Within 60 days after receipt of data from DOE
2017-P3-M1.2	Waste Management Symposium 2018	Submit draft paper to conference	12/15/2017
2017-P3-M1.3	Complete addition of SSL to WIMS	E-mail notification to DOE	8/31/2018

Deliverables for Task 1*

Client Deliverables	Responsibility	Acceptance Criteria	Due Date
Draft Project Technical Plan	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	10/20/2017
Presentation overview to DOE HQ/Site POCs of the project progress and accomplishments (FIU Research Review)	Project Manager	Presentation to DOE HQ and Site POCs	4/6/2018**
Presentation overview to DOE HQ/Site POCs of the project progress and accomplishments (FIU Research Review)	Project Manager	Presentation to DOE HQ and Site POCs	9/28/2018**
Draft Year End Report	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	11/2/2018
Monthly Progress Report	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	Monthly
Quarterly Progress Reports	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	Quarterly

Final documents will be submitted to DOE within 30 days of the receipt of comments on the draft documents.

**Completion of this deliverable depends on availability of DOE-HQ official(s)*

Anticipated Issues

The following are potential issues related to the WIMS task. Approaches to mitigate the potential impacts of these issues will be pursued with the appropriate site, national laboratory, and DOE HQ Project Lead.

Every year, South Florida has a 6-month hurricane season. Twice in the past decade FIU has been closed 1-2 weeks due to hurricane storm damage. Care will be taken to minimize the impacts on the overall schedule of milestones and deliverables due to hurricanes.

Funding for WIMS beyond this project period will be needed to ensure the system will continue to be available for the user community.

Integration and deployment of new data onto the WIMS website will be completed within 60 days of receipt of the data from DOE. Delays in receiving the data will result in a subsequent delay in deployment of the new data.

FIU has provided recommendations to DOE for upgrading the WIMS hardware and software, including upgrading the WIMS application to the latest Microsoft.Net framework using the current Visual Studio development environment and migrating the database and reporting services to the latest SQL database server. Failing to make these improvements increases the risk of the system failing and becoming unavailable to the stakeholders.

The WIMS task is supported by DOE Fellows and FIU graduate students, primarily during the testing and quality checks performed after the importation of new data sets. During this time, WIMS usually has 2 to 3 students supporting the work for a couple of months. Changes to the project task scope may impact these students.

TASK 2: D&D SUPPORT TO DOE-EM FOR TECHNOLOGY INNOVATION, DEVELOPMENT, EVALUATION AND DEPLOYMENT

TASK 2 TECHNOLOGY NEEDS

Many of the facilities DOE has historically operated have been shutdown as a result of changes in scientific and military objectives. This change in laboratory mission within the DOE complex, along with facilities that have reached the end of their operating life, has led to an increased need to deactivate and decommission (D&D) surplus and aging facilities. Many such facilities exist across the DOE complex and are currently or will soon undergo D&D. The facilities that will undergo D&D include highly contaminated hot cells, reactor pools, and a variety of other buildings and process systems. D&D of these facilities will require characterization, decontamination, demolition, material sorting and segregation, size reduction, and waste packaging. In addition, many of these structures may remain in place, where the need exists for unconventional surveillance and monitoring capabilities.

TASK 2 DESCRIPTION

Objectives

This task provides direct support to DOE EM for D&D technology innovation, development, evaluation and deployment. For FIU Performance Year 8, FIU will assist the DOE Office of Infrastructure and D&D (EM-4.11) in meeting high priority D&D needs and technical challenges across the DOE complex. All technology development related activities will also engage the Office of Technology Development (EM-3.2). FIU will expand its research in technology development, demonstration and evaluation in the following key areas: 1) Assist/support SRNL in addressing high priority fire resiliency, protection and safety requirements in support of the SRS 235-F D&D project and across the DOE EM complex by conducting fire testing on SRNL's innovative radiological shielding foams; 2) Identify broader applications for intumescent coating technologies to mitigate the impacts of contingency scenarios across the DOE complex; 3) Execute a phased approach for the standards development, testing, evaluation, and deployment of D&D technologies; 4) Support an onsite demonstration of the intumescent coating; and 5) Collaborate with SRNL to initiate the development of testing protocols to determine the impacts of fixatives on airborne release fractions (ARF) and respirable fractions (RF) under normal conditions, as well as exposure to thermal and seismic stressors. FIU will further support the International Program (EM-2.1) and the Office of Infrastructure and D&D (EM-4.11) by participating in D&D workshops, conferences, and serving as subject matter experts.

Benefits

The benefits of this task include:

- Providing DOE with the information necessary to complete D&D safely and effectively with technologies that include remotely operated technologies for facilities which contain hazards that prevent the use of safe manual techniques,

- Reinforcing efforts in the theory development, laboratory experimentation, and proof-of-principle phases associated with the basic and fundamental research of D&D technologies,

- Enhancing safety while reducing risk to workers, the public, and the environment,

- Reducing the future cost, schedule, and risk for similar work through a thorough understanding of existing technologies and technical approaches from past D&D projects, and

- Providing the tools necessary to successfully complete difficult D&D tasks that can then be applied complex-wide to similar DOE facilities.

FIU PERFORMANCE YEAR 8 TASK 2 EXECUTION PLAN

Project Tasks

Subtask 2.1: D&D Technology Development, Demonstration, and Technical Support to SRS's 235 F-Facility Decommissioning

Though the primary area of focus for this task will be working with SRNL and SRS in addressing high priority fire resiliency/protection and safety requirements in support of the SRS 235-F D&D project, FIU will also engage other DOE sites to research and identify other specific potential applications of intumescent coating technology to satisfy other problem sets and challenge areas related to fire/extreme heat conditions.

Subtask 2.1.1: Fire Testing of Radiological Shielding Foams

The SRS 235-F facility has a current high priority need in the area of enhancing fire resiliency in facilities by deploying improved fire resistant fixatives in support of D&D activities. The objective of this subtask is to research, test, and validate the operational performance of D&D products designed to fix residual contamination with a special focus on maximizing the fire resiliency of these technologies. Specifically, FIU will utilize the testing protocols developed in support of the adaptation of intumescent coatings as incombustible fixatives task and conduct fire testing on SRNL's innovative radiological shielding foams.

This subtask is an extension of the work performed in FIU Performance Years 5-7, during which FIU worked closely with SRNL to define the technical requirements, identify a select list of contamination control products (e.g., fixatives and strippable coatings), baselined the selected products, researched other industries for products to maximize fire resiliency, and performed testing and evaluation of commercially available intumescent coatings to enhance fire resiliency and protection for fixatives and facilities in support of D&D activities at SRS 235-F.

During FIU Performance Year 8, FIU will work closely with SRNL to develop a draft test plan, with an emphasis on leveraging the fire resistant testing protocols developed and used for the previous research on adapting intumescent coatings as fire resistant fixatives, to support the testing and evaluation of SRNL's innovative radiological shielding foam. Once

concurrence on the proposed test plan is reached between FIU, SRNL, and DOE HQ, the test plan will be finalized and FIU will initiate the execution of the test plan.

Subtask 2.1.2: Application of Intumescent Coatings to other DOE EM Problem Sets

Discussions with SRS 235-F safety, fire, and site personnel, as well as SRNL and DOE EM HQ, have highlighted the potential of intumescent coatings to have much broader applications in mitigating the impacts of contingency scenarios outlined in Basis for Interim Operations documents at other sites (e.g., WIPP, Hanford, Oak Ridge, Idaho, Portsmouth, etc.). Consequently, FIU will engage other DOE sites and, in collaboration with SRNL, share the results of the intumescent coatings research and its applications at SRS 235-F, with the intent of identifying specific applications of intumescent coating technology to satisfy other problem sets and challenge areas related to fire/extreme heat conditions.

During FIU Performance Year 8, FIU will review contingency scenarios outlined in Basis for Interim Operations documents at other sites across the complex and identify potential broader applications of intumescent coating technology to satisfy problem sets and challenge areas related to fire/extreme heat conditions (e.g., WIPP, Hanford, Oak Ridge, Idaho, Portsmouth, etc.). Specific potential applications for ICs will be identified with a formal report outlining the findings.

Subtask 2.2: Technology Demonstration and Evaluation

FIU will continue implementation of a phased approach for the standards development, demonstration, evaluation and deployment of D&D technologies. This multi-tier/multi-year approach will include the identification and selection of appropriate D&D technologies, a proof-of-concept demonstration (Phase I), a large scale demonstration at the FIU Test Facility (Phase II), and support to DOE EM in identifying a DOE facility for an operational test and evaluation in a radioactive environment (Phase III). FIU will collaborate with DOE EM, DOE sites officials, and national labs to determine the utility and applicability of the selected technologies in addressing specific challenge areas at DOE sites (e.g., SRS, WIPP, Idaho, etc.). During FIU Performance Year 8, FIU will continue ASTM international standards development for high priority D&D testing procedures and standards with an anticipated continued focus on fixatives for radiological environments. FIU will also provide support to SRNL for a possible onsite intumescent coating demonstration.

Subtask 2.2.1: Uniform Testing Protocols and Performance Metrics for D&D

The development of uniformly accepted testing protocols and performance metrics is an essential component for testing and evaluating D&D technologies. During FIU Performance Year 6, an FIU representative obtained official membership on ASTM International's E10 Committee on Nuclear Technologies and Applications and was selected to serve as the Chairman of the ASTM International E10.03 Subcommittee. This Subcommittee oversaw the development of two new standard specifications for removable/strippable coatings and permanent coatings/fixatives. These documents were subsequently reviewed, revised, approved, and ultimately published by ASTM in July 2017.

During FIU Performance Year 8, FIU will continue to work with the Subcommittee membership to develop uniformly accepted testing protocols and performance metrics as an essential component for testing and evaluating D&D technologies. These efforts will help to ensure that the FIU three-phased Technology Test and Evaluation Model is uniform in its application and defensible in its findings and results. As part of these efforts, FIU will attend and participate in the ASTM International Conferences in February and July 2018.

As part of these efforts, FIU will work in collaboration with SRNL to initiate the development of testing protocols to determine the impacts of fixatives on airborne release fractions (ARF) and respirable fractions (RF) under normal conditions, as well as exposure to thermal and seismic stressors. The resulting data could potentially be used by DOE EM to support updates to bounding factors used in the Source Term Formula of DOE-HDBK-3010.

Subtask 2.2.2 Support to SRNL and SRS 235-F for Onsite Demonstration

During FIU Performance Year 8, FIU will coordinate with SRNL and SRS 235-F to support a possible onsite intumescent coating demonstration of an intumescent coating. The objective of this subtask is to select and validate operational performance of fire resilient fixative coating material(s) for residual surface contamination after gross decontamination is completed in a hot, radioactive environment.

Subtask 2.3: Support to DOE EM and the D&D Community

During FIU Performance Year 8, FIU will continue to support the DOE EM D&D program and the D&D community of practice by participating in D&D workshops, conferences, and serving as subject matter specialists.

Project Milestones for Task 2

Milestone No.	Milestone Description	Completion Criteria	Due Date
2017-P3-M2.1	Participate in ASTM E10 Committee Meeting to coordinate effort to develop standardized testing protocols and performance metrics for D&D technologies (subtask 2.2.1)	E-mail notification to DOE	2/28/2018
2017-P3-M2.2	Participate in ASTM International's Executive Steering Committee Meeting to coordinate effort to develop standardized testing protocols and performance metrics for D&D technologies (subtask 2.2.1)	E-mail notification to DOE	7/31/2018

Deliverables for Task 2*

Client Deliverables	Responsibility	Acceptance Criteria	Due Date
Draft Project Technical Plan	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	10/20/2017*
Draft Test Plan for SRNL's Rad Shielding Foam (subtask 2.1.1)	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	6/8/2018*
Presentation overview to DOE HQ/Site POCs of the project progress and accomplishments (FIU Research Review)	Project Manager	Presentation to DOE HQ and Site POCs	4/6/2018**
Decision brief to DOE EM on recommended D&D technologies to test for FIU Performance Year 9 using the 3-phased model	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	4/30/2018**
Draft progress report on the identification of IC applications to other DOE EM problem sets (subtask 2.1.2)	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	7/31/2018*
Presentation overview to DOE HQ/Site POCs of the project progress and accomplishments (FIU Research Review)	Project Manager	Presentation to DOE HQ and Site POCs	9/28/2018**
Draft Year End Report	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	11/2/2018*
Monthly Progress Report	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	Monthly
Quarterly Progress Reports	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	Quarterly

Final documents will be submitted to DOE within 30 days of the receipt of comments on the draft documents.

**Completion of this deliverable depends on availability of DOE-HQ official(s)*

Anticipated Issues

Every year, South Florida has a 6-month hurricane season. Twice in the past decade FIU has been closed 1-2 weeks due to hurricane storm damage. Care will be taken to minimize the impacts on the overall schedule of milestones and deliverables due to hurricanes.

The D&D task receives significant support from DOE Fellows. It is anticipated that 2 to 3 DOE Fellows will be supporting this task during FIU Performance Year 8. It is anticipated that research under this task may be used by students as the basis for an undergraduate senior design project or

a thesis or dissertation towards a graduate degree and would be impacted by a re-direction of the project task scope. FIU will communicate closely with DOE HQ and site contacts throughout the performance of the research tasks in order to accurately forecast the duration of the research tasks and minimize the potential negative impact of scope redirection on the graduate studies of any students working on that task.

FIU will collaborate with DOE EM, DOE sites officials, and national labs to determine the utility and applicability of the selected technologies in addressing specific challenge areas at DOE sites (e.g., SRS, WIPP, Idaho, etc.) and to identify technology deployment opportunities at DOE sites.

The development and execution of the test plan for fire testing SRNL's innovative radiological shielding foam technology will be dependent on the progress made by SRNL's R&D efforts.

TASK 3: KNOWLEDGE MANAGEMENT INFORMATION TOOL (KM-IT PLATFORM)

TASK 3 TECHNOLOGY NEEDS

The web-based KM-IT was developed to capture and preserve the knowledge-base of the EM community and to provide a platform tailored for easy retrieval by the user base. This system collects information from the subject matter specialists and builds a knowledge repository for future reference. The Knowledge Management Information Tool goes beyond lessons learned, since it functions as a point-of-access to broad EM information on the world-wide-web. In addition, functionality will continue to be expanded over time to strengthen the focus of the EM information sources available via the web from other government agencies, industry and academia.

TASK 3 DESCRIPTION

Objectives

The objective of the KM-IT is to provide a focused web-based tool to assist the DOE EM community in identifying potential solutions to their problem areas by using the vast resources and knowledge-based tools available through the web. The KM-IT archives in a retrievable module within the system information collected from the subject matter specialists, thereby building a knowledge repository for future reference. KM-IT, which has been developed for DOE's D&D community of practice, has a long-term strategic vision to *mature into a self-sustaining system through the active participation of the EM community it was designed to serve.*

Benefits

KM-IT makes excellent use of the knowledge that exists within the EM community by allowing project managers around the DOE complex to share innovative ideas, lessons learned, past experiences, and practices. The system is a knowledge tool that harnesses web technology, thereby enhancing communications; information searching, gathering, and distribution; and knowledge collection and exchange. Most importantly, the system encourages collaboration within the EM community of practice.

Too frequently, people in one part of the community "reinvent the wheel" or fail to solve problems quickly because while the knowledge they need exists elsewhere, it is not known or accessible to them. This tool helps to resolve these issues through better collaboration, knowledge sharing, and by following best practices for EM applications.

KM-IT defines, stores, categorizes, indexes and links digital information. It allows searching for relevant content and it presents the content with sufficient flexibility in order to render it meaningful and applicable across multiple contexts of use. KM-IT makes EM knowledge available to the people who need it, at the time they need it, and in a readily usable format. It uses the world wide web as the primary source for content in addition to information entered by the subject matter specialists and D&D community of practice.

FIU PERFORMANCE YEAR 8 TASK 3 EXECUTION PLAN

Project Tasks

The following subtasks have been identified for KM-IT:

Subtask 3.1: Outreach and Marketing (EM Community Support)

The key to the future of KM-IT operation and development is that the basic tenets of the "*D&D Knowledge Management Information Tool –A Strategic Approach for the Long-Term Sustainability of Knowledge*" be kept as key drivers. FIU's activities for outreach and training will be guided by this strategic document. The basic drivers include the following, which will be implemented in FIU Performance Year 8. Metrics progress on these drivers will be included in the monthly and quarterly reports.

- **Newsletters and Mass Communications:** Newsletters and online promotions are a great way to bring waves of traffic to the website. By using the registered users as recipients, users can be kept up to date on new features and content. FIU will develop at least four (4) newsletters/announcements during this performance year.

- **Conferences and Workshops:** Participation and presentations of KM-IT at industry conferences boosts awareness of the website and its capabilities to the target users. FIU will present KM-IT at conferences (e.g., Waste Management Symposia, American Nuclear Society (ANS) Utility Working Conference, etc.) through a combination of oral and poster presentations as well as individual and small-group demonstrations and workshops hosted in the exhibition hall. At these events, the site features can be explained in detail and participants can share their feedback and ideas. Offering workshops over the web using web conferencing tools will also be evaluated.

- **Social Media Integration and Support:** Leveraging existing social media platforms will be used to improve the outreach and marketing of KM-IT. During this performance year, FIU will provide social integration on KM-IT to allow Like/Share/Pin to Facebook, Twitter, LinkedIn, and Pinterest. This will consist of adding the necessary code to the master template of KM-IT that will allow users on the site to quickly "share" the page they are visiting on KM-IT to their own social network account pages. The result of this effort will be a network of users providing links back to KM-IT via their social media sites based on the pages they share. The actual integration will be in the form of an image button link at the top of every page just below the main navigation menu. Additionally, FIU will continue to coordinate with DOE HQ to make the legacy technology videos that FIU converted to digital format from VHS available to the EM community via the DOE EM YouTube channel and linked from KM-IT.

- **User Advisory Group:** FIU will pursue the formation of a core user group for the Knowledge Management Information Tool to develop ideas for enhancing the usability and content of the system, to perform a review/critique of the system, and to spread the word about KM-IT into the EM community.

- **User Support and Ad Hoc Specialized Reports:** This task includes supporting KM-IT users with a help desk role to resolve issues on a day to day basis as well as developing

specialized reports for unforeseen data requests using the KM-IT system from DOE or the EM community of practice.

Subtask 3.2: KM-IT Development and Enhancement

During this performance year, FIU will enhance the existing KM-IT platform by identifying and selecting high interest topical areas for the application of knowledge management for EM. Initial topical areas of interest discussed include other waste stream applications (e.g., high-level waste) or robotics and remote systems. Leveraging the existing KM-IT infrastructure, FIU will develop a pilot platform on the selected area of interest, integrated with D&D KM-IT, to share knowledge across the DOE EM Complex.

For FIU Performance Year 8, FIU proposes to enhance the KM-IT platform to support the robotics research area. This will be developed based on the current KM-IT infrastructure for D&D. The robotics KM-IT framework will support features similar to the D&D KM-IT and will be developed in phases. For FIU Year 8, the focus will be on the development of the robotics KM-IT framework and development /deployment of two modules: Technology and Vendor modules for robotics. The KM-IT platform will be published on the existing domain for Environmental Management: KBEM – Knowledge Base for Environmental Management. It will provide a common interface to D&D KM-IT and Robotics KM-IT. These systems will also be accessible from individual domains – www.dndkm.org and www.rkmit.org.

Subtask 3.3: Mobile Native Application Development

During FIU Performance Year 7, FIU developed a pilot native application using the D&D Fixatives Module for the Android platform. For this performance year, FIU will expand on this pilot mobile native application to other platforms (e.g., Windows, iOS). A native application is an app that is developed for use on a specific platform and which is downloaded onto a mobile device in order to be accessed. As such, the native app does not need an internet connection to be used. A web app, in contrast, is an internet-enabled app that is accessible via the mobile device's web browser; an internet connection is required to use a web app. The mobile apps developed for KM-IT in prior years have all been web apps, requiring the user to access the mobile app module using their mobile device's web browser.

Subtask 3.4: Content Management and Data Analytics

This task will focus on capturing, reviewing and publishing information in KM-IT as well as capturing the usage and search data on KM-IT.

- **Content Management:** Content management includes researching relevant additional information from various sources that can be added to or linked from KM-IT, including relevant vendors, technologies, videos/pictures, and documents, as well as conferences, training opportunities, and news items of interest to the EM community.

- **Data Analytics:** This activity includes Google analytics, text data mining using on premise research with machine learning and 3rd party tools, visualization, server log analysis, and metrics reporting and uses various tools and code. The data will be analyzed and used to market the site, measure the sites usage, and support decisions for ongoing content

development to ensure that it remains relevant to the needs of the community the system serves.

Subtask 3.5: IT Administration and Support

- **System administration:** This task includes the day-to-day maintenance and administration of the KM-IT servers. Major tasks involve load balancing, active directory accounts, security patches, operating system updates, system optimization, server monitoring, emergency problem resolution etc. FIU will maintain the KM-IT application system to ensure a consistent high level of performance.

- **Database administration:** This task includes database backup, optimization, performance tuning, and system security, controlling and monitoring user access to the database, maintain database cluster and other management tasks on a regular basis.

- **Network administration:** This task involves monitoring the network and server traffic, installation and maintenance of network hardware/software, assigning address to computer and devices on the network, troubleshooting network activities and performance tuning.

- **KM-IT Cyber Security:** FIU will maintain the KM-IT cyber security infrastructure based on the guidelines provided by DOE EM IT and NIST. The KM-IT system and infrastructure will continue to be audited by internal and external auditors on a periodic basis, including monthly and six-month audits. Findings of the audits will be implemented in the application, servers and infrastructure.

  DOE fellows and FIU graduate students will be assigned to research and develop expertise in the cyber security area to protect the KM-IT infrastructure. They will work with penetration testing tools, malware analysis, and digital forensics tools. They will also explore commercial off-the-shelf products, open source products and custom built solutions. This will allow FIU to develop expertise in cyber areas and will be used to test against the KM-IT system and infrastructure.

Project Milestones for Task 3

Milestone No.	Milestone Description	Completion Criteria	Due Date
2017-P3-M3.1	Waste Management Symposium Paper	Submit draft paper to conference	12/15/2017
2017-P3-M3.2	Complete integration of Like/Share/Pin buttons on KM-IT for social media	E-mail notification to DOE	1/12/2018
2017-P3-M3.3	Complete development of pilot native mobile application for D&D Fixatives Module for iOS	E-mail notification to DOE	3/09/2018
2017-P3-M3.4	Complete development of pilot native mobile application for D&D Fixatives Module for Windows	E-mail notification to DOE	5/18/2018
2017-P3-M3.5	Complete development of Robotics Technology module	E-mail notification to DOE	7/31/2018
2017-P3-M3.6	Complete development of Robotics Vendor module	E-mail notification to DOE	9/14/2018

Deliverables for Task 3*

Client Deliverables	Responsi bility	Acceptance Criteria	Due Date
Draft Project Technical Plan	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	10/20/2017
Presentation overview to DOE HQ/Site POCs of the project progress and accomplishments (FIU Research Review)	Project Manager	Presentation to DOE HQ and Site POCs	4/6/2018**
Presentation overview to DOE HQ/Site POCs of the project progress and accomplishments (FIU Research Review)	Project Manager	Presentation to DOE HQ and Site POCs	9/28/2018**
Draft Year End Report	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	11/2/2018
Monthly Progress Report	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	Monthly
Quarterly Progress Reports	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	Quarterly
Draft Tech Fact Sheet for new modules or capabilities of D&D KM-IT	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	30-days after deployment of new module or capability

Final documents will be submitted to DOE within 30 days of the receipt of comments on the draft documents.
**Completion of this deliverable depends on availability of DOE-HQ official(s)*

Anticipated Issues

Every year, South Florida has a 6-month hurricane season. Twice in the past decade FIU has been closed 1-2 weeks due to hurricane storm damage. Care will be taken to minimize the impacts on the overall schedule of milestones and deliverables due to hurricanes.

Funding for the D&D KM-IT System beyond this project period will be needed to ensure the system will continue to be available for the user community.

Continued enhancements to the system will have to be implemented based on feedback from the EM community and a User Advisory Group.

The KM-IT task receives significant support from DOE Fellows and FIU graduate students, including the data mining and content management subtask as well as for community outreach and training. It is anticipated that 2 to 3 DOE Fellows and FIU graduate students will be supporting

this task during FIU Performance Year 8. It is anticipated that research under this task may be used by students as the basis for a thesis or dissertation towards a graduate degree and would be impacted by a re-direction of the project task scope. FIU will communicate closely with DOE HQ and site contacts throughout the performance of the research tasks in order to accurately forecast the duration of the research tasks and minimize the potential negative impact of scope redirection on the graduate studies of any students working on that task.

COMMUNICATION PLAN, REGULATORY POLICIES AND SAFETY CONCERNS

Communication Plan

The communication with the research collaborators and other stakeholders at the DOE sites, national laboratories, and DOE HQ is a critical component of the project. The mode of communication will be e-mails, telephone/conference calls, meetings at the site. Though site-specific contact persons have been identified, constant communication will be maintained with client stakeholders at DOE HQ and the DOE sites to ensure all parties involved are aware of the project progress.

Information Item	Client Stakeholder	Schedule	Communication Method	Responsible Stakeholder
Status Update Teleconferences	DOE-HQ Site/Lab POCs	Monthly	Phone	Project Manager
EM-HQ Status Update Phone Call	DOE EM	Bi-weekly	Phone	Principal Investigator
Quarterly Report	DOE EM, SRNL	End of Q1, Q2, Q3, Q4	E-mail	Principal Investigator
Annual Year End Report	DOE EM, SRNL	45 working days after completion of performance period	E-mail	Principal Investigator/ Project Manager
Deliverables/ Milestones	DOE EM, SRNL	At completion of deliverable/ milestone	E-mail	Project Manager
Coordination of project activities	DOE EM, SRNL	As needed to discuss issues and reach consensus	Phone, E-mails	Project Manager

Regulatory Policies and Safety Concerns

Tasks 1 and 3 involve information technology development. Therefore, standard health and safety issues normally associated with field activities and laboratory experiments do not directly apply. All pertinent ARC health and safety policies will be followed.

Task 2 includes research conducted in facilities at the Applied Research Center which are designed specifically for R&D and technology development/demonstrations. All primary, secondary, and tertiary waste generated by these technology demonstrations will be disposed of according to local,

state, and federal regulations. In-house testing will be conducted, and necessary health and safety precautions will be followed in accordance with FIU and ARC procedures.

FIU will set up, operate, and dismantle experiments using proper procedures from FIU and that comply with standards issued by the Occupational Safety and Health Administration (OSHA). In order to minimize hazards, all staff and student employees will require documentation of all needed online and classroom health and safety training prior to their being authorized to work in the lab, on equipment, or on the test beds.

No undergraduate student will perform research in a lab without direct oversight of faculty, staff, or a qualified graduate student.

The Department of Health and Safety at FIU also provides other training relevant to specific tasks or subtasks. Either FIU EHS or FIU ARC may request an audit by FIU EHS of safety documentation, lab set up and procedures when there are any concerns by any staff working on the task.