PROJECT TECHNICAL PLAN

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

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INTRODUCTION

This project focuses on delivering solutions under deactivation and decommissioning (D&D) in support of DOE HQ (EM-4.11) as well as IT development for environmental applications (D&D KM-IT for EM-4.11) and Waste & Material Management (WIMS for EM-4.21). 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, EM-3.2, CA Technical Monitor, COR, etc.). Efforts on this project include the following tasks:

DOE EM HQ Contacts:
John De Gregory, CA Technical Monitor, EM-4.11
Andy Szilagyi, EM-4.11
Jonathan Kang, EM-4.22
Rod Rimando, EM-3.2

DOE Site Contacts:
Mike Serrato, SRNL
Aaron Washington II, SRNL
Connor Nicholson, SRNL

ARC Program Contacts:
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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 7**,** FIU will expand its research in technology development, demonstration and evaluation in the following key areas: 1) adapting intumescent coatings to enhance fire resiliency and protection for fixatives and facilities in support of D&D activities at SRS 235-F and across the DOE EM complex; 2) implementing a phased approach for the standards development, testing, evaluation, and deployment of D&D technologies, with an initial emphasis on intumescent coatings and fixatives; and 3) cross-cutting applications of robotic technologies from FIU's high-level waste research area (Project 1) in support of D&D activities. 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.

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

The D&D Knowledge Management Information Tool (KM-IT) is a web-based system developed to maintain and preserve the D&D 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 D&D KM-IT is a D&D community driven system tailored to serve the technical issues faced by the D&D workforce across the DOE Complex. D&D KM-IT can be accessed from web address http://www.dndkm.org.

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 7 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 7:

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 2017 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 2017 timeframe). The new set of transportation data will replace the existing previous transportation data and will become fully viewable and operational in WIMS.

Project Milestones for Task 1

Milestone No.	Milestone Description	Completion Criteria	Due Date
2016-P3-M1.1	Import 2017 data set for waste forecast and transportation data	Data imported into WIMS and available for testing over the web	Within 60 days after receipt of data from DOE
2016-P3-M1.2	Waste Management Symposium 2017	Submit draft paper to conference	11/04/16

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	9/29/16
Presentation overview to DOE HQ/Site POCs of the project progress and accomplishments (Mid-Year Review)	Project Manager	Presentation to DOE HQ and Site POCs	4/7/17**
Presentation overview to DOE HQ/Site POCs of the project progress and accomplishments (Year End Review)	Project Manager	Presentation to DOE HQ and Site POCs	9/29/17**
Draft Year End Report	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	10/13/17
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.

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 7**,** 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) adapting intumescent coatings to enhance fire resiliency and protection for fixatives and facilities in support of D&D activities at SRS 235-F and across the DOE EM complex; 2) implementing a phased approach for the standards development, testing, evaluation, and deployment of D&D technologies, with an initial emphasis on intumescent coatings and fixatives; and 3) cross-cutting applications of robotic technologies from FIU's high-level waste research area (Project 1) in support of D&D activities. 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 7 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 the Savannah River Site to demonstrate the effectiveness of intumescent coatings 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. FIU will work closely with the partnered national laboratories to address the intellectual property of the research results for the following tasks. The project tasking has sufficient flexibility to address any identified issues. In addition, FIU will begin identifying cross-cutting applications of robotic technologies being developed at FIU in the high-level waste research area that could potentially be used in support of D&D activities.

Subtask 2.1.1: Adaptation of Intumescent Coatings

DOE's SRS 235-F facility has a current high priority need in the area of enhancing fire resiliency and protection of fixatives and facilities in support of D&D activities. The objective of this subtask is to research, select, adapt, and validate the operational performance of commercially available products (i.e., intumescent coatings and/or fixatives) for residual surface contamination within the process cell and glove box after gross decontamination is completed with a special focus of maximizing the fire resiliency of the fixative and facility.

During FIU Performance Year 5, FIU worked closely with SRNL to define the technical requirements for achieving this objective, identified a select list of contamination control products for testing, and baselined the selected products. Based on the results from the previous year, FIU continued to collaborate with SRNL during FIU Performance Year 6 to expand the research into other commercial products being used by other agencies and industries to maximize fire resiliency. Intumescent coatings (ICs) were identified as a

promising area for research. FIU procured the selected IC products and performed testing and evaluation with the following main objectives: 1) to determine the fire resiliency of each selected product; and 2) to perform basic proof-of-concept testing for layering a contamination control product with a fire retardant product to improve performance during fire resiliency tests.

This testing showed that the initial hypothesis was correct, specifically that the fire resiliency of fixatives can be enhanced through the layering/combining of an intumescent coating. Additionally and equally promising, the results helped identify the possibility of some commercial-off-the-shelf ICs to function as standalone fixatives, in and of themselves, that could assist with managing the safety basis at SRS 235-F. For FIU Performance Year 7, FIU will continue the research and development associated with the adaptation of intumescent coatings to enhance fire resiliency and protection for fixatives and facilities in support of D&D activities at SRS 235-F.

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 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 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 7, 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 2.1.3: Robotic Technologies for D&D Applications

FIU's robotics initiatives under this subtask will support and supplement the technology development efforts under DOE EM-3.2. The SRS 235-F facility has a need to identify a remote/robotic systems that can assist with D&D activities in highly contaminated areas to minimize exposure and contamination risks to personnel. During FIU Performance Year 6, FIU performed research to identify robotic technology systems applicable to the challenges and needs of the SRS 235-F Facility. Research utilized the Robotic Database in D&D KM-IT to search and identify potential robotic technologies and compiled a spreadsheet of all of the available robotic technologies in the database. A summary report was prepared with the results of this search.

During FIU Performance Year 7, FIU will begin identifying cross-cutting applications of robotic technologies being developed at FIU in the high-level waste research area that could potentially be used in support of D&D activities. FIU will:

- Coordinate with points of contact at SRNL and SRS 235-F facility to define the requirements for a robotic technology to meet the D&D challenge(s) at that facility.
- Evaluate the potential for adapting and applying in-house technologies being developed and/or tested at FIU in the high-level research area (e.g., mini-rover inspection tool, peristaltic crawler, flying drone) to meet the defined D&D requirements.
- If potential for one of the technologies for the required application is identified, develop an initial conceptual design for adapting the technology and perform basic proof-of-concept testing on a small scale.

Subtask 2.2: Technology Demonstration and Evaluation

FIU will continue the technology demonstration and evaluation research using a phased approach for the demonstration, evaluation and deployment of D&D technologies. This multi-tier/multi-year approach will include the identification and selection of appropriate D&D technology(ies), a proof-of-concept demonstration (Phase I), a large scale demonstration at the FIU Test Facility (Phase II), and a "hot" demonstration at a selected DOE facility (Phase III). FIU will collaborate with DOE EM, DOE site officials, and national labs on the selection of appropriate D&D technologies as well as to determine the utility and applicability of the selected technologies in addressing specific challenge areas at DOE sites (e.g., SRS, WIPP, Idaho, etc.).

FIU aims to standardize and implement proven processes to refine and better synchronize DOE-EM technology needs, requirements, testing, evaluation, and acquisition by implementing a three-phased Technology Test and Evaluation Model:

- Phase I: Identification, initial assessment, and approved selection of technologies for further test and evaluation.
- Phase II: Test and evaluate designated technologies at FIU Testing and Evaluation Facility that replicates operating environment and conditions in which technology will be employed to the maximum extent.
- Phase III: Formal operational test and evaluation of technology in a radioactive environment at DOE facilities. Execution of Phase III requires major participation and commitment from an identified DOE site. FIU will work with DOE HQ to identify an appropriate DOE site and necessary resources to support technology evaluation (test plan development, test engineer, fact sheet and final report development).

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 lead the ASTM International E10.03 Subcommittee. In this position, FIU oversaw the development of two new draft standard specifications for

removable/strippable coatings and permanent coatings/fixatives. These draft documents completed the Working Group review process during FIU Performance Year 6 and will be submitted for a full E10.03 Subcommittee in early FIU Performance Year 7. FIU will continue to lead and 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 2017.

Subtask 2.2.2 Technology Demonstration under Nonradioactive Conditions at FIU

Leveraging the research being performed on intumescent coatings as part of subtask 2.1.1 and including close coordination with DOE EM, SRNL, and SRS, FIU will conduct a cold demonstration / test and evaluation of applying intumescent coatings in a full scale SRS 235-F hot cell mock-up at the FIU Hot Cell Test Bed during FIU Performance Year 7. FIU will:

- Complete planning and design of the hot cell mockup construction in collaboration with SRNL and develop the technology demonstration / test and evaluation test plan.
- Complete modification/construction of the hot cell mockup as needed per the determined design.
- Implement the technology demonstration / test and evaluation test plan.
- Complete development of a Tech Fact Sheet and technology demonstration / test and evaluation report.

Subtask 2.2.3 Support to SRNL and SRS 235-F for Onsite Demonstration

During FIU Performance Year 7, FIU will coordinate with SRNL and SRS 235-F to support a possible onsite intumescent coating demonstration on a contaminated apparatus (i.e., hot demonstration). 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.

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

During FIU Performance Year 7, 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
2016-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	2/28/17
2016-P3-M2.2	Complete demonstration / test and evaluation of IC on FIU hot cell test bed (subtask 2.2.2)	E-mail notification to DOE	4/28/17
2016-P3-M2.3	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	7/31/17

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	9/29/16
Draft Test Plan for IC Demo / Test & Evaluation at FIU (subtask 2.2.2)	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	1/6/17
Presentation overview to DOE HQ/Site POCs of the project progress and accomplishments (Mid-Year Review)	Project Manager	Presentation to DOE HQ and Site POCs	4/7/17**
Decision brief to DOE EM on recommended D&D technologies to test for FIU Performance Year 8 using the 3-phased model	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	4/28/17**
Draft summary report of robotic technologies for D&D (subtask 2.1.3)	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	5/31/17
Draft progress report on the adaptation of IC to enhance fire resiliency (subtask 2.1.1)	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	6/30/17
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	7/31/17

Presentation overview to DOE HQ/Site POCs of the project progress and accomplishments (Year End Review)	Project Manager	Presentation to DOE HQ and Site POCs	9/29/17**
Draft Year End Report	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	10/13/17
Draft technical reports for demonstrated technologies	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	30-days after evaluation/ demo
Draft Tech Fact Sheet for technology evaluations/ demonstrations	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	30-days after evaluation/ demo
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 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 7. 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.

TASK 3: D&D KNOWLEDGE MANAGEMENT – INFORMATION TOOL

TASK 3 TECHNOLOGY NEEDS

The web-based D&D KM-IT was developed to capture and preserve the knowledge-base of the D&D 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 D&D Knowledge Management Information Tool goes beyond lessons learned, since it functions as a point-of-access to broad D&D information on the world-wide-web. In addition, functionality will continue to be expanded over time to strengthen the focus of the D&D information sources available via the web from other government agencies, industry and academia.

TASK 3 DESCRIPTION

Objectives

The objective of the D&D KM-IT is to provide a focused web-based tool to assist the DOE D&D community in identifying potential solutions to their problem areas by using the vast resources and knowledge-based tools available through the web. The D&D 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. D&D Knowledge Management Information Tool (D&D 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 D&D community it was designed to serve.*

Benefits

D&D KM-IT makes excellent use of the knowledge that exists within the D&D community by allowing D&D 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 D&D 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 D&D application.

D&D 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.

D&D KM-IT makes D&D 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 7 TASK 3 EXECUTION PLAN

Project Tasks

The following subtasks have been identified for the KM-IT task:

Subtask 3.1: Outreach and Training (D&D Community Support)

The key to the future of D&D 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 7. Metrics progress on these drivers will be demonstrated through the completion of two metrics progress reports during FIU Performance Year 7.

- **Newsletters:** Newsletters are a great way to bring waves of traffic to the website. By using the registered users as recipients, websites can keep the users up to date on new features and content on the website. FIU will employ expanded use of interactive newsletters (e.g., embedded video, graphics and short simulations) to present graphically interesting information. A total 4 newsletters will be sent during FIU Performance Year 7.
- **Workshops:** Scheduling a workshop with the target audience is a great way to promote the website and increase ownership. At these workshops, the site features can be explained in detail and participants can share their feedback and ideas. As a result, they feel like contributors of the product and stay involved. During FIU Performance Year 7, FIU will target workshops for the D&D community at DOE sites/national laboratories and/or at industry meetings/conferences. Offering workshops over the web using web conferencing tools will also be evaluated. In addition, FIU will coordinate with DOE EM to host a workshop at DOE HQ with participants to include EM, HQ site liaisons, and site staff. This workshop will provide an orientation to D&D KM-IT and solicit ideas for future development and refinements.
- **Conferences:** Participation and presentations of D&D KM-IT at industry conferences will boost awareness of the website and its capabilities to the target users. D&D KM-IT will be presented at conferences such as the Waste Management conference in Phoenix, AZ and the American Nuclear Society (ANS) Utility Working Conference in Amelia Island, FL.
- **Contributing to D&D Knowledge Base on Wikipedia:** The general D&D knowledge which has been gained through this project offers an opportunity to expand access to a broad audience via Wikipedia, which has a significant presence on the web, thereby offering greater opportunities for collaboration on D&D knowledge. FIU will research and target D&D information on Wikipedia where D&D KM-IT can provide additional

information that is lacking. FIU will provide Wikipedia with information that is missing while citing the D&D KM-IT as a source with a link back to the original information on D&D KM-IT. During FIU Performance Year 7, FIU will generate at least 4 edits to existing articles or, if no article exists, create a new article on the topic. Each edit or new article will conform to Wikipedia standards and contain citations linking back to the D&D KM-IT as the source for the information.

- **User Advisory Group:** The formation of a core user group for the D&D Knowledge Management Information Tool will be implemented 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 D&D community.

Subtask 3.2: Mobile Native Application Development

Leveraging the resources and efforts as part of the site visits for hosting workshops under the Outreach and Training subtask, FIU will engage workshop participants to identify and explore the needs and opportunities for the development of mobile applications for DOE sites. FIU will prioritize any development by the platforms most supported by DOE EM-IT organizations, DOE sites, and the national laboratories.

In addition, during FIU Performance Year 7, FIU will develop a pilot native application using the D&D Fixatives Module for one or more platforms (Windows, Android, and/or Apple). 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 D&D 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. In FIU Performance Year 7, FIU will be exploring the potential to develop native apps, using the D&D Fixatives Module as a pilot.

Subtask 3.3: Data Mining and Visualization

This task will focus on capturing, reviewing and publishing information in KM-IT. DOE Fellows will work with the D&D community of practice, DOE sites, national labs, Waste Management Symposia and other conferences to collect information and publish them in D&D KM-IT. Data mining includes researching relevant additional information from various sources that can be added to or linked from D&D KM-IT. Visualization is any technique used to create visual imagery to communicate both abstract and concrete ideas. Placing data in a visual context allows patterns and trends to be easily recognized and helps to create understanding of the significance of the data.

- **Vendor Information:** Publish vendor information from Waste Management Symposia and other similar conference, DOE sites /contractors and by contacting vendors directly.
- **Technology Information:** Publish technology information by collecting technology information directly from vendors published in KM-IT.
- **Video/Pictures:** Publish videos and pictures from technology demos and site activities.

- **News/Training/Documents:** Update other sections of KM-IT.
- **Web Analytics:** FIU will capture usage and search data on the KM-IT using various tools and code, including Google Analytics and server logs. 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. Detailed reports will be generated from the captured data and reviewed on a quarterly basis with an annual analysis summary report with trends and recommendations to improve performance and outreach.
- **Ad Hoc Specialized Reports:** This activity captures the need for FIU to develop specialized reports for unforeseen data requests using the KM-IT system from DOE or the D&D community of practice.
- **DOE Research / DOE Fellows Website:** This activity includes the website content managements of other websites developed and hosted as part of the DOE-FIU Cooperative Agreement, including the DOE Research website and the DOE Fellows website.
- **Infographics:** FIU will collaborate with DOE to identify topic areas for the use of infographics and develop at least two infographics in FIU Performance Year 7. In addition, FIU will begin the exploration of implementing interactive elements into the existing and newly developed infographics.

Subtask 3.4: Social Media Integration

In an effort to continue to do outreach and marketing of D&D KM-IT, social media has been identified as a platform that could be targeted which is not currently being utilized by the system. The approach to be pursued initially consists of two main tasks during FIU Performance Year 7:

- **Provide social integration on KM-IT to allow Like/Share/Pin to Facebook, Twitter, LinkedIn, and Pinterest:** This task will consist of adding the necessary code to the master template of D&D KM-IT that will allow users on the site to quickly "share" the page they are visiting on D&D KM-IT to their own social network account pages. This can be accomplished by providing specific links back to each of the major social media sites (Facebook, Twitter, LinkedIn and Pinterest) based on the Application Program Interface (API) provided by those sites. These are not just links but scripts that associate the user visiting the site with their social media account and the page they are visiting on D&D KM-IT. The result of this effort will be a network of users providing links back to D&D 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.
- **Create pilot to utilize YouTube as platform for D&D KM-IT videos:** YouTube, owned by Google, is widely considered the number one search engine for adults ages 18-34. YouTube provides storage and unlimited bandwidth, leading FIU to explore the possibility of using YouTube as the platform to deliver the KM-IT video content. The pilot integration will consist of:

1. Creating a YouTube channel to house the D&D KM-IT videos to be uploaded.
2. Uploading a pilot video to this YouTube channel.
3. Making the necessary code changes to the current video library module to include a field to capture the YouTube generated embedded code.

When all these changes are in place, the result will be a video library module that displays the information about the video from the D&D KM-IT database but delivers the video from the YouTube server. FIU will collaborate closely with DOE-EM and the IT organization at DOE prior to going live online or expanding the YouTube video effort beyond the planned pilot video in order to identify and address any potential issues or concerns for this approach

Subtask 3.5: IT Administration and Support

- **System administration:** This task includes the day-to-day maintenance and administration of the D&D 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.
- **D&D KM-IT User Support:** This task includes supporting KM-IT users with a help desk role to resolve issues on a day to day basis.
- **KM-IT Cyber Security:** FIU-ARC 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. Monthly and six-month audits will be performed by Symatec and the FIU Security Team. Findings of the audits will be implemented in the application, servers and infrastructure. FIU will prepare two unclassified summary reports on the status and findings of the audits for the DOE HQ Project Lead.

  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.
- **DOE Research / DOE Fellows Website Administration**

Project Milestones for Task 3

Milestone No.	Milestone Description	Completion Criteria	Due Date
2016-P3-M3.1	Waste Management Symposium	Submit draft paper to conference	11/4/16
2016-P3-M3.2	Four Wikipedia integration edits/articles	E-mail notification to DOE	3/31/17
2016-P3-M3.3	Deployment of pilot video onto YouTube platform	E-mail notification to DOE	4/28/17
2016-P3-M3.4	Deployment of pilot native mobile application for D&D Fixatives Module	E-mail notification to DOE	5/31/17

Deliverables for Task 3*

Client Deliverables	Responsibility	Acceptance Criteria	Due Date
Draft Project Technical Plan	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	9/29/16
D&D KM-IT Workshop to DOE EM staff at HQ	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	2/28/17**
Preliminary Metrics Progress Report on Outreach and Training Activities	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	3/10/17
Unclassified summary report on the status and findings of the KM-IT audits	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	3/24/17
First D&D KM-IT Workshop to D&D community /DOE Site	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	3/31/17
First infographic to DOE for review	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	3/31/17
Presentation overview to DOE HQ/Site POCs of the project progress and accomplishments (Mid-Year Review)	Project Manager	Presentation to DOE HQ and Site POCs	4/7/17***
Second infographic to DOE for review	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	7/31/17

Metrics Progress Report on Outreach and Training Activities	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	8/18/17
Unclassified summary report on the status and findings of the KM-IT audits	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	8/25/17
Second D&D KM-IT Workshop to D&D community / DOE Site	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	8/25/17
Presentation overview to DOE HQ/Site POCs of the project progress and accomplishments (Year End Review)	Project Manager	Presentation to DOE HQ and Site POCs	9/29/17***
Draft Year End Report	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	10/13/17
D&D KM-IT Web Analysis Report	Project Manager	Acknowledgement of receipt via E-mail two weeks after submission	Quarterly
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 scheduling and availability of DOE EM staff*

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

Anticipated Issues

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 D&D community and a User Advisory Group.

The D&D 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 7. 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 project has some elements that require significant information and/or action from the site in order to proceed with proposed scope. Therefore, the communication with the clients and relevant experts at DOE sites 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, and where possible and warranted, web meetings such as Webinars and WebEx. 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	When?	Communication Method	Responsible Stakeholder
Status Update Teleconferences	DOE-HQ Site POCs	Monthly	Phone	Project Manager
EM-HQ Status Update Phone Call	DOE EM (John De Gregory)	Bi-Weekly	Phone	Principal Investigator/Project Manager
Quarterly Report	DOE EM	End of Q1, Q2, Q3, Q4	E-mail	Project Manager
Project videos, photographs, and graphics	DOE EM	At completion of demonstrations and other project activities where the collection of multi-media data is appropriate and allowed	E-mail	Project Manager
Draft Year End Report	DOE EM	30 working days after completion of performance period	E-mail	Project Manager
Papers and presentations	DOE EM	As developed for conferences (e.g., WM)	E-mail	Project Manager
Milestone completion E-mail	DOE EM	At completion of milestone	E-mail	Task Manager
Coordination of project activities	DOE EM, PNNL, SRNL, SREL, LANL	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. All student employees will complete online safety courses as well as a briefing for the safety in the laboratory in which they are performing research. No undergraduate student will perform research in a lab without direct oversight of faculty, staff, or a qualified graduate student.