

FIU-DOE COOPERATIVE AGREEMENT - FIU'S CONTINUED RESEARCH SUPPORT FOR DOE EM

ARC's research, technology development, demonstration and testing, information technology, and workforce development covers several major areas of environmental cleanup operations at DOE facilities across the U.S. ARC is currently executing research in the following technical areas: environmental remediation; radioactive waste processing; facility deactivation and decommissioning (D&D); knowledge management and other information technology (IT) applications/tools for environmental management; and training and mentoring the next generation of scientists and engineers that will continue addressing DOE EM environmental restoration technical challenges into the future.



Objectives

The overall objective of the Cooperative Agreement is to develop technical solutions for the environmental challenges faced across the DOE complex at sites such as Hanford, Oak Ridge, Savannah River (SRS), Idaho, and WIPP. ARC technical staff, DOE Fellows, and other students work closely with DOE-HQ, DOE sites, DOE contractors and technical support groups.

Research Areas

Environmental Remediation: ARC scientists collaborate with Hanford, SRS, and LANL scientists in developing strategies to improve the efficiency of actinides, Tc, and I stabilization in the subsurface, model the migration and distribution of natural organic matter in the subsurface, model the fate and transport of Hg and tin in sediments and surface water, and analyze the fate of actinides and lanthanides at variable ionic strength and in the presence of ligands in the waste stream.

High-Level Radioactive Waste/Waste Processing: ARC is conducting research to investigate a better final disposal path for millions of gallons of high-level radioactive waste stored at DOE facilities, including Hanford, SRS, and Idaho. Scientists and engineers at ARC conduct experimental research, computational modeling, and technology development/prototyping in support of these efforts.

D&D & IT: ARC's technical staff contributes toward the development and testing of new technologies, methodologies,

and standards for the deactivation and decommissioning of legacy facilities throughout the DOE Complex. ARC's staff has also developed knowledge management and information tools for EM and the community of D&D practitioners. These web-based systems collect, maintain, preserve, and disseminate knowledge across the DOE Complex and the globe.

Science, Technology, Engineering, and Math (STEM)

Workforce Development & Training: The DOE Fellows Program is an innovative workforce development and training program designed to create a "pipeline" of minority engineers specifically trained and mentored to enter the DOE workforce in technical areas of need. The students (DOE Fellows) conduct research for EM at ARC and DOE facilities as part of DOE-FIU cooperative agreement.

Accomplishments

Accomplishments for the research being performed under the Cooperative Agreement are available on a centralized portal at <http://doeresearch.fiu.edu> and include technical reports, quarterly progress reports, end of year reports, presentations, journal articles, conference papers, and more.

High-Level Radioactive Waste/Waste Processing:

- Developed two technologies for unplugging high-level waste transfer pipelines (peristaltic pipe crawler and asynchronous pulsing system) and evaluated a number of commercially available technologies.

ABOUT

Since 1995, the Applied Research Center at Florida International University has provided critical support to the Department of Energy's Office of Environmental Management mission of accelerated risk reduction and cleanup of the environmental legacy of the nation's nuclear weapons program. ARC's research performed under the DOE-FIU Cooperative Agreement (Contract # DE-EM0000598) can be classified as fundamental/basic, proof of principle, prototyping and laboratory experimentation.

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- Developed a test loop that can age non-metallic materials (EPDM) via elevated temperature and exposure to caustic materials to better understand changes in mechanical and material properties due to the multiple stressors.
- Evaluating sensor systems that can provide real-time thickness measurements of transfer pipelines that have been eroded or corroded.
- Developing two remote robotic tools for the inspection of double-shell tanks at Hanford (pneumatic pipe crawler and miniature motorized inspection tool). A mockup of the tanks is also being developed that can be used to demonstrate and evaluate inspection tools.



DST mockup facility and miniature rover with various sensors installed on top of the inspection tool.

Environmental Remediation:

- Performing research of variables that affect the binding and release mechanisms of actinides, Tc, and I in soil in support of the Hanford Site 200 & 300 Areas including the use of facultative bacteria, ammonia gas injection, and aqueous bicarbonate solutions, and calcium carbonate forming solutions.
- Researching transport parameters via column and batch sorption studies for modeling the migration and distribution of humate injected into the subsurface as a means of remediating uranium contamination and study the formation of reactive oxygen species in the presence of organic matter and its impact on the fate of Tc, I, and U at SRS.
- Modeling the fate and transport of mercury, tin and sediments for the Tims Branch ecosystem at SRS.
- Researching the fate of trivalent actinides and lanthanides (Pu, Am, Eu, Nd) at variable ionic strength and relevant conditions to WIPP.



ARC researcher in analytical laboratory and DOE Fellows collecting field data in Tims Branch, SRS.

Deactivation & Decommissioning (D&D) & IT for EM:

- Technology innovation, development, evaluation, and deployment, including fire and heat resilient fixatives & foams, and researching additional applications to solve other DOE EM problem sets.
- Hot cell test bed facility for cold testing & evaluation of innovative D&D technologies prior to site deployment.

- Participating in ASTM International E10.03 Subcommittee to develop standards and testing protocols that utilize scientific rigor to prove the utility and operational effectiveness of fixative technologies, including capacity to immobilize radioactive contamination under thermal and seismic/impact stressors.
- The Waste Information Management System (WIMS) is deployed at <http://www.emwims.org> with the latest set of DOE waste forecast data.
- The Knowledge Management Information Tool (KM-IT) captures and shares D&D knowledge in the U.S. and internationally (<https://www.dndkm.org>).



Testing fire resiliency of industry fixatives/IC/foams and hot cell test bed facility.

STEM Workforce Development & Training:

- News and accomplishments of the FIU-DOE Science and Technology Workforce Development Program are available at <http://fellows.fiu.edu/>.



DOE Fellows.

- 142 FIU STEM students (graduates and undergraduates) have been inducted as DOE Fellows and completed 119 internships at DOE sites, national laboratories, and private industry.
- DOE Fellows have given over 172 poster & oral presentations at national & international conferences (e.g., WM, ANS, and ICEM) and won several awards for Best Student Poster and one for Best Professional Poster.
- Ten (10) DOE Fellows have been hired by DOE-EM HQ (3), DOE national laboratories (4), and DOE contractors (3). In addition, 13 Fellows have been hired by other federal, state or local gov't agencies. Over 61 DOE Fellows graduated FIU and obtained employment in STEM industry. Hiring rate for DOE Fellows is 98%.
- 47 Fellows have continued towards master's or PhD degrees at FIU and other institutions.