YEAR-END TECHNICAL REPORT

May 18, 2012– August17, 2013

DOE-FIU Science & Technology Workforce Development Initiative

http://fellows.fiu.edu/

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Addendum:

This document represents one (1) of five (5) reports that comprise the Year End Reports for the period of May 18, 2012 to July 17, 2013 prepared by the Applied Research Center at Florida International University for the U.S. Department of Energy Office of Environmental Management (DOE-EM) under Cooperative Agreement No. DE-EM0000598.

The planned period of performance for FIU Year 3 under the Cooperative Agreement was May 18, 2012 to May 17, 2013. However, two no-cost extensions have been executed by DOE-EM. The first no-cost extension was received from DOE on 05/17/13 to extend the end of the period of performance for a period of two months (until 07/17/13). Another two months no-cost extension was received from DOE on 07/10/13 to extend the end of the period of performance to 9/16/13. The activities described in this report are for the FIU Year 3 period of performance from May 18, 2012 to August 17, 2013.

The complete set of FIU's Year End Reports for this reporting period includes the following documents:

1. Chemical Process Alternatives for Radioactive Waste
   Document number: FIU-ARC-2013-800000393-04b-213
2. Rapid Deployment of Engineered Solutions for Environmental Problems at Hanford
   Document number: FIU-ARC-2013-800000438-04b-217
3. Remediation and Treatment Technology Development and Support
   Document number: FIU-ARC-2013-800000439-04b-219
4. Waste and D&D Engineering and Technology Development
   Document number: FIU-ARC-2013-800000440-04b-216
5. DOE-FIU Science & Technology Workforce Development Initiative
   Document number: FIU-ARC-2013-800000394-04b-072

Each document will be submitted to OSTI separately under the respective project title and document number as shown above.

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PROJECT 5 OVERVIEW

There is a national need for more careers in science, technology, engineering and mathematics (STEM). This shortage is felt not only in the private industry sector but also across many federal agencies. Across the Department of Energy (DOE) and within DOE Environmental Management (EM), there is a similar critical shortage of entry-level STEM personnel. As of 2008, only 1% of DOE-EM's workforce was 30 years old or younger. The effects are already being felt across DOE EM and new ways to stimulate interest in STEM are being initiated by the federal government. If this shortage is not addressed, the risks include knowledge gaps (discontinuity of lessons learned) within the department and a lack of skilled personnel to carry out its cleanup mission effectively.

Florida International University (FIU), the largest Hispanic serving research-extensive institution in the continental United States, is one of the nation's leading producers of scientists and engineers from underrepresented groups. In 1995, DOE created a unique partnership with FIU to support environmental cleanup technology development, testing and deployment at DOE sites. This partnership spawned a research center at FIU dedicated to applied environmental research and development (R&D). The center, now known as the Applied Research Center (ARC), has tackled and helped solve problems at many DOE sites.

The DOE-FIU Science and Technology Workforce Development Initiative wasestablished in 2007 to create a pipeline of minority engineers specifically trained and mentored to enter the DOE-EM workforce in technical areas of need. This innovative program was designed to help address DOE's future workforce needs by partnering with academic, government and DOE contractor organizations to mentor future minority scientists and engineers in the research, development, and deployment of new technologies addressing DOE's environmental cleanup challenges. The main objective of the program is to provide interested students with a unique opportunity to integrate course work, DOE field work, and applied research work at FIU into a well structured academic program that leads to entry into DOEEM's Pathways Program. Students selected as DOE Fellowsperform research at FIU and at DOE sites, national laboratories, and DOE contractors. Upon graduation and completion of this fellowship, the students will submit an application to join the DOE federal internships programs such as Student Career Experience Program (SCEP), apply to DOE contractors, pursue post Master or postdoctoral positions at DOE National Labs, or apply to private industry in their field of study.

Since its inception in 2007, the DOE-FIU Science & Technology Workforce Development Initiative program has inducted 76 FIU minority STEM FIUstudents. DOE Fellows Induction Ceremonies have been attended by DOE EM officials including Mr. Mark Gilbertson (2007), former Assistant Secretary for Environmental Management, Mr. Jim Rispoli (2008), Ms. Yvette Collazo (2009), former Assistant Secretary for Environmental Management, Mrs. Ines Triay (2010), Acting Principal Assistant Secretary for Environmental Management, Mrs. Tracy Mustin (2011), and Associate Principal Deputy Assistant Secretary for Environmental Management, Mrs. Alice Williams (2012).All these students have been exposed to DOE EM applied research efforts being conducted at FIU-ARC, DOE sites, DOE national labs, and DOE contractor facilities across the US. Upon graduation and completion of this fellowship, DOE Fellows will join the STEM workforce by submitting applications to Federal Internship programs such as the Pathways Program and/or by applying to DOE Contractors, other federal agencies, and the STEM industry at large. Thus far, the program has

conducted81 internships at DOE sites, national laboratories, and DOE contractors industry. DOE Fellows have presented over 91 posters/oral presentations at national and international conferences. At the WM09, WM10, and WM11 Waste Management Symposia, three DOE Fellows have won the Student Poster competitions and one DOE Fellow received the award for the best poster out of all the professional poster sessions presented at WM09. A total of 9 DOE Fellows have applied to the DOE EM Professional Development Program (1 in 2009 and 8 in 2010) with one of our Fellows (Rosa Ramirez – Class of 2008) being selected for the DOE EM Professional Development Corps (EMPDC) program in September 2009. Also, in 2010, DOE Fellow DuriemCalderin was hired by a DOE Contractor (Columbia Energy Environmental Services) in Richland, WA. In addition, during the spring of 2011, 6 DOE Fellows applied to DOE EM's Student Career Experience Program (SCEP) program and 3 were selected. A DOE Fellow (Edgard Espinosa – Class of 2007)wasselected into the SCEP program and has successfully converted to a full-time federal employee in 2011. A second DOE Fellow (Lee Brady – Class of 2008) wasalso converted to full-time federal employee in the Spring of 2012. Another Fellow (Charles Castello – Class of 2008) completed the SCEP program but selected to accept a position at Oak Ridge National Laboratory underthe Alvin M. Weinberg Fellowship program. Also DOE Fellow, Merlin Ngachin, was hired by Waste Control Specialists this past year and is currently working at WCS facility in Texas. In addition, JantyGazhi was hired by Kiewit Powerin 2013, a nuclear utilities contractor/vendor. The program has been featured in DOE EM publications such as theEM-20Final Year Report, US DOE EM Highlights, Diversity @ EM magazine, and EM Program Update and FIU News.

The milestones and deliverables for Project 5 for FIU Year 3 are shown on the following table. No milestones or deliverables were due during this period.

Table 1: FIU Year 3 Milestones and Deliverables for Project 5

Milestone/ Deliverable	Description	Due Date	Status	OSTI
2012-P5-M1	Selection of new DOE Fellows - Spring 2012	05/30/12	Complete	
Deliverable	Draft Project Technical Plan sent to DOE	06/18/12	Complete	
Deliverable	List of 2012 Student Summer Interns and their research assignment	06/29/12	Complete	
2012-P5-M2	Waste Management Symposium 2013 abstract submitted	8/17/2012	Complete	OSTI[7]
2012-P5-M3	DOE Fellows Complete Summer Internships	08/31/12	Complete	
2012-P5-M4	Summer Internships Reports Completed	10/05/12	Complete	
Deliverable	Deliver Summer 2012 Interns reports to DOE	10/19/12	Complete	OSTI
2012-P5-M5	Selection of new DOE Fellows – Fall 2012	10/30/12	Complete	
Deliverable	List of identified/recruited DOE Fellow (Class of 2012)	10/31/12	Complete	
2012-P5-M6	Conduct Induction Ceremony – Class of 2012	11/13/12	Complete	
2012-P5-M7	Waste Management Symposium 2013 (submittal of student abstracts)	12/31/2012	Complete	OSTI
Deliverable	Draft Year End Report	06/28/13 extended to 08/17/13	On Target	OSTI

[7] Announcement of published journal or conference paper will be submitted to OSTI

Highlights during this reporting period include:

- Year End Reports for FIU Year 2 were completed for all projects and sent to DOE as well as site points of contact.

- Draft Project Technical Plans for FIU Year 3 were completed for all projects and sent to DOE as well as site points of contact.

- FIU ARC staff and students participated in the 2012 American Nuclear Society (ANS) Annual Meeting and Decommissioning, Decontamination and Reutilization (DD&R) Conferencein Chicago, Illinois, from June 24 to June 28, 2012. Participation included hosting an exhibitor booth in the vendor hall, presenting technical research at oral and poster presentations, and chairing technical sessions. A total of three professional oral and poster presentations were given by FIU Applied Research Center staff and students in the areas of D&D technologies, D&D knowledge management, and D&D best practices and lessons learned. Professional oral and poster presenters included Dr. Leo Lagos, Mr. HimanshuUpadhyay, and DOE Fellow Heidi Henderson. Two additional DOE Fellows (Lilian Marrero and Elicek Delgado-Cepero) also attended and participated in the conference as "Student Assistants," providing technical support during the technical sessions.

- Project progress and accomplishments for FIU Year 3 as well as projected scope for FIU Year 4 were presented to DOE-EM during a videoconference held 05/01/13. In attendance were the FIU-ARC Project 5 Program Director Dr. Leonel Lagos, DOE Fellows (Lilian Marrero, XimenaPrugue, Paola Sepulveda, and Gabriela Vazquez), Beth Moore (DOE), Andy Szilagyi (DOE), and John De Gregory (DOE).During this videoconference to DOE HQ, the four DOE Fellows presented their research:

    - DOE Fellow Gabriela Vazquez - Improved Third Generation Peristaltic Crawler
    - DOE Fellow Lilian Marrero - Integrated Flow and Mercury Transport Model for EFPC
    - DOE Fellow Paola Sepulveda - Microbial Dissolution of Uranium (VI) from Autunite
    - DOE Fellow XimenaPrugue - Development of a Mechanical Based System for Dry Retrieval of Single-Shell Tank Waste at Hanford

Major key accomplishmentsto date:

- DOE Fellows supported the Energy Facility Contractors Group (EFCOG) and contributed to the development of 12 Lessons Learned and Best Practices documents
- DOE Fellow (Charles Castello) was hired by DOE's Oak Ridge National Laboratory under the Alvin M. Weinberg Fellowship program

- DOE Fellow (Stephen Wood) joined Oak Ridge National Laboratory's Bredesen Center for Interdisciplinary Research and Graduate Educationas a Energy Science & Engineering PhD Fellow
- DOE Fellow(Edgard Espinosa)was hired by DOE-EM and is working for EM-22 (Nuclear Materials Disposition) under the direction of Mr. Gary Deleon
- DOE Fellow (Lee Brady) has graduated and will be hired by DOE-EM and will work for EM-13 (D&D and Facility Engineering) under the direction of Mr. Andrew Szilagyi
- DOE Fellow, (Merlin Ngachin) was hired by Waste Control Specialists (WCS) in Texas
- **31** master degrees and **3** Ph.D. degrees based on EM research program;
- DOE Fellows program featured in national and international newsletters;
- **9** peer reviewed journal publications developed in the last year by students and ARC staff on DOE-EM research;
- **Twenty-five (25)** other DOE Fellows graduated FIU with bachelor's or master's degrees and obtained employment in private industry and government agencies, including: Boeing Company (3 Fellows), GE (1 Fellow), NASA (1 Fellow), Florida Department of Environmental Protection (1 Fellow), Florida Power & Light (2 Fellows), Mount Sinai Medical Center (2 Fellow), Internal Revenue Service (1 Fellow), Department of Commerce (1 Fellow), PriceSmart Inc. (1 Fellow), Bouygues Civil Works Florida (1 Fellow), Crane Aerospace and Electronics (1 Fellow), and HP Foundation (1 Fellow), Lockheed (1 Fellow), US. Department of Health & Human Services (1 Fellow), Beckman Coulter (2 Fellows), Motorola (1 Fellow), Kiewit Power (1 Fellow), CPH Inc. (1 Fellow), Texas Instruments (1 Fellow), CPH, Inc. (1 Fellow), and others.
- DOE Fellows, Edgard Espinosa, Charles Castello, and Lee Brady were selected by DOE EM as part of Student Career Experience Program (SCEP). These Fellows completed SCEP assignments working for EM-2.1, EM-12, and EM-13 respectively
- DOE Fellow (Rosa Ramirez) was hired into the EM Professional Development Corps program
- DOE Fellow (DuriemCalderin) was hired by DOE Contractor Columbia-Energy Environmental Services, Duriem is working in Richland, WA
- DOE Fellow (Leydi Velez) won Best Professional Poster at WM09
- DOE Fellow (Stephen Wood) won Best Student Poster at WM11
- DOE Fellow (Denny Carvajal) won Best Student Poster at WM10
- DOE Fellow (DenisseAranda) won Best Student Poster at WM09
- Completed 81internships at DOE sites, DOE national labs, DOE-HQ, and DOE contractors since 2007 (including summer 2013)
- 91 presentations (posters and papers) at Waste Management conferences (2008, 2009, 2010, 2011, 2012, 2013)

- Twenty-one (26) DOE Fellows (FIU minority students) continuing to Master/Ph.D. degrees at FIU.
- Nine (9) DOE Fellows applied to the DOE EMPDC program in 2009 and 2010
- Six (6) DOE Fellows applied to DOE EM SCEP in spring 2011
- Development of DOE Fellows web site http://fellows.fiu.edu/ and Facebook page
- Two Fellows (Gabriela Vasquez and XimenaPrugue) will be participating and presenting their High Level Waste DOE EM applied research at ICEM2013 in Brussels, Belgium. The American Society of Mechanical Engineers sponsored their participation in the conference.

RESULTS AND DISCUSSION

1.0 DOEFELLOWS ENTERING TO DOE'S STUDENT CAREER EXPERIENCE PROGRAM (SCEP)

The vision of this program is to create a "**pipeline**" of minority FIU studentswhowill be trained and mentored as DOE Fellows and enter DOE's workforce. This vision became a reality when our first DOE Fellow (Rosa Ramirez) was hired by DOE in September 2009 and entered DOE's Professional Development Corps Program. Rosa is currently working for DOE EM's Soil and Groundwater group (EM-12) in Germantown, Maryland. Rosa continues to be a FIU graduate student and is continuing her work towards completing a master's degree in environmental engineering. The success story of the program continued in summer 2010 when DOE Fellow, DuriemCalderin, was hired by a DOE contractor (Columbia-Energy Environmental Services) in Richland, WA. Since then, Duriem has left Columbia-Energy and joined AREVA. The "pipeline" continued to work during the spring of 2011 when six DOE Fellows applied to the Student Career Experience Program (SCEP) in February/March 2011. In addition, DOE Fellow, Merlin Ngachin was hired by Waste Control Specialists, and DOE Fellow, JantyGhazy was recently hired in 2013 by Kiewit Power (see additional description show below). This federal internship program allows our DOE Fellows to work as federal employees during work assignments at DOE-HQ and return to FIU to complete their respective degrees. Once the DOE Fellows graduate from FIU and complete the SCEP program requirements, they are eligible for full time employment with DOE EM. The following 3 DOE Fellows were selected for the program and started their work assignments at DOE-HQ in Washington, DC during April/May in 2011. Two Fellows (Edgard Espinosa and Lee Brady) completed SCEP program and joined DOE-EM as fulltime employees. The third Fellow (Charles Castello) completed SCEP program but obtained an alternative offer from Oak Ridge National Laboratory.

1.1 Other DOE FellowsHired During This Reporting Period

During this period (May 18, 2012 to July 17, 2013), an additional twelve (12) DOE Fellows in science, technology, engineering, and math (STEM) disciplines were hired by DOE national laboratories and private industry. The following DOE Fellows were hired:

- **AlessandraMonetti(**DOE Fellows Class of 2009)- After Alessandra Monetti graduated with her bachelor's degree, she accepted an offer as a full-time federal employee working for SRC (Scientific Research Corporation), a federal contractor for the Department of Defense (DoD), working in DoD's Test Resource Management Center (TRMC) located in Virginia. She will have the title of Engineer I under the direction and supervision of Jim Hutchinson (Program Manager for Scientific Research Corporation SRC).
- **Heidi Henderson** (DOE Fellows Class of 2010)- Ms. Henderson recently obtained a Professional Engineer/Project Management position at CPH, Inc., a multi-discipline firm that provides complete turnkey services.
- **Jose Matos**(DOE Fellows Class of 2009) - Mr. Matos recently obtained employment with Beckman-Coulter in Miami, FL; he will complete his master's degree in mechanical engineering based on the DOE-EM research he has conducted.

- **Janty Ghazi**(DOE Fellows Class of 2010)-After graduating with his degree from Engineering Management, Mr. Ghazi received and accepted an employment opportunity as an Electrical/Controls Engineer –EE-1 at Kiewit Power.
- **Elicek Delgado-Cepero**(DOE Fellows Class of 2010)-After successfully graduating with a Master's degree in the Springof 2013, Mrs. Delgado-Cepero has accepted an employment offer from Motorola as a radio frequency (RF) engineer.
- **Jaime Mudrich**(DOE Fellows Class of 2011)- Mr. Mudrichcompleted his DOE-EM based mechanical engineering master's degree in the summer of 2013. The DOE Fellows Program is pleased to announce that Mr. Mudrich recently obtained employment with Beckman-Coulter.
- **Raul Ordonez** (DOE Fellows Class of 2012)- Mr. Raul Ordonez graduated from Florida International University, obtaining his bachelor's degree in electrical engineering in Spring 2013. The DOE Fellows Program is pleased to announce that Mr. Ordonez received and accepted an employment opportunity from Texas Instruments.

2.0 INCREASING THE RETENTION OF MINORITY STUDENTS IN SCIENCE, TECHNOLOGY, ENGINEERING, AND MATH (STEM) DISCIPLINES

2.1 DOE Fellows Continuing onto Graduate Degrees at FIU in the Areas of Science, Technology, Engineering, and Math (STEM) Education

A total of **26DOE Fellows** are currently pursing or have completed master's or Ph.D. STEM degrees at FIU. Most of these DOE Fellows started the DOE-FIU Science & Technology Workforce Development Program as undergraduates and have been successfully encouraged and preparedto continue onto graduate studies at FIU. The research conducted at ARC, DOE sites, DOE national laboratories, and DOE private contractors serve as the basis for their master's thesis or Ph.D. dissertation topics. Currently, 20 DOE Fellows have graduated with master's degrees and 1 with a Ph.D. Currently, 4 DOE Fellows are pursuing master's degrees and 1 DOE Fellow is pursuing a Ph.D. Table 1 below shows all the DOE Fellows pursuing graduate level work. In addition, several undergraduate DOE Fellows incorporate their EM applied research into their Senior Design or Capstone Projects at FIU.

Table 2. DOE Fellows in STEM Graduate Programs

	DOE Fellow	Discipline	Degree	Research Topic/Work Based on DOEEM projects	Anticipated Date of Graduation
1	Claudia Cardona	Environmental Eng.	Ph.D.	TBD	12/14
2	Eric Inclan	Mechanical Eng.	Master	Mesh adaptation for use in Lattice Boltzmann code	12/13

3	Lilian Marrero	Environmental Eng.	Master	Soil/Groundwater - Modeling of Mercury Contamination at ORNL	**Graduated: 08/13**
4	Jaime Mudrich	Mechanical Eng.	Master	Development of a Lee-Lin, Multiple Relaxation Time, parallel lattice Boltzmann method multiphase CFD solver	**Graduated: 08/13**
5	Janty Ghazi	Electrical Eng.	Master	Control, through Sensors and Labview, of the Asynchronous Pulsing Unit	**Graduated:05/13**
6	Amaury Betancourt	Environmental Eng.	Master	Soil/Groundwater - Modeling of Mercury Contamination at ORNL	**Graduated: 04/11**
7	Lee Brady	Engineering Mngmt.	Master	D&D Best Practices/Lessons Learned Development for EFCOG	**Graduated: 04/12**
8	Elsa Cabrejo	Environmental Eng.	Master	Soil/Groundwater - Modeling of Mercury Contamination at ORNL	**Graduated: 04/11**
9	Denny Carvajal	Biomedical Eng.	Master	Soil/Groundwater – Bacteria Interaction due to Polyphosphate Injection at Hanford	**Graduated:08/11**
10	Charles Castello	Electrical Eng.	Ph.D.	Soil/Groundwater - Sensor Development for Field Measurement of Mercury	**Graduated: 08/11**
11	Elicek Delgado-Cepero	Electrical Eng.	Master	Development of Remote	**Graduated: 05/13**
12	Edgard Espinosa	Mechanical Eng.	Master	Waste Processing - CFD Modeling of NuVison's Power Fluidic Technology/Process	**Graduated: 12/11**
13	SerkanAkar	Biomedical Engineering	Master	Design and Development of an Enzyme-Linked Biosensor for Detection and Quantification of Phosphate Species	**Graduated: 05/10**
14	Stephen Wood	Mechanical Eng.	Master	Modeling of Pipeline Transients: Modified Method of Characteristics	**Graduated:05/11**
15	Melina Idarraga	Environmental Eng.	Master	Dissolution rate of natural meta-autunite: effects of aqueous bicarbonate, pH and temperature	**Graduated: 12/11**
16	Heidi Henderson	Environmental Eng.	Master	Surface water and contaminant transport within the Oak Ridge National Laboratory	12/13

17	Merlin Ngachin	Environmental Sciences	Master	Waste Processing - Baltman-Lattice Method to Model HLW	**Graduated: 08/11**
18	Leydi Velez	Industrial Eng.	Master	Decision Modeling Tools D&D Surveillance & Maintenance	**Graduated: 12/10**
19	Jose Matos	Mechanical Eng.	Master	Development of improved Bodies for a Peristaltic Crawler for Radioactive Pipeline Unplugging	12/13
20	William Mendez	Engineering Mngmt.	Master	Development of Remote Stack Characterization System	**Graduated: 04/11**
21	Mario Vargas	Mechanical Eng.	Master	Kinematic Control of Remote Stack Characterization System	**Graduated: 08/12**
22	Melissa Sanchez*	Environmental Engineering	Master	Non-thesis option	**Graduated: 05/12**
23	Yulyan Arias*	Environmental Engineering	Master	Non-thesis option	**Graduated: 05/12**
24	DuriemCalderin	Biomedical Eng.	Master	Modeling of Loose Contamination Scenarios to Predict the Amount of Contamination Removed	**Graduated: 08/10**
25	Jose Vasquez	Environmental Eng.	Master	Effects of temperature and pH on volatilization of mercury after chemical reduction	**Graduated: 08/09**
26	Rosa Ramirez (Former DOE Fellow hired by DOE EM)	Environmental Eng.	Master	TBD	TBD
*Left DOE Fellows program but completed master's degree at FIU					

3.0 DOE FELLOWS RECRUITMENT&SELECTION

The DOE Fellows Spring recruitment period was initiated on March 19, 2012and continued until April 13, 2012. During this period, the current DOE Fellows and program director will host an Information Session for potential candidates, conduct recruitment campaigns by placing recruitment tables at College of Engineering, participate in the FIU College of Arts and Science's Job and Internship Fair, and make short presentations at targeted classes within the College of Engineering and College of Arts and Sciences. ADOE Fellows Information Session was also scheduled for April 4, 2012.

A total of 23 application packages were received and reviewed by the DOE Fellows Selection Committee integrated by representatives from DOE-HQ, FIU's College of Engineering and Art & Sciences, and ARC staff. A pre-selection process was conducted and 16 applicants were selected for formal interviews. Interviews were conducted during the last week of April and first week in May. Milestone 2012-P5-M5 was accomplished by the completion of DOE Fellows Fall 2012 recruitment process; more than 15 applications were received and evaluated. The table below shows the list of recruited DOE Fellows, class of 2012.

Table 3: New Students Entering the DOE Fellows Program

First Name	Last Name	Classification	Major
Jennifer	Arniella	Undergraduate	Mechanical Engineering
Francisco	Bolanos	Undergraduate	Mechanical Engineering
Dania	Castillo	Undergraduate	Structural Engineering
Robert	Lapierre	Undergraduate	Chemistry
Joel	McGill	Undergraduate	Civil Engineering
Lucas	Nascimento	Undergraduate	Electrical Engineering
Raul	Ordonez	Undergraduate	Electrical Engineering
Mariela	Silva	Graduate	Engineering Management
Vanessa	Vargas	Undergraduate	Electrical Engineering
Gabriela	Vazquez	Undergraduate	Mechanical Engineering
Revathy	Venkataraman	Graduate	Information Technology
Ashley	Wardlow	Undergraduate	Biochemistry & Criminal Justice

During the month of June, the new Fellows have completed the FIU's Environmental Health & Safety courses required by the university and ARC prior to conducting any work in ARC's lab facilities. The new Fellows also spent the month of June getting familiar with the DOE-EM applied research and working on their bios, schedule, and preliminary description of their DOE-EM assigned tasks. The new Fellows were also paired up with ARC mentors/supervisors. The Fellows also participated in weekly meeting conducted by program director, Dr. Lagos.

Also, a total of 16 applications were received during the Spring 2013 recruitment period. The DOE Fellows Selection Committee interviewed 11 FIU students during the week of June 3, 2013. FIU's Arts & Science, ARC and DOE-HR representatives integrated the committee. FiveFIU STEM students were selected to start the DOE Fellows program during summer 2013. A list of the new selected Fellows, their classification, and areas of study is provided below:

Table 4: Selected DOE Fellows Class of 2013 to be inducted in the fall, their classification, and areas of study is provided below

First Name	Last Name	Classification	Major
Michael	Abbott	Undergraduate	Mechanical Engineering
Pedro	Cordon	Undergraduate	Computer Engineering
Eduardo	Garcia	Undergraduate	Mechanical Engineering
Mariana	Evora	Undergraduate	Civil Engineering
Alexandra	Fleitas	Undergraduate	Mechanical Engineering

4.0 DOE FELLOWS INTERNSHIPS (SUMMER 2012)

A total of 11 DOE Fellows participated in internships at DOE Headquarters, DOE sites, DOE national laboratories and Sullivan International Consulting during summer 2012. Two DOE Fellows where sent to DOE-HQ (Cloverleaf). In addition, four DOE Fellows were working in the Oak Ridge, TN area. Two of those going to Oak Ridge were located at the Oak Ridge National Laboratory; the third was with the Oak Ridge National Reservation and the fourth with the Y-12 Security Complex. In addition one DOE fellow interned at the Savannah River Site. One DOE Fellow interned at Pacific Northwest National Laboratory and an additional DOE Fellow interned with Washington River Protection Solutions. Finally, two DOE Fellows supported the Sullivan International Consulting Company. The table below describes the DOE Fellows participating in internships, the site/national lab, and their assigned mentors, and the timeframe of the internship.

Table 5: List of DOE Fellows at Internships during 2012

DOE Fellow	Site/Office/Lab	Location	Mentor
Janty Ghazi	DOE-HQ EM-23	Washington DC	James Poppiti
Claudia Cardona	DOE-HQ EM-12	Washington DC	Kurt Gerdes
Joshua Midence	Savannah River Site	Aiken, SC	Alex Cozzi
Eric Inclan	Oak Ridge National Laboratory	Oak Ridge, TN	Dr. Prashant Jain
Jaime Mudrich	Oak Ridge National Laboratory	Oak Ridge, TN	Dr. Prashant Jain
Heidi Henderson	Oak Ridge Reservation	Oak Ridge, TN	Dr. Eric Pierce
RevathyVenkataraman	Y-12 Security Complex, Oak Ridge	Oak Ridge, TN	Charlie Barton
XimenaPrugue	WRPS, Hanford Site	Richland, WA	Leo Thompson
Robert Lapierre	Pacific Northwest National Lab	Richland, WA	Dr. Dawn Wellman
Lilian Marrero	Sullivan International Consulting	Chicago, IL	JD Campbell
Elicek Delgado	Sullivan International Consulting	Chicago, IL	JD Campbell

The DOE Fellow, Heidi Henderson, attended the American Nuclear Society's Decontamination, Decommissioning, and Reutilization (DD&R) conference and presented a student poster on the development of lessons learned and best practices for DOE-EM and the EFCOG group. Heidi also participated as "student assistant" during the conference and helped out at the various sessions during the conference. In addition, two other DOE Fellows (Elicek Delgado-Cepero and Lilian Marrero) are conducting a summer internship in Chicago and were able to participate in this conference as "student assistants," supporting conference organizers by working in the various technical sessions at DD&R and ANS meetings.

Also, while attending the DD&R conference in Chicago during this month, Dr. Lagos had the opportunity to visit DOE Fellows summer interns (Lilian Marrero and Elicek Delgado-Cepero). Lilian and Elicek are performing a 10-week summer internship in Chicago and working for Sullivan International Consulting. As described below, Lilian and Elicek also had the opportunity to attend and participate in ANS's DD&R conference.

Figure 1: ARC Booth at DD&R 2012. From left, Himanshu Upadhyay, Elicek Delgado-Cepero, Lilian Marrero and Dr. Leonel Lagos

Figure 2: DOE Fellows Lilian Marrero and Elicek Delgado-Cepero with Program Director Dr. Leo Lagos and mentors at Sullivan International Consulting

Also, DOE Fellows interning at the Department of Energy (DOE) Headquarters in Washington, DC, attended a breakfast reception with FIU president Mark Rosenberg and members of the Florida delegation at the US Capital Building on June 25, 2012. The students included DOE Fellows Claudia Cardona and Janty Ghazi from the FIU-DOE Science and Technology Workforce Development Program (http://fellows.fiu.edu), as well as other interns from FIU. Among the delegation present were Congresswoman Ileana Ros-Lehtinen, Congressman Mario Diaz-Balart, Congresswoman Frederica Wilson, and Congressman David Rivera.

Discussions at the breakfast reception included various aspects of FIU, ranging from finances to class availability. President Rosenberg was pleased to get the detailed feedback from the FIU interns about their views on subjects pertaining to the university. President Rosenberg also recognized that Claudia and Janty were with FIU's Applied Research Center (ARC) as part of the DOE Fellowship program. President Rosenberg was very proud of the work and research that goes on at ARC and expressed his support in the program. He mentioned the great job Dr. Leonel Lagos (DOE Fellow Program Director) and his DOE Fellows are doing at ARC as well as at the DOE sites throughout the country.

The Florida delegates expressed how impressed they were with the internships being performed by FIU students at the different government agencies and departments. They spoke of their support for FIU and the various programs that made the internships possible.

Figure 3: DOE Fellows with FIU President, Dr. Mark Rosenberg

Figure 4: DOE Fellow, Janty Ghazi, with Florida Delegates (Ileana Ros-Lehtinen, Mario Diaz-Balart, Frederica Wilson, and David Rivera) in front of US Capitol

Internships conducted during Summer 2013 period is presented in Section 10.0 below.

5.0 DOE FELLOWS POSTER EXHIBITION AND COMPETITION

5.1 2011 Student Poster Competition Winners

This year, the distinguished panel of judges evaluated the posters presented at the third DOE Fellows Poster Exhibition and Competition and selected 1st, 2nd, and 3rd place winners. The certificates and cash awards were presented at this year's DOE Fellows Induction Ceremony.

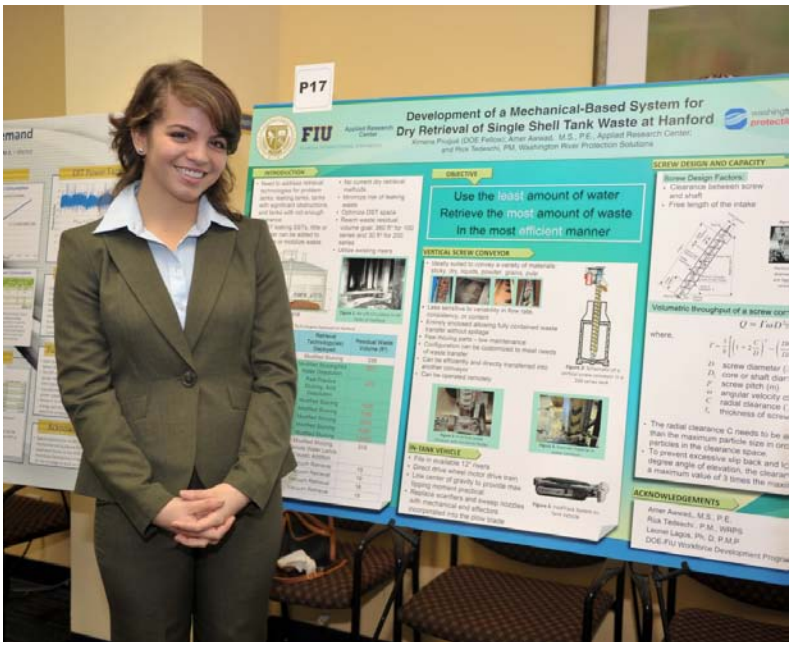

Figure 5: DOE Fellow Ximena Prugue presenting her research work at the 2012 Poster Exhibition and Competition

Figure 6: DOE Fellow Lucas Nascimento presenting his research work at the 2012 Poster Exhibition and Competition

First place winner:,Mr. Jaime Mudrich, DOE Fellows - Class of 2011

Poster title: "PaRAllel Thermal-Hydraulics Simulations using Advanced Mesoscopic Methods"

Figure 7: DOE Fellow Mr. Jaime Mudrichaccepting the first place award for the 2012 student poster competition.

Second place winner:, Elicek Delgado-Cepero,DOE Fellows - Class of 2009

Poster title: "Battery-less Wireless Sensors for Structural Health Monitoring for In Situ Decommissioning Tasks"

Figure 8: DOE Fellow Ms. Elicek Delgado-Cepero accepting the second place award for the 2012 student poster competition.

Third place winner: Ms. XimenaPrugue, DOE Fellows –Class of 2012, Civil Engineering

Poster title: "Development of a Mechanical-Based System for Dry Retrieval of Single Shell Tank Waste at Hanford"

Figure 9: DOE Fellow Ms. XimenaPrugue accepting her third place award for the 2012 student poster competition.

6.0 DOE FELLOWS 2012 INDUCTION CEREMONY

On November 13, 2012, Florida International University's (FIU's) Applied Research Center (ARC) conducted the sixth (6th) annual DOE Fellows Induction Ceremony. This year, Ms. Alice Williams (Associate Principal Deputy Assistant Secretary for the U.S. Department of Energy Office of Environmental Management) was one of the keynote speakers for the ceremony. Ms. Williams welcomed the FIU students to the DOE Fellows program and noted the impressive level of knowledge and skills they already possess.

Other distinguished guests included Ms. Rosa Elmetti (DOE EM International Program) and Mr. Lee Brady (DOE EM D&D and Facility Engineering), both DOE Fellow alumni Class of 2008 who have successfully secured employment with DOE EM. FIU was represented by Dr. Elizabeth Bejar (Vice Provost for Academic Affairs), Dr. E. George Simms (Director of Pre-Collegiate Programs and Grants), Dr. John Proni and Dr. Ines Triay (ARC Executive Directors), and Dr. Leonel E. Lagos (DOE Fellows Program Director), Dr. Kevin Cooper (Indian River State College – Nuclear Education and Training Center), as well as FIU faculty, staff, and students.

During this Induction Ceremony, 13new FIU STEM minority students were inducted as DOE Fellows:

- Nicole Anderson, Graduate Civil Engineering
- Jennifer Arniella, Undergraduate Mechanical Engineering
- Francisco Bolanos, Undergraduate Mechanical Engineering
- Dania Castillo, Undergraduate Civil Engineering

- DayronChigin, Undergraduate Electrical Engineering
- Robert Lapierre, Undergraduate Chemistry
- Joel McGill, Graduate Environmental Engineering
- Lucas Nascimento, Undergraduate Electrical Engineering
- Raul Ordonez, Undergraduate Electrical Engineering
- Valentina Padilla, Undergraduate Environmental Engineering
- Mariela Silva, Graduate Engineering Management
- Gabriela Vazquez, Undergraduate Mechanical Engineering
- RevathyVenkataraman, Graduate Information Technology

Figure 10: DOE Fellows Class of 2012 with DOE and FIU Representatives

Short bios and photos of the new inductees are presented in section 11 and also available on the DOE Fellows website (http://fellows.fiu.edu/) under DOE Fellows Bios tab.

Ms. Williams, Ms. Elmetti and Mr. Brady had the opportunity to participate in morning tours of the ARC research laboratories and listen to DOE Fellows presenting their research work. Presentations were given by Dr. Lagos and DOE Fellows Lilian Marrero and Jaime Mudrich. Dr. Lagos presented an update on the DOE-FIU Cooperative Agreement, the DOE Fellows program, the D&D KM-IT web-based knowledge management system, and the newly developed DOE-FIU Cooperative Agreement website dedicated to the DOE-EM research being conducted at ARC. Lilian Marrero presented her EM research and thesis on "Improvements in the Suspended Sediment Interactions Module of An Integrated Flow and Mercury Transport Model for East Fork Poplar Creek Watershed, Oak Ridge, Tennessee" and Jaime Mudrich presented his EM research and thesis on "Development of a LBM-Based

Multiphase Simulation Tool to Model Pulsed-Air Tank Mixing." Tours of the ARC facilities included visits to the radiological and composites laboratories as well as technology demonstrations in the multifunction assessment facility (i.e., high bay) of some of the more large-scale DOE projects. Technologies showcased included the experimental design and setup of wireless sensors for in situ decommissioning and evaluation of the sensor network energy demand; evaluation of pipeline unplugging instrumentation and technologies for Hanford (e.g., a peristaltic crawler for pipeline unplugging); and experiments related to soil & groundwater research for Hanford's uranium contamination. In addition, the distinguished guests and FIU faculty had the opportunity to interact with the DOE Fellows during a poster exhibition following the induction ceremony.

In addition, awards were presented to the DOE Fellows that won the DOE Fellows Poster Exhibition and Competition held on October 17, 2012. First place went to Mr. Jaime Mudrich for his poster titled, "PaRAllel Thermal-Hydraulics Simulations using Advanced Mesoscopic Methods." Second place went to Ms. Elicek Delgado-Cepero for her poster titled "Battery-less Wireless Sensors for Structural Health Monitoring for In Situ Decommissioning Tasks." Third place went to Ms. XimenaPrugue for her poster titled "Development of a Mechanical-Based System for Dry Retrieval of Single Shell Tank Waste at Hanford."

For the fourth year, the DOE Fellow of the Year Award and the Mentor of the Year Award were presented in the ceremony. DOE Fellows were requested to nominate their ARC mentors and ARC mentors were requested to nominate the DOE Fellows. An ARC committee was established to review and select the winners from the submitted nominations. The 2012 Mentor of the Year Award went to research engineer Mr. Jose Varona and the 2012 DOE Fellow of the Year Award was given to Ms. Lilian Marrero (DOE Fellows Class of 2011).

Figure 11: Mr. Jose Varona accepting the 2012 DOE Fellows Mentor of the Year Award

Figure 12: Ms. Lilian Marreroaccepting the 2012 DOE Fellow of the Year Award

A new award for the Alumni DOE Fellow of the Year was also presented at the ceremony to honor and recognize the professional achievements of former DOE Fellows. The 2012 Alumni DOE Fellow of the Year was presented to Ms. Rosa Elmetti (DOE Fellows Class of 2008). In addition, a second new award was presented to Ms. Patty Cepero for her superior efforts in successfully coordinating and organizing the DOE Fellows' Induction Ceremony.A DOE Fellows Poster Exhibition was also conducted at the end of this year's Induction Ceremony.

Figure 13: Ms. Rosa Elmetti accepting the first ever Alumni DOE Fellow of the Year

Figure 14: DOE Fellow (Jose Matos) Explaining his DOE-EM Research to DOE Representatives

7.0 WASTE MANAGEMENT CONFERENCE 2013ACCOMPLISHMENTS

Fellows continue their support to the DOE-FIU Cooperative Agreement by actively engaging in EM applied research and supporting ARC staff in the development and completion of the various tasks. Also, the program director continues to work with DOE sites and HQ to fully engage DOE Fellows with research outside ARC where Fellows provide direct support to mentors at DOE sites, DOE-HQ, and DOE contractors.

DOE Fellows participated in the Waste Management 2013 Conference (WM13) in Phoenix, AZ, from February 24 to February 28, 2013. A total of twenty-two (22) FIU students, including 21 DOE Fellows, participated in WM13 and twenty (20) presented technical posters during Session 31 (Student Poster Competition: The Next Generation – Industry Leaders of Tomorrow) based on the hands-on research that they have performed at ARC and during their summer internships at DOE sites, national laboratories, and site contractors.

The DOE Fellows also had the opportunity to meet Mr. David Huizenga (DOE's Senior Advisor for Environmental Management) and had a chance to describe their EM applied research work at **FIU's Applied Research Center** and the work they have performed during their internships at DOE HQ, DOE sites and national laboratories (Figure 5-23).

Figure 15: David Huizenga (DOE Senior Advisor for EM) with Dr. Ines Triay (Executive Director of the FIU Applied Research Center), Dr. Leo Lagos (DOE Fellows Program Director), andFIU's DOE Fellows at WM2012

DOE Fellows Program Director (Dr. Lagos) performed as the lead organizer for the student poster session (session 31) and co-chaired the panel discussions (sessions 62 and 63) on "Graduating Students and New Engineers – Their Wants and Needs" and "Young

Professionals". Dr. Lagos also made a professional oral presentation on "Training and Mentoring the Next Generation of Scientists and Engineers to Secure Continuity and Successes of the US DOE's Environmental Remediation Efforts."

7. 1 Student Poster Presentations at Waste Management 2013

The DOE Fellows presented their posters at WM13 showcasing their EM related research at a session entitled"The Next Generation, Industry Leaders of Tomorrow." A list of the posters presented and a short abstract is provided below:

Table 6: List of Posters and Respective Abstracts Presented at Waste Management 2013

DOE Fellow/Student	Poster Title / Brief description
Jennifer Arniella	*High-Level Waste Pipeline Unplugging Technologies: Asynchronous Pulsing System.* The asynchronous pulsing method creates pressure waves in a flooded pipeline from both ends of a blocked section. The waves are created asynchronously in order to break the mechanical bonds between the blockage and pipe wall. We are currently working on understanding how the air and the geometry of the pipeline affect the pressure waves. (Figure 5-3)
Francisco Bolanos	*Computer Simulations of Multiphase Flow Systems Applied to Transfer of High-Level Waste.* This work presents computer simulations dealing with 2D and 3D multiphase Lattice Boltzmann Method for high density ratio systems. The method is intended to accurately represent and predict fluid fluids in high level waste storage tanks. Simulations of computer model are presented and compared to benchmark case. (Figure 5-4)
Claudia Cardona	*The Effect of Ca Ions on the Removal of U(VI) at the Hanford Site Area*. Injection of NH3 is an innovative technology that targets uranium contamination in the vadose zone to reduce radionuclides mobility in subsurface. The effect of porewater constituents such as Si, Al, Ca,HCO3 on the U(VI) co-precipitation process is unknown. The research investigates the effect of porewater constituents on the removal of U(VI). (Figure 5-5)
Dania Castillo	*Computational Simulation and Evolution of High-Level Waste Pipeline Plugs at Hanford.* A multi-physics module is being developed to efficiently simulate and predict the formation of a plug in a high level waste pipeline. The simulations will demonstrate the relationship between plug formation and critical flow velocity, pipeline geometry and the physical properties of the waste stream during the transfer process. (Figure 5-6)
Elicek Delgado-Cepero	*Battery-less Wireless Sensors for Structural Health Monitoring for In-Situ Decommissioning of DOE Facilities.* Design considerations for monitoring using batteryless RFID sensing platforms inside grout, used for decommissioning DOE's nuclear facilities, include several key areas (e.g., materials characterization, transmission losses, sensor placement, etc.). These design considerations for structural monitoring using wireless sensors are applied to the detection of temperature, humidity and strain inside building structures. (Figure 5-7)
Janty Ghazi	*Hydrogen in Pipes and Ancillary Vessels in Waste Treatment Plant at the Hanford Site.* An evaluation, based on various research and testing, that determines the validity and dangers involved with a possible hydrogen explosion event which can possibly occur within the pipes in the "black cells" and "hot cells" of the waste treatment plant being built at DOE's Hanford Site. (Figure 5-8)
Heidi Henderson	*Storm Water Management Model Analysis of the Oak Ridge Storm Water Collection System Up To Outfall 211*. A hydrologic-hydraulic model of the

	ORNL 4500 Area's stormwater collection system has been developed in order to quantify flow rates within the system. The resulting flow rates from the model may be utilized in conjunction with contaminant data to assess contamination within the system. (Figure 5-9)
Robert Lapierre	*Single Pass Flow-Through Testing of Metals for Hanford 200 Area Vadose Zone.* This study investigates the effects of variables on the morphology and composition of U-bearing precipitates created as a result of ammonia gas pH manipulation in the Hanford 200 Area vadose zone conditions. The analysis of samples by scanning electron microscopy and energy dispersive spectrometry gauged the impact of variables such as time, bicarbonate concentration, and calcium concentration. (Figure 5-10)
Lilian Marrero	*Improvements and Modifications of an Integrated Flow and Mercury Transport Model for East Fork Poplar Creek, Oak Ridge, Tennessee.* Portions of the East Fork Poplar Creek watershed were heavily contaminated with mercury as a byproduct of nuclear processing activities. An integrated surface and subsurface flow and transport model was developed and implemented to determine the effect of hydrological and hydraulic parameters on mercury transport within the watershed. (Figure 5-11)
Jose Matos	*Development of Improved Bodies for a Peristaltic Crawler for Unplugging of Hanford Waste Transfer Pipelines.* Limitations in speed and force output of current peristaltic crawler robot designs limit their viability as an unplugging tool for DOE Hanford Site pipelines. The study described in this poster covers a new design of the crawler device which incorporates powerful, micro pneumatic cylinders in order to address these shortcomings. (Figure 5-12)
Joel McGill	*Degradation of Grout: Compressive Strength Comparative Analysis.* This research assists the Savannah River Site in their planned monitoring of the P and R reactor sites which have been decommissioned via in situ decommissioning. This project will help aid in the monitoring of the longevity of the compressive strength of the grout used to entomb the sites' underground portions. (Figure 5-13)
Joshua Midence	*Saltstone Processing of Low-Level Waste at Savannah River Site.* The process and safe storage of low-level radioactive waste at Savannah River site is of concern. The Saltstone formulation (a cementitious mixture) must produce a grout waste form that meets both placement and performance properties. Saltstone is a breakthrough process that not only encloses the tanks, but absorbs some of the damaging chemicals to be transported offsite. (Figure 5-14)
Jaime Mudrich	*A Lattice Boltzmann Method for the Analysis of Gas Behavior in Hanford Tanks.* In this work, computer simulations are presented based on the 3D multiphase lattice Boltzmann method for high density ratio systems. The method is capable of incorporating complex geometries generated in CAD software. The geometries are voxelized and then imported for use in multiphase flow simulations. Surface wetting features enable accurate simulation of contact angles. (Figure 5-15)
Lucas Nascimento	*Acoustic Pulse Reflectometry For Identifying Pipeline Properties At Hanford Site.* The U.S. Department of Energy's Hanford Site waste retrieval and transfer process can lead to pipeline plugging and corrosion. Acoustic pulse reflectometry (APR) is a technique that measures reflections from a volume to estimate plug formation and changes in pipeline geometry. This technique can be used to select unplugging

	technologies. (Figure 5-16)
Raul Ordonez	*Sensor Network Energy Demand for In-situ Decommissioning Applications at Savannah River Site.* The electrical resistance tomography (ERT) system is used to gain a better understanding of the performance of cementitious materials used for in situ decommissioning (ISD) at the Savannah River Site. The ERT system consumes too much power in the sensor network; therefore, other sources of energy or alternate methods were researched to diminish consumption. (Figure 5-17)
Justin Phillips	*Mobile Device Applications using Cloud Computing on ServiceOriented Architecture.* Three applications (based on jQuery, ASP.NET C#, and the Android Operating System environment) were created to test the performance and viability of service-oriented architecture in the mobile development task to ensure that it meets the standards and requirements for the D&D Knowledge Management Information Tool Mobile Application. (Figure 5-18)
XimenaPrugue	*Development of a Mechanical based System for Dry Retrieval of Single-Shell Tank Waste at Hanford.* This study explores the development of a mechanical based system to retrieve single-shell tank waste at Hanford without the addition of water. Focusing on leaking tanks and tanks with significant in-tank obstruction and utilizing existing risers in Hanford's tanks, commercially available technologies are evaluated for cost and efficiency. (Figure 5-19)
Mariela Silva	*SharePoint Based Secured Collaboration System for DOE-EM project management.* A SharePoint-based secured collaboration system is being implemented to enhance progress tracking, monitoring, and communication for five major projects that represent the continued support of Florida International University to DOE's Office of Environmental Management in its mission of accelerated risk reduction and cleanup of the environmental legacy of the nation's nuclear weapons program. (Figure 5-20)
Gabriela Vazquez	*Improved Third Generation Peristaltic Crawler for Removal of High-Level Waste Plugs in Hanford Site Pipelines.* The improved third generation pneumatic/hydraulic operated peristaltic crawler propels itself by a sequence of pressurization/depressurization of cavities used for unplugging clogged radioactive waste transport lines. The third generation crawler showed speed and maneuverability restrictions. The new design incorporates pneumatic valves to reduce cycle time, inspection camera for visual feedback, and a thin walled outer bellow for improved maneuverability. (Figure 5-21)
RevathyVenkataraman	*D&D Technology Services Development using Windows Communication Foundation on Cloud.* The Deactivation and Decommissioning Knowledge Management Information Tool (D&D KMIT) is a web-based tool custom built for the D&D user community. Its technology server module is being developed using Microsoft windows communication foundation services to study its performance, flexibility, implementation cost, scalability, interoperability and security of data when hosted in a cloud environment. (Figure 5-22)

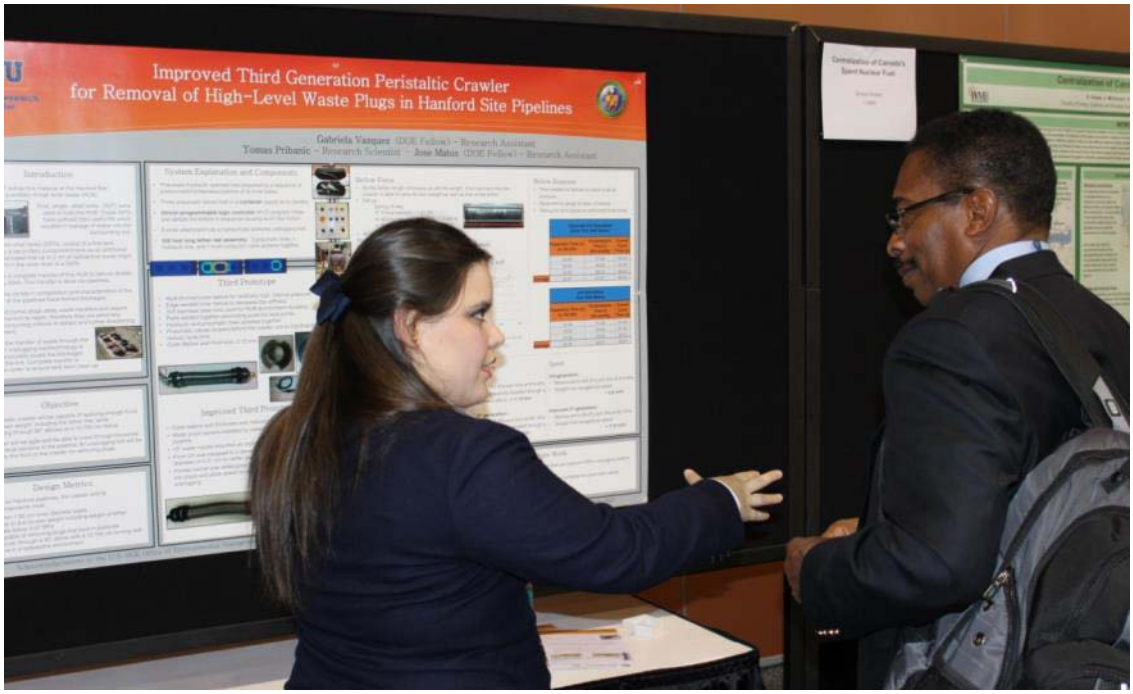

Figure 16: DOE Fellow Gabriela Vazquez presenting her research at the 2013 Waste Management Symposium

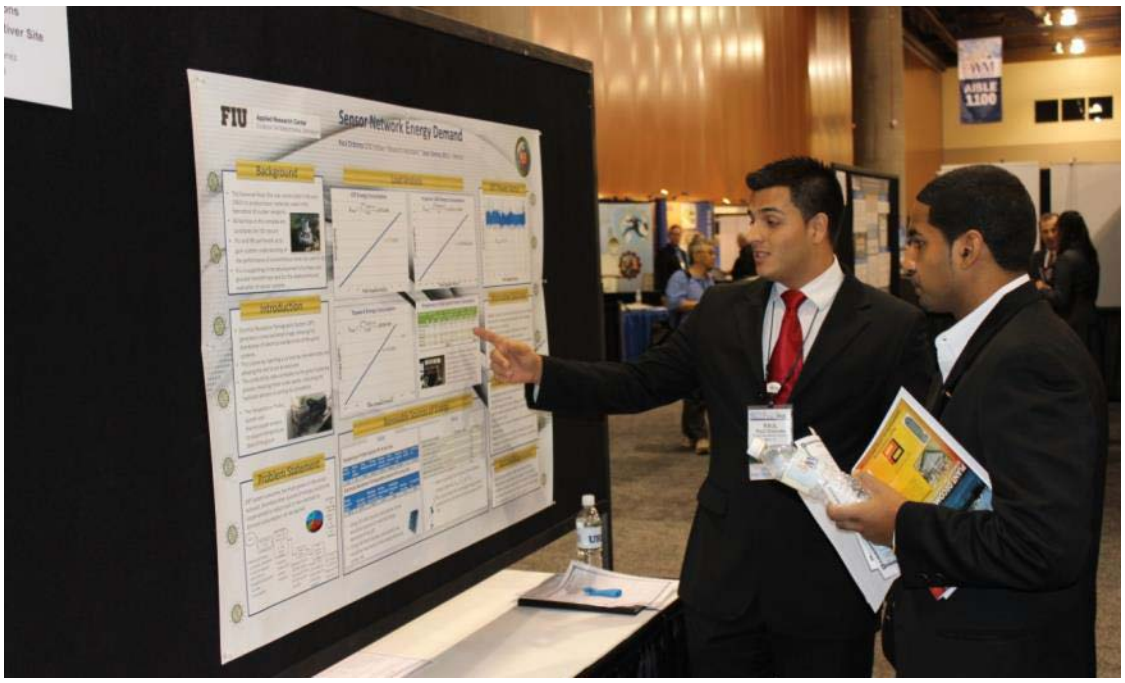

Figure 17: DOE Fellow Raul Ordonez presenting his research at the 2013 Waste Management Symposium

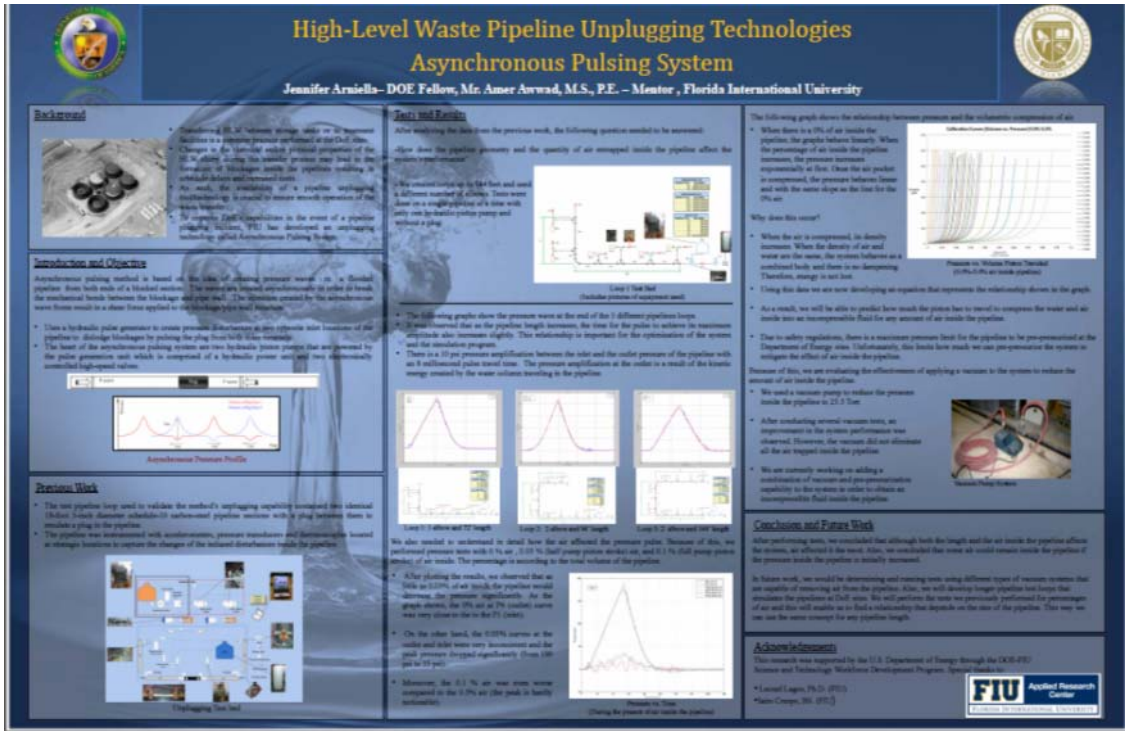

Figure 18: Poster entitled "High-Level Waste Pipeline Unplugging Technologies: Asynchronous Pulsing System" presented at Waste Management 2013

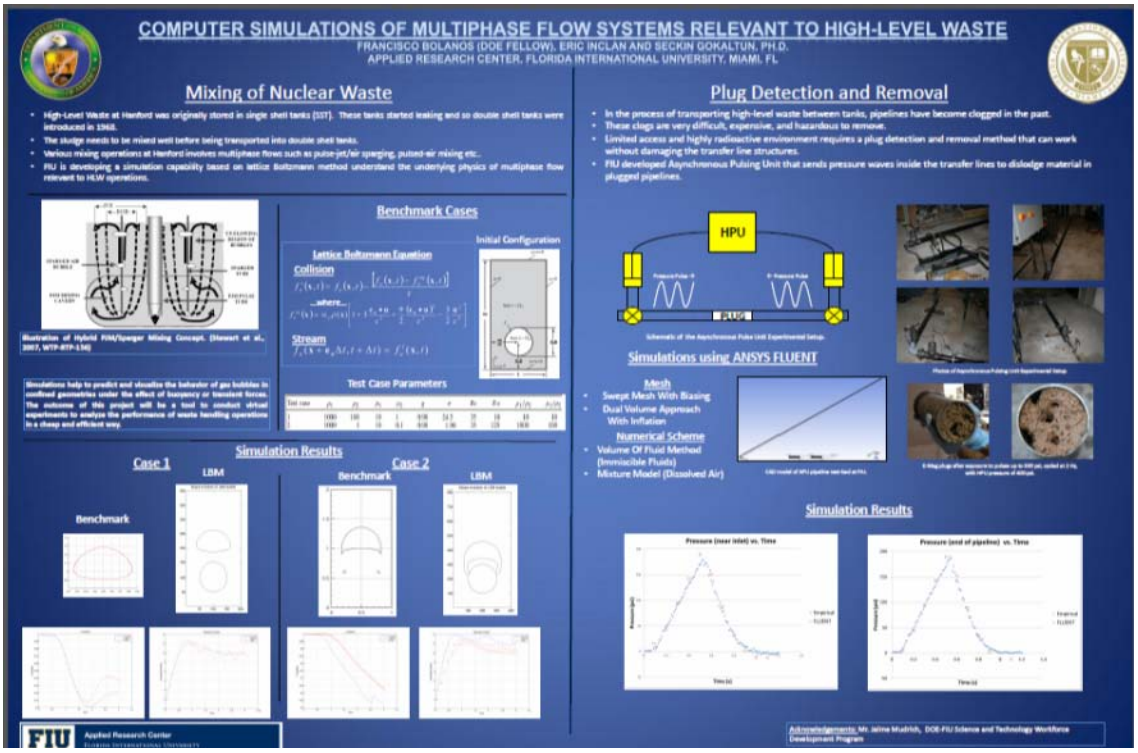

Figure 19: Poster entitled "Computer Simulations of Multiphase Flow Systems Applied to Transfer of High-Level Waste" presented at Waste Management 2013

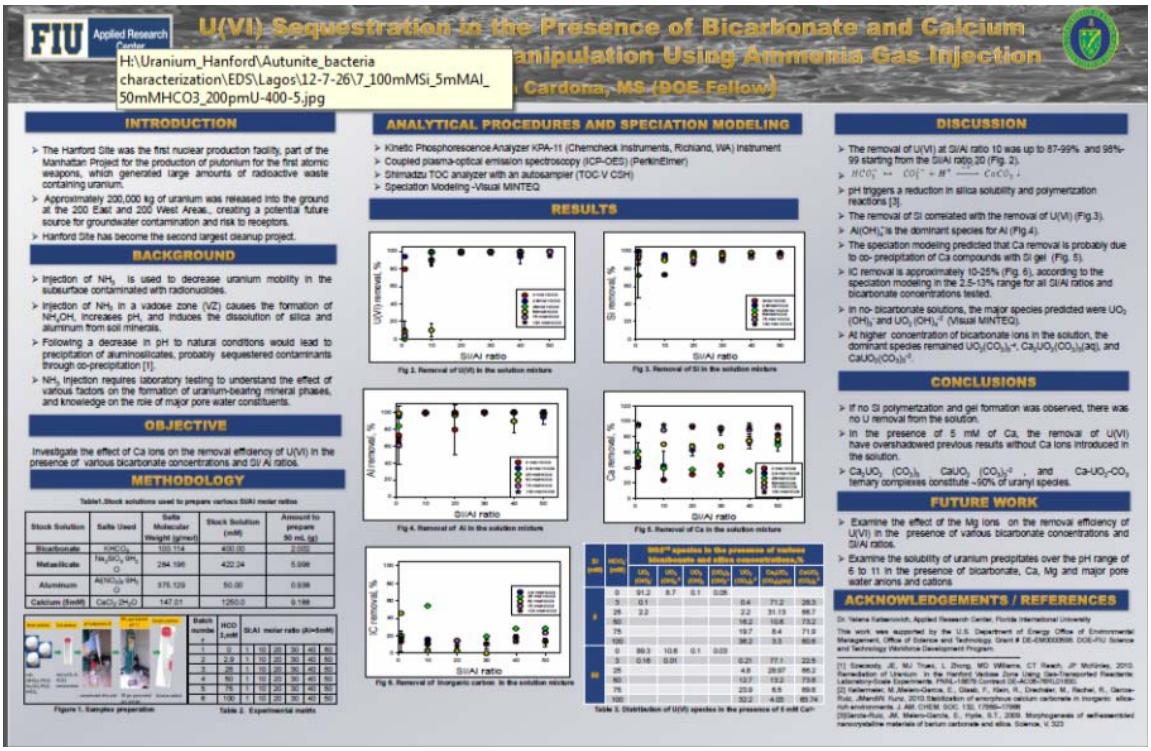

Figure 20: Poster entitled "The Effect of Ca Ions on the Removal of U(VI) at the Hanford Site Are" presented at Waste Management 2013

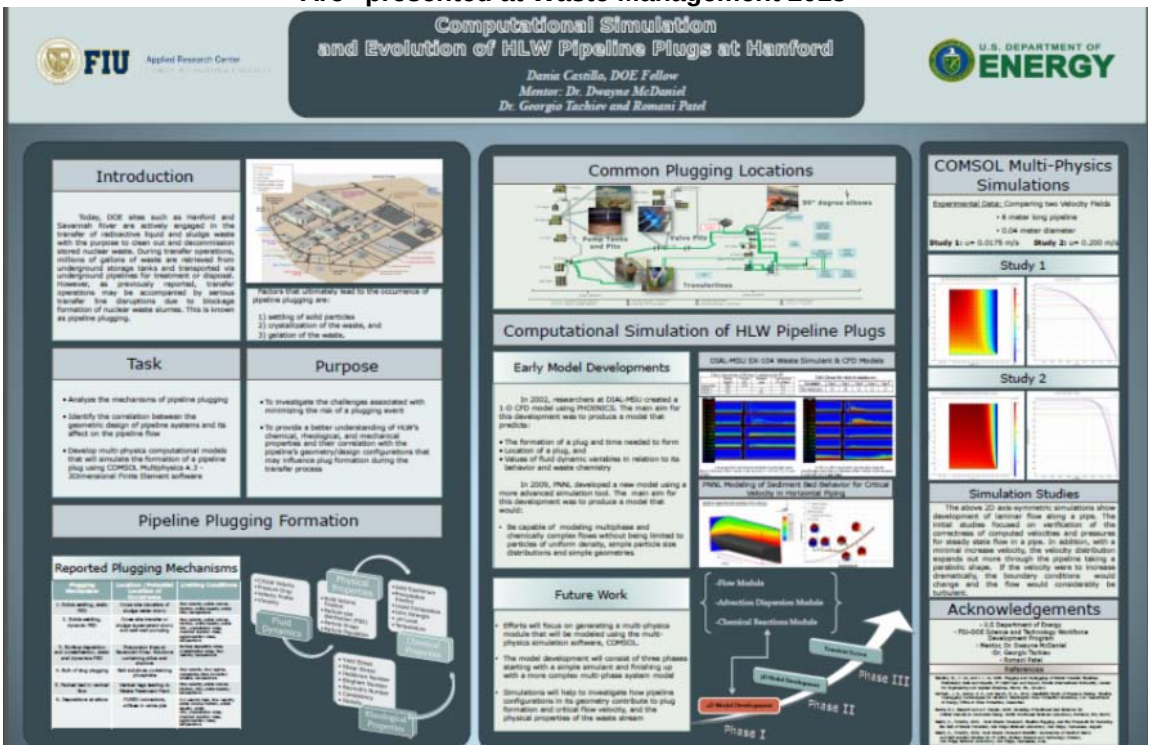

Figure 21: Poster entitled "Computational Simulation and Evolution of High-Level Waste Pipeline Plugs at Hanfor" presented at Waste Management 2013

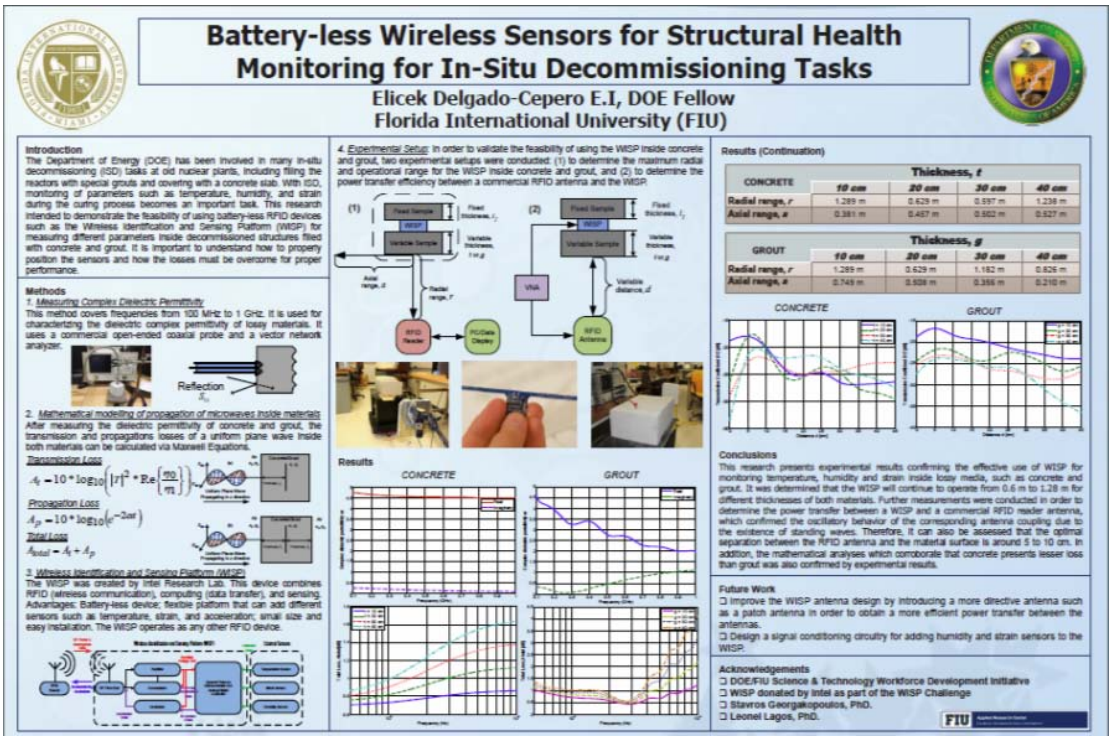

Figure 22: Poster entitled "Battery-less Wireless Sensors for Structural Health Monitoring for In-Situ Decommissioning of DOE Facilities" presented at Waste Management 2013

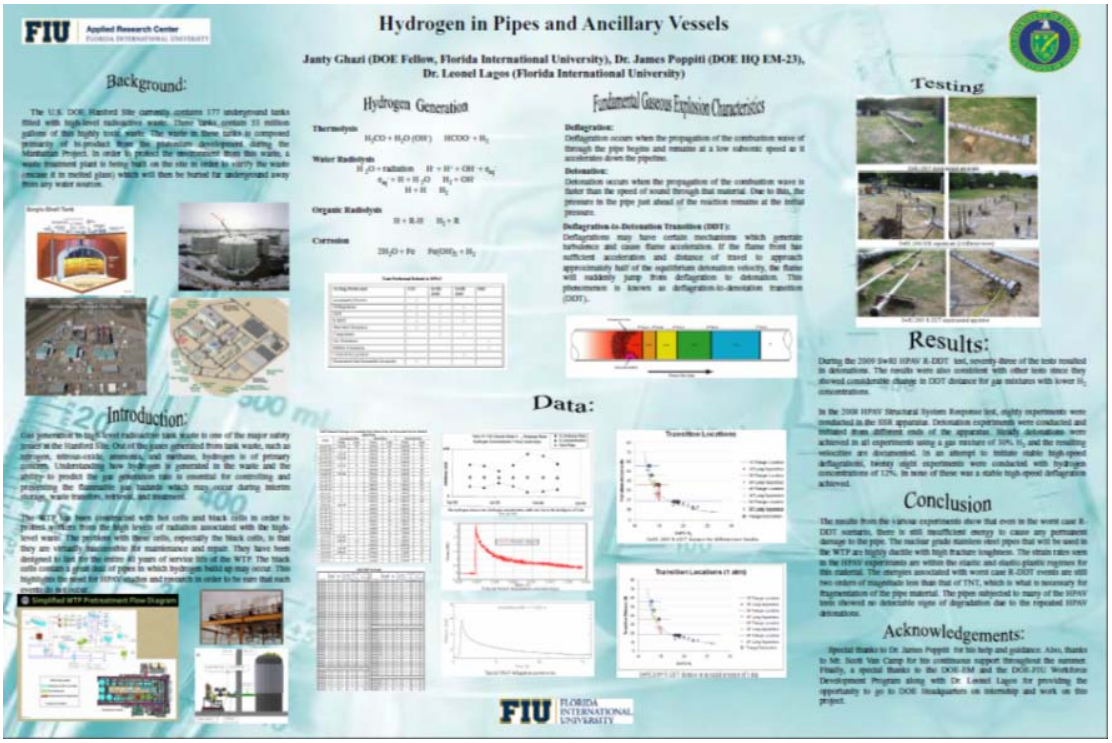

Figure 23: Poster entitled "Hydrogen in Pipes and Ancillary Vessels in Waste Treatment Plant at the Hanford Site" presented at Waste Management 2013

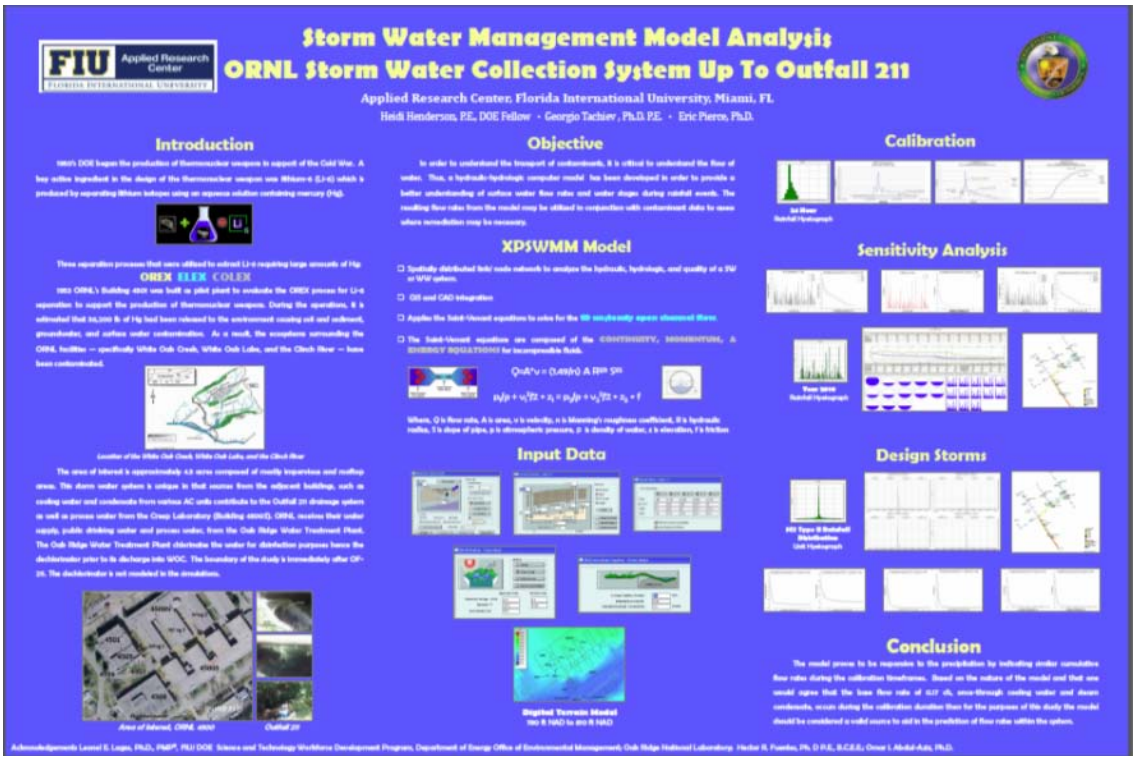

Figure 24: Poster entitled "Storm Water Management Model Analysis of the Oak Ridge Storm Water Collection System Up To Outfall 211" presented at Waste Management 2013

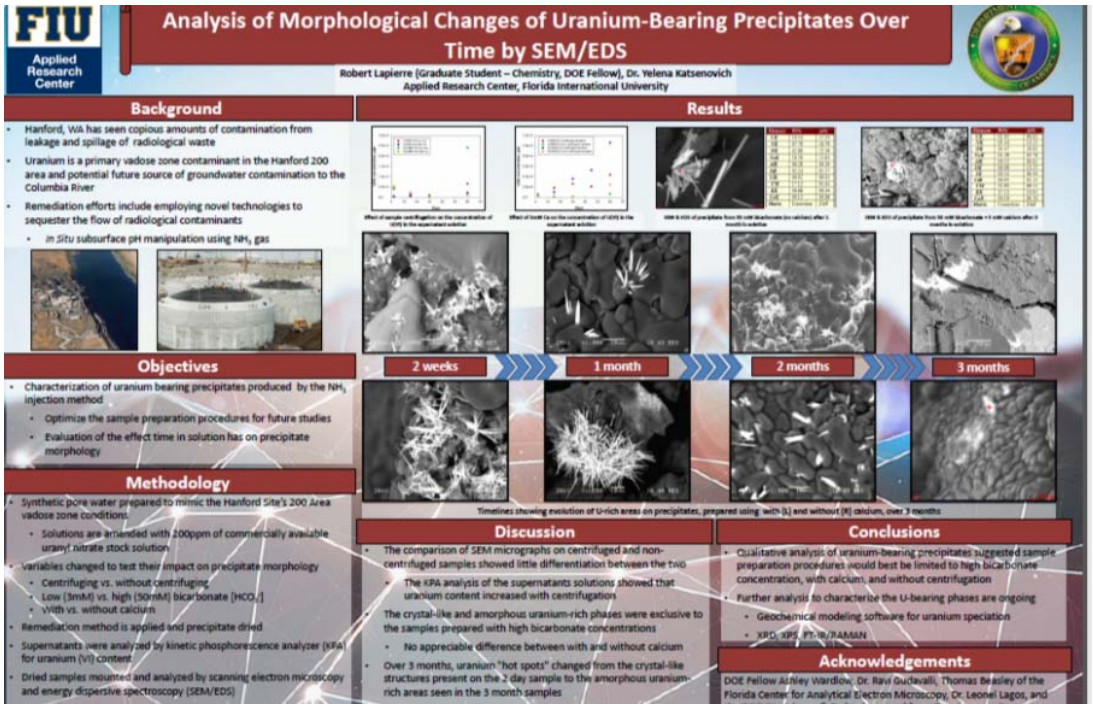

Figure 25: Poster entitled "Single Pass Flow-Through Testing of Metals for Hanford 200 Area Vadose Zone" presented at Waste Management 2013

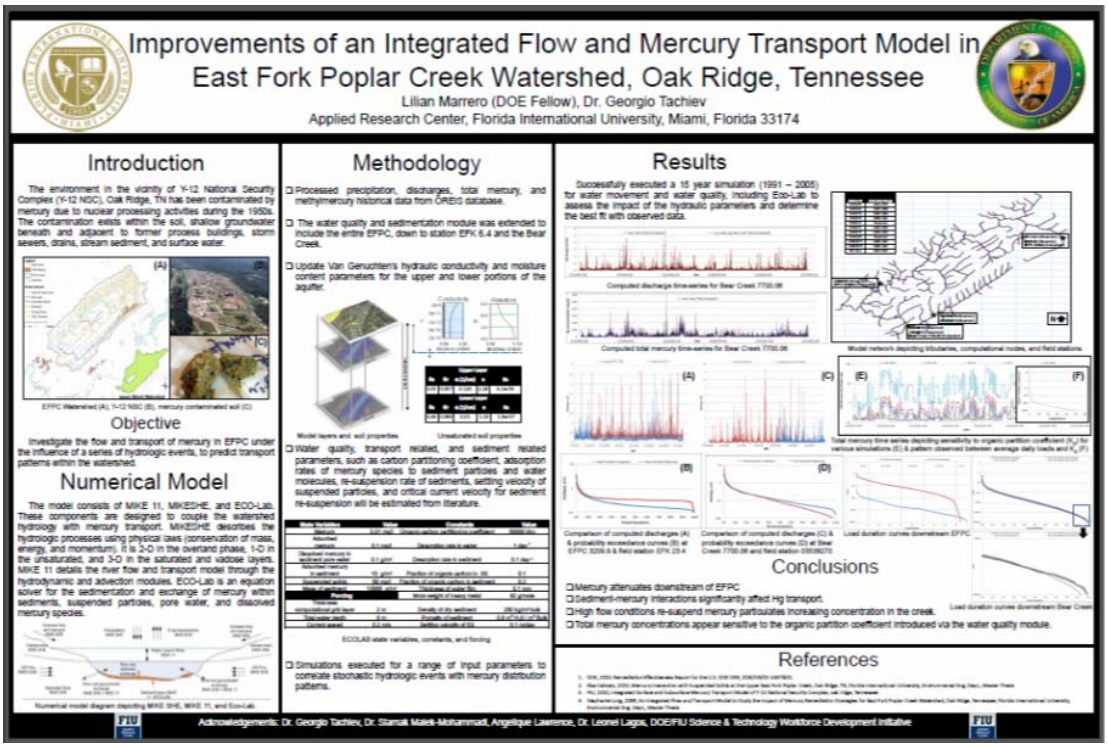

Figure 26: Poster entitled "Improvements and Modifications of an Integrated Flow and Mercury Transport Model for East Fork Poplar Creek, Oak Ridge, Tennessee" presented at Waste Management 2013

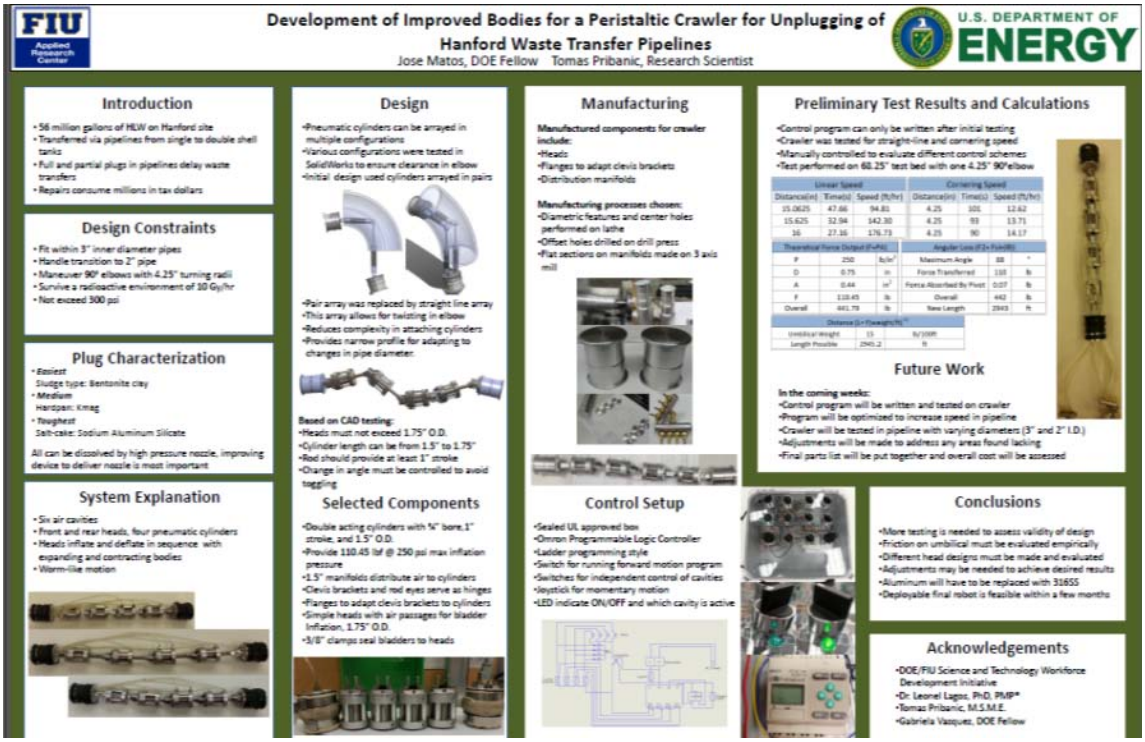

Figure 27: Poster entitled "Development of Improved Bodies for a Peristaltic Crawler for Unplugging of Hanford Waste Transfer Pipelines" presented at Waste Management 2013

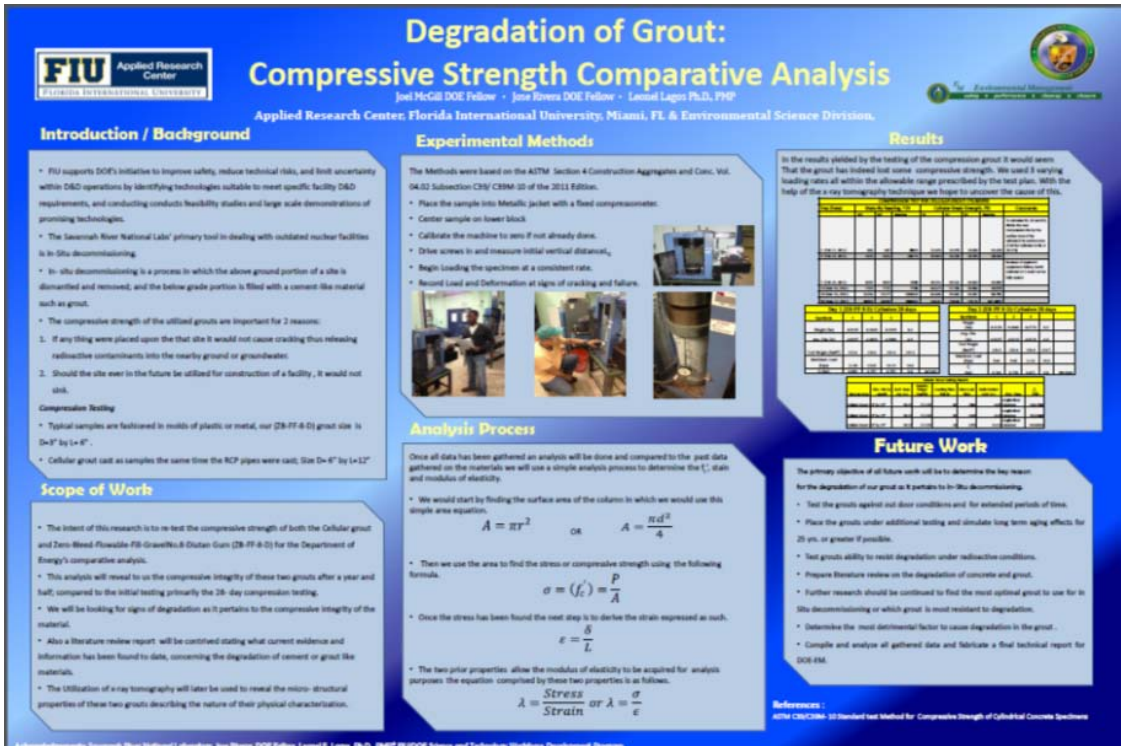

Figure 28: Poster entitled "Degradation of Grout: Compressive Strength Comparative Analysis" presented at Waste Management 2013

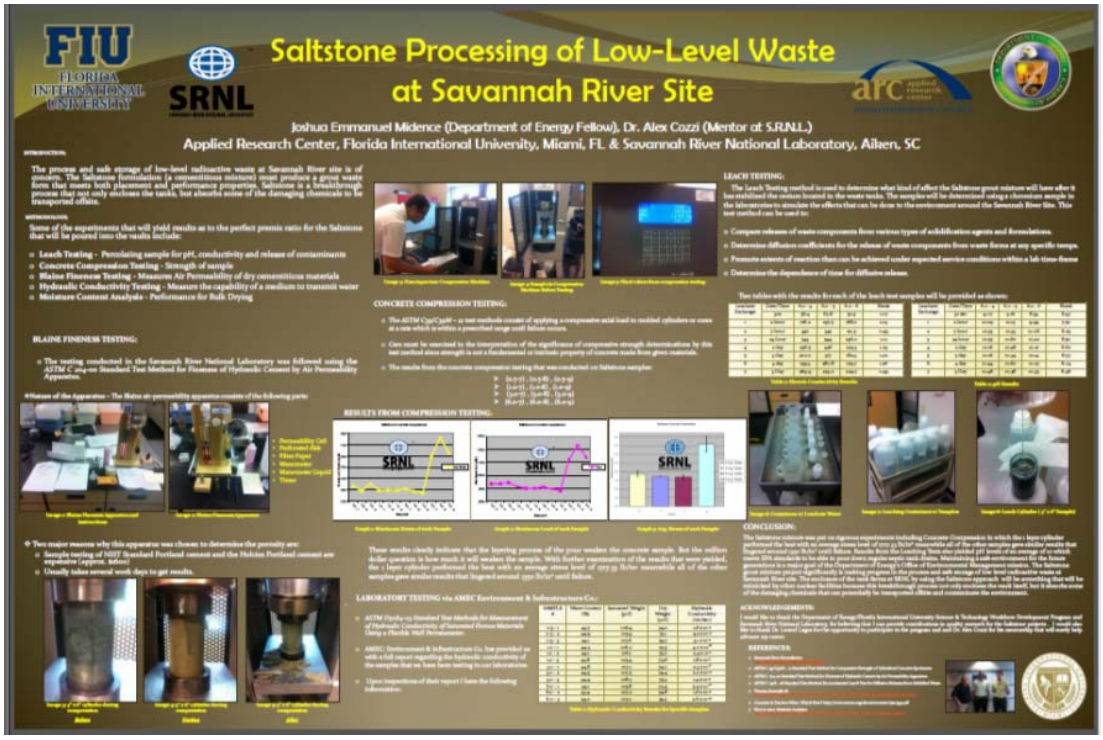

Figure 29: Poster entitled "Saltstone Processing of Low-Level Waste at Savannah River Site" presented at Waste Management 2013

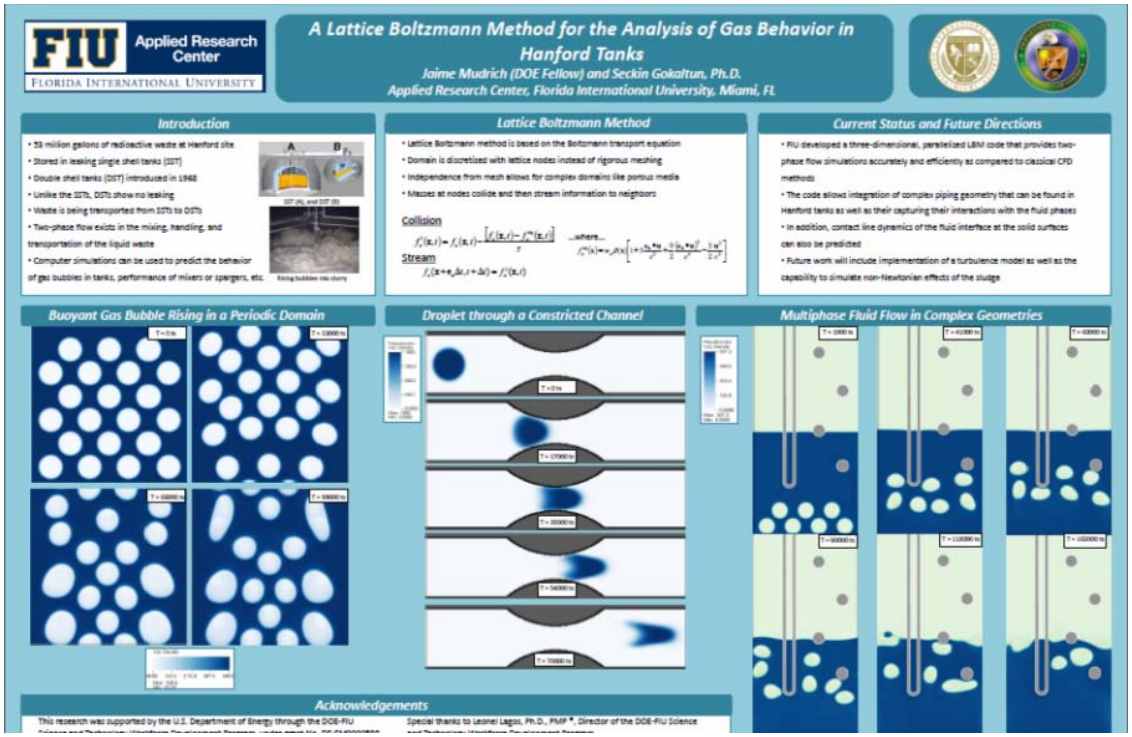

Figure 30: Poster entitled "A Lattice Boltzmann Method for the Analysis of Gas Behavior in Hanford Tanks" presented at Waste Management 2013

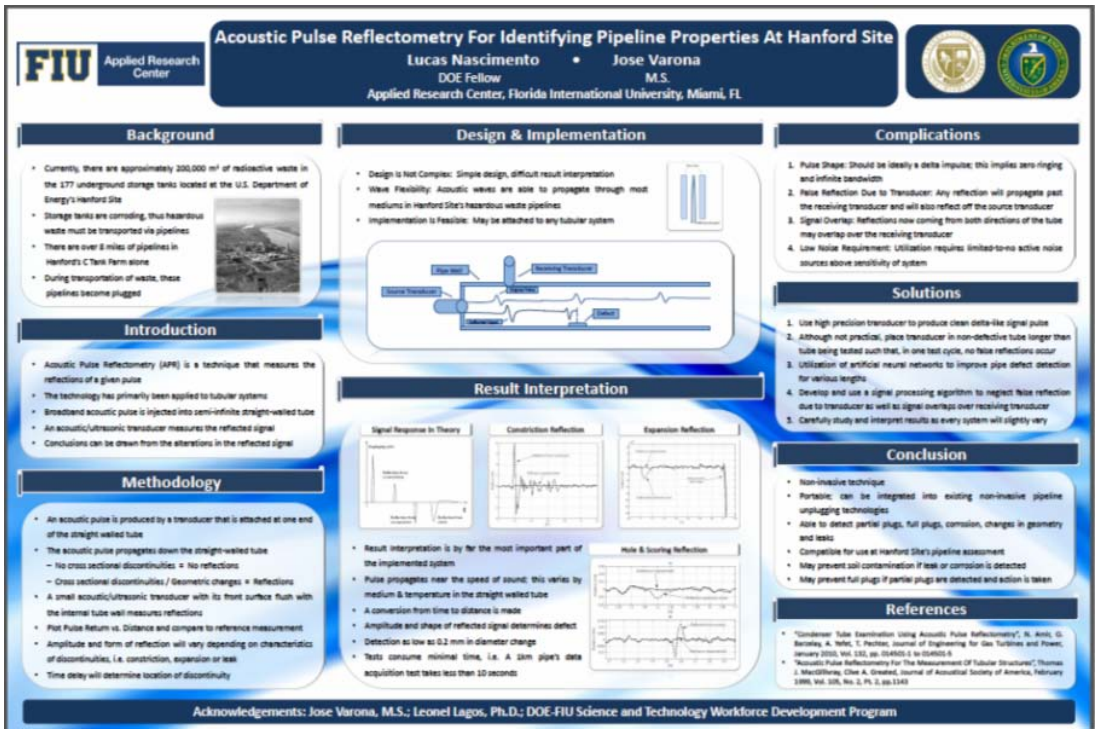

Figure 31: Poster entitled "Acoustic Pulse Reflectometry For Identifying Pipeline Properties At Hanford Site" presented at Waste Management 2013

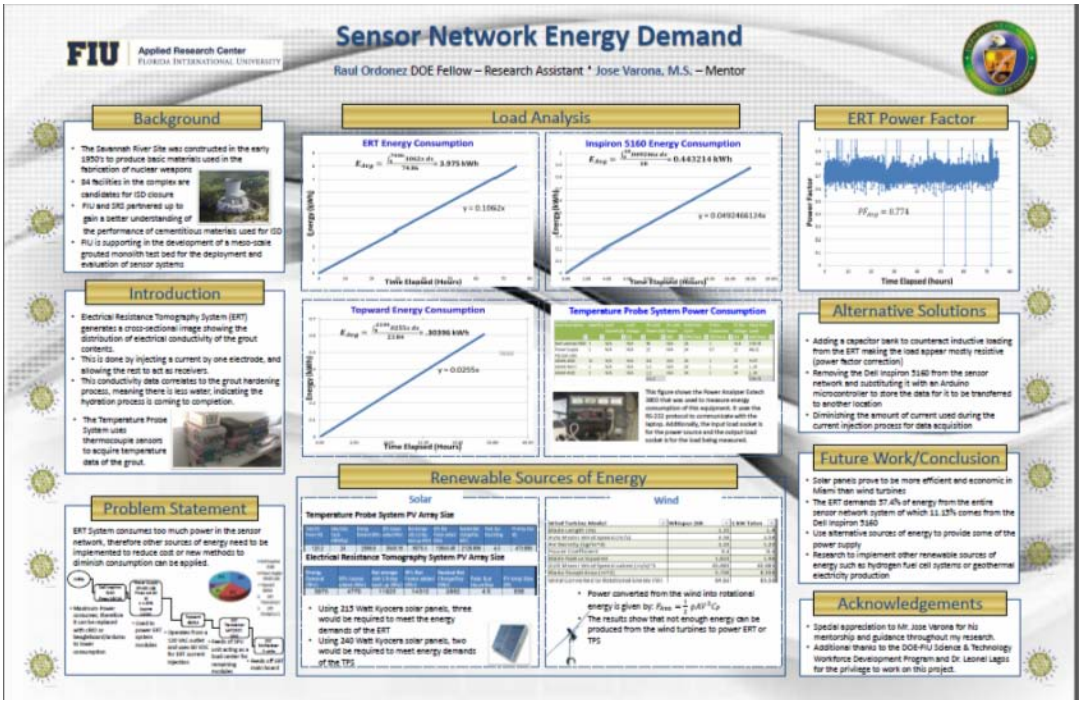

Figure 32: Poster entitled "Sensor Network Energy Demand for In-situ Decommissioning Applications at Savannah River Site" presented at Waste Management 2013

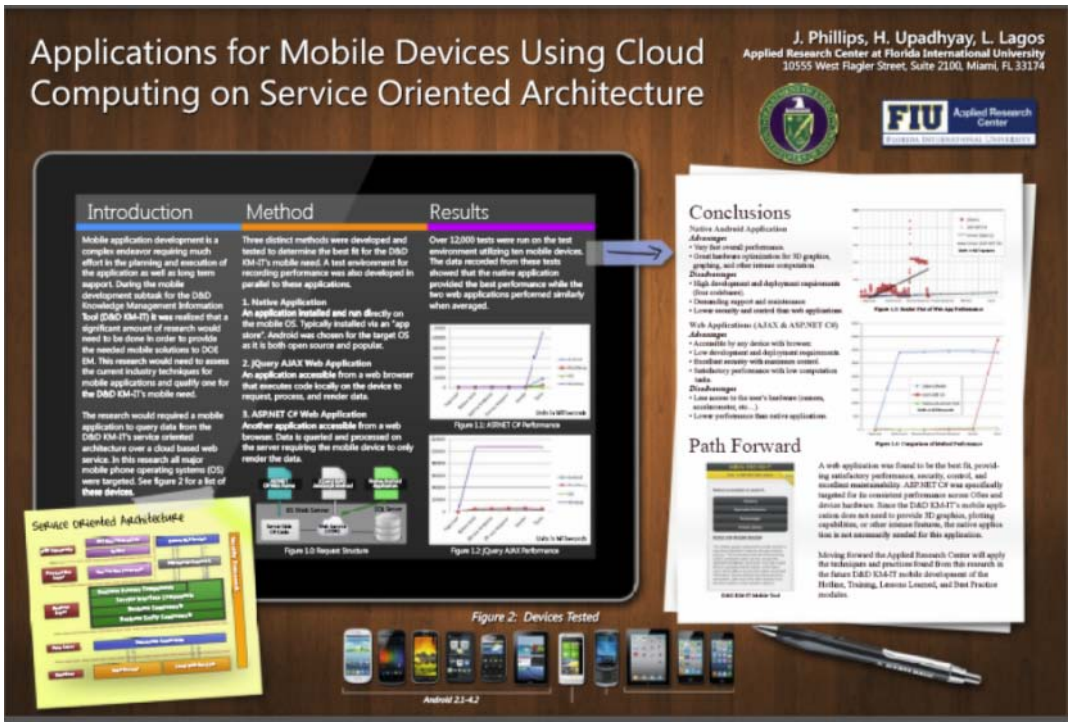

Figure 33: Poster entitled "Mobile Device Applications using Cloud Computing on Service Oriented Architecture" presented at Waste Management 2013

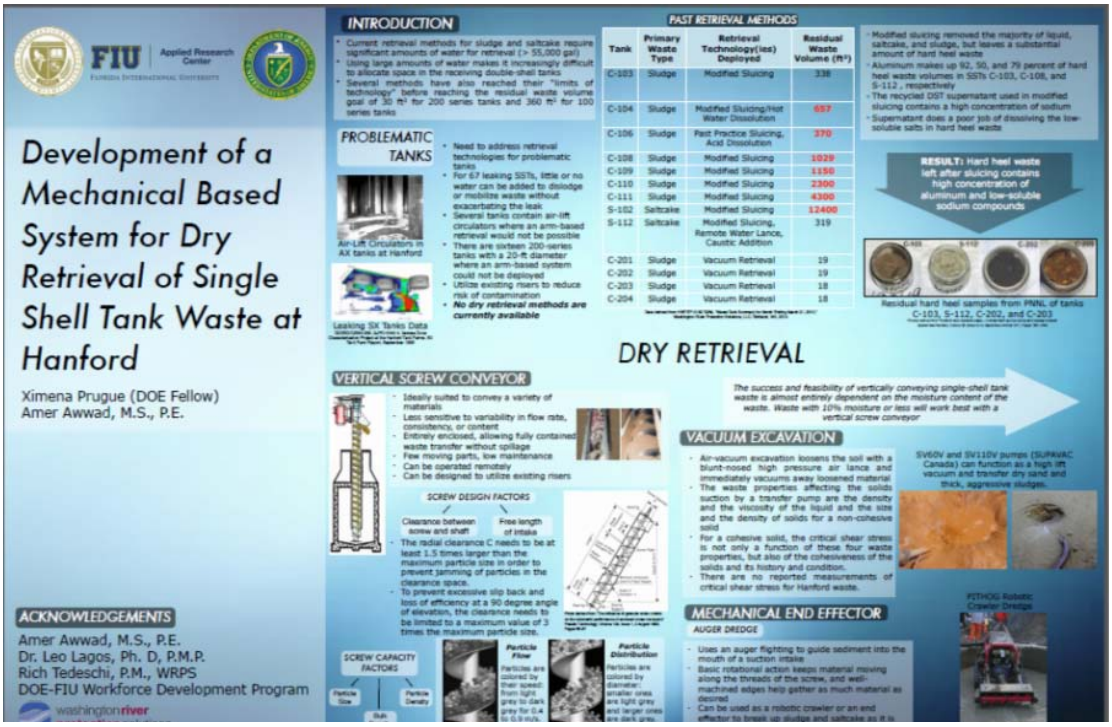

Figure 34: Poster entitled "Development of a Mechanical based System for Dry Retrieval of Single-Shell Tank Waste at Hanford" presented at Waste Management 2013

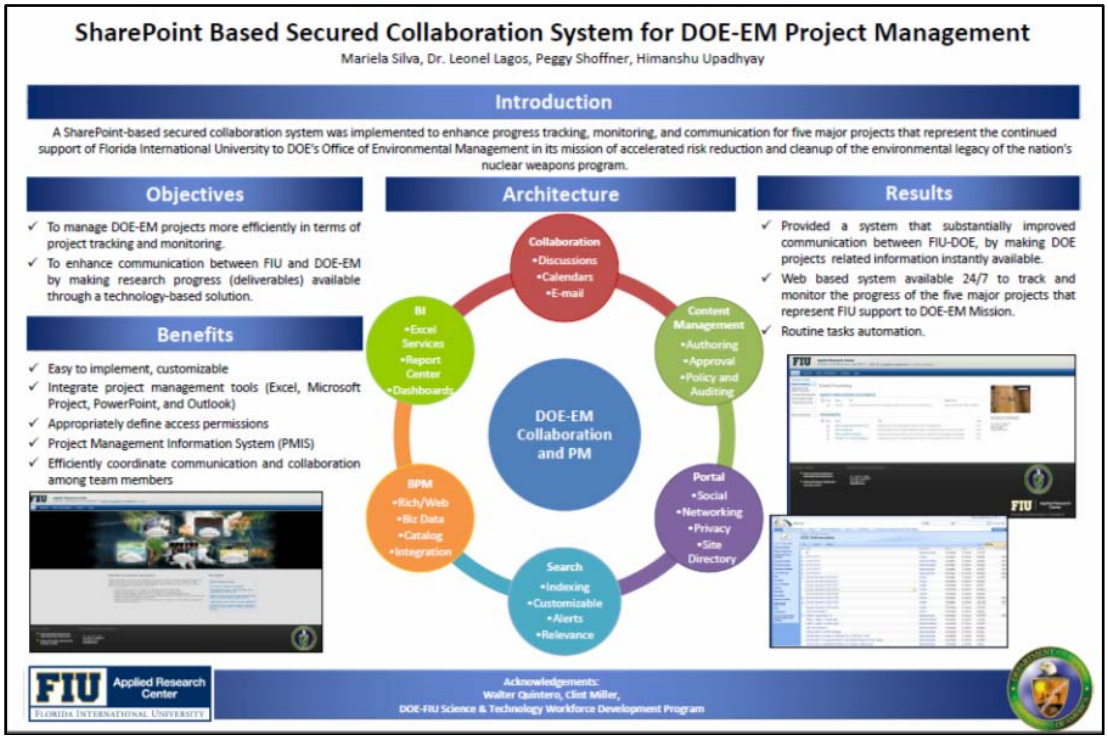

Figure 35: Poster entitled "SharePoint Based Secured Collaboration System for DOE-EM project management" presented at Waste Management 2013

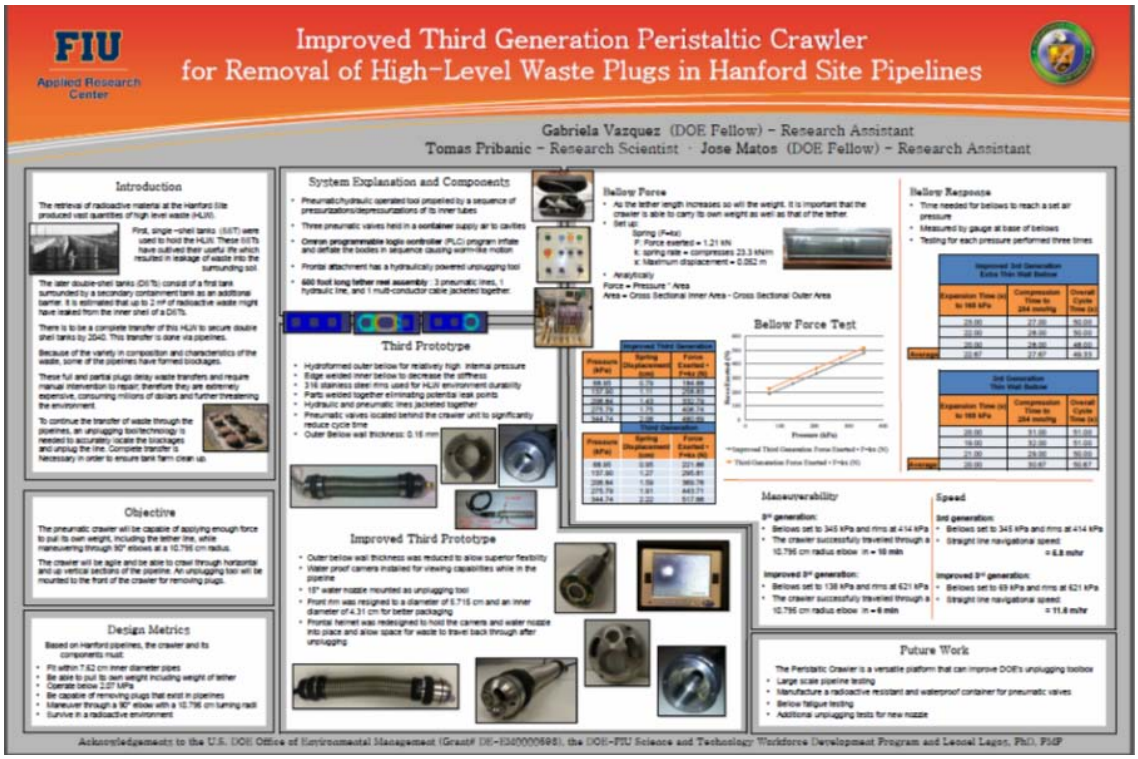

Figure 36: Poster entitled "Improved Third Generation Peristaltic Crawler for Removal of High-Level Waste Plugs in Hanford Site Pipelines" presented at Waste Management 2013

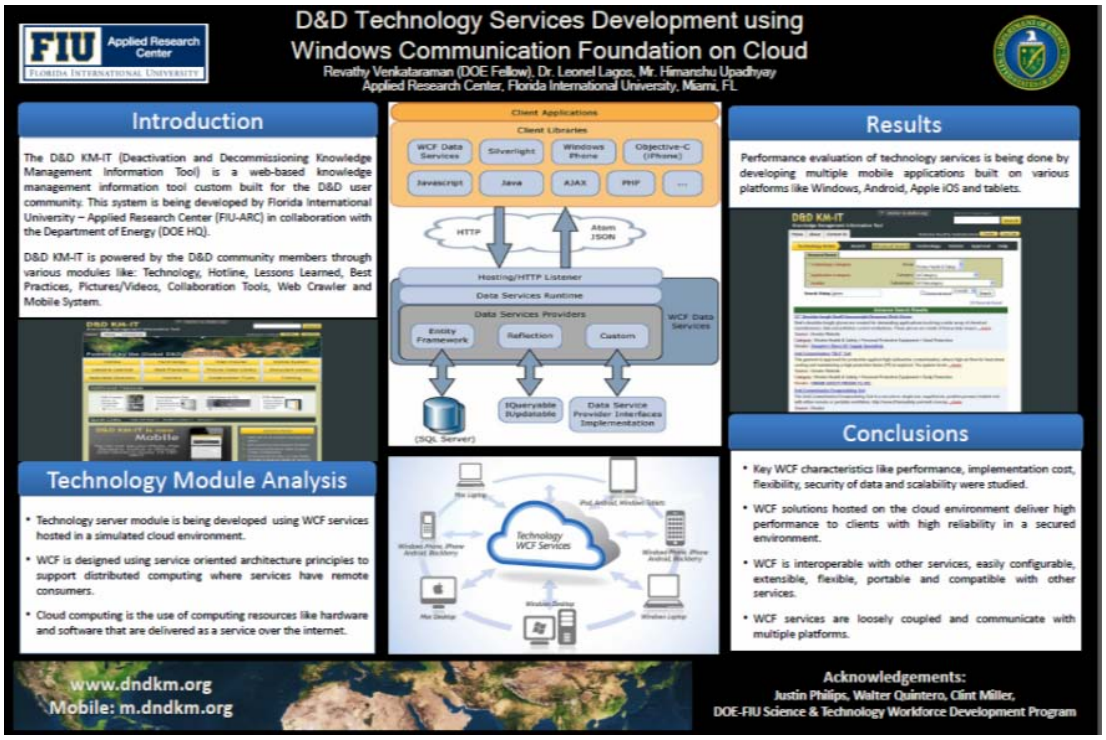

Figure 37: Poster entitled "D&D Technology Services Development using Windows Communication Foundation on Cloud" presented at Waste Management 2013

In addition, 2 DOE Fellows (Paola Sepulveda and Lilian Marrero) presented their DOE-EM research during the professional oral sessions. DOE Fellow (XimenaPrugue) participated in a panel session at the conference, Session 62 on "Graduating Students and New Engineers – Their Wants and Needs." During this panel session, students and industry and government representatives shared their perspectives of the newer generation entering a workforce primarily occupied by workers nearing retirement age (Figure 5-24). A former DOE Fellow, Rosa Elmetti (DOE EM), participated in a second panel session at WM13, Session 63 on "Young Professionals." Ms. Elmetti described her experience as a DOE Fellow and as a young professional working for DOE EM's International Program.

Figure 38: DOE Fellow XimenaPrugue presenting in the panel session *Graduating Students and New Engineers – Their Wants and Needs*

8.0 DOE FELLOWS DIRECTLY SUPPORTING DOE EM PROJECTS

The following sections report the direct DOE Fellows support to DOE EM projects around the complex. This information is also reported in 2011-2012 Year End Report - Project 4, under Task 2.

8.1 DOE's Savannah River National Laboratories Support

DOE Fellows:Jose Rivera, Alessandra Monetti, Elicek Delgado, Joshua Midence, Eric Inclan, Janty Ghazi

Mentor: Leonel Lagos (FIU-ARC)

Project: In-Situ Decommissioning Sensor Network Meso-Scale Test Bed (ISDS-MSTB)

In an effort to aid the various in-situ decommissioning projects at SRS, a meso-scale concrete test bed has been designed and is being installed at FIU-ARC in order to test various sensors imbedded in grout. This experiment consists of using various sensors including Electrical Resistivity Tomography, Advanced Tensiometers, Piezoelectric Sensors, and Fiber Optic Sensors (ERT, AT, PES, FOS) to measure various parameters including strain, crack detention, corrosion, fluid mobility, moisture, as well as a variety of others. Principal Investigators (PIs) from Idaho National Laboratory (INL), Mississippi State University (MSU), University of Houston (UH), and University of South Carolina (USC) will be providing the sensors as well as testing them. The main purpose is to recognize the limitations of these sensors for their future use in monitoring closed nuclear facilities.

Figure 39: Assembly of ISDSN sensor racks and sensor racks support assemblies.

Sensor frames and sensor racks were completed by FIU staff and students. In addition, PIs from all four institutions came to FIU facilities in Miami to install their sensors onto the FIU designed and constructed racks. DOE Fellows and graduate students as well as FIU staff provided support to the various PIs during the installation of the sensors. Over 250 remote sensors were place on 9 panel racks.

In addition, FIU coordinated the efforts of the test site development. An FIU contractor was hired to develop the test site, provide the test "cube" structure and prepare the test site. An office trailer was also rented to accommodate the data acquisition system being used by the four institutions.

Figure 40.Preparation of the "cube" test site.

Figure 41: PI's testing sensors.

Figure 42: Grout pump and filling the cube with grout.

FIU has been regularly inspecting the curing process of the grout and taking photos of the cube's surface and shell to identify visible cracks formed on the surface of the monolith. Three days after the grout dried and started to shrink, some cracks became visible around the edges of the cube and on the shell. By the end of March, some cavities had formed around some of the rods of the sensor racks. See photos below showing location of formed cracks.

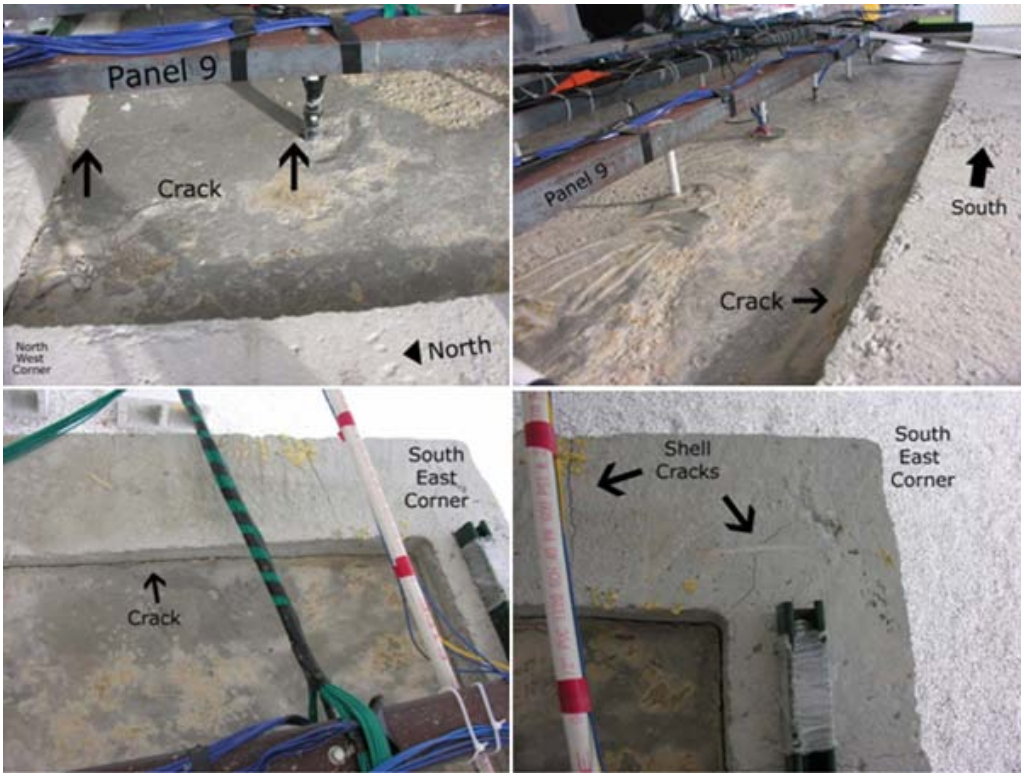

Figure 43: Cracks developing on cube surface.

Figure 44: Cavities developing around rods.

8.2 EFCOG Support

DOE Fellow: Heidi Henderson
Mentor: Leonel Lagos and Peggy Shoffner (Supporting EFCOG Working Group)
Project: Technical D&D support to DOE EM International Program & EFCOG'sD&D Lessons Learned/Best Practices

DOE Fellows continued to assist EFCOG in developing Lessons Learned and Best Practices documents. As of May22, the 185-3K Cooling Tower Demolition best practice received final DOE review and approval. FIU is working with the site point-of-contact to resolve DOE HQ comments on a lesson learned on the closure of the Reactor Maintenance, Assembly, and Disassembly Facility and the Pluto Disassembly Facility at the Nevada National Security Site. The document will then be ready for final DOE review and approval. Site release of the document was received for the lesson learned for the unanticipated high dose during the removal of wire flux monitor cabling from the HWCTR reactor vessel. This document was sent for EFCOG review. Finally, a new lesson learned for a radiological contamination event during the demolition of the Separations Process Research Unit (SPRU) building at the Knolls Atomic Power Laboratory has been drafted by a DOE Fellow and is undergoing review and revision by FIU.

The DOE Fellows are currently supporting FIU-ARC and EFCOG in the development of the Lessons Learned/Best Practices Module of the D&D Knowledge Management Information Tool. In an effort to capture the lessons learned and best practices acquired at most DOE sites, FIU worked with EFCOG to establish a formal data collection process where technical points of contact (TPC) from various sites are able to share their experiences and lessons learned with the rest of the D&D community using the KM-IT system. Three types of information are being collected from the TPC:

1. **Feedback on technology used at the sites:** The TPC will provide details on their experience using a particular technology.
2. **Official lessons learned and best practices documents from each site:** Site-specific official lessons learned and best practices documents are being collected from the TPC to be published in the Lessons Learned and Best Practices modules in KM-IT.
3. **Site experience from the TPC perspective:** General experience in the field that the TPC would like to share with the D&D community.

FIU-ARC support included the development of web based data collection and management as well as active participation of DOE Fellows during the data mining and interaction with the SMS identified by EFCOG.

Under this support, FIU-ARC provided support to the DOE EM-2.1 international partnerships and support to the DOE Bi-Lateral Agreement by providing D&D expertise, knowledge and support. In addition, FIU-ARC continued active support to DOE's Energy Facility Contractor's Group (EFCOG) by collaborating in the development of Lessons Learned and Best Practices, and other activities as identified and agreed by EFCOG and FIU-ARC. In addition, FIU-ARC participates in monthly conference calls as well as Fall, Spring, and Annual EFCOG meetings and presentations.

EFCOG Lessons Learned and Best Practices

This subtask focused on capturing the manager experience through the EFCOG points-of-contact. In an effort to capture the lessons learned and best practices acquired at DOE sites, FIU worked with EFCOG to identify various sites who were able to share their experiences and lessons learned with the EM D&D community. The development of each lessons learned and best practice was conducted with a standardized process, as shown in Figure 42.

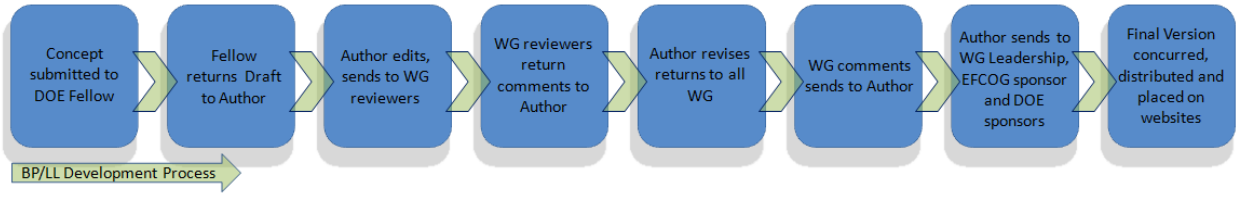

Figure 45: Process for developing Best Practice and Lessons Learned documents.

DOE Fellows continued to assist EFCOG in developing Lessons Learned and Best Practices documents. A total of 7 the Best Practices and Lessons Learned documents are final, two have recently been reviewed by DOE and are undergoing revision, and three are in development and review at FIU. The 185-3K Cooling Tower Demolition best practice was awaiting final DOE review and approval. FIU is working with the site point-of-contact to resolve DOE HQ comments on a lesson learned on the closure of the Reactor Maintenance, Assembly, and Disassembly Facility and the Pluto Disassembly Facility at the Nevada National Security Site. The document will then be ready for final DOE review and approval. Site release of the document was received for the lesson learned for the unanticipated high dose during the removal of wire flux monitor cabling from the HWCTR reactor vessel. This document is ready for EFCOG review. Finally, a new lesson learned was initiated for a radiological contamination event during the demolition of the Separations Process Research Unit (SPRU) building at the Knolls Atomic Power Laboratory. The draft of this document by a DOE Fellow is in progress.

The DOE Fellow, Heidi Henderson, prepared a poster on the development of lessons learned and best practices for DOE-EM and the EFCOG group to present at the American Nuclear Society's Decontamination, Decommissioning, and Reutilization (DD&R) conference. Finalized travel arrangements to participate in this conference.

Table 7: List of Best Practices and Lessons Learned Documents

Doc	BP/LL	Title	POC	Status as of 3/30/2013
1	BP	Explosive Demolition of Buildings 337, 337B, and the 309 Stack at the Hanford's 300 Area	Daniel Beckworth, Bob Smith, and Thomas Kisenwether	FINAL

2	BP	Open Air Demolition of Asbestos Gunite by Using a Track Mounted Wet Cutting Saw	Rob Vellinger	FINAL
3	BP	185-3K Cooling Tower Demolition	Bill Austin	FINAL
4	BP	Historical Hazard Identification Process for D&D	Paul Corrado	FINAL
5	LL	Closure of the Reactor Maintenance, Assembly, and Disassembly Facility and the Pluto Disassembly Facility at the Nevada National Security Site	Annette Primrose	Reviewed by DOE HQ. In revision.
6	LL	Unanticipated High Dose During the Removal of Wire Flux Monitor Cabling from the HWCTR Reactor Vessel	Bill Austin	FINAL
7	LL	Radiological Contamination Event during Separations Process Research Unit (SPRU) Building Demolition	Brad Smith	Reviewed by DOE HQ. In revision.
8	BP	Structural Code Guidance for D&D Activities at DOE Facilities	Kirk Dooley	FINAL
9	BP	Electrical Code Guidance for D&D Activities at DOE Facilities	Kirk Dooley	FINAL
10	BP	SRS R and P -Reactor Disassembly Basin In Situ Decommissioning	Bill Austin	Under development and review at FIU.
11	BP	Use of Earthen Benches and other Technologies to Support River Structures' Demolition Activities	Brad Smith	Drafted. Under review at FIU.
12	BP	327 Facility Source Term Stabilization and/or Removal Prior to Demolition	Brad Smith	Drafted. Under review at FIU.

9.0 INTRODUCTION TO DOE FELLOWS AND THEIR RESERCH WORK

9.1 DOE Fellows and their Research: Class of 2012-2013–SixthCohort

DOE Fellows Spring recruitment efforts started during the month of March. During this period, the current DOE Fellows and program director will host an Information Session for potential candidates, conduct recruitment campaigns by placing recruitment tables at College of Engineering, participate in the FIU College of Arts and Science's Job and Internship Fair, and make short presentations at targeted classes within the College of Engineering and College of Arts and Sciences.

Jennifer Arniella (Mechanical Engineering)

Jennifer Arniella is a junior undergraduate student pursuing a bachelor's degree in mechanical engineering at Florida International University (FIU). Her interests include engineering design, robotics, renewable energy and eco-friendly engineering. She is a member of the Society of Hispanic Professional Engineers (SHPE) at the FIU Chapter. She plans to continue her education in pursuit of a master's degree in engineering management upon completion of her bachelor's degree in the Spring of 2014.

Current commercially available pipeline unplugging technologies do not provide results that are cost-effective and reliable. Pumping high-level waste (HLW) between storage tanks or treatment facilities is a common practice performed at Department of Energy (DOE) sites. As part of the research objectives at FIU, novel pipeline unplugging technologies that have the potential to efficiently remediate cross-site and transfer line plugging incidents are being developed. Jennifer is currently working on the asynchronous pulsing system (APS) project mentored by Dr. AmerAwwad. The APS is based on the idea of creating pressure waves in the pipeline filled with water from both ends of the blocked section in order to dislodge the blocking material via forces created by the pressure waves. The waves are generated asynchronously in order to break the mechanical bonds between the blockage and the pipe walls as a result of the vibration caused by the unsteady forces created by the waves. Jennifer's main role has been assisting the team with the execution of pressure measurement trials. She makes sure the area is clean and ready for the trials to be performed. Also, she organizes the data collected from the sensors in Microsoft Excel to be able to create graphs that help analyze and compare all the information. Jennifer has also collaborated by creating drawings in Microsoft Visio to follow when constructing the testing pipelines. Finally, Jennifer assisted in the pipeline construction and installment of all the fittings and sensors needed to execute the experiments.

Francisco Bolanos (Mechanical Engineering)

Francisco Bolanos currently holds a Bachelor of Arts in business management economics from the University of California Santa Cruz. He is currently pursuing a Bachelor of Science degree in mechanical engineering at Florida International University after which he plans on continuing his education with a master's degree.

Dania Castillo (Civil Engineering)

Dania Castillo is an undergraduate student pursuing a bachelor's degree in civil engineering at FIU. She is currently an active member of the American Society of Civil Engineers (ASCE) student chapter at FIU. Dania has worked as a research assistant during the installation of the 12-Fan in the Wall of Wind Laboratory at FIU's Engineering Center. Her focus of study is structural engineering and her interests include architectural engineering, environmental design, sustainable site developments and other green building operations. After graduating with a bachelor's, Dania plans to continue her studies by pursuing a master's degree.

Today, many DOE sites such as Hanford, Oak Ridge and Savannah River, are actively engaging in the transfer of radioactive liquid and sludge waste with the purpose of cleaning out and decommissioning tankscontaining nuclear waste. During transfer operations, millions of gallons of waste are retrieved from underground storage tanks and transported via underground pipelines for treatment or disposal. However, as numerously reported , blockage formation of nuclear waste slurries frequently disrupt the transfer lines which can escalate the remediation costs and pose to serious dangers to the environment. Dania is currently working under the mentorship of Dr. Dwayne McDaniel on the Computational Simulation and Evolution of HLW Pipeline Plugs. Dania will be creating and using transport models to analyze and gain a better understanding of the mechanisms behind pipeline plugging. With a collection of model testing and intensive laboratory research, Dania will assist in identifying the correlations between the geometric design of pipeline systems and its effect on pipeline flow.

DayronChigin (Electrical Engineering)

DayronChigin is currently pursuing a Bachelor of Science degree in electrical engineering at FIU with an expected graduation date of Fall 2014. His professional interests include power systems, control systems, integrated nano-technology, communications and data system software.

Dayron graduated from John A. Ferguson Senior High School in the top 1% of his class. Upon graduation, Dayron was recognized with an International Baccalaureate (IB) program diploma. Dayron has been recognized in the Dean's List on numerous occasions for his outstanding academic achievements. His is the recipient of FIU's Academic Excellence Scholarship Award along with a full Bright Futures Scholarship and has been recognized by the McNair Fellows program for academic excellence. He was nominated into Tau Beta Pi Engineering Honor Society for being part of the top 10%. He also participates in professional societies such as the Society for Hispanic and Professional Engineers and Delta Epsilon Iota Honor Society.

During the summer of his freshman year, Dayron decided to be part of the Theta Chi social fraternity, originally founded in 1856. At the time of his initiation, Dayron was known as a founding father of the Iota Omicron Chapter of Theta Chi Fraternity at Florida International University. Within this fraternity, Dayron takes part in multiple philanthropic events such as FIU's Nature Preserve Program, FIU's Relay for Life, Beach Clean Up, and Cheers for Troops. Dayron is also an active participant in other events such as Baptist Hospital's Relay for Life, the Ronald McDonald House, and Lakes of the Meadow's Relay for Life.

Robert Lapierre (Chemistry)

Robert Lapierre graduated from Florida International University in Spring of 2012 with a Bachelor of Science in chemistry. He is currently pursuing a master's in chemistry in the fall of 2012. As an undergraduate, he spent 2-3 years working with Dr. Jose Almirall of FIU's International Forensic Research Institute (IFRI) doing research relating to novel planar solid phase micro-extraction (PSPME) devices, techniques and the detection of the trace volatile components of explosives by ion mobility spectrometry. Robert has since joined ARC as a DOE Fellow and graduate research assistant focusing on the hazardous waste/uranium remediation efforts at the Hanford Site. He spent the summer of 2012 working at Pacific Northwest

National Laboratory (PNNL) with his mentor, Dr. Dawn Wellman, on single-pass flow-through (SPFT) corrosion studies of solids and surfactant analysis relating to the delivery of chemicals into the deep vadose zone at the Hanford Site.FIU's Applied Research Center works closely with the Department of Energy Office of Environmental Management on projects relating to the environmental cleanup efforts they are involved in, including the remediation of uranium in the Hanford vadose zone. Robert is currently being mentored by Dr. Yelena Katsenovich and working on a project related to uranium sequestration by pH manipulation using NH3 gas.

Joel McGill (Civil Engineering)

Joel McGill graduated from FIU in the Spring of 2012 with a bachelor's degree in civil engineering and a specialty in environmental engineering. While pursuing his undergraduate degree, Mr. McGill was the treasurer of the National Society of Black Engineers (NSBE), as well as the secretary for the fraternity of Alpha Phi Alpha Fraternity Inc. Joel began his pursuit of a master's degree in civil engineering at Florida International University in the Fall of 2012. Mr. McGill is intrigued by both water and soil remediation and clean sustainable sources of energy as it pertains to environmental matters.

Lucas Nascimento (Electrical Engineering)

Upon being hired as a DOE Fellow, Lucas Nascimento was pursuing a Bachelor of Science in electrical engineering with concentrations in both integrated nano-technology and communication systems at FIU. He recently graduated in the Spring of 2013.

As a U.S. Department of Energy Fellow, Lucas worked under the mentorship of Jose Varona and was assigned to Project 4 Task 2 focusing on D&D Support to DOE EM for Technology Innovation, Development, Evaluation and Deployment. He was assigned with developing a LabVIEW VI to model an electrical resistivity tomography (ERT) for superior data acquisition. The ERT uses a thermocouple system to test and attain results of properties of materials surrounding the thermocouple which is applied to determine the solid concentration of a mixture of hazardous waste in high level waste tanks. Setting the thermocouples systematically allows for a more accurate array of results which will be compiled in the improved VI. This model will enable a shared-variable network that can be used to pool data from the thermocouple systems into one location for post-processing. This is done with the

intent of eliminating the need for one of the computing units, thereby reducing power consumption.

Raul Ordonez (Electrical Engineering)

Upon being hired as a DOE Fellow, Raul Ordonez was pursuing a Bachelor of Science in electrical engineering with a minor in mathematics at Florida International University. His expected graduation date is Spring of 2013. Raul's professional interests include power systems, communications systems, and eco-friendly engineering that prevents hazardous nuclear waste from contaminating the environment. After earning his bachelor's degree, Raul intends to deepen his education by obtaining a master's degree in electrical engineering.

Raul is currently working under the mentorship of Jose Varona on a project that focuses on delivering solutions under the decontamination and decommissioning and waste areas in support of DOE Office of Environmental Management. Raul's task is to design a mobile renewable energy system to power two loads, Electric Resistance Tomography System and Temperature Probe System, used for a sensor network project whose objective is to monitor fluid flow and transport through grout and concrete by installing embedded sensors in an offsite meso-scale test bed. Additionally, he will aid Mr. Jose Varona in the implementation of a photovoltaic grid system for the test site.

Valentina Padilla (Environmental Engineering)

Valentine Padilla graduatedmagna cum laude with a Bachelor of Science in environmental engineering . She was on the dean's list for 12 semesters and was the recipient of the outstanding graduate award in environmental engineering for the Spring 2013 graduating class. She was also inducted to Tau Chi Alpha, the National Environmental Engineering Honorary, and the Golden Key Honor Society, which recognizes only the top 15% of students in all disciplines of the University.

I have also been involved in student organizations She formed part of the Alpha Omicron Pi; a social sorority, standards committee.Her role was to ensure that all members of the sorority abided by the rules and regulations. In search of more leadership experience she joined the Panthellenic Council, which is responsible for all seven sororities and is the biggest women's organization on campus with over 500

members. During her first year on the Council as a Rho Gamma, she guided a group of twenty-eight female students through the entire sorority recruitment process. In her second year, she was elected Vice President of Programming where her responsibilities included planning, fundraising and assisting with over fifteen events, including Women's Empowerment weeks, Panhellenic Week, and Recruitment Week.

She has been competitively selected to participate in the FIU-DOE Science and Technology Workforce Development Program at FIU's Applied Research Center. This fellowship has allowedher to continue pursuing a master's degree in environmental engineering. Her research as a DOE Fellow evaluates the bioremediation of groundwater after the injection of ammonia gas at the Hanford Site in Washington State. She was schedule to participate in an internship at the Savannah River National Laboratory where she will be supporting the efforts of the in situ bioremediation of the F-area. This research will be part of her thesis topic.

Mariela Silva (Engineering Management)

Mariela Silva graduated from Venezuela's Central University with a bachelor's degree in petroleum engineering (2001), and has a certification in operations research by (2006). Her bachelor's degree thesis was to study the applications and advantages of a reversible invert emulsion in waste management operations. Her interests are in operations research and project management fields. Ms. Silva is now pursuing a master's degree in engineering management at Florida International University. Her expected graduation date is December 2013.

Mariela Silva is currently working with Peggy Shoffner on the preparation of monthly and quarterly reports for the DOE that summarize ARC's activities under the DOE Cooperative Agreement. Mariela is also tracking and monitoring all the work progress milestones and deliverables on the five major projects that represent FIU-ARC's continued support to the Department of Energy's Office of Environmental Management (DOE-EM). The projects are important to EM's mission of accelerated risk reduction and cleanup of the environmental legacy of the nation's nuclear weapons program.

Gabriela Vazquez (Mechanical Engineering)

Gabriela Vazquez graduated from Florida International University with a bachelor's degree in liberal studies in 2011. Upon graduation, she worked as a middle grades international baccalaureate teacher at Ponce de Leon Middle School. She is currently completing a second bachelor's degree in mechanical engineering. Her expected graduation date is the Fall of

2014. Her research interests include semi-autonomous robotics and mechanical design of power systems. After the completion of her bachelor's degree, Gabriela plans to continue her education in pursuit of a master's degree in engineering management.

The US DOE Hanford Site contains high level waste (HLW) with a complex chemical composition and diverse physical characteristics. Consequently, transfer pipelines have become clogged with substances that possess a variety of properties (high radioactivity sludge and crystallized precipitates, among others) making the clogs very difficult to remove.

Florida International University (FIU) has previously tested and evaluated various unplugging technologies through an industry call. Through mockup testing, the technology that showed the most potential to withstand the rigors of operation in a radioactive environment and have the ability to handle sharp 90° elbows was AIMM Technologies' hydrokinetics method. Based on the lessons learned from the underlying physics shown in the data analysis yielded form AIMM's experimental testing, two new pipeline unplugging technologies were proposed. These are the asynchronous pulsing system (APS) and the peristaltic crawler.

The APS is based on the principle of creating pressure waves in the pipeline filled with water from both ends of the blocked section in order to erode the blocking material by the forces created by the pressure waves. The waves are created asynchronously in order to shake the blockage as a result of the unsteady forces created by the waves. The peristaltic crawler is a pneumatic operated crawler that propels itself by a sequence of pressurization/depressurization of cavities (inner tubes). The changes in pressure result in the translation of the vessel by peristaltic movements.

Working under the supervision of Mr. Tomas Pribanic, Gabriela will assist in the experimental testing of the asynchronous pulsing system and the third-generation peristaltic crawler.

RevathyVenkataraman (Information Technology)

RevathyVenkataraman is currently pursuing her master's degree in information technology at Florida International University. Her expected graduation date is Fall of 2013. Previously, she worked as an Applications Programmer in Fidelity National Information Services, Sunrise, FL. She has a bachelor's degree in electrical and electronics engineering from Madras University, India. Revathy's professional interests include Microsoft .NET technologies and cloud computing.

Currently, Revathy is interning at the Y-12 National Security Complex in Oak Ridge, TN, for the summer of 2012. She is working on the EMBOS software under the supervision of Emma Jones and Jessica Metcalf. EMBOS is an electronic medical records management system that is currently used at Y-12 medical offices to maintain medical histories, questionnaires, and manage case histories. It is also used to schedule patient appointments and store spirometry, X-ray, ECG, vision, audiometer and urinalysis lab result files.

Revathy is designing and developing an automated .NET batch process to upload medical lab files to EMBOS. This will save time and help reduce manual work performed by lab assistants in uploading lab results to EMBOS.

10.0 SUMMER 2013DOE FELLOWS INTERNSHIPS

Prior to the start of internships, the DOE Fellows program director and the DOE Fellows organized and conducted teleconferences with most of the summer mentors at the respective facilities. In addition, the DOE Fellows contacted their summer mentors and developed a preliminary scope of work document containing a description of their summer internship assignments at the various locations. The following table details the DOE Fellows summer 2012 and summer 2013 internships.

Six (6) DOE Fellows from Florida International University (FIU) participated in summer internships across the DOE Complex. As part of the DOE-FIU Science and Technology Workforce Development Program, DOE Fellows participated in the 10-week summer internships where they were paired with scientists and engineers at DOE Headquarters, DOE facilities and national research laboratories.The DOE Fellows spent their summer workingat DOE program offices or on environmental research projects under the guidance of their site mentors. At the conclusion of their internships, DOE Fellows document their summer activities and results in a summer internship report and have the opportunity to present their accomplishments during the annual DOE Fellow's Poster Exhibition held every October at the Applied Research Center (ARC) at FIU.

The DOE Fellows who participated in 2013 summer internships include:

Table 8: List of DOE Fellows at Internships during 2013

DOE Fellow	DOE Site/ Lab/Contractor	Location	Mentor
Gabriela Vazquez	DOE-HQ EM-30	Germantown	Christine Gelles
Paola Sepulveda	DOE-HQ EM-12	Germantown	Skip Chamberlain
Joel McGill	DOE-HQ EM-02	Washington, DC	Ana Han
Valentina Padilla	Savannah River Site	Aiken, SC	Miles Denham
Jennifer Arniella	Hanford Site	Richland, WA	Ruben Mendoza
DayronChigin	Hanford Site	Richland, WA	Dennis Washenfelder

Our six summer interns are being exposed to DOE EM technical challenges by working at DOE-HQ, SavannahRiver National Laboratory, and the Hanford Site (Figures 5-1 to 5-3).

Figure 46: DOE Fellows DOE HQ interns meeting FIU President Dr. Mark Rosenberg

Figure 47: DOE Fellows interns (Jennifer Arniella and DayronChigin) with other summer interns at Hanford

10.1Summer Internship Location: DOE-HQ EM-12 - Germantown

Paola Sepulveda

During the summer of 2013, Ms. Paola Sepulveda interned with the Office of Environmental Management at Department of Energy Headquarters in Germantown, Maryland. During this time, Paola assisted Mr. Kurt Gerdes, Director of the Office of Soil and Groundwater, EM-12. EM-12 supports EM's mission by providing integration, planning, analysis, and guidance for ensuring safe and effective management and remediation of contaminated soil and groundwater with the goal of reducing risk and the life cycle cost of remediation. Her main role was to complete a database identifying DOE sites using pump and treat systems for groundwater remediation. Summarizing the area, contaminants present, costs, and year of operation. This database will eventually be used to update the End-States Analysis.

10.2Summer Internship Location: DOE-HQ EM-02 - Germantown

Joel McGill

Mr. Joel McGill has deeply enjoyed his time at DOE Headquarters; he feels it has been both eye opening and an invaluable experience. He has attended and participated in high level international affair meetings with senior management such as Senior Advisor for Environmental Management and Principle Deputy Assistant Secretary of DOE-EM.He has also participated in discussions/ meetings for overseas energy and nuclear technology relations with various countries that included DOE's EM, NNSA, EERE, and OPAB. In addition, Joel attended the DOE Overseas Corps Orientation Seminar 2013. In these meetings, a variety of topics were covered such as: nonproliferation, transport of spent

nuclear fuel and radioactive waste, various storage methods for containing high-level radioactive waste, various methods and advancements in sustainable energy, and how to advocate for American companies to have an equal opportunity market abroad.These topics pertainedto various projects with countries such as China, Korea, Japan, Germany and the UK.

As part of his summer internship activities, Joel prepared talking points, briefings, and presentations for DOE executives; for instance, he gathered information and assembledbriefing materials for the DOE Senior Advisor for Environmental Management in preparation of his visit to St. Petersburg, Russia, thatincluded an IAEA conference and bilateral meetings. Joel also regularly briefedhis supervisor on meetings he attended.

Some of the administrative duties which he performed included QA/QC of documents, coordination of meetings and teleconferences, and contacting contractors and private industry executives/specialists for information.Joel also performed budgeting activities, including organizing travel expenses, outlining and calculating reimbursement funds, and reviewing and outlining project funding and available funds. He feels these duties and experiences have given him a very in depth look into the corporate world and is very grateful for the opportunity.

10.3Summer Internship Location: DOE-HQ EM-30 - Germantown

Gabriela vazquez

During the summer of 2013, Ms. Gabriela Vazquez was given the opportunity to intern with the Office of Environmental Management (EM) at the Department of Energy (DOE) Headquarters, in Germantown, Maryland. During this time, Ms. Vazquez worked under the mentorship of Ms. Christine Gelles, Associate Deputy Assistant Secretary of the Office of Waste Management (EM-30) and Mr. Douglas Tonkay, Director of the Office of Disposal Operations (EM-31). With the collaboration of Mr. Jaime Joyce, a general engineer from the Office of Disposal Operations, Gabriela conducted research that summarizes past and current treatment technologies available from U.S. private sector vendors to treat low level waste (LLW) and mixed low level waste (MLLW). This research focused on identifying and expanding on treatment technologies used in the past or currently available within the U.S. that might be useful to other nations to treat their orphan wastes. Additionally, this research names which U.S. orphan waste streams either do not have a technology available for treatment or whose treatment pathway is not cost effective; this identification can lead to international collaboration to develop a treatment process pathway for disposal for these orphan waste streams.

Figure 48: DOE Fellow Gabriela Vazquez with Associate Deputy Assistant Secretary of the Office of Waste Management (EM-30)

Figure 49: DOE Fellow Gabriela Vazquez with Mr. Douglas Tonkay, Director of the Office of Disposal Operations (EM-31)

10.4Summer Internship Location: Savannah River National Lab, Aiken, SC

Valentina Padilla

Ms. Valentina Padillawas given the opportunity to intern with Savannah River National Laboratory under the mentorship of Dr. Miles Denham. During her visit, she took several samples from the wells in the F-area of the site. In 2010, ARCADIS initiated monthly molasses injections into these wells in order to create a reduced zone that will facilitate the bioremediation of uranium [U(VI)]. The sampling of these wells is important in order to understand the changes that have occurred to the underground water and soil. These results will help demonstrate the viability of the technology as a long term solution for *in situ*remediation of the site.

To further contribute to the research, Valentina also performed a microcosm study using core samples from the F-area that will provide useful information about the mineralogical changes caused by the molasses addition.

Figure 50: DOE Fellow intern Valentina Padilla with summer mentor (Dr. Miles Denham) at SRNL

10.5Summer Internship Location: Washington River Protection Solutions, Hanford Site, Richland, WA

DayronChigin

Mr. DayronChigin is currently attending a summer internship at the United States Department of Energy's Hanford Site in Richland, Washington. Dayron started his internship at Washington River Protection Solutions (WRPS) under the mentorship of Mr. Ruben Mendoza. Throughout his internship,Dayron is supporting his mentor's group, Waste Transfer and Storage Engineering, in order to address the issue of retrieving, treating, storing, and ultimately disposing of the approximately 53,000,000 gallons of nuclear and chemical waste stored in single and double shell tanks at the site. Within the group,Dayron is responsible for the creation, revision, and implementation of technical and analytical procedures for the sensors along the storage transfer lines from the 242A Evaporator to the Liquid Effluent Retention Facility (LERF). The sensors within these transfer lines are used to detect any leaks. Without proper configuration or preventative maintenance (PM) implemented, sensor readings could be inconsistent and possible soil and water radiological contamination could occur and produce harmful results to the surrounding environment. Dayron plays a crucial role in future environmental and safety goals for WRPS.

Figure 51: DOE Fellow DayronChigin, U.S. Department of Energy's B Reactor Control Room (built in 1943). Richland, Washington

Jennifer Arniella

Ms. Jennifer Arniella is currently conducting an internship at Washington River Protection Solutions at the Hanford Site, Richland, WA. She is working under the supervision of Mr. Dennis Washenfelder in the Tank and Pipeline Integrity Team. Her project involves organizing, graphing and analyzing data taken from corroded/eroded pipelines in order to find their life expectancy. Tank farms have implemented a Fitness-for-Service(FFS) program which determines the integrity of the waste transfer system. The FFS information is acquired from opportunistic evaluations of pipelines that have been removed from service. Eventually, all of the waste transfer system's pipeline materials and materials handling history will be represented. These include: 2-in and 3-in carbon steel and stainless steel process lines; 4-in and 6-in carbon steel encasements;2-in and 3-in carbon steel and stainless steel jumpers, including wide radius elbows, 5-in diameter elbows, and straight sections;and slurry and supernatant waste materials. This analysis will accurately determine the operational life of all the waste transfer lines underground and will allow prediction of the proper design allowances in replacement piping and jumpers.

Figure 52: DOE Fellow Jennifer Arniella at the U.S. Department of Energy's B Reactor Control Room, built in 1943. Richland, Washington

11.0 OTHER PROGRAM ACTIVITIES

- Project progress and accomplishments for FIU Year 3 as well as projected scope for FIU Year 4 were presented to DOE-EM during a videoconference held 05/01/13. In attendance were the FIU-ARC Project 5 Program Director Dr. Leonel Lagos, DOE Fellows (Lilian Marrero, XimenaPrugue, Paola Sepulveda, and Gabriela Vazquez), Beth Moore (DOE), Andy Szilagyi (DOE), and John De Gregory (DOE).

During this videoconference to DOE HQ, the four DOE Fellows presented their research:

- DOE Fellow Gabriela Vazquez - Improved Third Generation Peristaltic Crawler
- DOE Fellow Lilian Marrero - Integrated Flow and Mercury Transport Model for EFPC
- DOE Fellow Paola Sepulveda - Microbial Dissolution of Uranium (VI) from Autunite
- DOE Fellow XimenaPrugue - Development of a Mechanical Based System for Dry Retrieval of Single-Shell Tank Waste at Hanford

- DOE Fellow Elicek Delgado-Quintana prepared her poster titled *Structural Health Monitoring (SHM) inside Concrete and Grout using the Wireless Identification and Sensing Platform (WISP)*based on her research on RFID, for the 7th Annual Institute of Electrical and Electronics Engineers International (IEEE) Conference on RFID. This conference, known as IEEE RFID 2013, will be held at the Orange County Convention Center in Orlando, FL, from April 30 to May 2, 2013. RFID stands for radio-frequency identification and is the wireless non-contact use of radio-frequency electromagnetic fields to transfer data.

- The Nuclear Decommissioning Report from the United Kingdom, in its September/October issue, published an article titled “DOE Fellows training the future workforce of scientists and engineers for DOE-EM”, where the partnership between Florida International University and DOE is featured as a successful program in which FIU minorities students are specially mentored and trained to join the DOE workforce. Besides explaining the objectives of the program, the article emphasizes the accomplishments of the program and the challenges faced by the DOE Fellows as well.

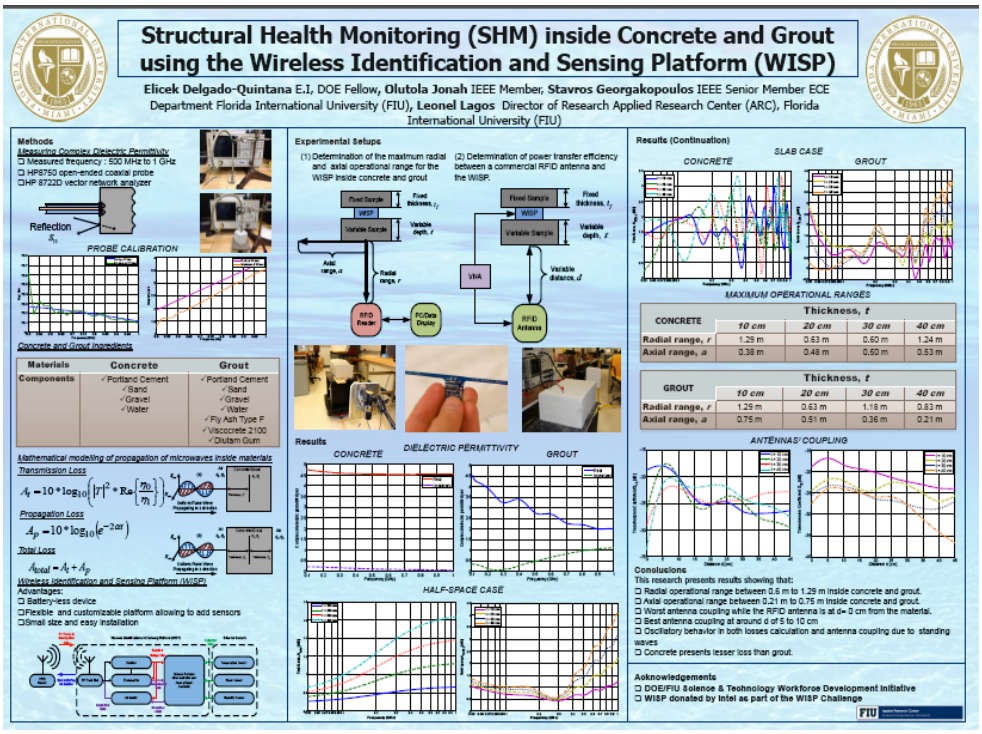

Figure 53: Poster titled Structural Health Monitoring (SHM) inside Concrete and Grout using the Wireless Identification and Sensing Platform (WISP) for the 7th Annual Institute of Electrical and Electronics Engineers International (IEEE) Conference

- Preparations have started to present a DOE-EM Workforce Development paper at ASME's International Conference on Environmental Remediation and Radioactive Waste Management to be held in Brussels, Belgium during September 8 -12, 2013. Final conference paper was submitted and presentation is being developed.

- In addition, two DOE Fellows are being fully supported by ASME to participate in ICEM2013. The DOE Fellows attending ICEM2013 will be presenting their DOE EM research being conducted at ARC.

- The Fellows completed the presentations of their summer internship experience as part of the DOE Fellows weekly meeting. Table below shows the presentation schedule for fall 2012:

Table 9: DOE Fellows Schedule of Summer 2012 Internship Presentations

DOE Fellow	DOE Site/National Lab/Contractor	Location	Presentation Date
Jaime Mudrich Eric Inclan	Oak Ridge National Laboratory	Oak Ridge, TN	09/07/12
XimenaPrugue	Washington River Protection Solutions, Hanford Site	Richland, WA	09/12/12
Heidi Henderson	Oak Ridge Reservation	Oak Ridge, TN	09/19/12
Lillian Marrero	Sullivan International Consulting	Chicago, IL	09/26/12
Janty Ghazi	DOE-HQ EM-23 (Tank Farm Program)	Washington, DC	10/03/12
RevathyVenkataraman	Y-12 Security Complex, Oak Ridge	Oak Ridge, TN	10/10/12
	DOE Fellows Poster Exhibition/Competition		**10/17/12**
Josh Midence	Savannah River National Lab	Aiken, SC	10/24/12
Claudia Cardona	DOE-HQ EM-12 (Soil/Groundwater)	Washington, DC	10/31/12
Elicek Delgado	Sullivan International Consulting	Chicago, IL	11/0712
	DOE Fellows Induction Ceremony		**11/13/12**
Robert Lapierre	Pacific Northwest National Lab	Richland, WA	11/21/12
Gabriela Vasquez	ARC Research	Miami	11/28/12
Lucas Nacimiento	ARC Research	Miami	12/05/12
Dania Castillo	ARC Research	Miami	12/12/12

- A professional paper entitled, “Training and Mentoring the Next Generation of Scientists and Engineers to Secure Continuity and Successes of the US DOE’s Environmental Remediation Efforts” was accepted by the Waste Management 2013 Symposia. In addition, DOE Fellows and other students completed preparation of brief abstracts on their research, including work performed at ARC and during their summer internships, for submittal to the conference and presentation during the student poster session.

- Milestone 2012-P5-M4 was completed and the summer interns’ reports were sent to DOE by the due date. Also, milestone 2012-P5-M5 was completed, and a list of recruited DOE Fellows, class of 2012 was sent to DOE personnel.

- Milestone 2012-P5-M6, Conduct Induction Ceremony – Class of 2012, was completed on November 13, 2012, and milestone 2012-P5-M7, submittal of student abstracts to the Waste Management Symposium, was completed on 12/28/12.

CONCLUSIONS

This new innovative program was officially established in March 2007. This project is successfully meeting its objectives by providing research training and mentoring for students from underrepresented groups on environmental problems at DOE sites in addition to providing several new formal recruitment and retention mechanisms for qualified students from underrepresented groups to pursue advanced studies, research training, and eventual career placement at DOE sites. During this year, students participated in 10-week internships at PNNL, Savannah River, Hanford, Lawrence Livermore National Laboratory, Moab Site, and DOE HQ in Washington, DC. Additional information about the entire program and the DOE Fellows can be found on the website http://fellows.fiu.edu/.

Major key accomplishments to date:

- Year End Reports for FIU Year 2 were completed for all projects and sent to DOE as well as site points of contact.

- Draft Project Technical Plans for FIU Year 3 were completed for all projects and sent to DOE as well as site points of contact.

- FIU ARC staff and students participated in the 2012 American Nuclear Society (ANS) Annual Meeting and Decommissioning, Decontamination and Reutilization (DD&R) Conferencein Chicago, Illinois, from June 24 to June 28, 2012. Participation included hosting an exhibitor booth in the vendor hall, presenting technical research at oral and poster presentations, and chairing technical sessions. A total of three professional oral and poster presentations were given by FIU Applied Research Center staff and students in the areas of D&D technologies, D&D knowledge management, and D&D best practices and lessons learned. Professional oral and poster presenters included Dr. Leo Lagos, Mr. HimanshuUpadhyay, and DOE Fellow Heidi Henderson. Two additional DOE Fellows (Lilian Marrero and Elicek Delgado-Cepero) also attended and participated in the conference as “Student Assistants,” providing technical support during the technical sessions.

- Project progress and accomplishments for FIU Year 3 as well as projected scope for FIU Year 4 were presented to DOE-EM during a videoconference held 05/01/13. In attendance were the FIU-ARC Project 5 Program Director Dr. Leonel Lagos, DOE Fellows (Lilian Marrero, XimenaPrugue, Paola Sepulveda, and Gabriela Vazquez), Beth Moore (DOE), Andy Szilagyi (DOE), and John De Gregory (DOE).During this videoconference to DOE HQ, the four DOE Fellows presented their research:

- DOE Fellow Gabriela Vazquez - Improved Third Generation Peristaltic Crawler
- DOE Fellow Lilian Marrero - Integrated Flow and Mercury Transport Model for EFPC
- DOE Fellow Paola Sepulveda - Microbial Dissolution of Uranium (VI) from Autunite
- DOE Fellow XimenaPrugue - Development of a Mechanical Based System for Dry Retrieval of Single-Shell Tank Waste at Hanford

Major key accomplishments to date:

- DOE Fellows supported the Energy Facility Contractors Group (EFCOG) and contributed to the development of 12 Lessons Learned and Best Practices documents
- DOE Fellow (Charles Castello) was hired by DOE's Oak Ridge National Laboratory under the Alvin M. Weinberg Fellowship program
- DOE Fellow (Stephen Wood) joined Oak Ridge National Laboratory's Bredesen Center for Interdisciplinary Research and Graduate Education as a Energy Science & Engineering PhD Fellow
- DOE Fellow(Edgard Espinosa) was hired by DOE-EM and is working for EM-22 (Nuclear Materials Disposition) under the direction of Mr. Gary Deleon
- DOE Fellow (Lee Brady) has graduated and will be hired by DOE-EM and will work for EM-13 (D&D and Facility Engineering) under the direction of Mr. Andrew Szilagyi
- DOE Fellow, (Merlin Ngachin) was hired by Waste Control Specialists (WCS) in Texas
- **31** master degrees and **3** Ph.D. degrees based on EM research program;
- DOE Fellows program featured in national and international newsletters;
- **9** peer reviewed journal publications developed in the last year by students and ARC staff on DOE-EM research;
- **Twenty-five (25)** other DOE Fellows graduated FIU with bachelor's or master's degrees and obtained employment in private industry and government agencies, including: Boeing Company (3 Fellows), GE (1 Fellow), NASA (1 Fellow), Florida Department of Environmental Protection (1 Fellow), Florida Power & Light (2 Fellows), Mount Sinai Medical Center (2 Fellow), Internal Revenue Service (1 Fellow), Department of Commerce (1 Fellow), PriceSmart Inc. (1 Fellow), Bouygues Civil Works Florida (1 Fellow), Crane Aerospace and Electronics (1 Fellow), and HP Foundation (1 Fellow), Lockheed (1 Fellow), US. Department of Health & Human Services (1 Fellow), Beckman Coulter (2 Fellows), Motorola (1 Fellow), Kiewit Power (1 Fellow),

CPH Inc. (1 Fellow), Texas Instruments (1 Fellow), CPH, Inc. (1 Fellow), and others.

- DOE Fellows, Edgard Espinosa, Charles Castello, and Lee Brady were selected by DOE EM as part of Student Career Experience Program (SCEP). These Fellows completed SCEP assignments working for EM-2.1, EM-12, and EM-13 respectively
- DOE Fellow (Rosa Ramirez) was hired into the EM Professional Development Corps program
- DOE Fellow (DuriemCalderin) was hired by DOE Contractor Columbia-Energy Environmental Services, Duriem is working in Richland, WA
- DOE Fellow (Leydi Velez) won Best Professional Poster at WM09
- DOE Fellow (Stephen Wood) won Best Student Poster at WM11
- DOE Fellow (Denny Carvajal) won Best Student Poster at WM10
- DOE Fellow (DenisseAranda) won Best Student Poster at WM09
- Completed 81 internships at DOE sites, DOE national labs, DOE-HQ, and DOE contractors since 2007 (including summer 2013)
- 91 presentations (posters and papers) at Waste Management conferences (2008, 2009, 2010, 2011, 2012, 2013)
- Twenty-one (26) DOE Fellows (FIU minority students) continuing to Master/Ph.D. degrees at FIU.
- Nine (9) DOE Fellows applied to the DOE EMPDC program in 2009 and 2010
- Six (6) DOE Fellows applied to DOE EM SCEP in spring 2011
- Development of DOE Fellows web site http://fellows.fiu.edu/ and Facebook page
- Two Fellows (Gabriela Vasquez and XimenaPrugue) will be participating and presenting their High Level Waste DOE EM applied research at ICEM2013 in Brussels, Belgium. The American Society of Mechanical Engineers sponsored their participation in the conference.

APPENDIX A
DOE FELLOWS INTERNSHIP REPORTS – SUMMER 2012

The DOE Fellows finalized their DOE Fellows Summer Internship Reports (milestone 2012-P5-M4) which were sent to DOE on 10/19/12 (deliverable). These reports will also be submitted to OSTI. The table below shows the DOE Fellows, summer mentors, and report titles.The following reports are available at the DOE Fellows website, http://fellows.fiu.edu.

DOE Fellow	Site/Office/Lab	Location	Mentor	Summer Internship Technical Report
Janty Ghazi	DOE-HQ EM-23	Washington DC	James Poppiti	Hydrogen in Pipes and Ancillary Vessels (HPAV)
Claudia Cardona	DOE-HQ EM-12	Washington DC	Kurt Gerdes	Database of Groundwater Pump-and-Treat Systems
Joshua Midence	Savannah River Site	Aiken, SC	Alex Cozzi	Saltstone Processing of Low-Level Waste at Savannah River Site
Eric Inclan	Oak Ridge National Laboratory	Oak Ridge, TN	Dr. Prashant Jain	Development of Pre-processing Software for Lattice Boltzmann Fluid Dynamics Solver
Jaime Mudrich	Oak Ridge National Laboratory	Oak Ridge, TN	Dr. Prashant Jain	Development of a Parallel, 3D, Lattice Boltzmann Method CFD Solver for Simulation of Turbulent Reactor Flow
Heidi Henderson	Oak Ridge Reservation	Oak Ridge, TN	Dr. Eric Pierce	Analysis of Oak Ridge National Laboratory Outfall 211 Contributing Drainage Areas
RevathyVenkataraman	Y-12 Security Complex, Oak Ridge	Oak Ridge, TN	Charlie Barton	Y-12 EMBOS Medical Lab Interface Batch Loader
XimenaPrugue	WRPS, Hanford Site	Richland, WA	Leo Thompson	Development of Mechanical Systems for Dry Retrieval of Single Shell Tank Waste at Hanford
Robert Lapierre	Pacific Northwest National Lab	Richland, WA	Dr. Dawn Wellman	Single Pass Flow-Through Testing of Metals
Lilian Marrero	Sullivan International Consulting	Chicago, IL	JD Campbell	An Evaluation of Volatile Organic Compound Contamination at Two Superfund Sites
Elicek Delgado	Sullivan International Consulting	Chicago, IL	JD Campbell	Metal Remediation of the Zinc Site