YEAR-END TECHNICAL REPORT
September 17, 2013 to May 17, 2014

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 September 17, 2013 to May 17, 2014 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 complete set of FIU's Year End Reports for this reporting period includes the following documents and are available at the DOE Research website for the Cooperative Agreement between the U.S. Department of Energy Office of Environmental Management and the Applied Research Center at Florida International University (http://doeresearch.fiu.edu):

Project 1: Chemical Process Alternatives for Radioactive Waste
Document number: FIU-ARC-2014-800000393-04b-233

Project 2: Rapid Deployment of Engineered Solutions for Environmental Problems
Document number: FIU-ARC-2014-800000438-04b-223

Project 3: Remediation and Treatment Technology Development and Support
Document number: FIU-ARC-2014-800000439-04b-225

Project 4: Waste and D&D Engineering and Technology Development
Document number: FIU-ARC-2014-800000440-04b-220

Project 5: DOE-FIU Science & Technology Workforce Development Initiative
Document number: FIU-ARC-2014-800000394-04b-079

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 U.S. 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, has tackled and helped solve problems at many DOE sites.

The DOE-FIU Science and Technology Workforce Development Initiative was established in 2007 to create a pipeline of minority engineers specifically trained and mentored to enter the DOE 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 DOE EM's Pathways Programs. Students selected as DOE Fellows perform 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 the Pathway Program, apply to DOE contractors, pursue post master or postdoctoral positions at DOE national laboratories, 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 93 minority FIU STEM students. 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, Ms. Ines Triay (2010), Acting Principal Assistant Secretary for Environmental Management, Ms. Tracy Mustin (2011), Associate Principal Deputy Assistance Secretary for Environmental Management, Mrs. Alice Williams (2012), and Senior Advisor to the U.S. Secretary of Energy for Environmental Management, Elizabeth Connell (2013). All of 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. As of summer 2013, the program has coompleted 81 summer internships at DOE sites, national laboratories, and DOE contractors. DOE Fellows have presented over 109 posters/oral presentations at national and international conferences. At the WM09, WM10, WM11, and WM14 Waste Management Symposia, four 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 (EMPCD) program in September 2009. 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) was selected 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) was also 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 under the Alvin M. Weinberg Fellowship program. The program has been featured in DOE EM publications such as the EM-20 Final Year Report, US DOE EM Highlights, Diversity @ EM magazine, EM Program Update, and FIU News.

Detailed task descriptions and deliverables and milestones can be found in the Project Technical Plan (Appendix 1). The milestones and deliverables for Project 5 for FIU Year 4 are also shown on the following table.

Table 1. FIU Year 4 Milestones and Deliverables for Project 5

Milestone/ Deliverable	Description	Due Date	Status
2013-P5-M1	Draft Summer Internships Reports	10/04/13	Complete
2013-P5-M2	Selection of new DOE Fellows - Fall 2013	10/31/13	Complete
2013-P5-M3	Submit draft paper to Waste Management Symposium 2014	11/07/2013	Complete
2013-P5-M4	Conduct Induction Ceremony - Class of 2013	11/13/13	Complete
2013-P5-M5	Submit student poster abstracts to Waste Management Symposium 2013	12/31/2013	Complete 1/10/2013
Deliverable	Draft Project Technical Plan sent to DOE	10/17/13	Complete
Deliverable	Deliver Summer 2013 Interns reports to DOE	10/18/13	Complete
Deliverable	List of identified/recruited DOE Fellow (Class of 2013)	10/31/13	Complete
Deliverable	Draft Year End Report	06/30/14	Complete
Deliverable	Update Technical Fact Sheet	30 days after end of project	Complete
Deliverable	Quarterly Progress Reports	Quarterly	Complete

Highlights during this reporting period include:

- Year End Reports for FIU Year 4 were completed for all projects and sent to DOE as well as site points of contact.
- Project Technical Plans for FIU Year 4 were completed for all projects and sent to DOE as well as site points of contact.

- Project progress and accomplishments for FIU Year 4 were presented to DOE-EM during a videoconference held February 26, 2014. In attendance were the FIU-ARC Project 5 Program Director Dr. Leonel Lagos, DOE Fellows (Dayron Chigin, Valentina Padilla, Gabriella Vazquez, Deanna Moya, Robert Lapierre, Natalia Duque, Ximena Prugue, Mariana Evora, Michael Abbott, Sasha Philius, Jennifer Arniella, and Pedro Cordon), Patricia Lee (DOE), and John De Gregory (DOE). During this videoconference to DOE HQ, three DOE Fellows presented their research:
    - DOE Fellow Gabriela Vazquez - Alternative Unplugging Technologies, Inspection Tools for DST Primary Tanks, and LLW/MLLW Treatment Technology Identification
    - DOE Fellow Dayron Chigin - Rapid Measurement of HLW Solids on Tank Bottoms
    - DOE Fellow Valentina Padilla - SRS Microcosm Study - Post Molasses Injection

Major key accomplishments to date:

- 31 master degrees and 3 Ph.D. degrees earned (or in progress) based on EM research program
- DOE Fellows program has been featured in national and international newsletters
- 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
- 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(Edgard Espinosa) was hired by DOE-EM and began working for EM-22 (Nuclear Materials Disposition) under the direction of Mr. Gary Deleon
- DOE Fellow (Charles Castello) was hired by DOE's Oak Ridge National Laboratory under the Alvin M. Weinberg Fellowship program
- DOE Fellow (Lee Brady) was hired by DOE-EM and began work for EM-13 (D&D and Facility Engineering) under the direction of Mr. Andrew Szilagyi
- DOE Fellow (Stephen Wood) joined Oak Ridge National Laboratory's Bredesen Center for Interdisciplinary Research and Graduate Education as an Energy Science & Engineering PhD Fellow
- DOE Fellow (Rosa Ramirez) was hired into the EM Professional Development Corps program
- Thirty (30) other DOE Fellows graduated FIU with bachelor's or master's degrees and obtained employment in private industry and government agencies, including: Columbia-Energy Environmental Services (1 Fellow), Waste Control Specialists (1 Fellow), Boeing Company (3 Fellows), GE (1 Fellow), NASA (1 Fellow), Florida Department of Environmental Protection (1 Fellow), Florida Power & Light (2 Fellows), Mount Sanai Medical Center (2 Fellows), 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), HP Foundation (1 Fellow), Lockheed (1 Fellow), U.S. Department of Health & Human Services (1 Fellow), Beckman Coulter (2 Fellows), Motorola (1 Fellow), Kiewit Power (1 Fellow), CHP Inc. (1 Fellow), Texas Instruments (1 Fellow), CPH Inc. (1 Fellow), and others.

- DOE Fellow (Leydi Velez) won Best Professional Poster at WM09
- DOE Fellow (Denisse Aranda) won Best Student Poster at WM09
- DOE Fellow (Denny Carvajal) won Best Student Poster at WM10
- DOE Fellow (Stephen Wood) won Best Student Poster at WM11
- DOE Fellow (Alexandra Fleitas) won Best Student Poster at WM14
- Completed 81 internships at DOE sites, DOE national labs, DOE-HQ, and DOE contractors since 2007
- 102 presentations (posters and papers) at Waste Management conferences (2008, 2009, 2010, 2011, 2012, 2013, 2014)
- DOE Fellows supported the Energy Facility Contractors Group (EFCOG) and contributed to the development of 13 Lessons Learned and Best Practices documents
- Development of DOE Fellows web site http://fellows.fiu.edu/ and Facebook page
- Two Fellows participated and presented their high level waste DOE EM applied research at ICEM2013 in Brussels, Belgium (details provided in Section 11). The American Society of Mechanical Engineers sponsored their participation in the conference.

RESULTS AND DISCUSSION

1.0 DOE FELLOWS ENTERING TO DOE'S PATHWAYS PROGRAMS

The vision of this program is to create a "**pipeline**" of minority FIU students who will be trained and mentored as DOE Fellows and enter DOE's workforce. This vision became a reality when our first DOE Fellow (Rosa (Ramirez) Elmetti) was hired by DOE in September 2009 and entered DOE's Professional Development Corps Program. Rosa is currently working for DOE EM's International Program (EM-1). 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, Duriem Calderin, 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. 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 Pathways 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 the SCEP program and joined DOE-EM as fulltime employees. The third Fellow (Charles Castello) completed the SCEP program but obtained an alternative offer from Oak Ridge National Laboratory.

1.1 Other DOE Fellows Hired During This Period

During this reporting period, an additional six (6) 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:

- **Mariela Silva (**DOE Fellow Class of 2012) - After successfully graduating with a master's degree in engineering management in the fall of 2013, Ms. Silva accepted an employment offer from Conoco Phillips as a project engineer at the Lost Cabin Gas Plant in Wyoming.
- **Revathy Venkataraman** (DOE Fellow Class of 2012) - Ms. Venkataraman recently accepted employment with TradeStation in Plantation, FL, after earning her master's degree in information technology in the spring of 2014.
- **Michael Abbott** (DOE Fellow Class of 2013) - Mr. Abbott recently accepted employment with Haiku Tech as mechanical and process engineer.
- **Valentina Padilla** (DOE Fellows Class of 2012) - Upon successful completion of her master's degree in the summer of 2013, Ms. Padilla accepted an employment offer from Brown and Caldwell, as an engineer.
- **Lilian Marrero** (DOE Fellow Class of 2011) - Upon successful completion of her DOE-EM based master's degree in the summer of 2013, Ms. Marrero accepted an employment offer from MWH, a local environmental/engineering company, as an associate civil engineer.

- **Paola Sepulveda** (DOE Fellow Class of 2011) - After successfully graduating with a master's degree in biomedical engineering in spring 2014, Ms. Sepulveda accepted an employment offer from Codman Neurovascular, a Johnson & Johnson Company as Research and Development Engineering Aide.

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 **34 DOE 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 prepared to 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. Table 2 below shows all the DOE Fellows who are pursuing or have completed 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 DOE EM projects	Anticipated Date of Graduation
1	Serkan Akar	Biomedical Engineering	Master	Design and Development of an Enzyme-Linked Biosensor for Detection and Quantification of Phosphate Species	**Graduated: 05/10**
2	Yulyan Arias**	Environmental Engineering	Master	Non-thesis option	**Graduated: 05/12**
3	Amaury Betancourt	Environmental Engr.	Master	Soil/Groundwater - Modeling of Mercury Contamination at ORNL	**Graduated: 04/11**
4	Lee Brady	Engineering Mngmt.	Master	D&D Best Practices/Lessons Learned Development for EFCOG	**Graduated: 04/12**
5	Elsa Cabrejo	Environmental Engr.	Master	Soil/Groundwater - Modeling of Mercury Contamination at ORNL	**Graduated: 04/11**
6	Duriem Calderin	Biomedical Engr.	Master	Modeling of Loose Contamination Scenarios to Predict the Amount of Contamination Removed	**Graduated: 08/10**

	DOE Fellow	Discipline	Degree	Research Topic/Work Based on DOE EM projects	Anticipated Date of Graduation
7	Denny Carvajal	Biomedical Engr.	Master	Soil/Groundwater – Bacteria Interaction due to Polyphosphate Injection at Hanford	**Graduated: 08/11**
8	Charles Castello	Electrical Engr.	Ph.D.	Soil/Groundwater - Sensor Development for Field Measurement of Mercury	**Graduated: 08/11**
9	Claudia Cardona	Environmental Engr.	Ph.D.	Sequestering Uranium at the Hanford 200 Area Vadose Zone by In Situ Subsurface pH Manipulation Using NH3 Gas	12/14
10	Elicek Delgado-Cepero	Electrical Engr.	Master	Structural Health Monitoring Inside Concrete and Grout Using the Wireless Identification Sensing Platform	**Graduated: 05/13**
11	Edgard Espinosa	Mechanical Engr.	Master	Waste Processing - CFD Modeling of NuVison's Power Fluidic Technology/Process	**Graduated: 12/11**
12	Janty Ghazi	Electrical Engr.	Master	Control, through Sensors and Labview, of the Asynchronous Pulsing Unit	**Graduated: 05/13**
13	Hansell Gonzalez	Chemistry	PhD	Groundwater Remediation at SRS F/H Area	12/18
14	Heidi Henderson	Environmental Engr.	Master	Surface water and contaminant transport within the Oak Ridge National Laboratory	**Graduated: 12/13**
15	Melina Idarraga	Environmental Engr.	Master	Dissolution rate of natural meta-autunite: effects of aqueous bicarbonate, pH and temperature	**Graduated: 12/11**
16	Eric Inclan	Mechanical Engr.	Master	Development of a Hybrid Optimization Algorithm for the Evaluation and Optimization of the Asynchronous Pulsing Unit	**Graduated: 08/13**
17	Robert Lapierre	Chemistry	Master	Mineralogical and morphological characteristics of precipitates formed during uranium sequestering at the Hanford 200 Area Vadose Zone	04/15
18	Lilian Marrero	Environmental Engr.	Master	Soil/Groundwater - Modeling of Mercury Contamination at ORNL	**Graduated: 08/13**

	DOE Fellow	Discipline	Degree	Research Topic/Work Based on DOE EM projects	Anticipated Date of Graduation
19	Jose Matos	Mechanical Engr.	Master	Development of Improved Bodies for a Peristaltic Crawler for Unplugging of Hanford Waste Transfer Pipelines	**Graduated: 8/13**
20	Joel McGill*	Civil Engr.	Master	Non-Thesis Option	**Graduated 04/14**
21	William Mendez	Engineering Mngmt.	Master	Development of Remote Stack Characterization System	**Graduated: 04/11**
22	Jaime Mudrich	Mechanical Engr.	Master	Development of a Model for Fluid-Structure Interaction using the Meshfree FEM and the Lattice Boltzmann Method	**Graduated: 12/13**
23	Merlin Ngachin	Environmental Sciences	Master	Waste Processing - Baltman-Lattice Method to Model HLW	**Graduated: 08/11**
24	Valentina Padilla	Environmental Engr.	Master	Non-Thesis Option	**Graduated 04/14**
25	Rosa Ramirez (Former DOE Fellow hired by DOE EM)	Environmental Engr.	Master	TBD	TBD
26	Lucas Scott*	Geology	Master	-	-
27	Paola Sepulveda-Medina*	Biomedical Engr.	Master	Investigating the Role of a Less Uranium Tolerant Strain, Isolated from the Hanford Site Soil, on Uranium Interaction in Polyphosphate Remediation Technology	**Graduated 04/14**
28	Melissa Sanchez**	Environ. Engr.	Master	Non-thesis option	**Graduated: 05/12**
29	Mariela Silva	Engr. Management	Master	SharePoint Based Secured Collaboration System	**Graduated: 12/13**
30	Mario Vargas	Mechanical Engr.	Master	Kinematic Control of Remote Stack Characterization System	**Graduated: 08/12**
31	Jose Vasquez	Environmental Engr.	Master	Effects of temperature and pH on volatilization of mercury after chemical reduction	**Graduated: 08/09**
32	Leydi Velez	Industrial Engr.	Master	Decision Modeling Tools D&D Surveillance & Maintenance	**Graduated: 12/10**

33	Revathy Venkataraman	Information Technology	Master	Performance Evaluation of Mobile Applications with KMIT Technology Web Services	**Graduated: 05/14**
34	Stephen Wood	Mechanical Engr.	Master	Modeling of Pipeline Transients: Modified Method of Characteristics	**Graduated: 05/11**
*Left DOE Fellows program before completion of master's degree					
**Left DOE Fellows program but completed master's degree at FIU					

3.0 DOE FELLOWS RECRUITMENT & SELECTION

The DOE Fellows Fall 2013 application process was completed on October 7, 2013. A total of 43 applications were received. FIU students' applications were reviewed, and selected candidates were interviewed by the DOE Fellows selection committee during the month of October. The committee included FIU's Arts & Science, ARC and DOE-HR representatives. Ten students were selected to start the program.

Table 3. New DOE Fellows Selected in Fall 2013

DOE Fellow	Current Academic Status	Major
Adamandios Manoussakis	Undergraduate	Electrical Engineering
Carmela Vallalta	Undergraduate	Mechanical Engineering
Christian Pino	Undergraduate	Chemistry and Biochemistry
Deanna Moya	Undergraduate	Mechanical Engineering
Hansell Gonzalez	Graduate	Chemistry
Lucas Scott	Graduate	Geology
Michelle Embon	Undergraduate	Civil Engineering
Natalia Duque	Undergraduate	Environmental Engineering
Sasha Philius	Undergraduate	Mechanical Engineering
Steve Noels	Undergraduate	Computer Science

A total of 15 applications were received during the DOE Fellows Spring 2014 recruitment application period that ended on April 25, 2014. Applications were reviewed by ARC researchers and scientists and by the selection committee that includes professors from other departments. FIU completed formal interviews of the 12 selected applicants for the DOE Fellows Spring recruitment efforts on 05/15/14 and 05/16/14. FIU completed the selection and 6 students were extended offers of which all 6 accepted and were hired as DOE Fellows. The selected students started the DOE Fellowship on June 9, 2014.

Table 4. New DOE Fellows Selected in Spring 2014

DOE Fellow	Current Academic Status	Major
Brian Castillo	Undergraduate	Biomedical Engineering
John Conley	Undergraduate	Mechanical Engineering
Maria Diaz	Undergraduate	Environmental Engineering
Anthony Fernandez	Undergraduate	Mechanical Engineering
Meilyn Planas	Undergraduate	Electrical Engineering
Aref Shehadeh	Undergraduate	Environmental Engineering

Each new DOE Fellow was assigned to an ARC staff member to act as their mentor and supervise their EM research work. Orientation for the new DOE Fellows was conducted and the new Fellows 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 DOE Fellows also created a brief bio to include on the DOE Fellows website.

4.0 DOE FELLOWS INTERNSHIPS (SUMMER 2013)

The summer 2013 internships were completed in August 2013 and details were included in the Year End Report for FIU Year 3. Six (6) DOE Fellows participated in 10-week internships across the DOE Complex during the summer of 2013 where they were paired with scientists and engineers at DOE Headquarters, DOE facilities and national research laboratories (Table 5).

Table 5. DOE Fellows at Summer 2013 Internships

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
Dayron Chigin	Hanford Site	Richland, WA	Dennis Washenfelder

The six summer interns were exposed to DOE EM technical challenges by working at DOE-HQ, Savannah River National Laboratory, and the Hanford Site (Figures 5 to 6). At the conclusion of their internships, DOE Fellows documented their summer activities and results in a summer internship report (Table 6). These reports are available on the DOE Fellows webpage (http://fellows.fiu.edu/InternshipReports.asp). The Fellows also had 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 (Section 5).

Table 6. DOE Fellows Summer 2013 Internships Reports

DOE Fellow	DOE Site/ National Lab/ Contractor	Location	Mentor	Technical Report Title
Gabriela Vazquez	DOE-HQ EM-30	Germantown	Christine Gelles	Low Level and Mixed Low Level Waste Treatment Technology and Orphan Waste Stream Identification
Paola Sepulveda	DOE-HQ EM-12	Germantown	Skip Chamberlain	Database of Groundwater Pump-and-Treat Systems
Joel McGill	DOE-HQ EM-02	Washington, DC	Ana Han	Office of Environmental Management International Program
Valentina Padilla	Savannah River National Lab	Aiken, SC	Miles Denham	SRS In Situ Bioremediation Techniques and F-Area Post Molasses Injection Analysis
Jennifer Arniella	Hanford Site	Richland, WA	Ruben Mendoza	Analysis of Life Expectancy for Waste Transfer Lines Located in the SY-Farm at the Hanford Site
Dayron Chigin	Hanford Site	Richland, WA	Dennis Washenfelder	Preventative Maintenance Procedures for Sensors along PC-5000 Condensate Transfer Line

Figure 1. DOE Fellows DOE HQ interns meeting FIU President Dr. Mark Rosenberg.

Figure 2. DOE Fellows interns (Jennifer Arniella and Dayron Chigin) with other summer interns at Hanford.

5.0 DOE FELLOWS POSTER EXHIBITION AND COMPETITION

The 7th annual DOE Fellows Poster Exhibition and Competition was conducted on October 16, 2013. The purpose of this event was to showcase the DOE Fellows' research accomplishments for the past year as a result of their participation in various U.S. Department of Energy - Environmental Management (DOE-EM) related applied research projects. A total of 12 posters were exhibited. Some of the projects showcased by the students were a result of their summer internship assignments at DOE Savannah River Site, Pacific Northwest National Laboratory, DOE Hanford Site, and DOE Headquarters (DOE-HQ) in Washington, DC. Also, some of the posters reflected the DOE Fellows' DOE-EM applied research that they conduct at the Applied Research Center (ARC) as part of the DOE-FIU Cooperative Agreement sponsored research.

Figure 3. Poster Exhibition and Competition participants and judges.

For some of the graduate students, these projects are also a part of their thesis towards a master's degree. This year's panel of judges comprised of Dr. Ines Triay (ARC Executive Director), Dr. Norman Munroe (Professor and Associate Dean for Undergraduate Studies & Academic Affairs - FIU College of Engineering), and Dr. David Roelant (ARC's Associate Director of Research). This year, the poster exhibition and competition was conducted at FIU's Engineering Center's Panther Pit and was attended by FIU faculty, ARC personnel, and FIU students. The posters presented included:

- **Uranium Sequestration by Subsurface pH Manipulation using NH_3 Gas Injection**
  DOE Fellow Claudia Cardona (Environmental Engineering)
- **Residual Waste Detection in HLW Staging Tanks**
  DOE Fellow Dayron Chigin (Electrical Engineering)
- **Low Level and Mixed Low Level Waste Treatment Technology Identification**
  DOE Fellow Gabriela Vazquez (Mechanical Engineering)
- **Analysis of Life Expectancy for Waste Transfer Lines Located in SY-Farm at Hanford Site**
  DOE Fellow Jennifer Arniella (Mechanical Engineering)
- **U (VI) Immobilization within SRS Groundwater**
  DOE Fellow Joel McGill (Environmental Engineering)

- **Radiological Decontamination with Permanent and Removable Coatings**
  DOE Fellow Mariana Evora (Civil Engineering)
- **SharePoint Based Secured Project Management for DOE-EM**
  DOE Fellow Mariela Silva (Engineering Management)
- **Investigation on Microbial Dissolution of Uranium (VI) from Autunite Mineral**
  DOE Fellow Paola Sepulveda (Biomedical Engineering)
- **Network Performance testing of D&D KM-IT with Traffic Generators**
  DOE Fellow Pedro Cordon (Computer Engineering)
- **Performance Evaluation of Mobile Applications with KM-IT Web Services**
  DOE Fellow Revathy Venkataraman (Computer Science)
- **Characterization of the Uranium-Bearing products of Novel Remediation Technologies**
  DOE Fellow Robert Lapierre (Chemistry)
- **Savannah River Site Internship**
  DOE Fellow Valentina Padilla (Environmental Engineering)

Figure 4. DOE Fellows presenting their research at the 2013 Poster Exhibition and Competition.

5.1 2013 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.

First place winner: Mr. Robert Lapierre, DOE Fellows - Class of 2012

Poster title: Characterization of the Uranium-Bearing Products of Novel Remediation Technologies

Figure 5. DOE Fellow Robert Lapierre presenting his research work at the 2013 Poster Exhibition and Competition.

Second place winner: Ms. Gabriela Vazquez, DOE Fellows - Class of 2012

Poster title: Low Level and Mixed Low Level Waste Treatment Technology Identification

Figure 6. DOE Fellow Gabriela Vazquez presenting her research work at the 2013 Poster Exhibition and Competition.

Third place winner (tie): Ms. Jennifer Arniella, DOE Fellows – Class of 2012

Poster title: Analysis of Life Expectancy for Waste Transfer Lines Located in SY-Farm at Hanford Site

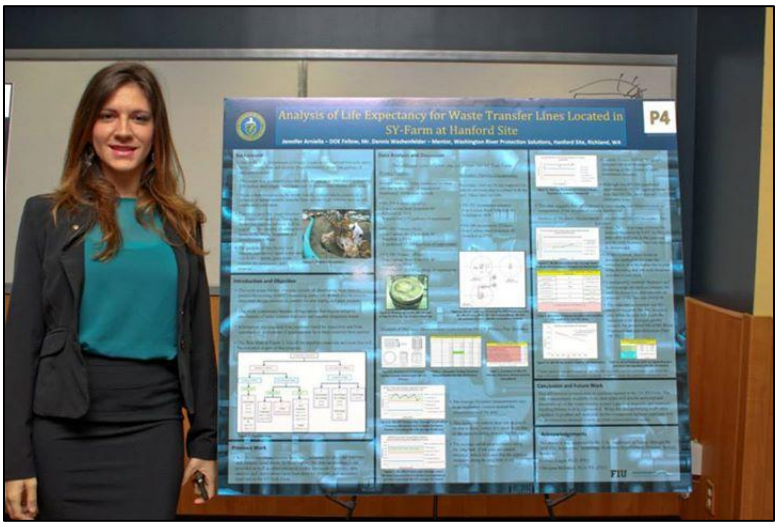

Figure 7. DOE Fellow Jennifer Arniella presenting her research work at the 2013 Poster Exhibition and Competition.

Third place winner (tie): Ms. Paola Sepulveda, DOE Fellows - Class of 2011

Poster title: Investigation on Microbial Dissolution of Uranium (VI) from Autunite Mineral

Figure 8. DOE Fellow Paola Sepulveda presenting her research work at the 2013 Poster Exhibition and Competition.

6.0 DOE FELLOWS 2013 INDUCTION CEREMONY

On November 13, 2013, FIU conducted the seventh annual DOE Fellows' Induction Ceremony to welcome our new DOE Fellows (Class of 2013) and celebrate the continuation of our DOE-FIU-ARC partnership. The ceremony was held at the MARC International Pavilion on the main FIU campus.

This year, Ms. Elizabeth "Betsy" Connell (Senior Advisor to the U.S. Secretary of Energy for Environmental Management) was one of the keynote speakers for the ceremony. Ms. Connell commented on the strong partnership between DOE and FIU over the last two decades and the contributions that FIU has made to the overall EM cleanup mission.

Other distinguished guests included Melody Bell (DOE EM's Office of Human Capital), Ana Han (DOE International Programs), Paul Deason (Associate Director of Savannah River National Laboratory), Margie Brown [Minority Serving Institute (MSI) Outreach Program Manager, GA Tech Research Institute], Dr. Peter Orther (UM, ARC Advisory Board Member), Dr. Lee Swanger (Exponent Engineering and Scientific Consulting, ARC Advisory Board Member), and James Ault (Florida Power and Light, NEXTERA). FIU was represented at the event by Dr. Andres Gil (Vice President for Research), Dr. Ken Furton (Dean, College of Arts and Sciences), Dr. Luis Salas (FIU Associate VP for Research), Norman Munroe (Associate Dean of FIU College of Engineering), Dr. Ines Triay (ARC Executive Director), Brian Fonseca (ARC Director of Operations) and Dr. Leonel E. Lagos (DOE Fellows Program Director), as well as FIU faculty, staff, and students.

Ms. Connell and the other distinguished guests 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 Gabriela Vasquez and Paola Sepulveda. Dr. Lagos presented an update on the DOE-FIU Cooperative Agreement and the DOE Fellows program. DOE Fellow Gabriela Vasquez presented her summer internship experience and research at DOE-EM30 under the supervision of Ms. Christine Gelles. DOE Fellow Paola Sepulveda presented her DOE EM research on the microbial dissolution of uranium (VI) from autunite mineral. Paola also participated in a summer internship this past summer at DOE-HQ working under the supervision of Mr. Kurt Gerdes (DOE EM12). In addition, 12 DOE Fellows had the opportunity to showcase their research by presenting posters as part of the morning presentations.

Tours of the ARC facilities included visits to the radiological laboratory, the environmental technology laboratory, the composites laboratory, the soil & groundwater laboratory, and the technology demonstration area. Technologies showcased included the peristaltic crawler and asynchronous pulsing unit for piping unplugging, the ISDSN test cube, the East Fork Poplar Creek model, the Waste Information Management System, and the D&D Knowledge Management Information Tool.

During this year's Induction Ceremony, 15 new FIU minority students were inducted as DOE Fellows:

- Michael Abbot - undergraduate, mechanical engineering
- Pedro Cordon - undergraduate, computer engineering
- Natalie Duque - undergraduate, environmental engineering
- Michelle Embon - undergraduate, civil engineering
- Mariana Evora - undergraduate, civil engineering
- Alexandra Fleitas - undergraduate, mechanical engineering
- Eduardo Garcia - undergraduate, mechanical engineering
- Hansell Gonzalez - graduate, chemistry
- Adamandios Manoussakis - undergraduate, electrical engineering
- Deanna Moya - undergraduate, mechanical engineering
- Steve Noel - undergraduate, computer science
- Sasha Philius - undergraduate, mechanical engineering
- Christian Pino - undergraduate, chemistry and biochemistry
- Lucas Scott - graduate, geology
- Carmela Vallalta - undergraduate, mechanical engineering

Figure 9. New DOE Fellows with FIU staff and Induction Ceremony guests.

In addition, awards were presented to the DOE Fellows that won the DOE Fellows Poster Exhibition and Competition held on October 16, 2013. First place went to Mr. Robert Lapierre for his poster titled, "Characterization of the Uranium-Bearing Products of Novel Remediation Technologies." Second place went to Ms. Gabriela Vazquez for her poster titled "Low Level and Mixed Low Level Waste Treatment Technology Identification." Two third places were awarded to Ms. Jennifer Arniella for her poster titled "Analysis of Life Expectancy for Waste Transfer Lines Located in SY-Farm at Hanford Site" and Ms. Paola Sepulveda for her poster titled "Investigation on Microbial Dissolution of Uranium (VI) from Autunite Mineral."

For the fifth 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 2013 Mentor of the Year Award went to research scientist Dr. Yelena Katsenovich and the 2013 DOE Fellow of the Year Award was given to Ms. Gabriella Vazquez (DOE Fellows Class of 2012) and Ms. Paola Sepulveda (DOE Fellows Class of 2011).

7.0 WASTE MANAGEMENT CONFERENCE 2014 ACCOMPLISHMENTS

DOE Fellows participated in the Waste Management 2014 Conference (WM14) in Phoenix, AZ, from March 2-6, 2014. The DOE Fellows prepared technical posters, presentation materials, written biographies (http://fellows.fiu.edu/studentsBios.asp), and brief videos for the WM conference to introduce themselves and their research. These videos can be previewed on the DOE Fellows website: http://fellows.fiu.edu/en_WM14Participation.asp.

A total of seventeen (17) DOE Fellows and two (2) FIU graduate students attended WM14 and presented nineteen (19) technical posters during Session 31 (Student Poster Competition: The Next Generation – Industry Leaders of Tomorrow) on Monday, March 3, 2014. The Fellows presented their DOE-EM research that they have performed at FIU's ARC and during their summer internships at DOE sites, national laboratories, and site contractors. **This year's Best Student poster went to Alexandra Fleitas, a 2013 DOE Fellow.** Fleitas' poster was titled, "Innovative High-Level Waste Pipeline Unplugging Technologies for Hanford Site Asynchronous Pulsing System," **marking the fourth time a DOE Fellow has won the Waste Management Student Poster Competition.**

In addition, 1 Ph.D. level DOE Fellow presented her research during the professional oral session 64 (Deep Vadose Zone Characterization and Remediation Technologies) on Tuesday, March 4, 2014:

- The Effect of Ca Ions on the Removal of U(VI) via *In Situ* Ammonia Gas Injection at the Hanford Site 200 Area (14434), Yelena Katsenovich, Claudia Cardona (DOE Fellow), Leo Lagos. **Presenter: Claudia Cardona (DOE Fellow)**

The student posters included:

- Innovative High-Level Waste Pipeline Unplugging Technologies for Hanford Site (Asynchronous Pulsing) - **Alexandra Fleitas (DOE Fellow)**
- Residual Waste Detection in HLW Tanks - **Dayron Chigin (DOE Fellow)**
- Computational Simulation and Evolution of High-Level Waste Pipeline Plugs - **Deanna M. Moya (DOE Fellow)**
- U.S. Low Level and Mixed Low Level Waste Treatment Technology Identification - **Gabriela Vazquez (DOE Fellow)**
- Analysis of Life Expectancy for Waste Transfer Lines Located at Hanford Site - **Jennifer Arniella (DOE Fellow)**

- Investigation of Permanent and Removable Coatings for Decontamination of Savannah River Site (SRS) Plutonium Fuel Form Facility - **Mariana Evora (DOE Fellow)**
- Computational Fluid Dynamics Simulations of Fluid Transients in a Pipeline at Hanford Site- **Michael Abbott (DOE Fellow)**
- Display of Contaminated Locations at Oak Ridge site using ArcGIS - **Michelle Embon (DOE Fellow)**
- A Study of Cell Viability on DOE Hanford Soil Isolates: Effect of U (VI) and Bicarbonate - **Paola Sepulveda-Medina (DOE Fellow)**
- Performance Evaluation of Mobile Applications with Deactivation & Decommissioning (D&D) Technology Services - **Chandrashekar Gama Deshika Swamy (FIU Graduate Student)**
- Performance Evaluation of Mobile Applications with Deactivation & Decommissioning (D&D) Technology Services - **Revathy Venkataraman (DOE Fellow)**
- Characterization of the Uranium-Bearing Products of Novel Remediation Technologies - **Robert Lapierre (DOE Fellow)**
- Design and Development of Geographical Information System (GIS) Map for DOE Waste Streams - **Sandhya Appunni (FIU Graduate Student)**
- GPU Accelerated Lattice-Boltzmann Method for Fluid Flows in Nuclear Waste Tanks at Hanford Site - **Sasha Philius (DOE Fellow)**
- Development of REST Services for Populating ESRI's ArcGIS Spatial Modeling Applications - **Steve Noel (DOE Fellow)**
- Microcosm Study on Mineralogical Changes of Post-Molasses Injection with Savannah River Site (SRS) F-area - **Valentina Padilla (DOE Fellow)**
- Engineering Scale Pipeline Unplugging Testing Using the Improved Peristaltic Crawler System for Removal of High Level Waste Plugs at Hanford Site Pipelines - **Carmela Vallalta (DOE Fellow)**
- The Effects of Silica and Humic Acid on U(VI) Removal from Savannah River Site (SRS) F/H Area Groundwater - **Joel McGill (DOE Fellow)**
- Environmental Remediation Optimization: Cost Savings, Footprint Reduction, and Sustainability Benchmarked on DOE Sites - **Natalia Duque (DOE Fellow)**

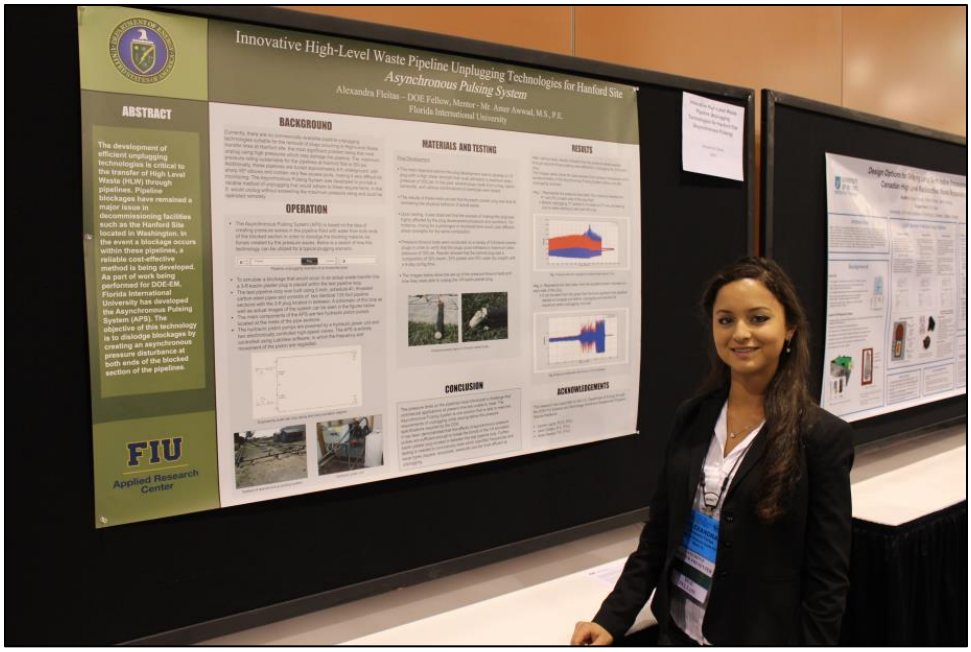

Figure 10. Alexandra Fleitas (DOE Fellow) presenting her research at WM14.

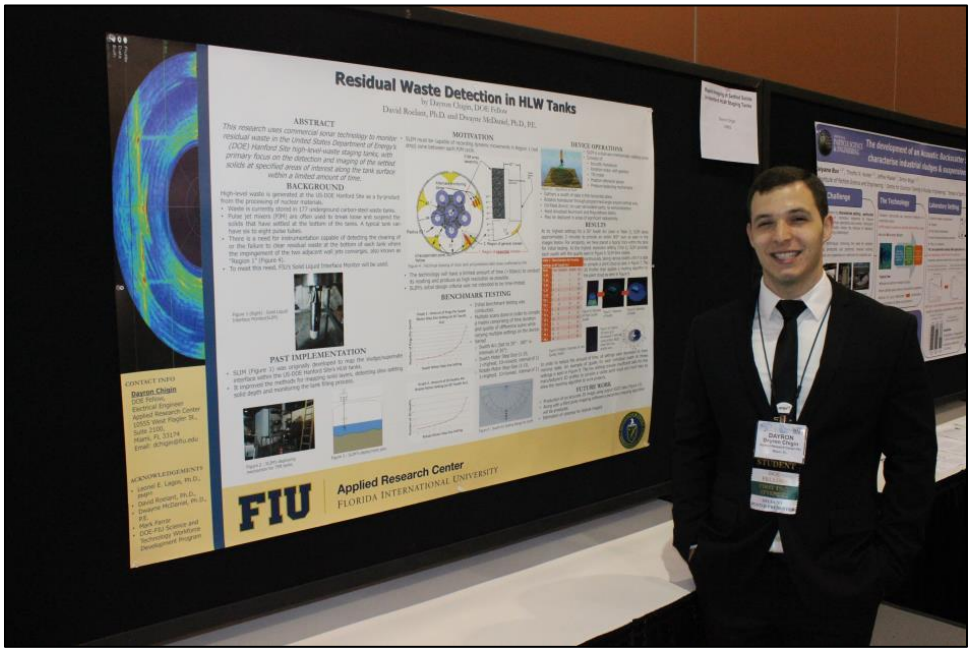

Figure 11. Dayron Chigin (DOE Fellow) presenting her research at WM14.

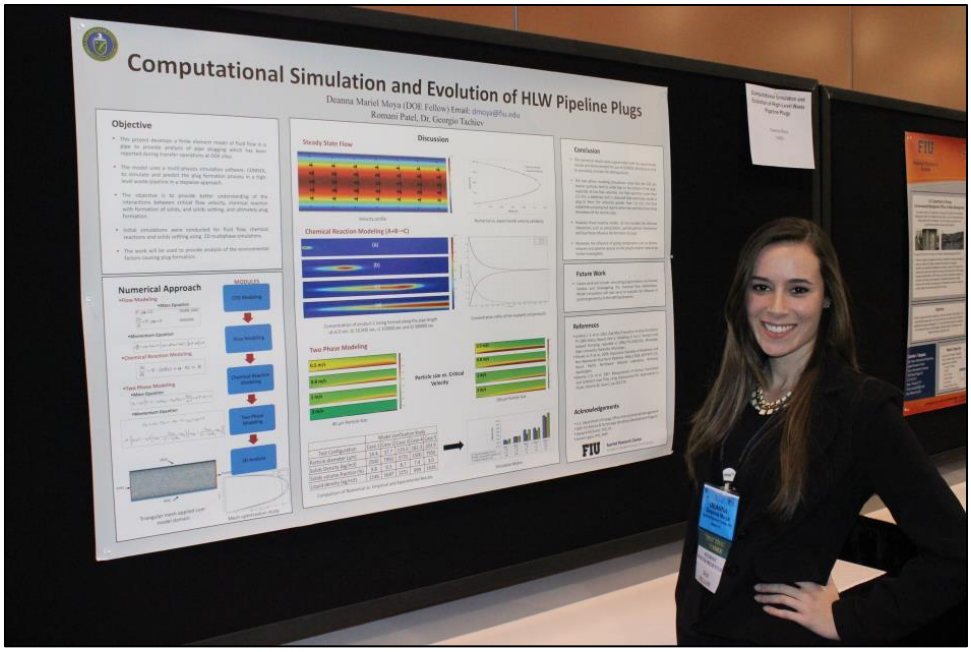

Figure 12. Deanna M. Moya (DOE Fellow) presenting her research at WM14.

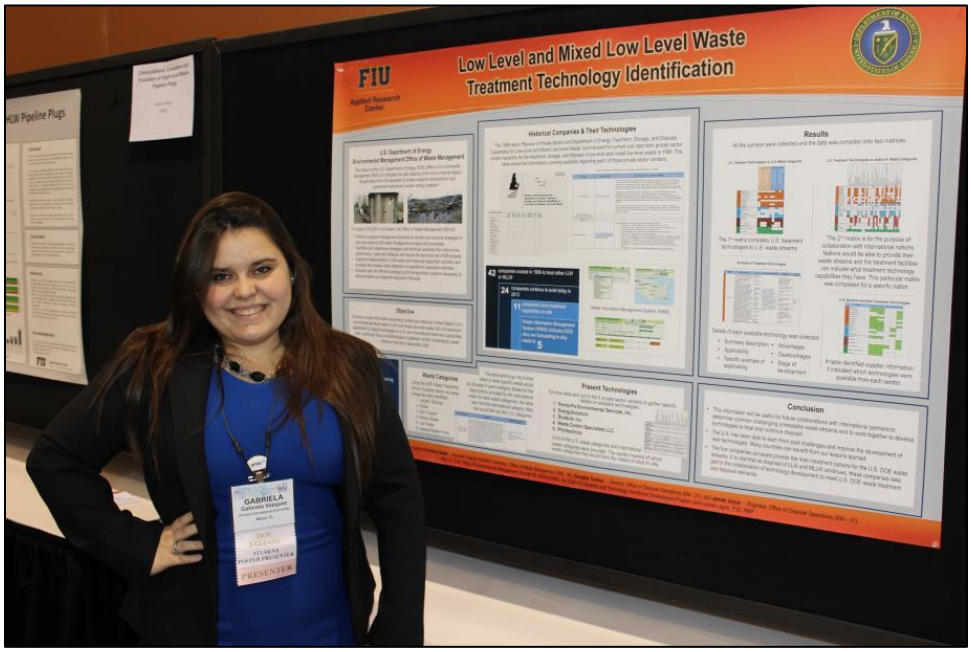

Figure 13. Gabriela Vazquez (DOE Fellow) presenting her research at WM14.

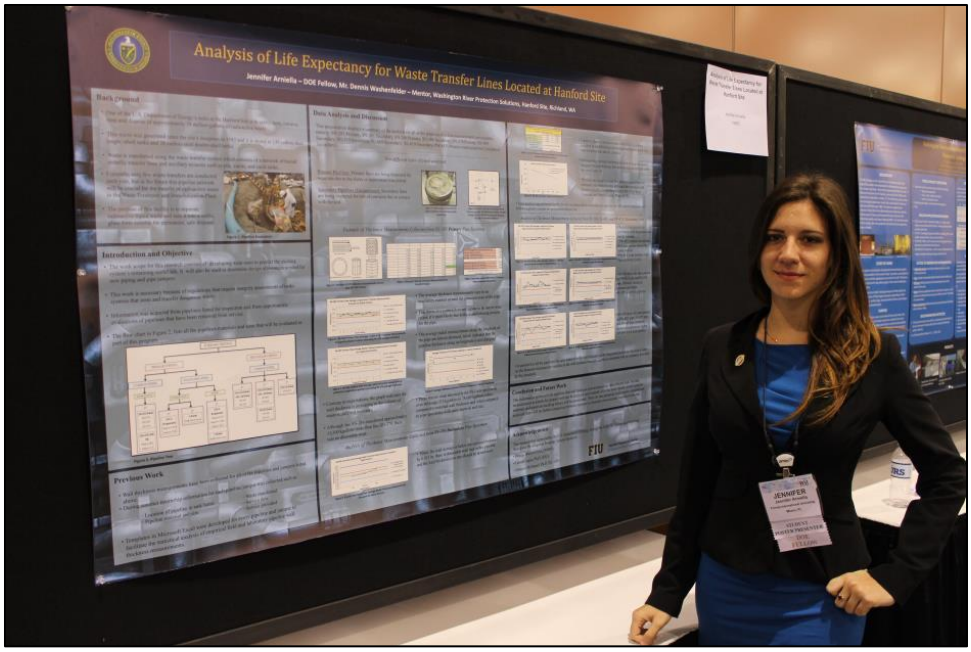

Figure 14. Jennifer Arniella (DOE Fellow) presenting her research at WM14.

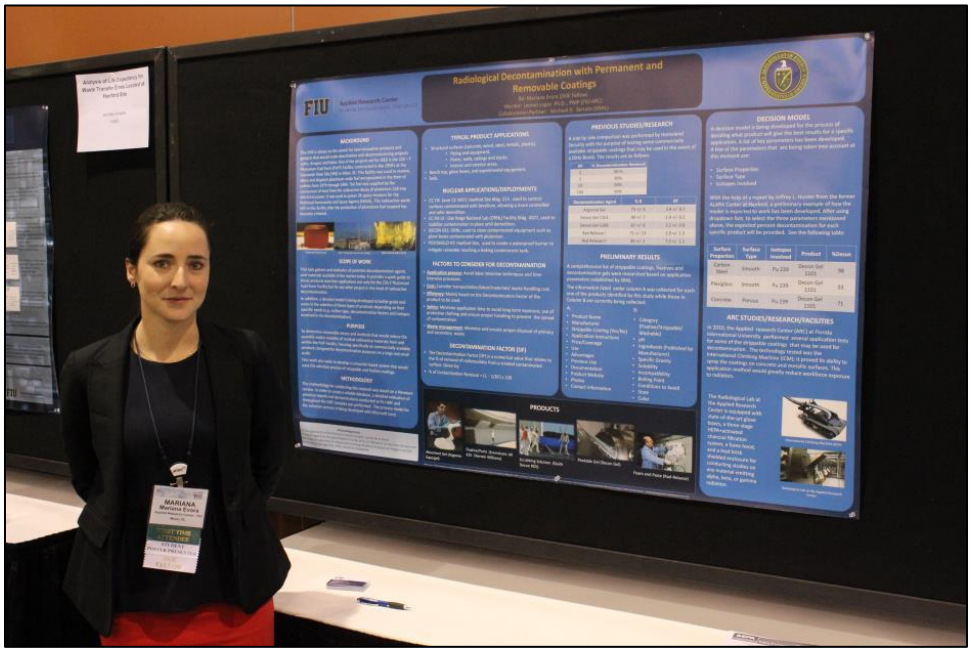

Figure 15. Mariana Evora (DOE Fellow) presenting her research at WM14.

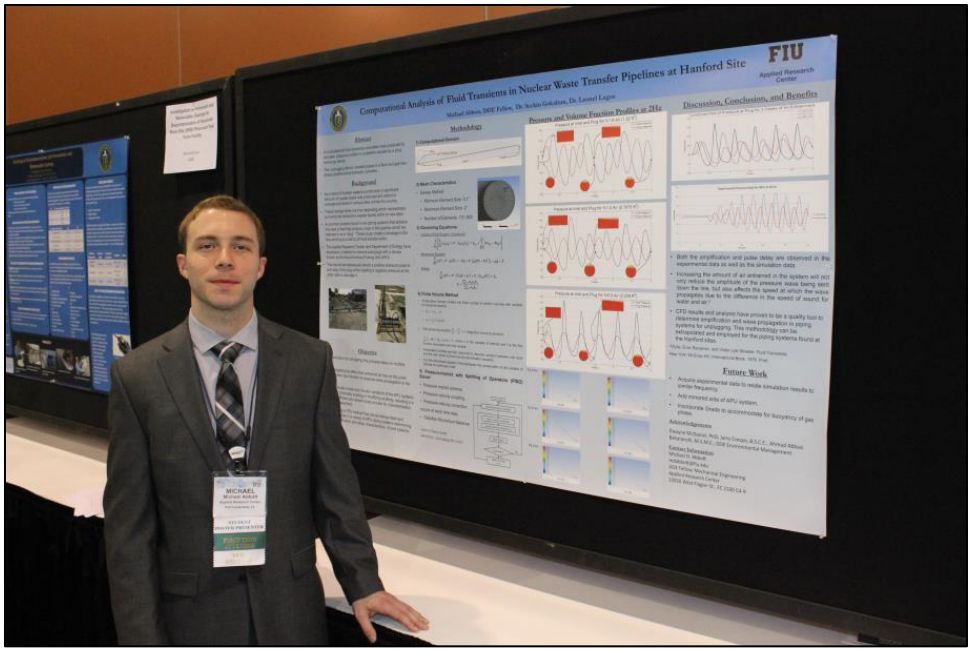

Figure 16. Michael Abbott (DOE Fellow) presenting her research at WM14.

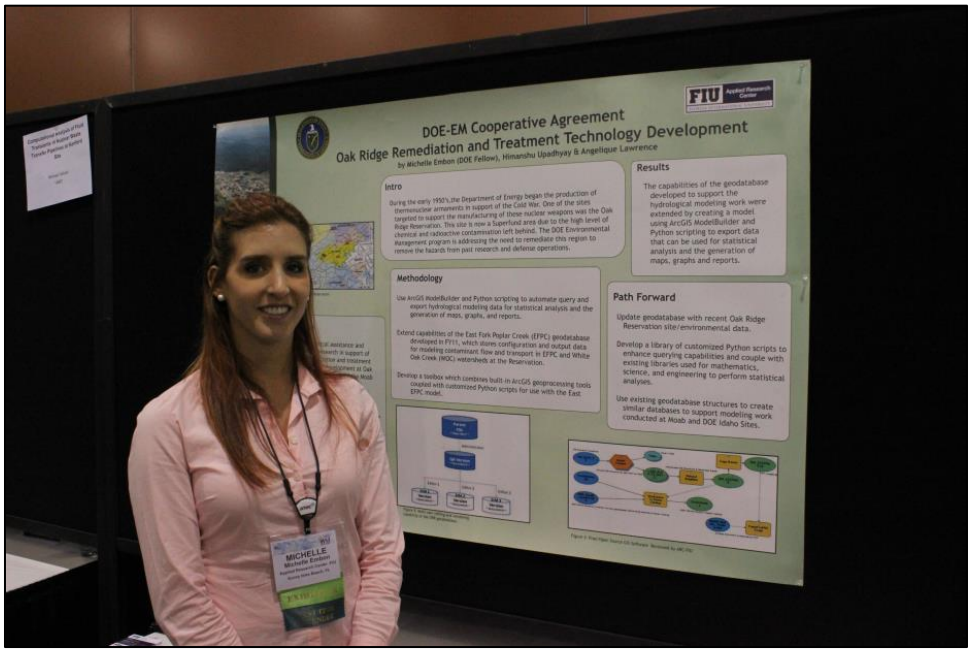

Figure 17. Michelle Embon (DOE Fellow) presenting her research at WM14.

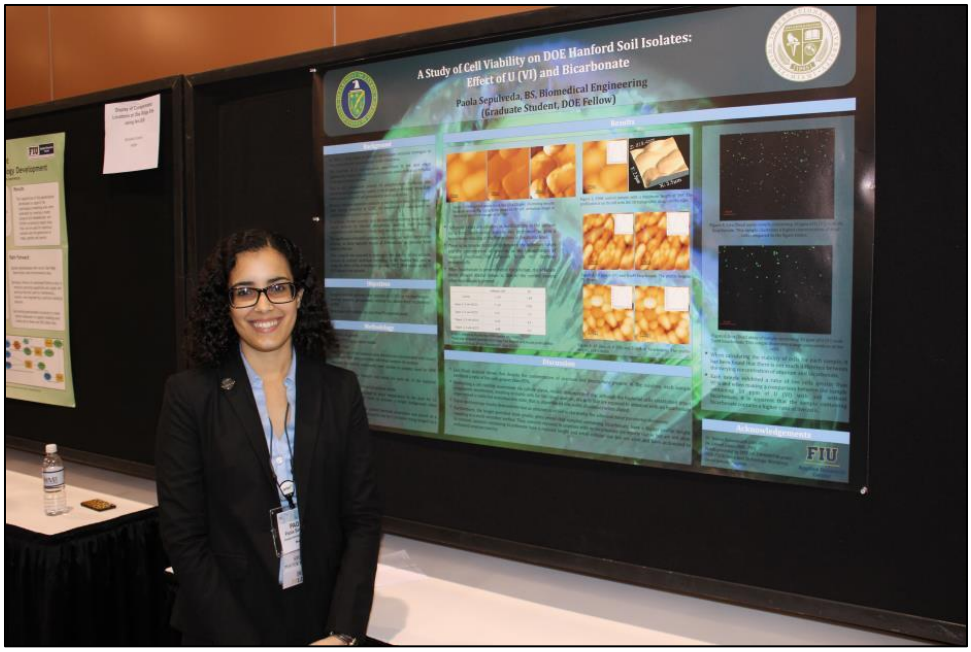

Figure 18. Paola Sepulveda-Medina (DOE Fellow) presenting her research at WM14.

Figure 19. Chandrashekar Gama Deshika Swamy (FIU Graduate Student) presenting her research at WM14.

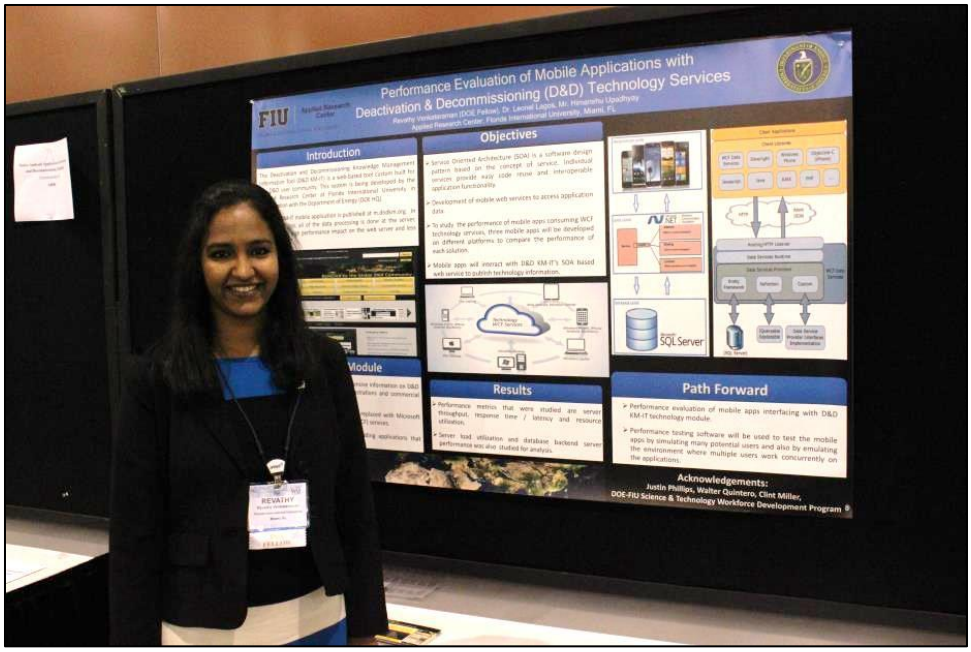

Figure 20. Revathy Venkataraman (DOE Fellow) presenting her research at WM14.

Figure 21. Robert Lapierre (DOE Fellow) presenting her research at WM14.

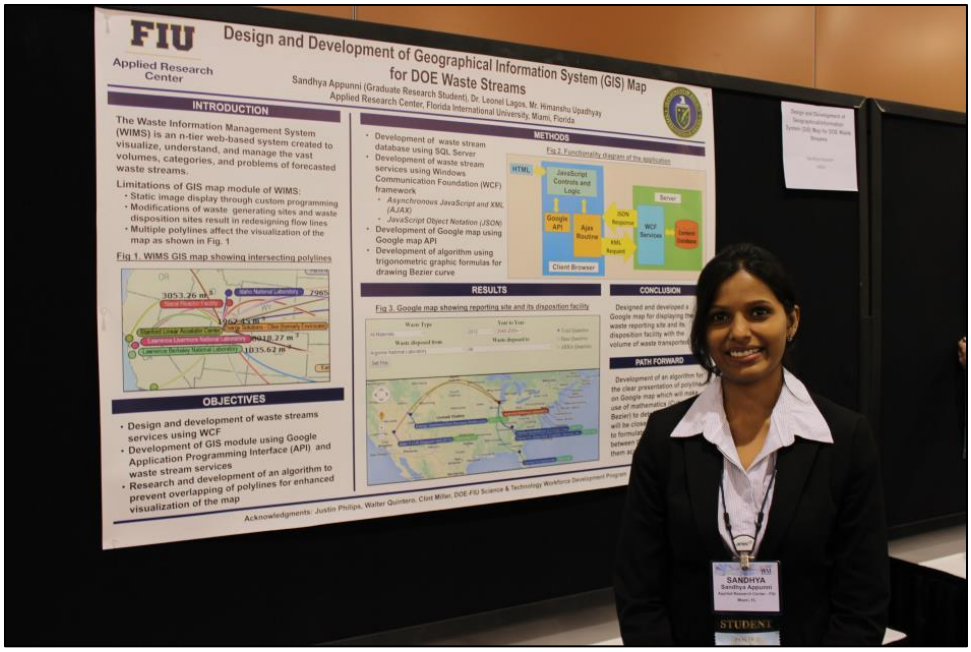

Figure 22. Sandhya Appunni (FIU Graduate Student) presenting her research at WM14.

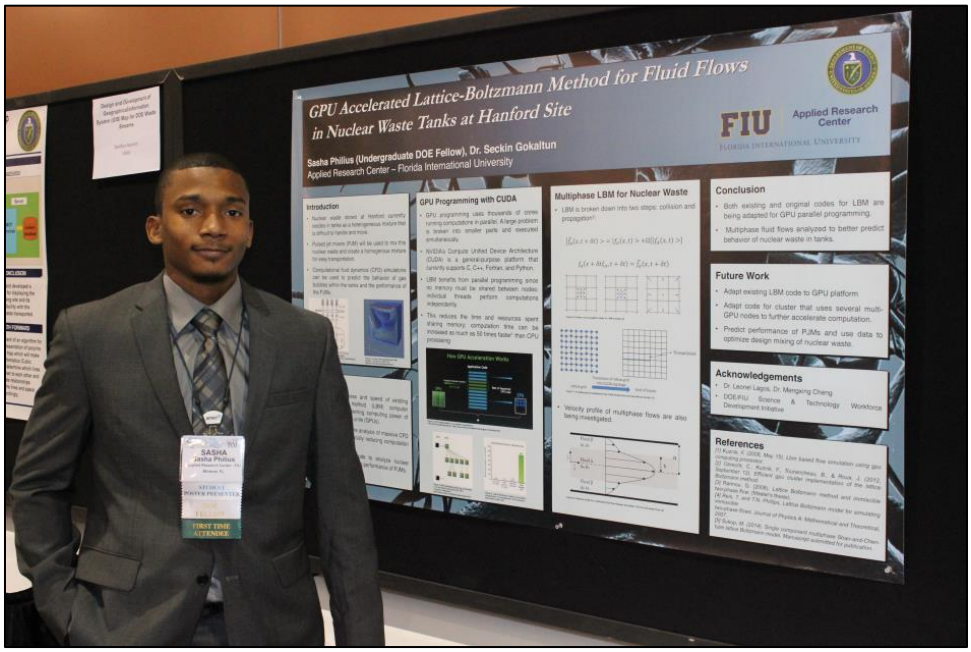

Figure 23. Sasha Philius (DOE Fellow) presenting her research at WM14.

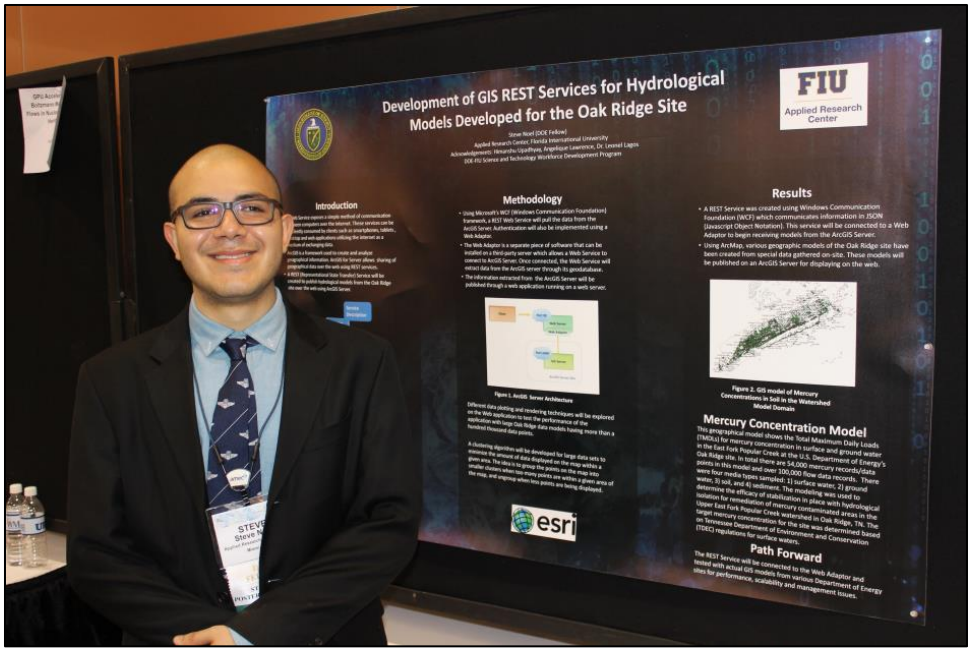

Figure 24. Steve Noel (DOE Fellow) presenting her research at WM14.

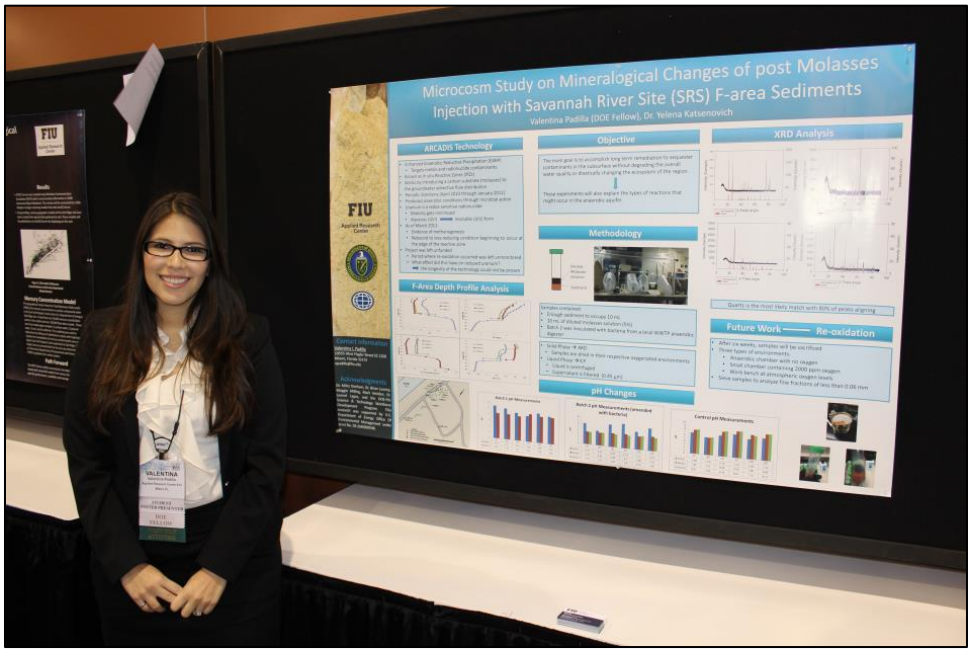

Figure 25. Valentina Padilla (DOE Fellow) presenting her research at WM14.

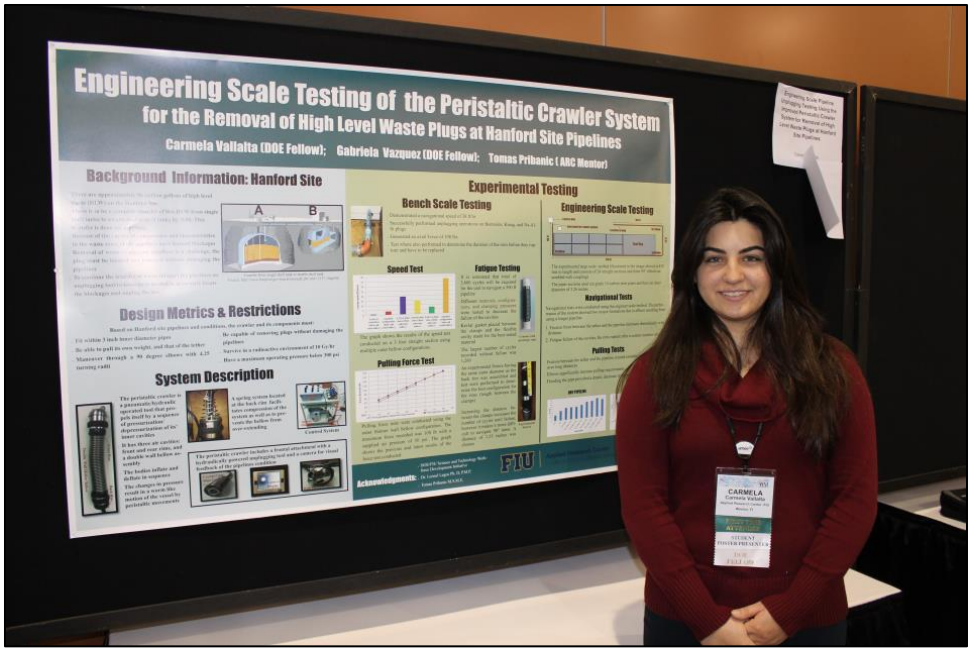

Figure 26. Carmela Vallalta (DOE Fellow) presenting her research at WM14.

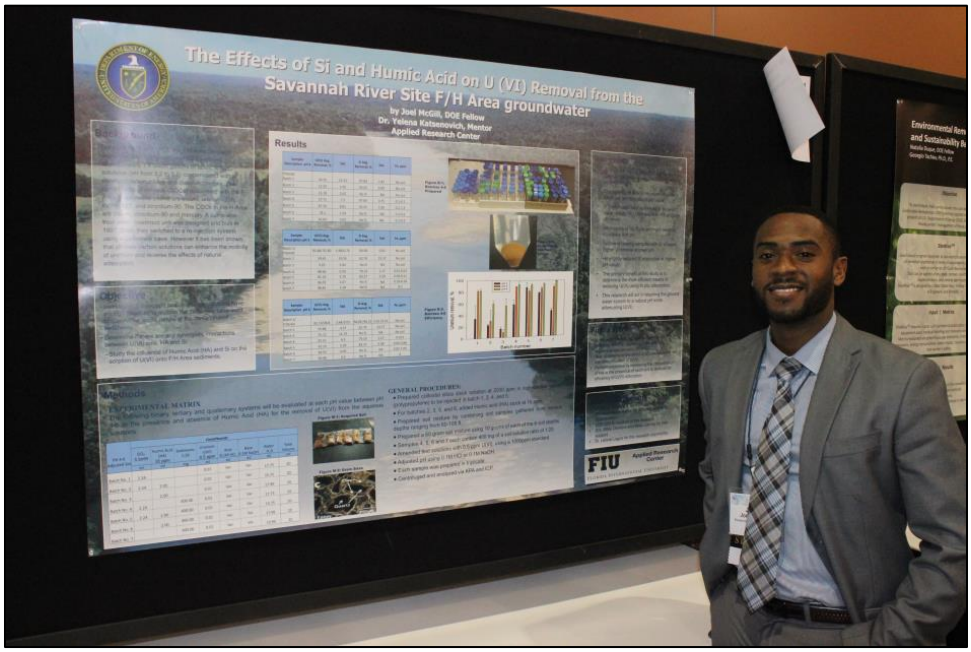

Figure 27. Joel McGill (DOE Fellow) presenting her research at WM14.

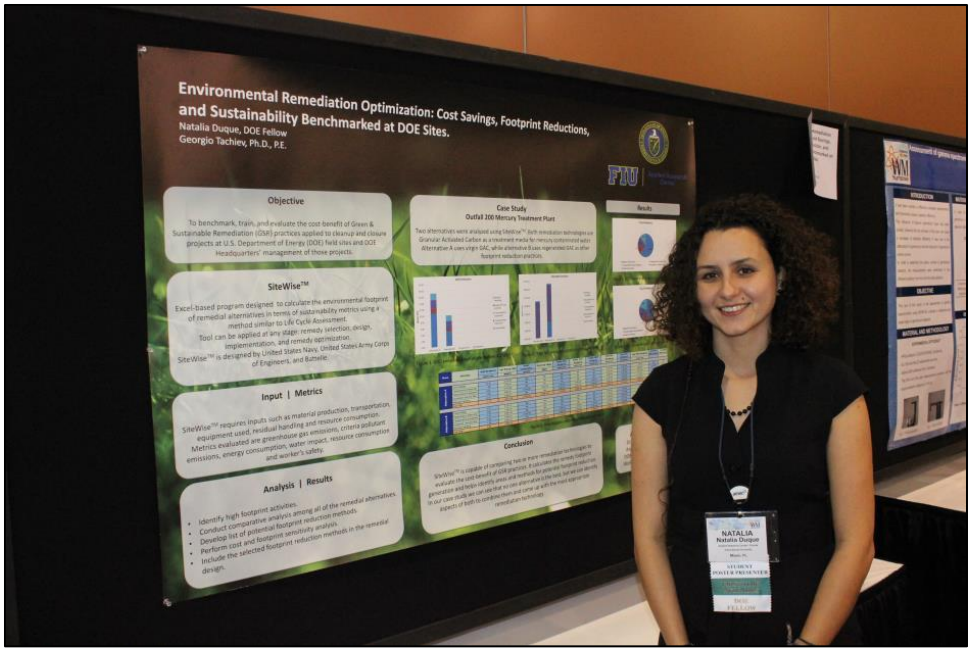

Figure 28. Natalia Duque (DOE Fellow) presenting her research at WM14.

Also during the conference, one (1) DOE Fellow (Gabriela Vasquez) participated in a panel session, Session 44 on "Graduating Students and New Engineers – 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. The DOE Fellows also had the opportunity to participate as Student Assistants at the conference and help conference organizers and presenters during the technical sessions. Figures 5-20 through 5-24 show photographs from the conference.

Figure 29. DOE Fellows at WM14 with Ana Han (EM Lead Foreign Affairs Specialist), Dave Huizenga (EM Acting Assistant Secretary) and Leo Lagos (DOE Fellows Program Director), seated front from left to right.

Figure 30. DOE Fellow Gabriela Vazquez with other panel members for the panel on "Graduating Students and New Engineers- Wants and Needs – Are Companies Even Listening?"

Figure 31. DOE Fellows posing with ARC staff Leo Lagos and Yelena Katsenovich during the Waste Management 2014.

Figure 32. DOE Fellows during the Waste Management 2014 Student Poster Competition

Figure 33. DOE Fellows in front of Michelle Embon's (DOE Fellow) student poster at WM14.

In addition, a former DOE Fellow (Duriem Calderin – Class of 2008) returned to WM14 and participated in Session 45 "Young Professional in Nuclear Science & Engineering." Duriem is working as an engineer at AREVA NP Inc's Thermal Hydraulic Group in Richland, WA. Duriem discussed his first step as a young engineer in the nuclear industry and his experience as a DOE Fellow.

8.0 DOE FELLOWS DIRECTLY SUPPORTING DOE EM PROJECTS

DOE Fellows provide direct support to DOE EM projects around the complex. Details of the applied research performed at ARC in support of DOE EM is reported in the FIU Year 4 Year End Reports for Project 1, 2, 3, and 4. A summary of the project tasks that received direct support from the DOE Fellows is provided below.

DOE's Hanford Site Support for HLW

DOE Fellows: Alexander Fleitas, Carmela Vallalta, Gabriela Vazquez, Eduardo Garcia
Mentors: Amer Awwad, Tomas Pribanic
Project Task: High level waste unplugging technologies

DOE Fellow: Dayron Chigin
Mentors: David Roelant, Dwayne McDaniel
Project Task: Rapid imaging of settled solids in HLW staging tanks

DOE Fellow: Deanna Moya, Michael Abbott, Sasha Philius
Mentor: Romani Patel, Seckin Gokaltun
Project Task: Computational simulations of HLW transfer pipelines

DOE Fellow: Jennifer Arniella
Mentor: Dwayne McDaniel, Dennis Washenfelder (WRPS)
Project Task: Life expectancy analysis for waste transfer lines

DOE's Hanford Site Support for Soil & Groundwater

DOE Fellow: Paola Sepulveda-Medina
Mentor: Yelena Katsenovich
Project Task: Effect of U(VI) and bicarbonate on cell viability

DOE Fellow: Claudia Cardona, Robert Lapierre
Mentor: Yelena Katsenovich
Project Task: In situ remediation using pH manipulation via ammonia gas

DOE's Savannah River Site Support for Soil & Groundwater

DOE Fellow: Valentina Padilla, Christian Pino
Mentor: Yelena Katsenovich
Project Task: U(VI) bioreduction via molasses-based reagent injection

DOE Fellow: Joel McGill
Mentor: Yelena Katsenovich
Project Task: Effects of silica and humic acid on U(VI) removal

Soil and Groundwater Remediation Support

DOE Fellow: Natalia Duque
Mentor: Georgio Tachiev

Project Task: Environmental remediation optimization

DOE's Savannah River National Laboratories Support

DOE Fellow: Mariana Evora
Mentors: Leo Lagos, Peggy Shoffner
Project Task: Decontamination agents/materials

Support to DOE EM-13 and Interface with EFCOG

DOE Fellow: Heidi Henderson
Mentors: Peggy Shoffner, Leo Lagos (Supporting EFCOG DD/FE Working Group)
Project Task: EFCOG's D&D Lessons Learned/Best Practices

D&D Knowledge Management Information Tool

DOE Fellows: Revathy Venkataraman, Mariela Silva, Pedro Cordon
Mentors: Himanshu Upadhyay, Peggy Shoffner
Project Task: Data mining activities and entries to populate D&D KM-IT

Centralized Knowledge Base System and FIU-DOE Research Website

DOE Fellows: Michelle Embon, Steve Noel
Mentors: Himanshu Upadhyay, Peggy Shoffner
Project Task: Provide a centralized location for the research information

9.0 INTRODUCTION TO DOE FELLOWS AND THEIR RESERCH WORK

9.1 DOE Fellows and their Research: Class of 2013 – Seventh Cohort

Adamandios Manoussakis (Electrical Engineering)

Adamandios is a senior undergraduate student pursuing a bachelor's degree in electrical engineering at Florida International University. His interests include communications, robotics, and embedded systems. He is the president of the Institute of Electrical and Electronics Engineers FIU student branch. After the completion of his bachelor's degree, he plans to continue his education by getting a master's degree in electrical engineering.

Alexandra Fleitas (Mechanical Engineering)

Alexandra Fleitas is an undergraduate student pursuing a Bachelor of Science degree in mechanical engineering at Florida International University (FIU). Alexandra's professional interests include manufacturing, applied mechanics, and energy efficiency, with a special interest in renewable energy technologies such as turbines and energy sources such as nuclear power. She is interested in further developing sustainable energy systems that will serve to deliver relevant engineering resources to advance public safety and quality of life. After completing her Bachelor of Science in mechanical engineering, Alexandra intends to continue her education by pursuing a master's degree. Alexandra is a member of the American Society of Mechanical Engineers (ASME) and during her time at FIU, she has been a recipient of the Academic Excellence Award.

Alexandra is DOE Fellow for the DOE-FIU Science and Technology Workforce Development Program, working under the mentorship of Mr. Amer Awwad, P.E., and Jairo Crespo on the un-plugging technology known as the "asynchronous pulsing system." The asynchronous pulsing system will serve to deliver a more reliable and effective solution when plugging occurs within high-level waste transfer lines. Alexandra analyzes the data recorded by pressure transducers and accelerometers located throughout the pipeline to determine how each pulse influences the total plug dynamic loading. She uses computer programs such as Excel and Matlab to represent the recorded data through graphs and simulations.

Carmela Vallalta (Mechanical Engineering)

Carmela Vallalta is an undergraduate student pursuing a Bachelor of Science degree in mechanical engineering at Florida International University (FIU). Her expected graduation date is spring 2016. After completing her degree in mechanical engineering, Carmela intends to continue her education by pursuing a master's degree.

Carmela is currently the Vice President of internal affairs for the SHPE (Society of Hispanic Professional Engineers) FIU student chapter, one of the largest SHPE student chapters in the U.S. She is in charge, among other things, of organizing campus-wide events for the group. She is also an active member in IEEE (Institute of Electrical and Electronics Engineers) where she participates in both the IEEE Hardware Competition and the NASA Hybrid Rocket Competition.

Prior to becoming a DOE Fellow, she was a student intern in DiscoveryLAB, an organization based in the Computer Science Department at FIU that develops products for the marketplace. In addition, the lab provides the hands-on experience needed to solve real-world challenges, develops student-led research opportunities, and fosters students' entrepreneurial skills. As the only mechanical engineer in a primarily computer science/computer programming lab, she was responsible for designing, manufacturing and modeling the mechanical components for many of the projects in the lab.

Working under the supervision of Mr. Tomas Pribanic, Carmela is assisting in the development and experimental testing of high-level radioactive waste pipeline unplugging technologies for the Hanford Site.

Carmela is also working on the Peristaltic Crawler, a pneumatically operated device that propels itself through the pipe by a series of pressurization and depressurization of its inner tubes. The front of the crawler includes an unplugging tool attachment designed to dissolve the plugged waste as well as a camera for visual feedback of the pipeline's condition.

Christian Pino (Chemistry)

Christian Pino is currently a senior undergraduate student pursuing a Bachelor of Science degree in chemistry at Florida International University. He is interested in organic chemistry and the remediation of radioactive components from the soil. Christian is also on the executive board of Tau Kappa Epsilon Fraternity and the FIU Student Chapter of the American Chemical Society as Chaplin and CSO Representative, respectively. In 2013, Christian worked as a learning assistant for Dr. Kavallieratos and was an adjunct teaching assistant. After graduation, Christian plans on continuing to further his education.

As a DOE Fellow, Christian is currently researching the remediation of radioactive iodine. His research is finding significant information about iodine's speciation and other aspects; however, a technique for its remediation has not yet been successfully implemented. Christian is working closely with his mentor, Dr. Yelena Katsenovich, to identify a practical method of iodine remediation.

Deanna Moya (Mechanical Engineering)

Deanna Moya is a junior undergraduate student pursuing a bachelor's degree in mechanical engineering and a minor in business administration at Florida International University (FIU). She is a member of the Tau Beta Pi Engineering Honors Society as well a member of the Society of Hispanic Professional Engineers (SHPE). Her research interests include mechanical design, robotics, and computational modeling of fluid systems for the waste removal projects at DOE. After the completion of her bachelor's degree in fall 2015, she plans to continue her education in pursuit of a master's degree.

Deanna is a DOE Fellow for the DOE-FIU Science and Technology Workforce Development Program, working on the computational simulations and evolution of high-level waste pipeline plugs under the mentorship of Romani Patel. Over the past years, Florida International University's Applied Research Center (ARC) has attributed the pipeline plugging to two main factors: chemical instability and settling of solids. Deanna's research includes the use of computational fluid dynamics (CFD) modeling to simulate and predict the plug formation process in a high-level waste pipeline. With these 2D multiphase simulations, the risk of pipeline plugging can be reduced and the relationships between plug formation, critical flow velocity, and settling dynamics can be better understood.

Hansell Gonzalez (Electrical Engineering)

Hansell Gonzalez Raymat graduated from Florida International University in fall 2012 with a Bachelor of Science in chemistry. He started his PhD in chemistry in spring 2014. In his undergraduate research in summer 2011, he worked in Dr. Stanislaw Wnuk's group doing research on the synthesis of cyclic analogs of s-adenosylhomocysteine and the elucidation of its structures. He is interested in environmental chemistry and in remediation of contaminated areas.

Hansell has been competitively selected as a DOE Fellow for the Department of Energy's (DOE) Science and Technology Workforce Development program, where he started doing research on groundwater remediation for uranium removal at the Savannah River Site.

Mariana Evora (Civil Engineering)

Mariana Evora is an undergraduate student at Florida International University pursuing a bachelor's degree in civil engineering with an expected graduation date of August 2014. Focused on structural engineering, her main interests are building design and refurbishment; she is also interested in the development of new innovative sustainable solutions for some of the challenges we currently face, like climate change. She is the current treasurer of the American Society of Civil Engineers (ASCE) - FIU Chapter and the Secretary of the Cuban American Society of Civil Engineers (CAACE) – FIU Chapter. Mariana is interested in continuing her education towards a master's degree in civil engineering upon graduation.

As a DOE Fellow, Mariana has conducted an intense literature search in order to gather and evaluate a list of commercially available strippable and fixative coatings that would assist in decontamination and decommissioning (D&D) efforts by reducing the quantity of residual radiological contamination from a contaminated facility. In addition, she is helping develop a computer based model that will guide end users in the selection of these types of products depending on their specific needs and site application.

Michael Abbott (Civil Engineering)

Michael Abbott is currently attending Florida International University to obtain a degree in mechanical engineering. Michael's professional interests include computational modeling and materials engineering, with an emphasis on nanotechnology.

Michael is currently a DOE Fellow for the DOE-FIU Science and Technology Workforce Development Program, working under the mentorship of Dr. Seckin Gokaltun. Dr. Gokaltun is introducing him to computational modeling of fluid systems for the DOE's application of waste removal from high-level waste tanks. Michael has developed a simulation for the piping systems found at the Hanford Site in Washington State. The project is focused on modeling an unplugging method known as asynchronous pulsing where the objective is to apply a simultaneous increase of pressure and decrease of pressure respectively on each side of the pipeline plug to dislodge and remove it.

Michelle Embon (Civil Engineering)

Michelle Embon graduated with honors from Georgetown University with a B.A. in economics and a physics minor. She is currently pursuing a second bachelor's in civil engineering from FIU, and hopes to continue with her education by getting a master's degree upon graduation. She has served as an intern for both the National Science Foundation (NSF) engineering communications department and for the VTech Occoquan Watershed monitoring lab, where she worked as a water quality research assistant. Her academic interests include environmental hydrology, water supply and resources engineering, and GIS systems. Among many other honors, she has been nominated president of the Georgetown Economics Honor Society and secretary of the GU Latin American Club. Michelle is a member of the Florida Water Environment Association, American Academy of Environmental Engineers and Scientists (AAEES) and the Tau Beta Pi Engineering Honors Society.

Michelle is a DOE Fellow for the DOE-FIU Science and Technology Workforce Development Program, currently working on GIS imaging and analysis of nuclear contamination and dissipation within the Oak Creek watershed site. Specifically, this project conducts an analysis on changes of mercury load as a function of hydrology and other variable environmental conditions. Experimenting with different sedimentation modules, the team forecasts the fate of the chemical by simulating the interaction between particles, water, and mercury.

Natalia Duque (Environmental Engineering)

Natalia Duque is an undergraduate student pursuing a Bachelor of Science degree in the track of environmental engineering at Florida International University. Her expected graduation date is spring 2014. Natalia's professional interests include green engineering, clean and renewable sources of energy, groundwater and soil remediation, among others. She is currently conducting a research study on renewable and integrated systems of energy to be implemented in developing countries. Natalia is a member of the Society of Hispanic Professional Engineers (SHPE), the American Society of Civil Engineers (ASCE), the American Academy of Environmental Engineers and Scientists (AAEES) and the Florida Water Environment Association (FWEA). After completion of her bachelor's degree, Natalia plans to continue her education in pursuit of a master's degree.

As a DOE Fellow, Natalia is currently working under the mentorship of Dr. Georgio Tachiev in the development and optimization of remediation treatment technologies. The project involves the use and integration of a number of computer modeling platforms to provide a comprehensive assessment of the remediation technologies being used at different DOE sites.

Pedro Cordon (Computer Engineering)

Pedro Cordon is an undergraduate student pursuing a Bachelor of Science degree in computer engineering at Florida International University (FIU). His expected graduation date is fall 2014. Pedro's professional interests include ethical hacking, embedded system programming, web designing, integrated circuits, logic-based programming, and data system software. After completing his Bachelor of Science in computer engineering, Pedro intends to continue his education by pursuing a master's degree.

Pedro graduated from Miami Beach Senior High summa cum laude. He was the founder and president of Sociedad Honoraria Hispanica (Hispanic Honor Society), treasurer of both Phi Beta Chi (Science Honor Society) and Mu Alpha Theta (Mathematics Honor Society) as well as a member of the Miami Beach Silver Hi-Tide Marching Band. In the summer of 2009, he served as a City of Miami Beach intern where he solidified his passion for engineering and computing and received various awards. Since 2009, he has kept himself busy as a tutor during which he completed well over 40 free sessions in an after-school tutoring program and even extended his skills by tutoring an average of 15 hours a week privately.

During his time at FIU, he has received various honors and awards such as the Academic Excellence Scholarship and the Buick Achievers Scholarship. He is also an active member of Tau Beta Pi (Engineering Honor Society), Society of Hispanic Professional Engineers (SHPE) and Society of Women Engineers (SWE).

As a DOE Fellow, Pedro is under the mentorship of Himanshu Upadhyay and is currently assigned to a task under Project 4, the Deactivation and Decommissioning Knowledge Management Information Tool (D&D KM-IT). He has applied his wide skill-set in the development and design of a Native Android Application for D&D KM-IT and the testing of local networks to enhance security for servers within the Applied Research Center. In addition, Pedro has data mined technology reports and videos to add information to the DOE Environmental Management database and has presented research to engineering students, mentors and colleagues.

Sasha Philius (Mechanical Engineering)

Sasha Philius is an undergraduate student pursuing a Bachelor of Science degree in mechanical engineering at FIU. Sasha's professional interests include robotics, computational modeling, and design optimization. After completing his BS, Sasha intends to continue his education by pursuing a master's degree. He is a current executive board member of the Tau Beta Pi Engineering Honor Society.

Sasha is currently working on the asynchronous pulsing system (APS) project mentored by Dr. Amer Awwad. Pumping high-level waste (HLW) between storage tanks or treatment facilities is a common practice performed at Department of Energy (DOE) sites. Current commercially available pipeline unplugging technologies do not provide results that are cost-effective and reliable. 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. 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. Sasha has been tasked with assisting in the execution of pressure measurement trials. He ensures the testing site is prepped for trial runs and organizes the data collected from the sensors. He also helps to install and repair any fittings or sensors needed for the experiments.

Steve Noel (Computer Science)

Steve Noel is a senior undergraduate student in the Computer Science Department at Florida International University. His interests include parallel computing, computer graphics, database management and mobile development. He is expected to graduate in fall 2014. After completing his bachelor's degree in computer science, he plans to continue his studies into graduate school.

Steve is a DOE Fellow for the DOE-FIU Science and Technology Workforce Development Program, currently working on the waste and D&D engineering and technology development project mentored by Himanshu Upadhyay, particularly, with the deployment of environmental contamination and remediation models. There are many nuclear facilities across the country dealing with nuclear and

radioactive waste cleanup efforts. This project aims to develop geographical models of the contamination at these various sites using GIS (geographic information systems) technology such as ArcGIS and publishing these models on a universal platform.

10.0 SUMMER 2014 DOE FELLOWS INTERNSHIPS

A total of 10 DOE Fellows are participating in internships at DOE Headquarters, DOE sites, DOE national laboratories, and DOE contractors during summer 2014. Two DOE Fellows are performing internships at DOE-HQ (with EM-12 at Cloverleaf and EM-13 at Forrestal) this summer. In addition, six DOE Fellows are interning in Washington State. Two of those will work at the Pacific Northwest National Laboratory, two DOE Fellows with Washington River Protection Solutions, one with Bechtel at the WTP, and one with AREVA Federal Services in Seattle. In addition two DOE Fellow are interning at the Savannah River National Laboratory.

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 table below describes the DOE Fellows participating in internships, the site/national lab, and their assigned mentors.

Table 7. List of DOE Fellows Participating in Internships during 2013

DOE Fellow	Location	Summer Site Mentor
Deanna Moya	DOE-HQ EM-12, Cloverleaf, MD	Justin Marble/ Patricia Lee
Natalia Duque	DOE-HQ EM-13, Forrestal, Washington D.C.	Albes Gaona
Carmela Vallalta	WRPS, Hanford, WA	Dennis Washenfelder
Sasha Philius	WTP (Bechtel), Hanford, WA	Brad Eccleston/ Joel Peltier
Anthony Fernandez	WRPS, Hanford, WA	Ruben Mendoza
Christian Pino	PNNL, Richland, WA	Amoret Bunn
Robert Lapierre	PNNL, Richland, WA	Dawn Wellman
Brian Castillo	AREVA Federal Services, Seattle, WA	Rich Smith
Hansell Gonzalez	SRNL, Savannah River, SC	Brian Looney/ Miles Denham
Steve Noel	SRNL, Savannah River, SC	Mary K. Harris

Figure 34. DOE Fellows summer 2014 interns with program director Dr. Lagos.

11.0 OTHER PROGRAM ACTIVITIES

- Project progress and accomplishments for FIU Year 4 were presented to DOE-EM during a videoconference held February 26, 2014. In attendance were the FIU-ARC Project 5 Program Director Dr. Leonel Lagos, DOE Fellows (Dayron Chigin, Valentina Padilla, Gabriella Vazquez, Deanna Moya, Robert Lapierre, Natalia Duque, Ximena Prugue, Mariana Evora, Michael Abbott, Sasha Philius, Jennifer Arniella, and Pedro Cordon), Patricia Lee (DOE), and John De Gregory (DOE). During this videoconference to DOE HQ, three DOE Fellows presented their research:
    - DOE Fellow Gabriela Vazquez – Alternative Unplugging Technologies, Inspection Tools for DST Primary Tanks, and LLW/MLLW Treatment Technology Identification
    - DOE Fellow Dayron Chigin – Rapid Measurement of HLW Solids on Tank Bottoms
    - DOE Fellow Valentina Padilla – SRS Microcosm Study – Post Molasses Injection
- 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. 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. All Fellows also participated in a weekly meeting conducted by the program director. During each of these meetings, one DOE Fellow presents the work they performed during their summer internship and/or EM research work they are performing at ARC. Presentations are listed in the table below.

Table 8. DOE Fellow Presentations on their Summer 2013 Internships or EM Research at ARC

DOE Fellow	Presentation Date
Gabriela Vazquez	09/30/13
Paola Sepulveda	10/07/13
Dayron Chigin	10/14/13
Valentina Padilla	10/28/13
Joel McGill	11/04/13
Jennifer Arniella	11/19/13
Carmela Vallalta	04/15/14
Hansell Gonzalez	05/05/14

- ARC participated in the American Society of Mechanical Engineers (ASME) 15th International Conference on Environmental Remediation and Radioactive Waste Management (ICEM2013) held in Brussels, Belgium, during September 8 -12, 2013. Dr. Leonel Lagos (Director of Research at ARC) attended the conference and presented two papers based on the applied research and workforce development being conducted at ARC in support of the Department of Energy Office of Environmental Management (DOE EM). Dr. Lagos was also invited to form part of an international panel to address challenges and opportunities affecting the global environmental remediation and radioactive waste management community. Two DOE Fellows accompanied Dr. Lagos to the conference and each presented a paper based on the DOE EM research they are conducting at ARC. Dr. Lagos' participation in the conference was fully supported by FIU and he made presentations on the following:
    - Training and Mentoring the Next Generation of Scientists and Engineers to Secure Continuity and Successes of the US DOE's Environmental Remediation Efforts
    - D&D Knowledge Management Information Tool – A Web Based System Developed to Share D&D Knowledge Worldwide
    - International Collaboration Panel onChallenges and Opportunities Affecting the Global Environmental Remediation and Radioactive Waste Management Community

  The two DOE Fellows were fully supported by ASME to participate in ICEM2013. The DOE Fellows attended ICEM2013 and presented their DOE EM research being conducted at ARC:

    - **DOE Fellow Ximena Prugue** - Development of a Mechanical Based System for Dry Retrieval of Single-Shell Tank Waste at Hanford

- **DOE Fellow Gabriela Vazquez** - Improved Third Generation Peristaltic Crawler for Removal of High-Level Waste Plugs in United States Department of Energy Hanford Site Pipelines

Figure 35. DOE Fellows Gabriela Vazquez (second from left) and Ximena Prugue (third from left) with Rosa Elmetti-Ramirez (DOE-EM) and Leo Lagos (FIU) at the 15th ICEM Conference in Brussels, Belgium.

- ARC participated and contributed toward FIU's first College of Engineering Research Day. The event was organized by the College of Engineering and student societies. This successful event took place on September 26, 2013 and brought together College of Engineering's faculty, staff and students. ARC's DOE Fellows and students presented a total of eight (8) posters showcasing the U.S. Department of Energy's funded applied research. ARC's DOE Fellows had the opportunity to meet and present their research to FIU's President Dr. Mark Rosenberg who visited the Engineering Center and participated in this event. The posters presented included the following:
  - Development of a Mechanical Based System for Dry Retrieval of Single Shell Tank Waste at Hanford -Ximena Prugue (DOE Fellow)
  - Applications for Moville Devices Using Cloud Computing on Service Oriented Architecture - Justin Phillips (DOE Fellow)
  - Peristaltic Crawler for Pipeline Removal of High-Level Waste Plugs - Gabriela Vazquez (DOE Fellow)
  - Salt Stone Processing of Low-Level Waste at Savannah River Site - Joshua Midence (DOE Fellow)
  - D&D Technology Services Development using Windows Communication Foundation on Cloud - Revathy Venkataraman (DOE Fellow)

- Investigation on Microbial Dissolution of Uranium (VI) from Autunite Mineral - Paola Sepulveda (DOE Fellow)
- Residual Waste Detection in HLW Staging Tanks - Dayron Chigin (DOE Fellow)
- Analysis of Life Expectancy for Waste Transfer Lines Located in SY-Farm at Hanford Site - Jennifer Arniella (DOE Fellow)

Figure 36.DOE Fellows presenting their research on College of Engineering Research Day.

CONCLUSIONS

This innovative workforce development 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 the summer of 2014, students are participating in 10-week internships at PNNL, SRNL, Hanford, AREVA in Seattle, 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/.

APPENDIX

The DOE Fellows finalized their DOE Fellows Summer Internship Reports which were sent to DOE on 10/18/13 (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
Gabriela Vazquez	DOE-HQ EM-30	Germantown	Christine Gelles	Low Level and Mixed Low Level Waste Treatment Technology and Orphan Waste Stream Identification
Paola Sepulveda	DOE-HQ EM-12	Germantown	Skip Chamberlain	Database of Groundwater Pump-and-Treat Systems
Joel McGill	DOE-HQ EM-02	Washington, DC	Ana Han	Office of Environmental Management International Program
Valentina Padilla	Savannah River National Lab	Aiken, SC	Miles Denham	SRS In Situ Bioremediation Techniques and F-Area Post Molasses Injection Analysis
Jennifer Arniella	Hanford Site	Richland, WA	Ruben Mendoza	Analysis of Life Expectancy for Waste Transfer Lines Located in the SY-Farm at the Hanford Site
Dayron Chigin	Hanford Site	Richland, WA	Dennis Washenfelder	Preventative Maintenance Procedures for Sensors along PC-5000 Condensate Transfer Line

In addition, the following report is available at the DOE Research website for the Cooperative Agreement between the U.S. Department of Energy Office of Environmental Management and the Applied Research Center at Florida International University: http://doeresearch.fiu.edu

1. Florida International University, *Project Technical Plan*, Project 5: DOE-FIU Science & Technology Workforce Development Program, October 2013.