

US DEPARTMENT OF ENERGY-FLORIDA INTERNATIONAL UNIVERSITY (US DOE-FIU) SCIENCE AND TECHNOLOGY WORKFORCE DEVELOPMENT PROGRAM

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ABSTRACT

The DOE-FIU Science and Technology Workforce Development Program is an innovative program developed between the US Department of Energy's Office of Environmental Management (DOE-EM) and Florida International University's Applied Research Center (FIU-ARC). The program is designed to create a “**pipeline**” of minority students specifically trained and mentored to enter the Department of Energy 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. Students selected as DOE Fellows perform DOE-EM related “hands-on” research at FIU’s Applied Research Center, and at DOE sites, national laboratories, DOE contractors, and DOE-HQ. Upon graduation and completion of this fellowship, the students will submit an application to join the [DOE EM Professional Development Corps \(PDC\)](#). Employment opportunities for DOE Fellows are also pursued with DOE contractors, national labs, and other federal agencies [1]. This paper discusses how FIU-ARC has teamed up with DOE-EM to address the aging workforce issues faced by DOE-EM and to develop a program to minimize this aging workforce gap. This paper also discusses the program’s structure, results, and accomplishments achieved since its inception in February 2007.

INTRODUCTION

DOE’s Strategic Plan, Goal 5.2, states: “*Ensure that DOE’s workforce is capable of meeting the challenges of the 21st Century by attracting, motivating, and retaining a highly skilled and diverse workforce to do the best job*” [3]. DOE-EM’s Office of Human Capital was created in 2003 and it was chartered to focus on human capital issues. In 2006, the office established the Deputy Assistant Secretary for Human Capital and Business Services position. This office also established a corporate EM Human Capital Steering Committee to provide strategic guidance and oversight to human capital initiatives. Some of the challenges faced by this office included [4]:

- Aging workforce and wave of retirements
- Loss of skills/emerging critical skills
- Lack of succession planning
- Focus on embracing diversity
- Strengthen leadership skills in order to improve employee engagement

According to a survey conducted by EM’s Human Capital Office in 2008, 43% of its workforce was 50-59 years old and 37% of the workforce was between the ages of 40-49 years old. In contrast, 11% of its workforce was age 60 or older and only 1% of its workforce was 30 years

old or younger (see Figure 1). As reflected in Figure 1, 91% of EM workforce is 40 years old or older.

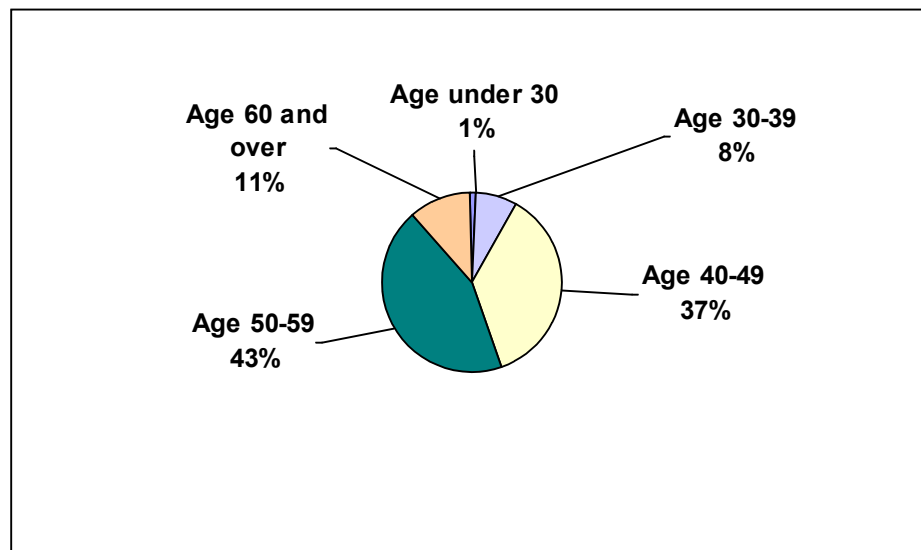


Figure 1 EM Employee Age Profile as of April, 2008 [4]

In response to these challenges, EM initiated a series of programs and initiatives that included:

- Strong workforce planning process
 - Corporate workload forecasting system and site workforce plans
 - Succession planning
- Complex-wide skills gap analyses in critical areas
 - Best-in-class for project and contract management and science and engineering
- Acquisition of new skills
 - Training, qualifying, and certifying programs
 - Hiring junior and seasoned employees
- Leadership Excellence Program
- Streamlining hiring processes
- Key diversity initiatives now being deployed across EM
 - Created tailored training program
 - Focus on on-boarding

In addition to the above mentioned strategies and responses, the US Department of Energy's Office of Environmental Management (DOE-EM) and Florida International University's Applied Research Center (FIU-ARC) partnered to create a unique workforce development program for underrepresented FIU students. The program was called the DOE-FIU Science & Technology Workforce Development Program and it was established in February 2007. This paper discusses the program's structure, results, and accomplishments achieved since the program's inception.

PROGRAM DESCRIPTION

The DOE-FIU Science and Engineering Workforce Development Program has the mission to train and mentor FIU minority students. The students are specifically trained and mentored to enter the Department of Energy's workforce in technical areas of need. FIU minority students are

recruited, selected, and formally inducted as **DOE Fellows**. The selected students are provided with the opportunity to conduct “**hands-on**” research at FIU’s Applied Research Center on DOE-EM’s technical areas (D&D, soil/groundwater, waste processing, and EM knowledge management). The main objective of the program is to provide interested students with a unique opportunity to integrate course work, DOE field work, and DOE-EM applied research work at FIU into a well structured academic and training program that leads to permanent full time positions with DOE-EM, DOE national laboratories, and DOE contractors.

RESULTS AND DISCUSSION

Since its inception in 2007, the program has formally recruited, selected and inducted a total of 43 students. Twenty seven (27) students have participated in internship assignments at Oak Ridge, Hanford, Idaho, Savannah River, DOE-HQ (Forrestal and Germantown), and at DOE contractor sites (NuVision Engineering and Columbia Energy). A total of 26 DOE Fellows have also participated and presented at national conferences such as the Waste Management (WM) Symposia. For example, a total of nineteen (19) posters and papers have been presented by DOE Fellows at WM08 and WM09. DOE Fellows have presented their work at WM’s Student Poster Competition, professional poster tracks, and oral paper presentations. Furthermore, DOE Fellows won the WM09 Student Poster Competition (Denisse Aranda) and best poster for professional presentation at WM09 (Leydi Velez) [2].



Figure 2 Dr. Ines Triay and DOE Fellows at Waste Management Symposia 2009

Recruitment Efforts

Formal recruitment efforts of FIU minority students were conducted in the April/May (Spring Semester) and September/October (Fall Semester) timeframes each year since the program’s inception. Recruitment efforts included the development of a dedicated program web site (www.arc.fiu.edu/intern), in-class room presentations, recruitment tables at the College of Engineering and the College of Arts and Sciences, booths at FIU Job Fairs, information sessions,

and presentations at student societies such as the Society of Hispanic Professional Engineers, the Society of Women Engineers, and the Society of Black Engineers

Students were required to turn in application packages that included a complete application, three letters of recommendation from FIU faculty, an updated resume, and unofficial FIU transcripts. A DOE Fellows Selection Committee was formed with the participation of DOE's EM personnel (including DOE EM-HR), FIU faculty members, and ARC staff members. Applications were reviewed by the committee and pre-selected students were called for formal interviews. Since 2007, a total of 138 application packages have been obtained and 91 interviews have been conducted. A total of 43 students have been selected and inducted as DOE Fellows (20 in 2007, 13 in 2008, and 10 in 2009).

DOE Fellows Induction Ceremony

FIU students that are recruited and selected for this program are formally inducted as DOE Fellows. The selected students are vested this name at a special ceremony conducted each Fall semester. The DOE Fellows Induction Ceremony is an event that is attended by DOE Officials, FIU Administration, faculty, staff, students and of course our DOE Fellows. A total of three formal induction ceremonies have been conducted since 2007. These ceremonies have included the participation of several DOE officials including: Mr. James Rispoli (former Assistant Secretary for Environmental Management), Mr. Mark Gilbertson (Acting Deputy Assistant Secretary for Engineering & Technology), Ms. Yvette Collazo (Acting Director, Office of Technology Innovation and Deployment), Ms. Shirley Frush (Headquarters Technical Program Manager), Mr. Desi Crouther (Director EM's Office of Human Capital), Dr. Charles Nalezny (DOE-FIU grant technical monitor), and Mr. Tim Walsh (DOE EM's Professional Development Corps Program Director). In addition, FIU's Provost (Dr. Berkman and Dr. Wartsok), FIU's Vice Presidents of Research (Dr. Gil, Dr. Salas, and Dr. Walker), and FIU's Dean of College of Engineering (Dr. Mirmiran) have participated as well. In addition, awards were presented to the DOE Fellows that won the DOE Fellows Poster Exhibition and Competitions. Also, the DOE Fellow Mentor of the Year Award, and the DOE Fellow of the Year Awards are presented at this ceremony.

DOE Fellows Conducting Office of Environmental Management "hands-on" Research

Since the program started in 2007, all DOE Fellows inducted into the program have been engaged in DOE-EM applied research activities being conducted at FIU-ARC. DOE Fellows are involved in soil and groundwater EM projects being conducted by ARC scientists in collaboration with Oak Ridge National Laboratory (i.e. developing computer models for fate and transport of mercury contamination) and Pacific Northwest National Laboratory (i.e. investigating uranium sequestration issues due to polyphosphate injection). DOE Fellows have also participated in decontamination and decommissioning (D&D) activities including the evaluation of D&D technologies (i.e. evaluation of a robotic platform capable of spraying fixatives inside hot cell facilities, and the evaluation of an innovative technology developed by the Y-12 National Security Complex – SIMWyPES[®]) and the development of an innovative D&D Knowledge Management Information Tool (KM-IT). Also, DOE Fellows have collaborated with our researchers in the development of innovative technologies for the detection and measurement of high level waste at Hanford's Tank Farm (i.e. ARC's Solid-Liquid Interface Monitor technology).

In addition, our DOE Fellows have participated in a total of 27 summer internship appointments at DOE sites (Hanford, Oak Ridge, Savannah River, Idaho), DOE-HQ (Forrestal and Germantown offices), and DOE contractors (NuVision Engineering and Columbia-Energy Environmental Services). The DOE Fellows have developed a total of 27 summer internship technical reports and numerous posters presented at FIU, national laboratories, and Waste Management conferences. Many of our DOE Fellows have continued to support the research after their summer internships. The DOE Fellows continued to support the various sites and contractors working from FIU-ARC. Some of this research included:

- Leydi Velez, Development of a Decision Analysis Tool for Surveillance & Maintenance of DOE Facilities– Work that started with her summer internship at ORNL has continued and expanded to directly support the development for ORNL and DOE-HQ
- William Mendez, Design of a Remote Stack Characterization System for DOE's Contaminated Stacks – Work started with his summer internship at ORNL and has continued with direct support to ORNL during the conceptual design and trade studies phases
- Denisse Aranda, Re-Design of EM's Website – Denisse continued her support to EM once she returned to FIU-ARC from her Summer 2008 internship at DOE-HQ
- Cristian Acevedo, Determining the Effects of Radiation on Aging Concrete of Nuclear Reactors – Cristian has continued with his summer research and has provided direct support to SRS
- Edgard Espinoza, Computational Fluid Dynamics modeling of NuVision's Power Fluidic Mixing Technology, Edgard continued his support to NuVision after his summer 2009 internship and is currently developing the CFD model at FIU-ARC
- Ramon Colon, Development of Compendium of D&D Technologies for DOE-HQ – Ramon continued his support to EM-40 and continued researching additional D&D technologies
- Raul Dominguez, Temperature Profiles for Single Shell Tank Closure through Mass Grout Pours – Raul continued his research that started at Columbia-Energy during his internship there during the summer of 2009

In addition, during the summer of 2009, 13 DOE Fellows' summer internship technical reports were produced as a result of these summer internships across the DOE Complex. The DOE Fellows that participated in summer 2009 internships, the location of the internship, and the titles of the conducted research are presented below:

- Mr. Alexander Henao (Idaho National Laboratory) - Separation of Metal and Metal Oxides using Ethyl Acetate and Bromine
- Mr. Amaury Betancourt (Pacific Northwest National Laboratory) - Adsorption of Dissolved Metals in the Berkeley Pit using Thiol-SAMMS
- Mr. Lee Brady (NuVision Engineering) - NuVision Engineering Power Fluidics™ System: Improving the Efficiency of Enhanced Chemical Cleaning
- Mr. Charles C. Castello (Oak Ridge National Laboratory) - Mercury Remediation using Dow's Experimental XUS-43604.00 Ion-Exchange Resin at Oak Ridge National Laboratory

- Mr. Cristian E. Acevedo (Savannah River) - Determining the Effects of Radiation on Aging Concrete of Nuclear Reactors
- Mr. Duriem Calderin (Columbia-Energy Environmental Services) - Wiped Film Evaporator Pilot- Scale Experimental Design Data Analysis
- Mr. Edgard Espinosa (NuVision Engineering) - NuVision Support: Demonstration of Power Fluidic™ Mixing Technology to Enhance Chemical Cleaning Operations in High Level Waste Tanks
- Miss Melina Idarraga (Pacific Northwest National Laboratory) - The Dissolution of Natural Autunite as a Function of Aqueous Bicarbonate
- Mr. Ramon A. Colon Mendoza (DOE-HQ, Germantown) - Compendium of Technology Providers, Experts, & University/Commercial Research Programs Applicable to D&D
- Mr. Raul Dominguez (Columbia-Energy Environmental Services) - Temperature Profiles for Single Shell Tank Closure through Mass Grout Pours
- Miss Rosa G. Ramirez (DOE-HQ, Germantown) – Summer Internship Experience at DOE Headquarters Office of Groundwater and Soil (EM-22)
- Mr. Serkan Akar (Oak Ridge National Laboratory) - Biosensor Development for Detection/Quantification of Phosphate in Hanford Contaminated Area
- Mr. Stephen Wood ((Oak Ridge National Laboratory) - Verification and Validation of the AMROC Fluid Solver Framework Coupling with DYNA3D within the Virtual Test Facility Fluid Structure Interaction Suite

DOE Fellows Poster Competition and Exhibition

DOE Fellows poster exhibitions and competitions were conducted in 2008 and 2009. The 2009 DOE Fellows Poster Exhibition and Competition took place on October 15, 2009. A total of 18 posters were exhibited showcasing the DOE Fellows (Class of 2007, 2008, and 2009) research accomplishments during this past year. The research accomplishments included work performed by the DOE Fellows at the Applied Research Center and during their 2009 summer internship assignments at DOE Savannah River site, Oak Ridge National Laboratory, Idaho National Laboratory, Pacific Northwest National Laboratory, DOE Headquarters in Germantown, Maryland, and at two DOE contractor sites (NuVision Engineering in Mooresville N.C., and Columbia-Energy in Richland WA). This year's poster exhibition and competition was attended by FIU faculty, students, ARC personnel, and a DOE official. Our distinguish guests included Ms. Yvette Collazo (DOE's Office of Environmental Management), Dr. Andres Gil (FIU's Vice President for Research), Dr. John Proni (ARC Executive Director), and Dr. Gautam Sen (Associate Dean, Research & Facilities – College of Arts & Sciences). A panel of judges was assembled to review and evaluate the DOE Fellows' posters. The panel of judges was composed of Ms. Yvette Collazo (DOE's Office of Environmental Management), Dr. Scott Hamilton (Director of FIU's McNair Fellowship), Dr. Anthony Mcgoron (Chair Person Biomedical Engineering), Dr. Norman Munroe (ARC Director of Research), and Dr. Dave Roelant (ARC's Associate Director). The DOE Fellows answered several questions from the general audience and from the judges. The panel of judges selected a total of 4 posters (1st, 2nd, and two 3rd place posters). The awards were presented at this year's DOE Fellows Induction Ceremony held in Miami, Florida on November 18, 2009.



Figure 3 2009 DOE Fellows Poster Exhibition and Competition

DOE Fellows Obtaining Graduate Degrees in the area of Science, Technology, Engineering, and Math (STEM) Education

A total of 10 DOE Fellows are currently pursuing master's or Ph.D. degrees. The research conducted at the Applied Research Center, DOE sites, national laboratories, and DOE contractors' sites serve as the basis topic for their master's thesis or Ph.D. dissertations. Currently, 9 DOE Fellows are pursuing master's degrees and 1 DOE Fellow is pursuing a Ph.D. degree. This past summer, Jose Vasquez (DOE Class of 2007) was the first DOE Fellow to have gone thru this program and obtain a Master in Environmental Engineering. Jose's research topic was based on his summer internship conducted at Oak Ridge National Laboratory where he worked with Mr. George Southworth researching mercury contamination issues. Table 1 shows all the DOE Fellows pursuing graduate level work. In addition, several DOE Fellows incorporate their EM applied research into their Senior Design or Capstone Projects.

Table 1 DOE Fellows Pursuing Graduate Degrees

DOE Fellow	Discipline	Degree	DOE Related Research Topic
Serkan Akar	Biomedical Eng.	Master	Soil/Groundwater - Nano Sensor Development for Detection of Phosphate
Amaury Betancourt	Environmental Eng.	Master	Soil/Groundwater - Modeling of Mercury Contamination at ORNL
Elsa Cabrejo	Environmental Eng.	Master	Soil/Groundwater - Modeling of Mercury Contamination at ORNL
Duriem Calderin	Biomedical Eng.	Master	D&D - Innovative Method for Removal of Loose Contamination
Denny Carvajal	Biomedical Eng.	Master	Soil/Groundwater – Bacteria Interaction due to Polyphosphate Injection at Hanford
Charles Castello	Electrical Eng.	Ph.D.	Soil/Groundwater - Sensor Development for Field Measurement of Mercury
Edgard Espinosa	Mechanical Eng.	Master	Waste Processing - CFD Modeling of NuVison’s Power Fluidic Technology/Process
Melina Idarraga	Environmental Eng.	Master	Soil/Groundwater - Uranium Sequestration Issues at Hanford
Merlin Ngachin	Environmental Sciences	Master	Waste Processing - Baltman-Lattice Method to Model HLW
Leydi Velez	Industrial Eng.	Master	Development of a Decision Support Tool for Prioritization of Surveillance and Maintenance Investment
Jose Vasquez	Environmental Eng.	Master	Thesis and degree completed in June 09 - “Effects of Temperature and pH on Volatilization of Mercury after Chemical Reduction”

The “Pipeline” is working

In its short existence, this program has been able to train and mentor FIU minority students on DOE-EM related applied research. FIU-ARC has 14 full-time researchers dedicated to EM’s environmental restoration mission. This infrastructure makes an ideal place for the mentoring and training of students. This past summer, two DOE Fellows applied to DOE EM’s Professional Development Corps Program. DOE Fellow, Rosa Ramirez, was selected to participate in this prestigious program and she is currently working at DOE EM’s Office of Groundwater and Soil (former EM-22). Rosa (see Figure 4) is an excellent example of the quality students this program is training and mentoring. In addition to Rosa, Mr. Jose Vasquez also applied to the program. Jose will be doing an internship at EM’s Oak Ridge Field office starting in Spring 2010. Also, six additional DOE Fellows are applying to the EMPDC program – Class of 2010.



Figure 4 DOE Fellow, Rosa Ramirez, with Secretary Steven Chu

CONCLUSION

According to data compiled and reported by EM, 91% of EM workforce is 40 years old or older and only 1% of its workforce is 30 years old or younger (see Figure 1). This has created a legitimate concern at EM. EM has realized the gap that will be created by this aging workforce and it has taken steps to mitigate this situation. One of EM strategies is to work with institutions of higher education and develop training program and employment opportunities for college students. One such as program is the DOE-FIU Science and Technology Workforce Development Program created between US DOE-EM and Florida International University's Applied Research Center located in Miami, Florida.

The vision of this program was to create a "pipeline" of FIU minority students specifically trained and mentored on DOE-EM environmental remediation issues and challenges. The program was started in February 2007 and thus far a total of 43 FIU students have been recruited, selected, and inducted as **DOE Fellows**. A total of 27 summer internships have been conducted as part of this program. DOE Fellows have performed research at DOE sites (Hanford, Oak Ridge, Savannah River, Idaho), DOE Headquarters (Forrestal and Germantown), and at DOE contractors (NuVision, and Columbia Energy). Our DOE Fellows have participated at the Waste Management Symposia and last year two of our Fellows won the Student Poster Competition and the Best Poster in her professional track session. DOE Fellows are directly supporting scientists and engineers at DOE sites and contractors, this work has led to the development of a Decision Analysis Tool being implemented and used by Oak Ridge and DOE-HQ. This past summer our first DOE Fellow (Miss Rosa Ramirez) joined DOE-EM's Professional Development Corps Program and 6 DOE Fellows will be applying to the same program for their 2010 Class. The "pipeline" is working and this program is producing well trained young professionals that will fill a gap in DOE's aging workforce.

REFERENCES

[1] Applied Research Center, DOE-FIU Science & Technology Workforce Development Program, Year End Report, February 2009.

[2] Applied Research Center, DOE-FIU Science & Technology Workforce Development Program, Quarterly Progress Report, November, 2009.

[3] US Department of Energy, Office of Workforce Development for Teachers and Scientists, *Future Workforce Strategy*, November 2007, DOE/SC-0099.

[4] US Department of Energy, Office of Environmental Management Human Capital and Business Services, “Environmental Management Human Capital Initiatives,” Diane Cochran, Deputy Assistant Secretary, Presentation, April 2008.