

Final Scientific/Technical Report

For

Award DE-FG07-05ID14637

February 28, 2012 Deliverable

FINAL PROGRESS REPORT

Project Title: Advanced Fuel Cycle Initiative University Fellowship Program

Covering Period: 12/20/2004 through 11/30/2011

Date of Report: March 9, 2012

Recipient: University Research Alliance, West Texas A&M University,
WTAMU Box 60189, Canyon, Texas 79016

Award Number: DE-FG07-05ID14637

Subcontractors: None

Other Partners: None

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the U.S. Department of Energy, Office of Nuclear Energy, Office of Fuel
Cycle Technologies

Executive Summary

AFCI University Fellowship Program

The goal of this effort was to be supportive of university students and university programs – particularly those students and programs that will help to strengthen the development of nuclear-related fields. The program also supported the stability of the nuclear infrastructure and developed research partnerships that are helping to enlarge the national nuclear science technology base. In this fellowship program, the U.S. Department of Energy sought master's degree students in nuclear, mechanical, or chemical engineering, engineering/applied physics, physics, chemistry, radiochemistry, or fields of science and engineering applicable to the AFCI/Gen IV/GNEP missions in order to meet future U.S. nuclear program needs. The fellowship program identified candidates and selected full time students of high-caliber who were taking nuclear courses as part of their degree programs. The DOE Academic Program Managers encouraged fellows to pursue summer internships at national laboratories and supported the students with appropriate information so that both the fellows and the nation's nuclear energy objectives were successful.

Innovations in Fuel Cycle Research Awards Program

In 2010, a new program was initiated to demonstrate the Office of Fuel Cycle Technologies' commitment to higher education in fuel-cycle-relevant disciplines. The program was designed to award graduate and undergraduate students for innovative fuel-cycle-relevant research publications, and to support communications among students and DOE representatives.

Background

The Advanced Fuel Cycle Initiative (AFCI) was established on October 1, 2002, evolving out of the Advanced Accelerator Applications (AAA) Program, which evolved out of the Accelerator Transmutation of Waste Program (ATW). The ATW program was a U.S. Department of Energy (DOE) program commissioned by Congress in FY2000 and constituting a national effort by DOE laboratories, industrial representatives, and universities to address a significant nuclear issue facing the United States. The primary mission of the program was to develop the technology base for the transmutation of nuclear waste and to demonstrate its practicality and value for long-term waste management, relying to a considerable extent on the use of accelerator-driven systems. In 2002, the AAA Program was transitioned into the Advanced Fuel Cycle Initiative, with a focus on the development of chemical separations and transmutation fuel technologies which, coupled with the use of reactors, can help to improve the management of nuclear waste through recycle and transmutation. In 2009, the initiative was transitioned into Fuel Cycle Research and Development (FCRD).

Implementation of AFCI/FCRD technologies has the potential to reduce the cost of waste management, delay the technical need for a second geologic repository, and dramatically reduce the inventory of civilian plutonium in the U.S. while recovering the energy value from spent nuclear fuel.

The AFCI/FCRD program has played an important role in re-establishing the viability of civilian nuclear capabilities and facilities in the United States. Improved management of nuclear waste is expected to enhance the long-term prospects for nuclear power. Maintaining nuclear power as an important contributor to the nation's energy supply requires strong support for America's nuclear science and engineering infrastructure.

Advanced Fuel Cycle Initiative University Fellowship Program

University Research Alliance of West Texas A&M University worked with the U.S. Department of Energy, Office of Nuclear Energy, to enhance the development and coordination of the Advanced Fuel Cycle Initiative University Fellowship Program. The 2006 fellowship program was expanded to include the Gen IV program and was referred to as the AFCI/Gen IV University Fellowship Program. The 2007 the fellowship program was modified to include the Global Nuclear Energy Partnership and was referred to as the AFCI/GNEP University Fellowship Program. In 2009, the program once again became the Advanced Fuel Cycle Initiative University Fellowship Program (without GNEP) and the DOE management organization was renamed the Office of Fuel Cycle Technologies.

Also in 2009, management of university programs was shifted to Idaho and funding was not provided for additional AFCI fellows. Support for continuing fellows and program management was provided.

Status

Advanced Fuel Cycle Initiative University Fellowship Program

The fellowship program accomplished each of its goals by selecting and supporting the fellowship classes of 2005, 2006, 2007, and 2008. The program's goals were:

- Support US citizen and Permanent Resident Alien master's degree students in the United States.
- Promote academic opportunities for highly motivated students in nuclear related science and engineering disciplines.
- Strengthen the academic and research infrastructure necessary to advance the state of the art in nuclear and fuel cycle science, engineering, and technology.
- Engage creative academic talent in research areas needed to support AFCI R&D.
- Strengthen relationships between universities and DOE laboratories.
- Expand student/National Laboratory, and DOE interactions.

The fellowship program began in 2001. During the four fellowship years 2005-2008 included in this report, University Research Alliance announced the program and provided information about the program to more than 24,000 professors at more than 250 universities, including thousands of professors at Historically Black Colleges and Universities, Hispanic Serving Institutions, and Minority Institutions.

Thirty-five high caliber students were selected for the fellowship classes of 2005-2008. Twenty-one different universities had AFCI fellows. The program received, on average, 108 applications for the 6-12 fellowships available each year. On average, each fellowship solicitation received applications from students at 70 universities.

Details on the application process and the fellows' progress can be obtained from the submitted 2006-2009 yearly progress reports.

Innovations in Fuel Cycle Research Awards Program

The Innovations awards program accomplished each of its goals by awarding prizes to students who have published papers in a fuel-cycle-relevant discipline. The program's goals are:

- Award graduate and undergraduate students for innovative fuel-cycle-relevant research publications
- Demonstrate the Office of Fuel Cycle Technologies' commitment to higher education in fuel-cycle-relevant disciplines.
- Support communications among students and DOE representatives.

A total of 56 students received awards in the 2010 and 2011 Innovations awards program, 49 graduate students and 7 undergraduate students. Five students have won awards in both years. Awards have been presented to students at 23 universities.

As of November 2011, 22 out of 26 award winners from 2011 and 24 out of 30 award winners from 2010 have attended meetings with DOE Office of Nuclear Energy leadership. Some have participated in more than one meeting. More interactions will occur in 2012 with the Innovators' Forum.

Details on the awards competition categories and the application process can be obtained from the submitted 2011 and 2012 yearly progress reports.

Plans for Next Year

University Research Alliance will be managing the Fuel Cycle Support Program for the years 2012-2017 under a new grant, DE-NE0000478, awarded to West Texas A&M University under the management of the University Research Alliance.

Patents: No patents have been applied for as a result of this award.

Milestone Status Table

Advanced Fuel Cycle Initiative University Fellowship Program 2005-2009

ID Number	Task / Milestone Description	Planned Completion	Actual Completion	Comments
5271 and 5279	Monthly Status Report	1-18-05	1-04-05	
5271 and 5279	Monthly Status Report	2-18-05	2-09-05	
5271 and 5279	Monthly Status Report	3-18-05	3-11-05	
5271 and 5279	Monthly Status Report	4-18-05	4-08-05	
5271 and 5279	Monthly Status Report	5-18-05	5-13-05	
5271 and 5279	Monthly Status Report	6-18-05	6-10-05	
5271 and 5279	Monthly Status Report	7-18-05	6-30-05	
5271 and 5279	Monthly Status Report	8-18-05	8-04-05	
5271 and 5279	Monthly Status Report	9-18-05	9-12-05	
5271 and 5279	Monthly Status Report	10-18-05	10-11-05	
5271 and 5279	Monthly Status Report	11-18-05	11-11-05	
5271 and 5279	Monthly Status Report	12-18-05	12-08-05	
5271 and 5279	Monthly Status Report	1-18-06	1-12-06	

ID Number	Task / Milestone Description	Planned Completion	Actual Completion	Comments
5271 and 5279	Monthly Status Report	2-18-06	2-15-06	
5271 and 5279	Monthly Status Report	3-18-06	3-09-06	
5271 and 5279	Monthly Status Report	4-18-06	4-09-06	
5271 and 5279	Monthly Status Report	5-18-06	5-12-06	
5271 and 5279	Monthly Status Report	6-18-06	6-12-06	
5271 and 5279	Monthly Status Report	7-18-06	7-12-06	
5271 and 5279	Monthly Status Report	8-18-06	8-12-06	
5271 and 5279	Monthly Status Report	9-18-06	9-13-06	
5271 and 5279	Monthly Status Report	10-18-06	10-10-06	
5271 and 5279	Monthly Status Report	11-18-06	11-10-06	
5271 and 5279	Monthly Status Report	12-18-06	12-08-06	
5271 and 5279	Monthly Status Report	1-18-07	1-08-07	
5271 and 5279	Monthly Status Report	2-18-07	2-12-07	
5271 and 5279	Monthly Status Report	3-18-07	3-08-07	
5271 and 5279	Monthly Status Report	4-18-07	4-05-07	
5271 and 5279	Monthly Status Report	5-18-07	5-14-07	
5271 and 5279	Monthly Status Report	6-18-07	6-11-07	
5271 and 5279	Monthly Status Report	7-18-07	7-03-07	
5271 and 5279	Monthly Status Report	8-18-07	8-08-07	
5271 and 5279	Monthly Status Report	9-18-07	9-11-07	
5271 and 5279	Monthly Status Report	10-18-07	10-10-07	
5271 and 5279	Monthly Status Report	11-18-07	11-07-07	
5271 and 5279	Monthly Status Report	12-18-07	12-14-07	
5271 and 5279	Monthly Status Report	1-18-08	1-16-08	
5271 and 5279	Monthly Status Report	2-18-08	2-15-08	
5271 and 5279	Monthly Status Report	3-18-08	3-12-08	
5271 and 5279	Monthly Status Report	4-18-08	4-11-08	
5271 and 5279	Monthly Status Report	5-18-08	5-12-08	
5271 and 5279	Monthly Status Report	6-18-08	6-12-08	
5271 and 5279	Monthly Status Report	7-18-08	7-12-08	
5271 and 5279	Monthly Status Report	8-18-08	8-8-08	
5271 and 5279	Monthly Status Report	9-18-08	9-12-08	

ID Number	Task / Milestone Description	Planned Completion	Actual Completion	Comments
5271 and 5279	Monthly Status Report	10-18-08	10-14-08	
5271 and 5279	Monthly Status Report	11-18-08	11-12-08	
5271 and 5279	Monthly Status Report	12-18-08	12-3-08	
5271 and 5279	Monthly Status Report	1-18-09	1-08-09	
5271 and 5279	Monthly Status Report	2-18-09	2-12-09	
5271 and 5279	Monthly Status Report	3-18-09	3-08-09	
5271 and 5279	Monthly Status Report	4-18-09	4-05-09	
5271 and 5279	Monthly Status Report	5-18-09	5-14-09	
5271 and 5279	Monthly Status Report	6-18-09	6-11-09	
5271 and 5279	Monthly Status Report	7-18-09	7-03-09	
5271 and 5279	Monthly Status Report	8-18-09	8-08-09	
5271 and 5279	Monthly Status Report	9-18-09	9-11-09	
5271 and 5279	Monthly Status Report	10-18-09	10-10-09	
5271 and 5279	Monthly Status Report	11-18-09	11-07-09	
5272 and 5280	Monthly Program Controls Report	1-10-05	1-06-05	
5272 and 5280	Monthly Program Controls Report	2-10-05	2-04-05	
5272 and 5280	Monthly Program Controls Report	3-10-05	3-10-05	
5272 and 5280	Monthly Program Controls Report	4-11-05	4-11-05	
5272 and 5280	Monthly Program Controls Report	5-10-05	5-10-05	
5272 and 5280	Monthly Program Controls Report	6-10-05	6-14-05	
5272 and 5280	Monthly Program Controls Report	7-10-05	6-30-05	
5272 and 5280	Monthly Program Controls Report	8-10-05	08-04-05	
5272 and 5280	Monthly Program Controls Report	9-12-05	09-12-05	
5272 and 5280	Monthly Program Controls Report	10-11-05	10-11-05	

ID Number	Task / Milestone Description	Planned Completion	Actual Completion	Comments
5272 and 5280	Monthly Program Controls Report	11-14-05	11-14-05	
5272 and 5280	Monthly Program Controls Report	12-10-05	12-09-05	
5272 and 5280	Monthly Program Controls Report	1-10-06	1-10-06	
5272 and 5280	Monthly Program Controls Report	2-10-06	2-10-06	
5272 and 5280	Monthly Program Controls Report	3-10-06	3-09-06	
5272 and 5280	Monthly Program Controls Report	4-11-06	4-10-06	
5272 and 5280	Monthly Program Controls Report	5-10-06	5-10-06	
5272 and 5280	Monthly Program Controls Report	6-12-06	6-12-06	
5272 and 5280	Monthly Program Controls Report	7-11-06	7-11-06	
5272 and 5280	Monthly Program Controls Report	8-10-06	8-10-06	
5272 and 5280	Monthly Program Controls Report	9-10-06	9-10-06	
5272 and 5280	Monthly Program Controls Report	10-11-06	10-06-06	
5272 and 5280	Monthly Program Controls Report	11-10-06	11-15-06	The due date was changed due to changes in the PICS work package submission dates.
5272 and 5280	Monthly Program Controls Report	12-10-06	12-11-05	
5272 and 5280	Monthly Program Controls Report	1-10-07	1-09-07	
5272 and 5280	Monthly Program Controls Report	2-10-07	2-08-07	

ID Number	Task / Milestone Description	Planned Completion	Actual Completion	Comments
5272 and 5280	Monthly Program Controls Report	3-10-07	3-09-07	
5272 and 5280	Monthly Program Controls Report	4-11-07	4-09-07	
5272 and 5280	Monthly Program Controls Report	5-10-07	5-10-07	
5272 and 5280	Monthly Program Controls Report	6-11-07	6-11-07	
5272 and 5280	Monthly Program Controls Report	7-10-07	7-09-07	
5272 and 5280	Monthly Program Controls Report	8-10-07	8-09-07	
5272 and 5280	Monthly Program Controls Report	9-10-07	9-10-07	
5272 and 5280	Monthly Program Controls Report	10-10-07	10-10-07	
5272 and 5280	Monthly Program Controls Report	11-10-07	N.A. See comments.	Report not submitted due to changes in PRC reporting.
5272 and 5280	Monthly Program Controls Report	12-10-07	N.A. See comments.	Report not submitted due to changes in PRC reporting.
5273 and 5281	Quarterly Status Report	1-21-05	1-20-05	
5273 and 5281	Quarterly Status Report	4-21-05	4-21-05	
5273 and 5281	Quarterly Status Report	7-21-05	7-15-05	
5273 and 5281	Quarterly Status Report	10-21-05	10-20-05	
5273 and 5281	Quarterly Status Report	1-21-06	1-20-06	
5273 and 5281	Quarterly Status Report	4-21-06	4-21-06	
5273 and 5281	Quarterly Status Report	7-21-06	7-20-06	
5273 and 5281	Quarterly Status Report	10-21-06	10-19-06	
5273 and 5281	Quarterly Status Report	1-21-07	1-17-07	
5273 and 5281	Quarterly Status Report	4-21-07	4-17-07	
5273 and 5281	Quarterly Status Report	7-21-07	7-09-07	
5273 and 5281	Quarterly Status Report	10-21-07	10-17-07	

ID Number	Task / Milestone Description	Planned Completion	Actual Completion	Comments
5273 and 5281	Quarterly Status Report	1-21-08	1-28-08	Quarterly reports were terminated.
5274 and 5282	Semi-Annual Status Report	2-1-05	2-1-05	
5274 and 5282	Semi-Annual Status Report	9-12-05	9-10-05	
5274 and 5282	Semi-Annual Status Report	12-15-05	12-15-05	
5274 and 5282	Semi-Annual Status Report	12-15-05	12-15-05	
5274 and 5282	Semi-Annual Status Report	2-01-06		This AFCI Semi-annual Meeting did not occur. This was noted on the PICS system.
5274 and 5282	Semi-Annual Status Report	9-07-06	9-06-06	
5274 and 5282	Semi-Annual Status Report	2-01-07	N.A. See comments.	This AFCI Semi-annual Meeting did not occur.
5274 and 5282	Semi-Annual Status Report	9-07-07	10-03-07	The 2007 AFCI Annual Meeting was moved to October.
5274 and 5282	Semi-Annual Status Report	9-09-08	10-09-08	
5274 and 5282	Semi-Annual Status Report	9-07-09	10-22-09	The 2009 CAES Annual Meeting was held October 19-22, 2009.
5275 and 5276	Semi-Annual Report	12-15-04	12-14-04	
5275 and 5276	Semi-Annual Report	7-15-05	7-15-05	
5275 and 5276	Semi-Annual Report	12-15-05	12-15-05	
5275 and 5276	Semi-Annual Report	12-15-05	12-15-05	
5275 and 5276	Semi-Annual Report	6-15-06	6-15-06	
5275 and 5276	Semi-Annual Report	12-15-06	12-15-06	
5275 and 5276	Semi-Annual Report	6-15-07	6-15-07	

ID Number	Task / Milestone Description	Planned Completion	Actual Completion	Comments
5275 and 5276	Semi-Annual Report	12-15-07	12-15-07	
5275 and 5276	Semi-Annual Report	3-1-08	3-1-08	
5275 and 5276	Semi-Annual Report	6-15-09	6-15-09	
5277	Establish Solicitation	1-31-05	1-20-05	
5277	Establish Solicitation	1-31-06	3-1-06	This deliverable was delayed due to delay in funding for the 2007 Fellowship class.
5277	Establish Solicitation	1-31-07	3-1-07	Program was not funded until March.
5277	Establish Solicitation	3-1-08	3-1-08	
5277	Establish Solicitation	1-31-09	N.A. See comments.	Program was not funded.
5270 and 5278	Draft and Final Work Packages	9-30-2005	9-30-2005	
5270 and 5278	Draft and Final Work Packages	1-10-2006	1-10-2006	
5270 and 5278	Draft and Final Work Packages	1-10-2007	N.A. See comments.	Draft and final work packages were not requested.

Innovations in Fuel Cycle Research Awards Program 2010-2011

Action	Anticipated Date for Completion	Date Completed
Pre-announcement activities necessary to developing the program (conversations with Fuel Cycle Technologies management, faculty, students, and national laboratory representatives; writing the program announcement; developing the website; developing the application)	Six weeks following DOE approval of the Innovations in Fuel Cycle Research Awards program. Target date: April 30, 2010.	April 2010
Website up	April 30, 2010	April 2010
Announcement published/sent	April 30, 2010	April 2010
Program promotions	May 30, 2010	May 2010

Action	Anticipated Date for Completion	Date Completed
Final Date for Applications	May 30, 2010	May 30, 2010
Applications and Papers sent to reviewers	June 10, 2010	June 10, 2010
Papers Ranked	July 20, 2010	July 20, 2010
Rankings Submitted to DOE for approval	July 30, 2010	July 30, 2010
DOE Approval	August 12, 2010	August 12, 2010
Semi-annual Report on AFCI University Programs	August 31, 2010	August 31, 2010
Notification of winners and notification to those who did not win	August 31, 2010	August 31, 2010
Planning for ANS presentations	November 10, 2010	November 10, 2010
Presentation of winners' papers – pending ANS approval of session	ANS Winter Conference, November 10 and 11, 2010	November 11, 2010
Award Recipient and Program promotional activities related to award recipients	November 30, 2010	November 30, 2010
Participation in Fuel Cycle Technologies Annual Meeting (includes some student participation)	October 26-28, 2010	October 26-28, 2010
Semi-annual Report on AFCI University Programs	December 15, 2010	December 15, 2010
2011 Pre-announcement activities necessary to continuing the program (conversations with Fuel Cycle Technologies management, faculty, students, and national laboratory representatives; updating the program announcement; updating the website; updating the application)	Six weeks following DOE approval. Target date: April 30, 2011.	April 2011
Website up	April 30, 2011	April 2011
Announcement published/sent	May 12, 2011	May 12, 2011
Program promotions	May 30, 2011	May 2011
Final Date for Applications	June 12, 2011	June 12, 2011
Applications and Papers sent to reviewers	June 13, 2011	June 13, 2011
Papers Ranked	June 30, 2011	June 30, 2011
Rankings Submitted to DOE for approval	June 30, 2011	June 30, 2011

Action	Anticipated Date for Completion	Date Completed
DOE Approval	July 3, 2011	July 3, 2011
Notification of winners and notification to those who did not win	July 3, 2011	July 3, 2011
Semi-annual Report on AFCI University Programs	August 15, 2011	Report was no longer needed and was cancelled.
Planning for ANS presentations	October 30, 2011	October 30, 2011
Presentation of winners' papers – pending ANS approval of session	ANS Winter Conference, October 30-November 3, 2011	October 30- November 3, 2011
Award Recipient and Program promotional activities related to award recipients	November 30, 2011	November 30, 2011
Participation in Fuel Cycle Technologies Annual Meeting (includes some student participation)	November 8-12, 2011	November 8-12, 2011
Innovators' Forum	Scheduled for Spring 2012	Scheduled for April 23-25, 2012
Final Scientific/Technical Report	March 31, 2012. A no-cost extension of the contract until November 20, 2011.	March 9, 2012.

Budget Data

			Approved Spending Plan			Actual Spent to Date		
Phase / Budget Period			DOE Amount	Cost Share	Total	DOE Amount	Cost Share	Total
	From	To						
Year 1	01/05	12/05	638,250		638,250	499,444		499,444
Year 2	01/06	12/06	800,000		800,000	576,873		576,873
Year 3	01/07	12/07	678,925		678,925	654,129		654,129
Year 4*	01/08	12/08	1,075,135		1,075,135	655,311		655,311
Year 5*	01/09	12/09	499,096		499,096	458,034		458,034

			Approved Spending Plan			Actual Spent to Date		
Phase / Budget Period			DOE Amount	Cost Share	Total	DOE Amount	Cost Share	Total
Year 6*	01/10	12/10	558,264		558,264	354,440		354,440
Year 7*	01/11	12/11	no-cost extension		no-cost extension	205,185		205,185
Totals		4,249,670		4,249,670	3,403,416		3,403,416	

*includes carryover totals.

Spending Plan for the Next Year: The work for FY12-FY17 is being completed under a new grant, DE-NE0000478, awarded to West Texas A&M University under the management of the University Research Alliance.