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**Support of Nuclear Engineering
Education and Research
at the University of Michigan**

DOE/Industry Matching Grant Program

*Final Report for the Period
September 30, 2001–September 29, 2003*

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During the academic year 2001-2002, the Department of Nuclear Engineering and Radiological Sciences (NERS) received \$50,000 of industrial contributions from Westinghouse Electric Company and DTE Energy, matched in part by a DOE grant of \$35,000, for a total of \$85,000 for the DOE/Industry Matching Grant Program. We used the combined grant of \$85,000 in three major areas: (a) support of undergraduate students, (b) support of graduate students, and (c) partial support of a primary research scientist. Due to delays in the billing and invoices related to the project grant, the DOE funding of \$35,000 for the grant was not fully expended in 2002 and a no-cost time extension until 30 September 2003 was obtained. The report summarizes expenditures that will be included in the closeout statement for the Matching Grant.

1. Support of Undergraduate Students

The DOE/Industry Matching Grant funding has been valuable to the NERS Department in our continuing effort to recruit and retain top-quality undergraduate students in the department. During the academic year 2001-2002, we offered Undergraduate Merit Scholarships to the following:

Robert H. Ambrose - \$2,500

Nathan C. Sheets - \$2,000

Samuel J. Serrano - \$2,000

Kevin P. Lynn - \$2,000

Matthew P. Biersack - \$2,000

Bryan P. Bednarz - \$2,000

Brian N. Jerred - \$2,000

In addition, we supported an undergraduate student, Michael Delaney, during the Fall Term 2001 as part of his undergraduate research program. His research project was in plasma processing and his stipend of \$2,740 was charged to the industry portion of the grant.

Direct cost: \$14,500

Indirect cost: \$1,611

Total expenditures (DOE): \$16,111

2. Support of Graduate Students

The DOE/Industry Matching Grant was used to support three graduate students, all with interest in the fields of fission reactor engineering.

(a) Fernando Ramalho received a graduate student research assistantship for one term through the Matching Grant, during the final stage of his doctoral dissertation research. The nonlinear control algorithm he developed makes direct use of numerical models representing a particular system or component and is capable of accounting for sensor noises and uncertainties in system modeling in an integrated fashion. The methodology will be applicable also to Generation IV nuclear energy systems and the enhancement of the algorithm has been a key part of a Nuclear Energy Research Initiative (NERI) grant initiated at Michigan in September 2002. The NERI grant includes collaboration with Sandia National Laboratory and Westinghouse Electric Company.

Reference: F. P. Ramalho and J. C. Lee, "Nonlinear H_∞ Control of Nuclear Stream Generators," *Trans. Am. Nucl. Soc.*, 84, 200 (2001).

Direct cost: \$13,564

Indirect cost: \$1,507

Total Expenditures (DOE): \$15,071

(b) Stipends for two National Academy for Nuclear Training (NANT) Fellows have been augmented with the Matching Grant. The NANT Fellowship provides an annual stipend of \$14,000, considerably less than the actual stipend of \$21,000 for AY 2002-03. Thus, the Matching Grant was used to cover the stipend differential and other expenditures for Jeffrey C. Davis and Gregory O'Donnell. Gregory participated in a

research project related to reaction rate measurements of actinides as part of international collaboration between the French CEA and Argonne National Laboratory. Gregory graduated with a M.S. degree in December 2002. Part of his stipend augmentation in the amount of \$5,936 has been charged to the industry portion of the grant. Jeffrey's research focus has been in nuclear waste management, including the feasibility of using denatured thorium in fast-spectrum reactors, and he is currently in the doctoral program. The augmentation of his stipend and other expenditures in the amount of \$13,405 was charged to the industry portion of the grant.

Direct cost: \$3,436

Indirect cost: \$382

Total Expenditures (DOE): \$3,818

3. Partial Support for a Research Scientist

We used the Matching Grant to provide partial support to Dr. Ronald R. Berliner, who joined the NERS staff in May 2001. He is a leading expert in neutron diffractometry and initiated an effort to build a neutron diffractometry facility at the Ford Nuclear Reactor. His effort did not bear fruit due to the unfortunate decision by the University administration to shut down the Ford Reactor in July 2003. Nonetheless, the combined federal and industrial funding made it possible for the Ford Nuclear Reactor and the Department of Nuclear Engineering and Radiological Sciences to propose a key initiative toward enhancing research activities at the Ford Nuclear Reactor. We expect that the equipment Dr. Berliner built at Michigan will find a new home in another university reactor facility in the near future. A total support of \$27,919 for Dr. Berliner was charged to the industry portion of the Matching Grant.

Summary

Direct cost: \$31,500

Indirect cost: \$3,500

Grand Total Expenditures (DOE): \$35,000

Total Expenditures (Industry): \$50,000