John G Hewidge
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REPORT to DoE and EXELON CORPORATION

MATCHING GRANT PROGRAM
for the
NUCLEAR ENGINEERING PROGRAM
at
UNIVERSITY of WISCONSIN, MADISON

previously → **DE-FG02-92ER75725**
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U.S. DEPARTMENT OF ENERGY

OFFICE OF NUCLEAR ENERGY, SCIENCE AND TECHNOLOGY

DOE/INDUSTRY MATCHING GRANT PROGRAM

DOE Patent Clearance Granted
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DISCLAIMER

The DOE/Industry Matching Grant Program, which began in 1992, is designed to encourage collaborative support for nuclear engineering education as well as research between the nation's nuclear industry and the U.S. Department of Energy (DoE). Over the past two decades nuclear engineering programs in the United States have witnessed a serious decline in student enrollments, number of faculty members and support from their host universities. Despite this decline, the discipline of nuclear engineering remains important to the advancement of the mission goals of the U.S. Department of Energy. These academic programs are also critically important in maintaining a viable workforce for the nation's nuclear industry. As conceived by Commonwealth Edison, this program has focused on creating a partnership between DOE and private sector businesses, which employ nuclear engineers. The program is designed to ensure that academic programs in nuclear engineering are maintained and enhanced in universities throughout the United States.

The Industry/DoE Matching Grant funds at UW-Madison Nuclear Engineering are used to:

- Provide scholarships to meritorious undergraduate nuclear engineering students. With Exelon and our department scholarship funding we have been able to provide scholarships (typically $1,000 to $1,500 per year) to all nuclear engineering students with a GPA greater than 3.25 (on a 4.0 scale).

- Support undergraduates to work on research projects and reactor laboratory improvements. Last summer this funding supported two students to work on projects related to our nuclear reactor. We are promoting undergraduate participation in research as an added benefit of the program in collaboration with our nuclear reactor director as well as our faculty research.

- Annually, industry has helped to support the UW Nuclear Reactor Laboratory by offsetting some operating expenses through the DoE-Industry Matching Grants program. These funds are used in covering some of the staff and supplies support needed to offer the resource intensive Nuclear Instrumentation and Nuclear Reactor Laboratory courses to undergraduates and masters graduate students.

- Upgrade instrumentation used in nuclear engineering teaching laboratories as well as our senior design course. We continue to make significant improvements to our Nuclear Instrumentation Laboratory (NEEP 427), and Nuclear Reactor Laboratory (NEEP 428) and have recently improved the facilities for our Senior Capstone Design Course (NEEP 412).

- Provide support for graduate students to engage in advanced study related to nuclear power and to undertake M.S. theses relevant to nuclear utility needs. Over the matching grant program duration, we have had several students conduct MS thesis research related to the nuclear power industry and Exelon nuclear power plants in particular (see attached).

- Recruit students into nuclear engineering and explain the benefits of nuclear power to high school teachers and students. Funds have been used to promote outreach activities of the ANS student chapter, the UW Nuclear Reactor Teacher/Student Outreach Workshops and the Young Generation in Nuclear group (YGN was begun at UW-Madison by our graduate

students), for open houses to acquaint entering freshmen with nuclear engineering, and for "advertising" in high schools with teachers, counselors and selected student groups. For example, in association with the YGN organization, we will conduct an essay and drawing contest for middle school students. As a result of these activities, the decline of our undergraduate enrollment has stopped we now have over 30 freshmen in our Introduction to Nuclear Engineering course. Also, the Pre-Engineering office at UW-Madison reports a noticeable upturn in this year's sophomore class showing interest in nuclear engineering.

- In addition to continuing the above, we have initiated a long-range program to develop web-based versions of our nuclear engineering courses. These have been used for:

  - Supporting the South Carolina State University –UW-Madison partnership, which requires that some of the UW nuclear engineering courses be given at SCSU using distance technology; specifically last year we used funds in the delivery of Nuclear Engineering Problem Solving (NEEP 271) to SCSU juniors and seniors,

  - Allowing nuclear engineering students to take courses while on co-op assignments, and providing continuing education opportunities to nuclear engineering staff at nuclear utilities; e.g., we are in the process now of using the same E-Technology to develop distance-learning versions of our other junior and senior nuclear engineering courses such as Nuclear Reactor Physics.

Significant Developments related to Nuclear Engineering at Wisconsin:

UW-SCSU partnership

The University and South Carolina State University have signed an articulation agreement under which students at SCSU can complete their studies at Wisconsin and receive a UW BS or MS degrees in nuclear engineering along with an Engineering Technology Degree at SCSU. This is a pilot program proposed by DoE to encourage greater diversity in the nuclear engineering workforce. DoE and its Savannah River Site funding will provide scholarship support to students and allow the hiring of two nuclear engineering faculty members at SCSU. Our role in the process is to provide via courses to the SCSU via distance learning as well as on-site education with our seniors and masters students.

UW Nuclear Reactor License Renewal

The campus has formally submitted the application to the NRC to renew the reactor license. The action to do this was supported at the highest levels, i.e. the Chancellor (our former Provost) and by the Vice Chancellor for Finance. The NRC has ruled the application timely and extended the current license until the NRC can rule on the renewal application. Our license renewal is for an additional twenty years.

UW Nuclear Reactor INIE Proposal with Big 10 Team

The DoE has just released a new request for proposal in support of improving the infrastructure for university research and training reactors. This RFP encourages a multi-university team and UW is part of a Big 10 team involving Illinois, Penn State and Purdue. It is anticipated that if the Big 10 team can obtain this grant, we will be able to enhance the capabilities of these university research and training reactors for use by the nuclear utilities such as Exelon.

Faculty Additions in Nuclear Engineering

The campus is adding new faculty through a cluster hire process to promote interdisciplinary research and activities. We joined with other departments to propose a faculty cluster (four professors) in energy sources and policy, which was approved by the administration. The first hire from this recruiting effort has been a top-notch nuclear engineer, Dr. Paul Wilson, whose expertise is reactor physics and transport theory. In addition, the Dean has allowed the department to formally search for three new professors (in addition to the cluster hire above), one of which is to be in nuclear systems engineering. That search is still underway at present.

High School Science Teachers Workshops

The UW reactor staff conduct three to four workshops per year for middle and high school science teachers this fall. A total of about 120 teachers attended this fall and received instruction in nuclear science, radiation, and nuclear power. Each instructor received four Geiger counters and materials on how to use them to take back to their classrooms. The evaluations from the teachers were very positive.

Accreditation

All engineering programs at Wisconsin were reviewed by the Accreditation Board for Engineering and Technology (ABET) in Fall 2000 as part of the normal review every six years. By official action in July 2001, our nuclear engineering was re-accredited for six more years.

Appendix

M.S. Theses Specific To Nuclear Power Industry Needs

1. *Effects of a Light Gas on Steam Condensation in a Nuclear Reactor Containtment,* Arthur Pernsteiner, 1993. Advisor: Prof. Corradini

2. *Comparison of MAAP4 to MELCOR Simulations for a Station Blackout Transient,* Hung Yoo, 1994, Advisor: Prof. Corradini

3. *Effects of a Variable Doppler Temperature Coefficient Model on Transient Analysis*, Tracy Cartwright, 1994. Advisor: Prof. Corradini

4. *Using DORT to Predict Currents at Startup for Power Range Detector Calibration*, Michael Shackelford, 1994. The work was done for the Zion nuclear power plant. Advisor: Prof. Blanchard

5. *Design of 24 Month Transition and Equilibrium Fuel Cycles for Dresden Unit 3*, Tavan Hendrik, 1995. Advisor: Prof. Witt

6. *Development of Neutron Radiography Imaging for the UW Nuclear Reactor,* Robert Agasie, 1997. Advisor: Prof. Corradini

7. *Design of 24 Month Transition and Equilibrium Nuclear Fuel Cycles for LaSalle Unit 2*, Lonnie Kress, 1997. Advisor: Prof. Witt

8. *The Impact of Restructuring the Electricity Industry on Nuclear Power Plant Safety,* James Joosten, 2001. Advisors: Profs. Bier and Corradini