Fifteen Years Experience In Delivering A Nuclear Engineering Technology Program To A Nuclear Utility Site

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I. Introduction.
The University of North Texas, Department of Engineering Technology has delivered a Nuclear Engineering Technology program which leads to a Bachelor’s degree in Nuclear Engineering Technology to a nuclear power plant site 92 miles from the main campus, which is located in Denton, Texas. During this time it was possible to expand the program to include a Bachelor’s degree Electronics Engineering Technology, a Master’s Degree in Engineering Technology, and a Masters degree in Business Administration. The program is entirely supported by the utility and no state funds are involved in the program. The program has strong competition from non-accredited degree granting institutions. Methods of delivery vary with the course of instruction. For laboratory courses, the instructor will generally travel from campus to deliver the material at the site; for lecture only courses, videoconference is frequently used. Efforts are underway to import additional courses from other universities at the time of this writing.

II. Initial Justification for the Program.
The Chernobyl accident of 1986, following on the heels of the Three Mile Island incident in the US prompted the Nuclear Regulatory Commission to consider a requirement that all operators have a degree in a technical area. The utility industry wisely resisted this notion and the resultant compromise that was reached stated that the Senior Reactor Operators, the Shift Supervisor, or a new position called the Shift Technical Advisor, would have a technical degree and be present in the control room at all times. The power plant management chose to develop their own crew of educated operators by providing an easily accessible technical education delivered to the plant site.

III. Program Initiation.
The utility company and its power plant management requested statements of interest from three Texas universities in 1990. The result was that their evaluation indicated that an engineering technology degree best suited their purposes. The program delivery had to be made onsite. The University of North Texas was selected to provide the program with the stipulation that the
University would pursue permission from the Texas Higher Education Coordinating Board (THECB) to offer the degree and seek ABET accreditation for the program.

The THECB stipulated that all lower division courses available from Hill Community College of Hillsborough would be taught by them and that the University of North Texas would offer only upper division courses. That arrangement has worked extremely well and a close working relationship between those two institutions has developed.

The THECB further stipulated that the State of Texas would contribute no funds to the operation of the program and that the utility would pay the full cost of the program. Further, the state would collect tuition and fees from the students. This has meant that the utility and the University of North Texas negotiate each year for a fee to cover the full cost of the program. For operations personnel, the cost of the fees, books and tuition is fully reimbursed upon successful completion of a course; for others, the reimbursement is 75% of cost. There is a cap of $5,000/year for reimbursements.

IV. Profile of the Students.
As one might guess, the students of this program are not typical college students. The ages of the initial students ranged from 32 to 45. Most students had a navy nuclear submarine background and some prior college experience before signing on with the Navy. All students, except one, worked directly for the power plant.

The first class sizes were small, with only a total of three students in each of two classes. The number of students in classes increased to a high of 54 before declining slightly to the current level in the mid 40’s. Initially, it seemed as though other possible participants were holding back to see what happened to the first graduates. As the years went by, two women entered the program and one received a UNT degree. The other chose to complete her degree in another program. Both still work at the power plant.

V. Instructor Profiles.
The program started with one director and a part time instructor from the physics department. After two years, the director left and a new director, who had a PhD in Nuclear Engineering was hired. Several instructors were hired from the plant staff for teaching evening courses. Each of these instructors has a master’s degree in his or her technical specialty and the majority meet the Technology Accreditation Commission (TAC) of ABET basic credentials.

To meet the ABET program criteria for accreditation, a second full time instructor was hired at the rank of lecturer in 1995. The lecturer has both a BS and MS in Nuclear Engineering from the University of Wisconsin. He also holds a PE license in two states and brings a wealth of 15 years of nuclear industry experience to the classroom.
The director teaches a number of courses to provide as great a diversity of viewpoints and experiences as possible for the students. To extend the benefit of diversity, the program has purchased DVD course materials from the University of Wisconsin and has made an agreement with the University of Texas for another course to be delivered by the web.

VI. ABET Accreditation.
With the first program graduates in 1994, the program made immediate application for accreditation along with three other programs from the Department of Engineering Technology in 1995. The first visit of the program by ABET resulted in accreditation. A second visit in 2001 reconfirmed the accreditation. Both accreditations were done under the old ABET criteria. Since that time, much work has gone into developing and using assessment methods to meet the new criteria.

Program Expansion to Include Electronics: In 2000, the plant management made the decision to convert the control system from a centralized analog system typical of the 60’s or 70’s when the plant was designed, to a modern distributed digital control system. This resulted in a program expansion to include an electronics component that lead to a Bachelor’s of Science in Electronics Technology with an emphasis in controls. Further, an intensive training program was started to update the skills of the plant technicians, who had many years’ experience in the use of analog equipment and the calibration procedures appropriate to their tasks, to prepare them for their first encounters with the digital world.

The first graduates of the Electronics Engineering Technology (ELET) program are due to complete the program in December of 2004. Unlike the nuclear program, which has persisted for a long period, the electronics program is perceived as much more of a once through program. The level of support will be greatly reduced after 2004 with the intent of not admitting new students to the ELET program and graduating the stragglers on a minimal support basis. The ELET program is being discontinued because it was designed solely to support the control system change-out as opposed to the long term development of technical personnel for plant operations.

VII. Program Expansion to Include a Master’s Degree.
The advent of videoconferencing in the mid to late 90’s permitted the offering of a Master’s degree in Engineering Technology. The master’s courses are offered at 6:00 PM weekday evenings. By teaching the course in a room equipped with videoconference capability, it was possible to broadcast over the same equipment purchased for the undergraduate programs to facilities at the power plant. This enabled five students to obtain master’s degrees by this method with virtually no travel to the campus.
VIII. Program Expansion to Include an MBA Degree.
Several students expressed a desire to obtain a Master’s degree in business. The Department of Management within the College of Business Administration had an interest in offering their courses remotely, and when they learned of the interest of the power plant employees, they were prepared to offer classes. This activity began in Fall 2002 and the first graduates are expected in December 2004. The pace is somewhat slowed by the fact that students typically take only one to two courses per semester and summer term.

The MBA program is conducted entirely through the Department of Management, without additional funding from the utility. The utility pays some administrative costs for all other programs. The state funds awards the customary Student Credit Hour (SCH) funding to the department and the department further collects distance learning incentives from the university.

IX. Benefits to the University
The program with the utility has provided many benefits to the university. At the highest levels, it has provided proof that the University of North Texas could manage a multiyear, multimillion dollar program. The program has provided the initial incentive to make the conversion from a program of Industrial Technology to Engineering Technology and to seek ABET accreditation. Later expressions of interest in engineering degrees from the utility helped motivate the university to initiate a college of engineering, which they did in July 2003 by hiring a founding dean for the college.

In monetary terms, the contract has been a leading source of overhead money for the university and for the department of Engineering Technology. The program has provided summer salary for the director, a half-time secretary job, full-time jobs for up to two lecturers and supplemental pay for part time instructors.

X. Benefits to the Utility
In addition to meeting its goal of having college educated personnel available in the control room, the utility received citations from the Institute of Nuclear Power Operations for their college program as an organizational strength. Further, some of the graduates have found their way into responsible management positions at the power plant. It is probable that some employees, who wanted degrees, stayed at the power plant to participate in the program instead of moving to job openings elsewhere.

XI. The Competition
The program was constantly harried by the departure of students to seek a degree from Thomas Edison State of Trenton, New Jersey. Thomas Edison is regionally accredited but not ABET accredited. The advantage of the Thomas Edison degree is that it offers up to 60 credit hours for nuclear navy experience and schools. The best that the University of North Texas could do was to offer credit according to the ACE guidelines and that was usually limited to 12 hours of
electives. Despite being higher priced and having less educational value, the amount of time required to finish the program was so much shorter that many opted for that degree.

In many cases, students took UNT or Hill courses to apply toward their Thomas Edison degree. The utility management did not seem to differentiate between the accredited and non-accredited degrees in hiring and promotion.

XII. Program Future.
The future of the program is almost certainly one of change. The expression of interest in engineering degrees may mean the end of the engineering technology degree offerings to the plant personnel. Further, the increased availability of web based courses leading to a degree from recognized and accredited programs is a very real second threat to continuation in the same mode.

If a “World Nuclear University” develops as current discussion recommends, then there should also be an Engineering Technology component aimed at the operators and support personnel who are not involved directly in the design. While all may work to the same purpose, a diversity of skill sets is going to remain essential.

XIII. Conclusions
The Nuclear Engineering Technology program had an extraordinarily long run in delivering course material to a remote power plant site. All parties involved appear to have benefited from the relationships that were formed. Changes in technology probably will not require that such a mode of operation ever be attempted again.

XIV. Acknowledgments.
The authors thank the University of North Texas for supporting this research and for the generous travel allowances that permitted travel to make this presentation.

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