Electrical Utilities and Substation Technology Program Expansion

for the Power Line Construction & Maintenance Program

Presented to the South Dakota
State Board of Education
March 2011
For Implementation
Fall 2011

Mitchell Technical Institute
821 N. Capital • Mitchell, SD 57301

Mitchell Technical Institute

Program Expansion: **Electrical Utilities and Substation Technology**

Length of Program: **9 months Associate Degree**
Prerequisite: Degree/Diploma in Power Line or Power Line Journeyman License

Number of Students: **24**

Projected Start Date: **Fall 2011**

Executive Summary:

Mitchell Technical Institute is requesting approval to expand its existing Power Line Construction and Maintenance program to offer an Associate Degree in Electrical Utilities and Substation Technology beginning in the fall of 2011. The goal of the expanded program is to provide students with an extensive hands-on educational experience that integrates the knowledge, skills and competencies that the electrical power utility industry needs to insure customers have access to power. Graduates will learn to install, inspect, test, repair and maintain electrical equipment in substations and other smart grid equipment on the power grid.

Local and regional utility partners such as Otter Tail Power, Montana Dakota Utilities, East River Electric, Black Hills Power, and Northwestern Energy have indicated they are experiencing a shortage of candidates for employment as substation technicians. Additionally, these organizations have stated that there is no formal course for training technicians in substation electronics and relays. The ultimate goal of the program will be to provide power line graduates or journeymen with overhead line technology skills the opportunity to acquire an advanced degree, thereby increasing their employability and earning potential.

Identification and Description of Program:

The Electrical Utilities and Substation Technology associate degree option combines academic coursework and technical training to strengthen the student's ability to succeed in the utilities industry. The program will provide hands-on skills with an emphasis placed on safe work practices and procedures in the electrical environment.

A substation is used to collect power at the generation site, connect to a transmission grid, and download energy to a distribution network where the power is delivered to the consumer. Substation technicians are individuals who work with an electrical engineer to design, construct and maintain a substation. Program graduates may work outdoors at a substation or they may maintain the grid system housed in a utilities service facility. Graduates will be called upon to diagnose problems, outages, and issues in the substation. The graduates will be prepared for long-term employment with an emphasis in the line worker/ substation area. Many skills learned in the program will transfer to a variety of positions in this field.

Applicants to the program must be a registered Journeyman or hold a power line degree or diploma from an accredited postsecondary institute. All Electrical Utilities and Substation Technology students will be required to complete the Associate Degree general education requirements.

Objectives and Purpose of the Program:

The Electrical Utilities and Substation Technology program will be dedicated to offering students the experience and overall training to become successful substation technicians. Graduates of the program will be able to:

- Construct, test, maintain, and repair substation relay and control systems
- Inspect and test equipment and circuits to identify malfunctions or defects, using wiring diagrams and testing devices such as ohmmeters, voltmeters, or ammeters
- Consult manuals, schematics, wiring diagrams, and engineering personnel in order to troubleshoot and solve equipment problems and to determine optimum equipment functioning
- Notify facility personnel of equipment shutdowns
- Install bypass bar to isolate defective relays; then perform adjustments or repairs
- Prepare and maintain records detailing tests, repairs, and maintenance
- Analyze test data in order to diagnose malfunctions, to determine performance characteristics of systems, and to evaluate effects of system modifications
- Test insulators and bushings of equipment by inducing voltage across insulation, testing current and calculating insulation loss
- Install, test, and replace smart meters and other smart grid equipment
- Communicate effectively through both oral and written means
- Demonstrate a professional attitude and work ethic
- Apply reasoning and critical thinking to solve problems and seek information
- Work cooperatively in a team environment
- Use computer technology within a field of study
- Apply technical skills required of an entry-level technician in a chosen field

Methods of Attaining the Objectives of the Program:

Pending approval, MTI will develop marketing materials and recruit students. MTI will hire instructors and, with assistance from an advisory committee, will finalize course syllabi, purchase equipment and supplies, arrange classrooms, develop schedules, secure resource materials, and interview staff to hire.

MTI provides assurance that it possesses the resources and staff necessary to:

- Develop marketing materials and recruit students
- Recruit and supervise qualified staff
- Assess the abilities of students for good program and course placement
- Provide tutoring for students needing extra academic help
- Provide access to library materials and computer labs
- Develop and administer budgets
- Make available textbooks and other instructional resources
- Provide career and personal counseling to students
- Evaluate programs and staff
- Assist students in finding jobs
- Secure input from industry through advisory committees
- Maintain membership in professional organizations and provide time and fiscal resources for professional development
- Provide financial aid and scholarships
- Provide a typical two-year technical institute climate
- Assist students with housing and provide daytime food service
- Provide services to disabled and nontraditional students
- Provide classrooms and laboratories

- Provide a variety of general education courses

Description of Labor Market Demand:

Graduates of the Electrical Utilities and Substation Technology associate degree option are in demand by electrical utilities, rural electric cooperatives, municipalities and construction companies. MTI instructors and administrators have had several conversations with companies such as Otter Tail Power, East River Electric, Black Hills Power, Montana Dakota Utilities, and Northwestern Energy, all of whom have indicated they have a need for employees with this skill set and training.

The employment opportunities for substation technicians are growing across the country, as the utilities industry is undergoing change in the distribution and monitoring of its power systems. Students who complete this associate degree option should not only see higher wages, but will have a wider scope of employment opportunities and have a greater opportunity for advancement.

United States	**Employment**		**Percent Change**
	2008	**2018**	
Electrical and electronics repairers, powerhouse, substation, and relay	23,400	26,100	+12%
Electrical power-line installers and repairers	113,900	119,000	+4%
South Dakota	**Employment**		**Percent Change**
	2008	**2018**	
Electrical and electronics repairers, powerhouse, substation, and relay	65	90	+38.5%
Electrical Power-Line Installers and Repairers	795	855	+7.5%

[1]Job Openings refers to the average annual job openings due to growth and net replacement.

National Data Source: Bureau of Labor Statistics, Office of Occupational Statistics and Employment Projections.
South Dakota Data Source: DOL Labor Market Information Center, Jan. 2011

Population Served:

The program is available to any applicant who has successfully completed the admission requirements set by Mitchell Technical Institute. MTI does not discriminate in its educational programs on basis of race, color, creed, religion, age, sex, disability, national origin or ancestry. The program will draw its students from South Dakota and surrounding states, and the opportunities for employment will favor that same geographical area. This program will not only be targeted at traditional-age college students, but will also be appealing to career changers and older workers looking to change or enhance skills.

Projected Three-Year Budget:

	2011-2012	2012-2013	2013-2014
Salaries/Benefits	$71,000	$75,000	$80,000
Equipment	$100,000	$50,000	$10,000
Supplies	$15,000	$15,000	$15,000
Travel	$1,500	$1,500	$1,500
Marketing	$2,500	$2,500	$2,500
TOTAL	**$190,000**	**$144,000**	**$109,000**

Program Competencies and Entry and Exit Points:

Entry point will be the fall of 2011. The exit point will be at the completion of coursework. Graduates will receive an Associate Degree in Electrical Utilities and Substation Technology. Students must maintain an overall GPA of 2.0 to graduate. The curriculum is competency-based and will be reviewed and approved by a program advisory committee. Additionally, MTI will adhere to any future guidelines or certifications set by the utilities industry.

Statement of Nonduplication:

At the present time, we are not aware of a similar degree offered anywhere in South Dakota.

Curriculum Design and Research:

Applicants to the program must be a registered journeyman or hold a power line degree or diploma from an accredited postsecondary institution. All Electrical Utilities and Substation Technology students will be required to complete the Associate Degree general education requirements.

Fall Semester

Course Title	Credit Hours
IT Essentials	3
Introduction to SCADA Electronics I	3
Wireless Communication	3
Introduction to SCADA Control Room Software	4
Concepts of Smart Metering	2
Substation Operations	3
General Psychology	3
Total Credits	21

Spring Semester

Course Title	Credit Hours
Cisco Discovery I	3
Introduction to SCADA Electronics II	3
Substation/SCADA Testing and Control Lab	4
Concepts of Smart Grid	2
Substation Relay Lab	3
Fiber Optics Splicing	1
Industrial Relations	3
Total Credits	19

Wage Factor:

Location	Pay Period	2009				
		10%	25%	Median	75%	90%
United States	Hourly	$20.90	$25.82	$29.94	$34.33	$39.21
	Yearly	$43,500	$53,700	$62,300	$71,400	$81,600
South Dakota	Hourly	$24.09	$26.86	$29.79	$32.52	$35.67
	Yearly	$50,100	$55,900	$62,000	$67,600	$74,200

National Data Source: Bureau of Labor Statistics, Occupational Employment Statistics Survey
State Data Source: South Dakota Wage Information

CIP Code:

46.0399 Electrical and Power Transmission Installers, Other

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February 21, 2011

Mr. Mark Wilson
Director of Curriculum, Career and Technical Education
SD Department of Education
Pierre, SD 57501

RE: Electrical Utilities and Substation Technology

Dear Mr. Wilson:

I am providing this letter of support for the proposed Electrical Utilities and Substation Technology Program at Mitchell Technical Institute (MTI).

East River Electric Power Cooperative (East River) employees over sixty personnel dedicated to the day-to-day work of constructing, operating, and maintaining an electric transmission system in eastern South Dakota and western Minnesota. This transmission system is an important part of the backbone electric delivery system for East River to provide reliable wholesale power supply to the twenty-five retail distribution systems which own East River and serve over 100,000 retail residential, farm, commercial, and industrial accounts. East River has integrated into its utility operation increasingly sophisticated Supervisory Control and Data Acquisition applications, digital relaying, automated distribution, and telecommunications and metering applications, all of which require expanded training requirements.

East River, along with most of its industry peers, finds itself dealing with a dramatic evolution in electrical grid technology and a shortage of qualified personnel due to the aging of the workforce and the continuing demands of new technology. This is especially so in the substation electronics area. The development of the Smart Grid concept, along with the rapid change in communications and control technology that increasingly relies on Internet Protocol, poses a challenge to the industry in not only finding an entry level workforce with the right skills, but a methodology to retrain a portion of our existing workforce to handle this significant shift in technology.

The proposed expansion of MTI's Power Line Program to offer an option for substation training is the right approach to addressing this training. This would also allow for qualified power linemen currently in the industry to upgrade their skills to better fit the needs of the industry as well as facilitating their own professional advancement. The program that is proposed by MTI will afford program graduates the requisite skills to deal with the electronics, controls, and IP infrastructure that will continue to be the heart of future substations and electric transmission and distribution systems.

This course start is timely and appropriate in being able to provide East River Electric and the electrical utility industry with the right workforce skills. We endorse and strongly support MTI's efforts to field this program.

Sincerely,

Jeffrey L. Nelson
General Manager

JLN/sl

Black Hills Power

Michael Theis
Manager—Electric Distribution Operations
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March 2, 2011

Mr. Mark Wilson
Director of Curriculum, Career and Technical Education
SD Dept. of Education
Pierre, SD

RE: Electrical Utilities and Substation Technology

Dear Mr. Wilson,

I am providing this letter of support for the Electrical Utilities and Substation Technology Program at MTI.

Black Hills Power serves customers in Western South Dakota, Eastern Wyoming and Southeastern Montana. We own and operate our own generating and transmission facilities for these locations, as well as other subsidiaries of Black Hills Corporation in Wyoming and Colorado. As part of this infrastructure, we have a significant number of substations and relay equipment. We have already begun to face the challenges of retirements in the industry, and have had little success with finding training programs to meet our needs in these areas.

Black Hills Corporation does not have a unique challenge with our workforce. The electrical power industry finds itself in a position where a number of retirements are expected in the next 10 years and, at the same time, there are dramatic changes taking place in the electrical grid. These two factors are changing the requirements for our workforce—especially as it pertains to the substation. This is especially true of Substation Electricians and Relay Technicians. Because of the dearth of training in these areas in formalized schools, we are faced with either having to train our own replacements over several years, or encouraging a technical school that already has a mature electrical power training program to expand to address these needs. In this regard, we support MTI's efforts to expand their current Power Line Program to incorporate a second year of substation technology.

The program that is proposed by MTI will afford program graduates the requisite skills to deal with the infrastructure that will be the heart of the substation. We will also help guide MTI's efforts in developing the curriculum so that it fits BHP and industry needs for substation technicians. MTI has been very responsive in our needs for training, and this is another example of MTI being on top of industry needs. We strongly endorse MTI's efforts in developing this program.

Sincerely,

Mike Theis
Manager of Electric Operations