

Meeting Educational Needs of the Sustainable Energy Industry

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Abstract – *This paper assesses and addresses the educational need in sustainable energy with a focus on Pennsylvania. The relevant training and educational sequence and scope are discussed. Continuing education courses focusing on sustainable energy have been developed in addition to an alternative energy and power generation track for a baccalaureate degree in General Engineering. The program's goal is to create graduates who will enter the job market in the alternative energy and/or power generation industry. The graduates from the proposed program will have extensive training in the alternative and renewable energy fields. They will also have a critical understanding of the environmental, social, and economic aspects of the power generation industry. They will have the background, knowledge, and skills necessary to be successful in the contemporary power generation sector while being able to lead the industry toward a more environmentally-friendly goal, using alternative and renewable energy technologies.*

1. Introduction

According to a Commonwealth of Pennsylvania, Department of Environmental Protection report, by 2020 Pennsylvania has projected that 10% of all of the energy generated in the commonwealth will come from clean, efficient sources, including renewable sources [1]. This situation is not unique to Pennsylvania. New Jersey will require 25 percent clean electricity by 2021, and Maryland projects a 12 percent increase by 2022 [2]. Michigan is projected to reduce the use of traditional fossil fuels for producing energy by 45 percent by 2020 [3], and 25 percent of the state's energy may be generated from sustainable sources by 2025 [4]. Connecticut anticipates 20 percent of all energy used and sold will come from clean or sustainable resources by 2020 [5]. Texas has proposed to increase development of bio-fuels and dramatically boost the state's production and use of wind energy [6]. The increase in the development and usage of sustainable energy resources will also create a large demand for engineering professionals with expertise in these new forms of sustainable energy and power generation. By 2025, over 44,000 additional jobs would need to be created in Pennsylvania as the sustainable energy production in the state increases [7]. Due to the increased interest in sustainable energy, it is estimated that the U.S. alternative energy sector could create 40 million jobs by 2030[4]. In Northeastern Pennsylvania, educational needs for the sustainable energy field are not being fully addressed. Educational institutions in the area are responding to the demands of local industry in the region by developing and implementing new programs. This paper addresses the assessment of the educational needs in the sustainable energy field and describes the initiatives at Penn State Hazleton which are geared toward addressing those needs.

2. Educational Needs

The educational needs of the power generation industry are being addressed by a number of local institutions in Northeastern Pennsylvania who are cooperating to fill the educational gap in the sustainable energy area. Presently cooperation exists between Penn State Hazleton (baccalaureate degree institution), Luzerne County Community College (associate degree institution), and West Side Technology and Career Center, Hazleton Area Career Center, and Elk Lake High School (secondary vocational programs). Fig. 1 shows the different levels of training. Some of the programs are already being offered while other programs are in the development or implementation stages. Students have the opportunity for transition from the secondary vocational programs at the technology and career centers to either associate degree programs at Luzerne County Community College and/or baccalaureate degree programs at Penn State Hazleton, such as, the Bachelor of Science in General Engineering with Alternative Energy and Power Generation Track.

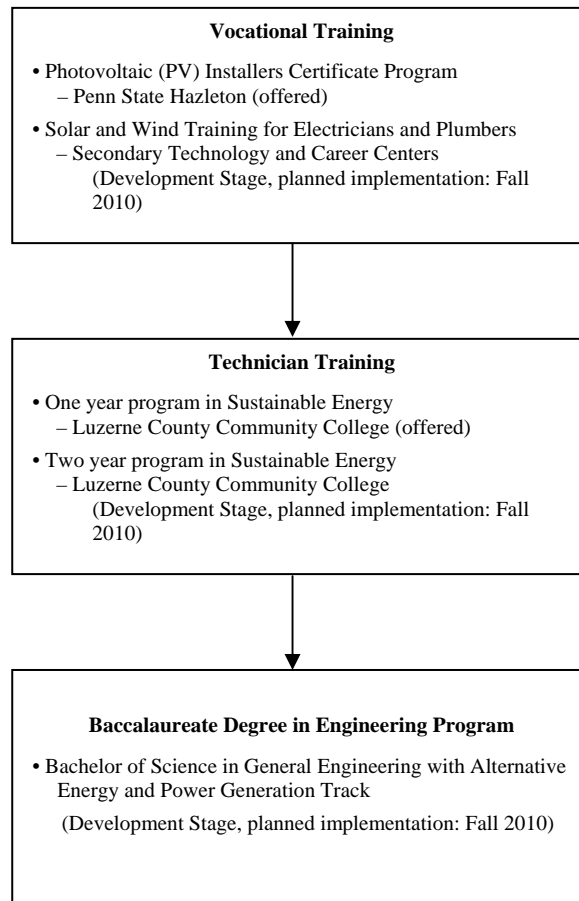


FIGURE 1
EDUCATIONAL MODEL IN SUSTAINABLE ENERGY EDUCATION AND TRAINING

3. Educational Scope and Sequence

The educational scope and sequence are designed to meet the needs of the sustainable energy industry are described in greater detail. The three levels of education and training are as follows:

1. Training of the Installers (Secondary Vocational Programs)
 - a. Photovoltaic (PV) System Installers (Residential)
Licensed electricians are trained to install PV systems connected to the grid.
 - b. Solar Thermal Installers (Residential)
Licensed plumbers are trained to install solar water heaters.
 - c. Wind Turbine Installers (Residential)
Licensed electricians with the necessary background are trained to install small wind turbines (up to 20 kW).
 - d. Geothermal Installers (Residential and Commercial)
Licensed plumbers are trained to install geothermal systems.
2. Technician Training (Associate Degree)
 - a. Photovoltaic (PV) System Designers/Project Managers
Designers and project managers are trained in designing the PV system for residential and commercial customers. They are responsible for preparing the necessary documentation, securing permits, overseeing the installation/inspection, and connecting the system to the grid. In addition technicians are trained in engineering sales and troubleshooting.
 - b. Solar Thermal Technicians
Technicians are trained in sizing the system, technical sales, preparing necessary technical documentation, securing permits, overseeing installation, repair work, and maintenance.
 - c. Wind Turbine Technicians

Technicians are trained to handle technical sales, sizing the wind turbine/tower, prepare technical documentation, secure the necessary permits, supervise the installation process, and connect the system to the grid, as well as, maintenance and equipment repair.

d. Geothermal Technicians/Project Managers

Technicians and project managers are trained in sizing the system, technical sales, preparing necessary technical documentation, securing permits, overseeing installation, repair work, and maintenance.

e. Energy Auditing Technicians/Licensed Energy Auditors

Technicians and auditors are trained in energy auditing on a residential and commercial scale. They are also responsible for the development of the energy saving plan based on the energy audit.

3. Licensed Engineers (Baccalaureate Degree)

These engineers would be trained as specialists in the sustainable energy field. They would be responsible for designing the system, performing structural analysis from the perspective of public safety. Their background would need to include all forms of sustainable energy (photovoltaic, solar, solar thermal, geothermal, big/small wind turbines, etc).

4. Development and Implementation Challenges

The main challenges in the development and implementation of the sustainable energy programs of sustainable energy programs and courses are

- Difficulty in finding qualified faculty
- Lack of clear educational program objectives
- Very dynamic job market
- Lack of laboratory equipment
- Lack of clear industry codes (which are just being developed)

The positive aspects in the developments and implementation of sustainable energy programs and courses are

- Strong interest among high school students in pursuing careers related to alternative energy and power generation
- Positive public image of the programs
- Growing job market

5. Conclusion

The paper is focusing on an assessment of educational needs for sustainable energy industries with a focus on Pennsylvania were conducted. The initiatives at Penn State Hazleton to meet those educational and industry needs are presented. The practical educational and training scope and sequence are also discussed. In addition the authors have presented the challenges and opportunities in developing this new educational and training model.

References:

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