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# Programmed for Success: Educating Tomorrow's Workforce

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guest editorial

Mariesa Crow

# programmed for success

## *educating tomorrow's workforce*

I RECENTLY STEPPED DOWN AS chair of the IEEE Power & Energy Society (PES) Power & Energy Education Committee (PEEC) to take my place among a very dedicated group of past chairs and exemplary educators. I have been an active member of the PEEC since the start of my academic career 20 years ago in 1990. The education committee is comprised of educators and practicing engineers who are committed to power engineering career development, university education, and lifelong learning. The committee strives to address issues of whole-life education. This issue of *IEEE Power & Energy Magazine* has six feature articles that discuss power engineering education in all its many facets. I will provide a brief summary of each and describe how it relates to the mission of PEEC. I encourage you to take the time to read each article in full and give us your feedback and opinions:

- ✔ "The New Centurions" by Mariesa Crow and Lynn Stichnote
- ✔ "Engineering the Future," by Wanda Reder, Anjan Bose, Alex Flueck, Mark Lauby, Dagmar Niebur, Ann Randazzo, Dennis Ray, Gregory Reed, Peter Sauer, and Frank Wayno
- ✔ "Continue Your Learning" by S.S. (Mani) Venkata, Sukumar Brahma, Jason Stamp, and Prabha Kundur
- ✔ "The Importance of Modern Teaching Labs" by Bruce Wollenburg and Ned Mohan
- ✔ "Remote Control" by Mini S. Thomas
- ✔ "Where School Is Cool," by Hugh Rudnick, Rodrigo Palma-Behnke, Sandoval Carneiro, Jr., Tatiana M.L. Assis, Harold Salazar, and Jaime A. Valencia.

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As noted in several of these feature articles, utility executives estimate that half of the technical workforce will retire over the next decade. The primary concern, especially in the United States, is whether the industry will be able to recruit and retain energetic, motivated young people to take their place. Much of the retiring workforce is part of the so-called baby boomer era—people who were born between the end of World War II and the early 1960s—and they have shaped the corporate engineering workplace that currently exists. Their children, the up-and-coming "millennial" generation, make up nearly as large a cohort as the boomers but approach life (and work) very differently. We face significant challenges in recruiting young people into the study of engineering. And there is another problem: how do we retain the best and the brightest in our companies?

Two of the featured articles address these questions of recruitment but from different perspectives. The first article, "The New Centurions," is written by me and Lynn Stichnote, who was the longtime director of admissions at Missouri University of Science and Technology. In this article, we discuss the unique qualities of the millennial generation and what may or may not influence them in their career choices. Educators and employers who are familiar with and embrace their characteristics will have a much greater ability to engage these young people in power engineering. The millennials have also been called the Net generation because they are the first generation that has not known life without the Internet. Millennials are extremely comfortable with technology, but that doesn't necessarily make them *interested* in technology or how it is developed. Charles Vest, the president of the National Academy of Engineering, observed:

> … this current generation of young people is actually very idealistic. They very much want to make the world a better place, and very few of them see or understand engineering as a mechanism for doing that.

Millennials are geared for hands-on experiential learning and want to get immediately involved. Simply telling millennials about an occupation is not sufficient; they must experience it firsthand. There are numerous pipeline programs geared to young people: Project Lead the Way, INFINITY Project, FIRST, and Expanding Your Horizons are just a few experiential programs aimed at introducing precollege students to math, science, and engineering. The Career Promotion and Workforce Development Subcommittee of PEEC helps with providing solutions for power engineering workforce challenges and stimulating interest in power and energy engineering careers. This subcommittee is responsible for two career video productions for high school and college-age students (available on the PES Web site) and will soon release a new career video targeted at middle school students.

Since millennials like to experience their potential careers before their

first day on the job, it is important to involve them early in the activities of their professional society. The Student Meeting Subcommittee of PEEC works to facilitate and organize student activities programs with the help of conference local committees for the following conferences:

- ✔ IEEE PES General Meeting
- ✔ IEEE PES Power System Conference and Exposition
- ✔ IEEE PES Transmission and Distribution (T&D) Conference and Exposition
- ✔ North American Power Symposium.

Our president-elect, Noel Schulz, started her PES career participating in the PES winter meetings as part of the student meeting program. Today, the Student Meeting Subcommittee supports and assists hundreds of students annually with conference accommodations, poster presentations, specialized activities, and career development at various meetings. This early exposure to the activities of the professional society has cemented a lifelong attachment on the part of many engineers to PES and the power engineering community.

The second article, "Engineering the Future," is a summary of the activities of the Power and Energy Engineering Workforce Collaborative (PWC), spearheaded by Wanda Reder, past president of PES. This article summarizes the challenges facing the electric power and energy industry with respect to the declining workforce. PWC is organized into three main working groups: outreach and image, education, and research support. The outreach and image working group is tasked with analyzing the engineering pipeline and improving the image of power engineering to make it a more attractive and visible career field. The education working group is tasked with building partnerships to improve curricula and educational models. The research support group is working to raise the visibility of the need for funding for state-of-the-art research and the development of researchers capable of producing innovative solutions. The article discusses a variety of recommendations for the different sectors that contribute to workforce development: industry, federal and state agencies, IEEE, and educational institutions. One of the recommendations to PES is to develop training plans targeted toward lifelong learning. This leads directly into the third article on lifelong learning.

"Continue Your Learning," by Mani Venkata, Sukumar Brahma, Jason Stamp, and Prabha Kundur, describes the wide array of postgraduate educational opportunities currently available. Most engineers are familiar with conferences and short courses as venues for obtaining professional development to maintain professional licensure or to stay current with new areas. The advent of the Internet, however, has increased the availability of more in-depth educational opportunities for the practicing engineer. It is no longer necessary to live in a metropolitan area near an engineering school to pursue graduate-level

training or to travel to conferences to obtain the latest information. Graduate courses are now available online via streaming video and can be used to obtain graduate certificates or even degrees. Webinars offer the ability to participate in presentations in real time and benefit from interaction with "attendees" from all over the world.

PEEC's Life-Long-Learning (LLL) Subcommittee facilitates and monitors the tutorial offerings at PES general meetings, T&D expositions, and PSCE conferences. The subcommittee also facilitates the offering of continuing engineering education units (CEEUs) for these tutorials. The subcommittee maintains a database of all online resources for lifelong learning opportunities on the PEEC Web site.

As noted previously, today's engineering student craves experiential, hands-on learning. Two of the articles in this issue describe university laboratories: "The Importance of Modern Teaching Labs" describes a series of undergraduate laboratories, while "Remote Control" describes a laboratory for graduate students.

"The Importance of Modern Teaching Labs," by Bruce Wollenberg and Ned Mohan, describes an ongoing effort at the University of Minnesota to upgrade and revitalize the power engineering curriculum to better suit the needs of both students and industry. In this article, the authors stress the importance of the laboratory experience for engineering students and describe three laboratory courses that complement the power and energy lecture courses. The authors highlight several novel features of their power electronics, electric drives, and power systems laboratories.

Mini Thomas, in her article "Remote Control," describes the development of a SCADA laboratory for graduate student use and professional engineer training. This article provides an in-depth description of the primary system components, with accompanying photos and layouts. The SCADA laboratory has been expanded to include a substation automation laboratory that provides hands-on experience with relay IEDs, communication protocols, and component interoperability. The article concludes with a description of the research projects and industry collaborations that have resulted from the unique capabilities of these laboratories.

This issue is rounded out by the final article, "Where School Is Cool," by Hugh Rudnick, Rodrigo Palma-Behnke, Sandoval Carneiro, Jr., Tatiana Assis, Harold Salazar, and Jaime Valencia. The article focuses on the efforts under way in several Latin-American universities to modernize their curricula. It provides an in-depth description of the engineering degree programs in these countries and of how students decide to embark on an engineering career. The stature and popularity of engineering in these countries are significantly higher than in the United States and Canada. Therefore these countries have little difficulty in recruiting qualified and talented young people into engineering but still struggle to provide a course of study that is rigorous and modern.