

The Emerging Technical Talent is our Future... *Are we Ready?*

Wanda Reder

IEEE PES President



Vice President — Power Systems Services
S&C Electric Company



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Overview

- US Electric Industry Challenge
- Technical Workforce Supply
- Recognition of the Workforce Challenge
- Power Engineering Trends and Concerns
- Workshop and Recommendations
- Organizing for Implementation

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The US Electric Industry Challenge

- US electric demand predicted to increase 40% by 2030*
 - Capacity margins eroding
 - Requires additional generation and delivery investments
- Aging infrastructure:
 - More maintenance
 - Increased equipment replacement
- Complex systems:
 - More reliant on technology
 - Convergence of communications, computing and energy systems
- Changing societal needs and global concerns

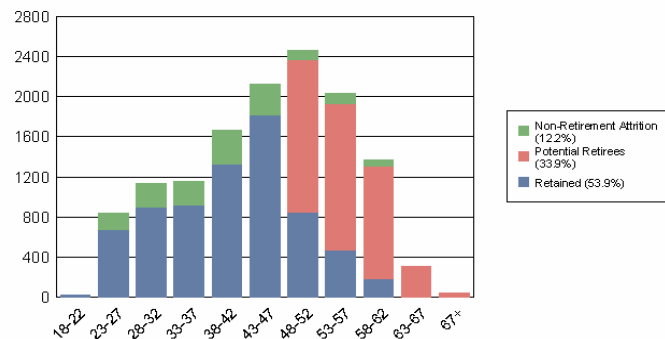
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* Source: US Department of Energy, Annual Energy Outlook 2007 Early Release

Technical Workforce Supply

46% of engineering jobs could be vacated by 2012 *

All Engineers



Potential Retirees are defined as older than 53 with 25+ years of service, or older than 63 with 20 years of service, or older than 67 within the next five years

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*Source: Gaps in the Energy Workforce Pipeline: A 2007 Workforce Survey Report From the Center for Energy Workforce Development Center

Recognition of the Workforce Challenge

Workforce Trends in the Electric Utility Industry: DOE, 2006

"Today, the power engineering education system in the United States is at a critical decision point. Without strong support for strategic research in power systems engineering and without qualified replacements for retiring faculty, the strength of our Nation's university-based power engineering programs will wane, and along with them, the foundation for innovation in the power sector to meet our energy challenges in the 21st century."

Long-Term Reliability Assessment: NERC, 2007

"The loss of industry workers and their years of accumulated expertise due to retirements is a serious threat to the bulk power system reliability, exacerbated by the lack of new recruits entering the field."

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Power Engineering Trends

- From 2001-02 to 2005-06 enrollments* ...
 - Electrical engineering enrollment: declined
 - Undergraduate elective power class students: declined 3500 to 3300
 - Graduating Masters students in power: declined 1600 to 1400
 - Graduating power-related Ph.D.s: rose slightly 800 to 900
- Untenured faculty decline: 20% in early 90s to 12% now
- Research funding decline: 17% compared to 2001-02
- Not all retiring professors are being replaced
- Major university power programs ending
- Increasing international graduate students: now 59%

*Source: IEEE Power Engineering Education Committee Survey Results for 2005-06 Academic Year.

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Power Engineering Concerns

The Emerging Technical Talent is our Future...

Need more:

- Increasing demand for technical talent and experience
- Rapid forecasted attrition

Supply is questionable:

- Students in the pipeline are declining
- Retiring faculty are not being replaced
- Education infrastructure needed to capture emerging interest in 'energy,' 'sustainability', and saving the earth

Are we Ready?

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Future Power Engineering Workshop

- Workshop held in November 2007 with 75 attending
 - Sponsor: National Science Foundation
 - Co-Sponsor: NERC, IEEE PES, PSERC
 - Attendance from industry, government, universities
 - Included an Executive Summit comprised of key leaders
- Purpose: explore how to build university infrastructure for the upcoming power engineering demand
 - Making the case for building, enhancing and sustaining programs
 - Accepting ownership of the problems
 - Building the student pipeline
 - Communicating an exciting image
 - Teaching to motivate
 - Supporting research for innovation and faculty hiring
 - Committing to work for solutions

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Key Recommendations

- Create a single, collaborative voice on solutions
- Paint future challenges to enhance the image and increase interest in related careers
- Stimulate interest and prepare students for a post-high school engineering education
- Make the higher education experience relevant, stimulating and effective
- Strengthen the case to build, enhance and sustain university programs
- Increase university research funding by government and industry to find innovative solutions and to enhance student education

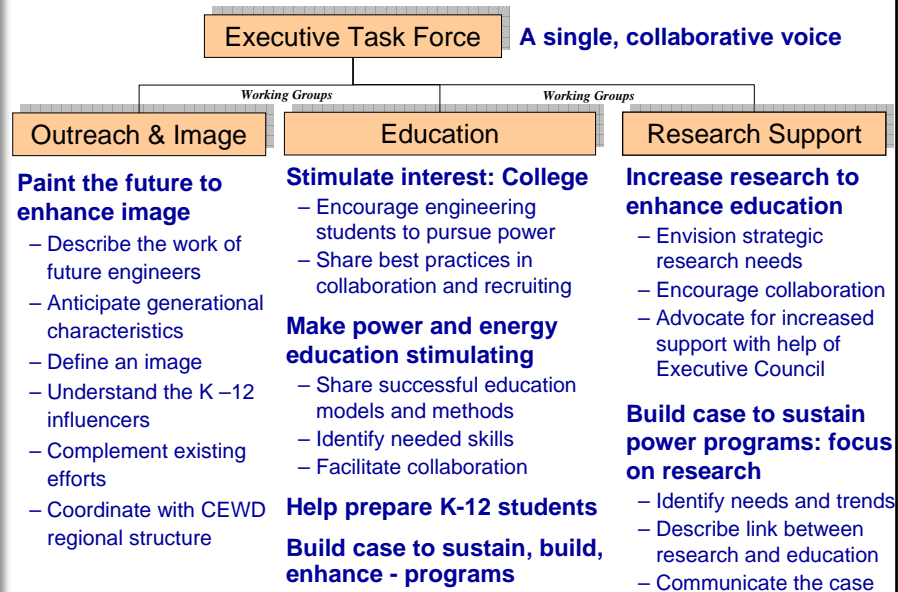
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Organize for Implementation

- Begin Power and Energy Engineering Workforce Collaboration Initiative
- Define a structure to implement recommendations
 - Build more collaboration for outreach, education and research
 - Complement existing efforts of others to the extent possible
 - Get all stakeholders to realize their roles in the solutions
- Proposed interim structure
 - Executive Council:
 - Lead working group activities
 - Plan activities and advocate for solutions
 - Working groups
 - Outreach & Image: Create and communicate exciting image
 - Education : Enhance at K-12 and university levels
 - Research Support : Expand funding of university research

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Collaboration Initiative for Power and Energy Engineers



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Breakthroughs Require Diverse Skills

- Asset management
- Power electronics
- Advanced protection equipment
- Sophisticated computations
- New monitoring systems
- Powerful communications
- Risk assessment and management
- Circuit of the Future (distribution)
- Utility of the Future (smart grid)
- Integration of wind, dispersed generation and storage



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Conclusions

- The emerging technical talent is our future
 - Demand is increasing
 - Supply is decreasing
- Opportunity to capture interest 'energy' and 'sustainability'
- Collaboration and organization is key for success
 - Outreach and Image
 - Education
 - Research Support
- We will be ready!

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For More Information:

Wanda Reder

IEEE PES President



Vice President — Power Systems Services
S&C Electric Company



773-338-1000 x2318

WReder@sandc.com
w.reder@ieee.org



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