WPI 2014 Energy Symposium

Grid Modernization and Its Impact on Educational Needs

David Zabetakis, President
Doble Engineering Company
DOBLE AT-A-GLANCE

• Founded in 1920
• ESCO operating company since 2007
• Global operations in 110 countries
• 70+ field experts with more than 1,000 years cumulative industry experience
• Serve all segments: Power Generation, Power Transmission & Distribution, Manufacturing Companies, Industrial Distillers and Refiners, Oil Rigs and Mining.
SUPPORTING OVER 5500 DIVERSIFIED CUSTOMERS IN 110 COUNTRIES
Overview of the Electric System
The goal is to use advanced, information-based technologies to increase power grid efficiency, reliability, and flexibility, and reduce the rate at which additional electric utility infrastructure needs to be built.
Electric Energy Drivers and a Changing Workforce Landscape

Electric Energy Drivers
- Growing electric demand
- Aging infrastructure
- Grid modernization
- New technologies
- Changing societal needs

Changing workforce landscape
- Increasing retirements
- Less experienced new hires
- Cultural differences
- Evolving competencies
- Efforts to develop, recruit, retain
- More outsourcing
62% of the workforce may need replaced in 10 years.
Workers continue to delay their retirement due to the economy

According to CEWD
- Industry workforce has decreased by 11,000+ jobs since 2009
- The average age of the workforce has increased to 46.1
- Employees age 53 and above has increased by 5% since 2006
- Employees 30+ years of service has increased by 5.2% since 2006

Jobs that were anticipated have not incrementally been added

Hiring and retaining the best and brightest can be challenging in lieu of a decreasing workforce

Fewer new applicants can meet pre-employment requirements
Landscape is Changing

- Aging demographic of power engineering academics
- Emerging student interest in green jobs with large societal impact
- Many new initiatives -- scholarships, internships, career awareness, surveys, curriculum developed from stimulus funding
- Emerging competency requirements for the future grid
- New curriculum has been developed
- Efforts to allocate research through Centers for Excellence
A Variety of Responses

• IEEE Power and Energy Engineering Workforce Collaborative

• IEEE PES Scholarship Plus Initiative

• DOE Electricity Advisory Committee Workforce Ad-Hoc

• ARRA funding of $100M for 54 workforce training projects

• Engineering Research Centers
IEEE PES Scholarship Plus Initiative ™

• Scholarship: $2000, $2000 and $3000 in year 1, 2 and 3

• For US citizen or permanent residents with one year of completed undergraduate study

• Attending accredited school with Power Program

LEARN - www.ee-scholarship.org
LIKE - www.facebook.com/ieeepes.scholarship.plus
CONNECT - www.ieee-pes.org/workforce/pes-careers
DONATE - www.ee-scholarship.org/sponsorship/donate-now/
2012 - 2014 IEEE PES Scholars

• 2012 – 2013 PES Scholars:
  • 228 PES Scholars selected
  • From 100 U.S. Universities

• 2014 - 2015:
  • Over 2000 applications
  • More than 200 schools

• Apply – March to June 30th

http://www.ee-scholarship.org
Modernization of the Grid = Smarter Grid

• Innovation into the 21st Century
• Demand Response and Energy Efficiency
• Distributed Generation
• Micro grids
• Renewable Energy
• Energy Storage
• Power Electronics
• Electric Vehicles
Modernization of the Grid = Smarter Grid

- Innovation into the 21st Century
- Computer-based remote control and automation
- Two way communication
- Computer Processing
- DATA
- DATA
- DATA

- The convergence of Information Technologies and Operation Technologies.....Grid Visibility and Asset Management
MARKET TRENDS

Maintenance

- **Run to Failure/Reactive**
- **Scheduled/Interval Maintenance**
- **Counter Based Maintenance**
- **Condition Based Maintenance**
- **Real-Time Condition Based Maintenance**

**Historically prevailing maintenance model**

**Market**

**Trending**

**Rationale**

- Lower O&M
  - More cost effective for lower value assets
  - More tenable where downstream impact is limited

- Higher reliability
  - More efficient Capex and O&M
  - Better asset life extension
WHERE INDUSTRY IS GOING:

### PREDICTIVE MAINTENANCE

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<tr>
<th>Implementation Cost</th>
<th>Run to Failure/Reactive</th>
<th>Scheduled / Interval Maintenance</th>
<th>Counter Based Maintenance</th>
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- Overlay of a maintenance schedule based on age
- Change maintenance schedule to be based on events
- Schedule asset performance data collection - maintain asset based on performance parameters
- Continuously monitor asset performance and perform maintenance when there is an indicator of a problem

**Most Utilities**

- Maximum Reliability
- Grid Visibility across aging assets
- Efficient O&M
- Just in time / risk assessment included
WHAT WE’VE BEEN ASKED FOR

The future is likely to lead us

• Consolidation of diagnostics- multiple vendor systems fed into a common integrator - leading to only one data stream
• Rationalization of communications - hard wired, wireless, fiber, etc.
• A need to deal with many protocols- IEC 61850, DNP3, Modbus, etc.
• The ability to interplay SCADA data in CIM with such diagnostic data

Plus

• Automated analyses to trigger alerts
• The ability to assess meaning of alerts through easy access databases
• Expertise to interpret diagnostics in terms of equipment engineering
THE FOREFRONT OF THE DIGITAL ENERGY MOVEMENT

- Enterprise asset management
- Operational excellence and budget optimization

Predictive indicators of developing faults + Remote management & control = Efficient & effective maintenance
REPORTING – BUSINESS INTELLIGENCE

Summary Reporting

- Fleet
- Region
- Location
- Risk
- Rankings
- Capital
- Back Office – Testing
- Statistics
- Alerts - Notifications
• Doble Comprehensive Analysis

• Operational Awareness

• Instant Risk Updates
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Modernization of the Grid = Smarter Grid

• Innovation into the 21st Century
• Cyber Security
• Physical Attacks
• Grid Resilience from weather
• Hardening Infrastructure and Shielding Equipment from EMP assault
THANK YOU

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