New Member Orientation

Power Delivery and Energy Utilization Sector

Ivo Hug
Marketing Manager

Lora Cocco
Senior Operations Manager

Together…Shaping the Future of Electricity
Our History…

• Founded “by and for” the electricity industry in 1973

• Independent, nonprofit center for “public interest” energy and environmental research

• Collaborative resource for the electricity sector

• 450+participants, 18 % international participation

• EPRI members generate more than 90% of the electricity in the United States

“Collaborate!”

EPRI’s Founder
Chauncey Starr
Help Move Technologies to the Commercialization Stage…

Our Role…

“Technology Accelerator!”
Our Mission…

• To conduct research on key issues facing the electricity sector…on behalf of its members, energy stakeholders, and society.
EPRI Portfolio Spans the Entire Industry

**Generation**
- Advanced Coal Plants, Carbon Capture and Storage
- Combustion Turbines
- Environmental Controls
- Generation Planning
- Major Component Reliability
- Operations and Maintenance
- Renewables

**Nuclear Power**
- Material Degradation/Aging
- Fuel Reliability
- High-Level Waste and Spent Fuel Management
- Nondestructive Evaluation and Material Characterization
- Equipment Reliability
- Instrumentation and Control
- Risk and Safety Management
- Advanced Nuclear Technology
- Low-Level Waste and Radiation Management

**Power Delivery & Utilization**
- Condition Monitoring of Critical Assets
- Reliability Metrics and Drivers
- Operating the grid reliably with renewable resources
- Electric Transportation
- Efficiency and Demand Response
- Electric Storage
- Work practices
- Smart Grid
- Mitigation of Hazards

**Environment**
- Air Quality
- Global Climate Change
- Land and Groundwater
- Occupational Health and Safety
- T&D Environmental Issues
- Water and Ecosystems
Overview
Power Delivery and Utilization
Power Delivery & Energy Utilization Sector
From Generator Bus Bar to End Use

Distribution  Transmission  End Use

Strong Collaborative: ~100 members ~$100M Annual R&D Funding
Resources (Laboratories, Technical Staff) as Extensions of our Member’s Staff

Collaboration…..Technical Expertise….Thought Leadership
Industry Needs

- Maximize use of existing transmission corridors
- Ensure grid reliability with increasing penetration of intermittent generation and demand response
- Automate condition based inspection and maintenance
- Mitigate risks of low frequency and high impact events
- Ensure interoperability of smart grid technologies to reduce cost and risk of technology obsolescence
- Deploy T&D and end use efficiency and peak demand reduction technologies
- Electrify transportation with an enabling grid infrastructure
## 2011 Power Delivery and Utilization Portfolio

### Transmission

<table>
<thead>
<tr>
<th>Transmission Lines &amp; Substations</th>
</tr>
</thead>
<tbody>
<tr>
<td>35: Overhead Transmission</td>
</tr>
<tr>
<td>36: Underground Transmission</td>
</tr>
<tr>
<td>37: Substations</td>
</tr>
<tr>
<td>162: HVDC and FACTS Systems</td>
</tr>
</tbody>
</table>

**Grid Operations and Planning**

| 39: Grid Operations               |
| 40: Grid Planning                 |
| 172: Efficient Transmission       |
| 173: Bulk Integration of Renewables|

### Distribution

<table>
<thead>
<tr>
<th>Distribution Lines and Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>180: Distribution Systems</td>
</tr>
<tr>
<td>174: Integration of Distributed Renewables</td>
</tr>
</tbody>
</table>

### Efficient Use of Energy

<table>
<thead>
<tr>
<th>Energy Utilization</th>
</tr>
</thead>
<tbody>
<tr>
<td>18: Electric Transportation</td>
</tr>
<tr>
<td>170: End-Use Energy Efficiency and Demand Response in a Low Carbon Future</td>
</tr>
</tbody>
</table>

### Cross Cutting Technologies and Integration

| 1: Power Quality                   |
| 94: Energy Storage                 |
| 161: IntelliGrid                   |
Transmission

• **Condition Assessment and Maintenance**
  - Failure modes, inspection methodologies
  - End of life strategies
  - Component reliability
  - Asset condition monitoring
  - Understand safety in operations, switching and life-line working
  - Design and engineering

• **Operations and Planning**
  - Increase utilization and efficiency of transmission
  - Operate under complex conditions
  - Manage extensive models

• **Integrate Bulk Variable Resources**
  - Manage the variability with flexibility
  - Frame work for grid planning with renewables
Distribution

• Condition Assessment
  – Component failure mechanisms and inspection technologies
  – Evaluate condition assessment technologies for distribution cables
  – Mitigate severity of manhole events
  – Selection guides and reference books

• Planning and Operations
  – Integrate photovoltaic (PV) sources
  – Efficient distribution operations
  – Converter technology for PV and storage
  – Voltage optimization

• Technology Development
  – Nano-dielectrics for underground cables
  – Intelligent Universal Transformer
  – OpenDSS: Modeling of the distribution system
Efficient Use of Energy

• **End Use Efficiency**
  – Understand energy and carbon reduction potential of various technologies
  – Evaluate and demonstrate efficient technologies ready for inclusion in programs
  – Behavior, rate structure and load surveys

• **Reduce carbon through electrification**
  – Changing fuels may reduce carbon

• **Plug-in Hybrid and Electric Transportation**
  – Impact on grid
  – Smart charging
  – Lead collaboration auto and utility industry
  – Demonstrations
Cross Cutting Issue

**Smart Grid**
- Communications and IT infrastructure
- Security and privacy
- NIST and tracking priority action plans
- Smart Grid Demonstration
  “The Virtual Power Plant”

**Energy Storage**
- Understand storage options for bulk, peak management and renewable integration
- Primary and secondary battery lifecycles
- Demonstrating Compressed Air
  Energy Storage

**Power Quality**
- Root cause, tools and mitigation options
EPRI Laboratory in Knoxville
Smart Grid – Efficiency – Renewables - Storage
EPRI Laboratories in Lenox and Charlotte
High Voltage – High Current – Aging - Corrosion
The EPRI Advisory Structure

...on behalf of its members, energy stakeholders, and society
Advisory Structure

- Advisory Council
- Board of Directors
- Research Advisory Committee
  - Generation Sector Council
  - Nuclear Sector Council
  - Power Delivery & Utilization Council
  - Environment Sector Council
    - Program Committees
    - Program Committees
    - Program Committees
    - Program Committees

~1,400 Advisors
Board of Directors

• 33 individuals representing all dimensions of the industry.

• Authorizes EPRI’s overall business strategies and key policies

• Oversees financial planning and controls

• Oversees corporate compliance and governance
Advisory Council – For the Public Benefit

• Leaders from:
  • Regulatory community
    (Ten nominated by NARUC)
  • Environment community
  • Industry
  • Government
  • Academia
Research Advisory Committee (RAC)

- Corporate Level
- Sector Level
- Program Level

R&D “Big Picture” and Technology Innovation
< 10 years

Sector Strategic Plan & Focus
< 5 years

Program Scope, Budget, Schedule
< 5 years
Sector Council

Provide Advise on Sector-level Strategy and Integrate Issues Across Sector Programs
Council Participation is a Contact Sport

- Requires Engagement – Blocking and Tackling
  - Challenge strategies when relevant issues omitted
  - Challenge focus when targeting irrelevant issues

- Provide Comments on Strategic Industry initiatives
  - Review white papers and provide comments
  - Highlight challenges and future needs
Network and Provide Leadership

• Help us to Communicate Research results
  – Inform and advice Research Advisory Committee and possible Board Members
  – Provide Leadership to Program and Task Force advisors

• Share Successes
  – Share EPRI technology application successes within your organization and with EPRI
  – Share success stories from other members within your utility
Advisor Roles

• Provide oversight to EPRI Programs
  – Provide technical guidance
  – Monitor/assess research progress & completion

• Provide input for planning and prioritization
  – Participate in gap analysis for strategic plans
  – Review and advice on multi-year plans
  – Assist in planning program deliverables
  – Prioritize annual scope based on available funding

• Encourage applying EPRI results
  – Connect to potential users of the research
  – Identify and recommend potential task force members
  – Mentor colleagues how to leverage EPRI participation
  – Inform your council member of value of EPRI Research
Power Delivery & Utilization Council

Transmission & Substation
- Overhead Transmission Program 35
- Inspection & Assessment of Overhead Transmission Lines
- Improve Transmission Line Lighting Performance
- Overhead Transmission Design for Optimized Life Cycle Costs
- Improve Live-Line Maintenance Work Practices
- Overhead Transmission Insulators
- Increased Transmission Capacity
- Underground Transmission Program 36
- Design, Reliability and Performance
- Cable Dynamic Rating & Increased Power Flow
- Supercapacitors

Grid Operations, Planning & Renewable Integration
- Substations Program 37
- Transformer Life Management
- Improve Overall Substation Maintenance
- SF6 Environmental Management
- Switching Safety & Reliability
- Circuit Breaker Life Management
- Fault Current Management & Equipment Rating
- Protection & Control
- HVDC Systems Program 162
- HVDC Systems
- Cross-Cutting
- Robotics
- Grid Operations Program 39
- Grid Operations
- Grid Planning Program 49
- Transmission & Resource Planning
- Efficient Transmission Systems for a Low Carbon Future Program 172
- Bulk Power System Integration of Variable Generation Program 173
- Bulk System Variable Generation Integration

Distribution
- Distribution Systems Program 180
- Arc Flash
- Stray & Contact Voltage
- Sensors
- Advanced Meters
- Smart Power Electronics
- Power Quality Program 1
- Integration of Distributed Renewables Program 174
- Enabling Integration of Distributed Renewables

Energy Utilization Council

Electric Transportation Program 18
- HVDC Systems
- Cross-Cutting
- Robotics

End-Use Energy Efficiency & Demand Response in a Low-Carbon Future Program 170
- Security Issues for the Power System Communication, Information, and Control Infrastructure
- Efficiency
- IntelliGrid Technology Transfer & Industry Systems
- Infrastructure for Intelligent Transmission Systems
- Infrastructure for Intelligent Distribution Systems
- Infrastructure & Technology for Advanced Metering

* Chair & Vice Chair of Executive Committee are members of the Executive Leadership Team
Power Delivery & Energy Utilization Sector
From Generator Bus Bar to End Use

Strong Collaborative: ~100 members ~$90M Annual R&D Funding
Resources (Laboratories, Technical Staff) as Extensions of our Member’s Staff

Collaboration.....Technical Expertise.....Thought Leadership
PDU Sector Council Structure

Power Delivery and Utilization Sector Council

Sector Executive Leadership Team
Council Chair
Council Vice Chair

DISTRIBUTION
Chair
Vice Chair

TRANSMISSION
Chair
Vice Chair

ENERGY UTILIZATION
Chair
Vice Chair

Executive Committee

Executive Committee

Executive Committee

Power Delivery Council Members at-large

Energy Utilization Council Members at-large
Distribution Executive Committee

- Mike Hervey, Vice President Operations, LIPA – Chair
- Bill Herdegen, Vice President, T&D, KCPL - Vice Chair

- Aubrey Braz, V.P., Staten Island & Electric Services, Consolidated Edison
- Terry Finley, V.P., Distribution Engineering & Services, CenterPoint Energy
- Oliver Huet, R&D Distribution Program Director, EDF Electricité de France
- Denis O’Leary, Head of Asset Management, ESB Networks
- Craig Rhoades, V.P., Cust & Dist Services, American Electric Power
- Dave Schepers, V.P., Energy Delivery Tech Services, Ameren Services
- Leslie Sibert, Vice President, Distribution, Southern Co./Georgia Power
- Ralph Zucker, Director, Smart Grid Development, BC Hydro
Energy Utilization Executive Committee

• Lynda Ziegler, Sr. Vice President, Customer Svc., SCE – Chair
• Mike McGinnis, Manager, Strategic Planning, SRP – Vice Chair

• Phyllis Dubé, Director, Advocacy & Energy Options, We Energies
• Don Horsley, V.P Cust Svs and Retail Marketing Southern Company
• Deborah Korenæk, Divison V.P. Marketing, CenterPoint Energy
• Barbara Nick, Sr. V.P., Energy Del. & Cust. Service, Wisconsin Public Service
• John Paganie, Vice President, Energy Efficiency, FirstEnergy
• Shawn Schukar, V.P. Strategic Initiatives, Ameren
• Lowell Stave, Sr. Manager, Member Services & Rates, Tri-State Gen & Trans
Transmission Executive Committee

• Mike Heyeck, Sr. Vice President, Transmission, AEP – Chair
• Rob Manning, Exec. V.P., Power System Operations, TVA – Vice Chair

• Larry Avery, Vice President, Power Delivery, PowerSouth Energy
• Sanjay Bose, Vice President, Substation Operations, Consolidated Edison
• David Curtis, Dir. of Asset Management Processes & Policies, Hydro One
• Jennifer Dering, Manager of Operations Planning, New York Power Authority
• Terry Oliver, Chief Technology Innovation Officer, Bonneville Power Adm.
• Ian Welch, R&D Strategy Manager, Asset Management, National Grid
PDU Ad-Hoc Committees

• Transmission Efficiency Ad-Hoc Committee
• Distributed PV Ad-Hoc Committee
• Smart Grid Ad-Hoc Committee
• PMU Ad-Hoc Committee

All Ad-Hoc Committees may include hosting and attending regional workshops and designating technical staff to work with EPRI technical staff
Purpose of Ad-Hoc Committees

• Green Transmission Efficiency Ad-Hoc Committee
  – Help identify and formulate regional projects to improve transmission efficiency and achieve lower carbon future

• Smart Grid Ad-Hoc Committee
  – Provide advice and guidance for Smart Grid-related research, development and demonstrations
  – Focus on cross cutting issues such as communications, cyber security and data management

• Distributed Photovoltaic Ad-Hoc Committee
  – Provide guidance on strategy, priorities for distribution system integrated PV research

• Phasor Measurement Unit Ad-Hoc Committee
  – Complement other industry activities such as the North American Synchrophasor Initiative
  – Bring industry leadership to bear on issues at hand and targeted solutions either through EPRI or through engagement with other groups
R&D Process

Issue

Technology Transfer

Solution

R&D Portfolio
From the Issue to the Portfolio

**Program Committees**
- Define problem, scope and budget - summarize priorities

**February**
- Sector Councils reviews and advices Program Needs

**April**
- RAC reviews “Big Picture” and consistence across EPRI

**July**
- “Go Live”

**Annual R&D Portfolio**
- Confirm funding commitments from July to January . . .

* Note: May also include input from Working Groups, Task Force, etc.

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From the Portfolio to the Solution

January to February
“Fine-tuning”

January to December
“Execution”

Annual R&D Portfolio

Program Committees review recommendation & revise

Sector Councils reviews and endorse

Program Committees and Sector Council Update in September/October
RAC Update in October
Summary of Advisor Roles

• Provide oversight to EPRI Programs
  – Provide technical guidance
  – Monitor/assess research progress & completion
  – Participate in gap analysis for strategic plans
  – Review and advice on multi-year plans
  – Assist in planning program deliverables & funding
  – Prioritize annual scope based on available funding
  – Provide feedback through member satisfaction survey
  – Confirm selection of key results

• Provide feedback for Council Executive Committee
Power Delivery & Energy Utilization Sector
Research for a Highly Reliable, Efficient and Sustainable Grid

• Transforming the Grid
  – Smart Grid, NIST and priority action plans
  – New technologies and techniques

• Carbon Reduction
  – End-use and grid efficiency
  – Electrification of transportation
  – Integration of renewable energy

• Increase Performance and Reliability
  – Sensors and condition based maintenance
Council Members Role

• Engage

• Provide Guidance on Strategic Industry initiatives

• Help us to Communicate Research results

• Share Successes
Mark Your Calendar
Upcoming EPRI PDU Advisory Meetings in 2011

Program Meetings: September 12-14, 2011
Council Meetings: September 14-15, 2011

Westin – Boston Waterfront
425 Summer Street
Boston, MA 02210

http://www.westinbostonwaterfront.com/
EPRI Group Rate: $199