Overview of EPRI’s Work in Renewable Energy

Bryan Hannegan, Ph.D.
Vice President, Environment & Renewables

Research Advisory Committee
March 30, 2010
Virtual “Renewable Energy Sector”

- Reduces Cost of Generation Technology Options
- Integrates Variable Generation with Transmission and Distribution
- Optimizes Energy Storage Capability
- Understands and Minimizes Environmental Impacts

Cuts Across all EPRI Sectors
EPRI MERGE – Two Possible Future Mixes

Renewables are > 20% by 2030 in both scenarios

Limited Portfolio

Full Portfolio

© 2009 Electric Power Research Institute, Inc. All rights reserved.
2008: Workshops on Integration

- Distributed Photovoltaics
  Tempe, AZ
  June 13, 2008
  32 Attendees

- Variability of Large Renewable Resources
  Dallas, TX
  June 5, 2008
  36 Attendees
2009: Renewable Power Summits

- **Geothermal Power**
  - Tri-State G&T
  - December 8, 2009

- **Wind Power**
  - Xcel Energy
  - April 28, 2009

- **Biomass**
  - Southern Co. & Oglethorpe Power
  - October 2, 2009

- **Solar Power**
  - Edison International
  - July 17, 2009

International workshop planned for 2010
ACORE – EPRI Renewable Energy R&D Roadmap

EPRI and ACORE jointly developed a high-level roadmap for renewable power generation R&D needs.

Expanding EPRI’s Renewables Portfolio

Also includes energy storage; demonstration projects
Renewables: The Generation Challenge

Levelized Cost of Electricity, $/MWh

Cost of CO₂, $/Metric Ton

- Biomass
- Wind (32.5% Capacity Factor)
- IGCC
- NGCC ($6-8/MMBtu)
- Nuclear
- PC

Renewables “out of the money” without incentives or mandates

95% confidence level values based on EPRI Report 1018329

All costs are in December 2007 $
High Levels of Variable Wind and Solar PV Will Present an Operating Challenge!
Program 94: Energy Storage

Technology Watch and Strategic Intelligence

Market Analysis  Strategic Intelligence  On-line Assessment Guide  Evaluation Tools

Technology Assessment & Evaluation

Fuel Cells and Flow Batteries  Compressed Air Cycles  Li-ion Batteries  Thermal Storage Systems  Micro-generation

Testing, Validation and Demonstration

NaS Battery  ZnBr Battery  Large CAES  Li-ion Battery  Mobile Storage Systems

Short-Term  Long-Term
Environmental Aspects of Renewable Energy

Interest Group Formed to:

• Assemble advisors to define and prioritize research needs
• Engage with non-utility organizations
• Examine and share successful strategies and approaches
• Launch initial, high priority supplemental projects
• Jumpstart the new program that will begin in 2011
Industry Demonstration Projects

Technology Challenges

1. Enabling energy efficiency with efficient end-use technologies and smart grids
2. Enabling variable renewables with advanced transmission and energy storage
3. Deploying advanced light water reactors
4. Deploying carbon capture and storage

Demonstration Projects

- Energy efficiency projects
- Smart grids
- Energy storage projects
- Solar, geothermal, and other projects
- Nuclear projects
- PC with CCS projects
- Oxy-combustion projects
- IGCC with CCS projects

Goal: Large-scale demonstrations in multiple areas needed to meet the PRISM goal for a low-carbon future
Renewable Energy Council

• New advisory council to help guide EPRI’s research in renewable energy

• Provide oversight to entire renewable energy portfolio

• Diverse membership (VP level or above)
  – Fossil Ops
  – T&D/Grid Ops
  – Environmental Compliance
  – Renewables Strategy

• Schedule
  – Initial webcast held November 2009
  – First in-person meeting March 25-26
Renewable Energy Council Members

- AES Solar Energy
- Ameren
- American Electric Power
- Arkansas Electric Cooperative
- Buckeye Power
- CPS Energy
- Dayton Power & Light
- Duke Energy
- E.ON UK
- Electricité de France
- Edison Mission Energy
- Entergy
- ESKOM
- FirstEnergy
- Hawaiian Electric
- Iberdrola S.A.
- Kansas City Power & Light
- Minnesota Power

- New York Power Authority
- NextEra Energy Resources
- OG&E Electric Services
- Oglethorpe Power
- Ontario Power Generation
- Pacific Gas & Electric
- Progress Energy
- Public Service Co. of New Mexico
- Sacramento Municipal Util. District
- Snohomish County Public Util. Dist
- Southern California Edison
- Southern Company
- Sunflower Electric Power
- Tennessee Valley Authority
- TransAlta Generation Partnership
- Tri-State G&T Association
- Xcel Energy
Compared to my company's needs, the proposed 2011 research scope for these programs should ...
Compared to 2010, my company believes 2011 funding levels for these programs should ...

- Renewable Generation – Program 84: 3.7
- Waterpower – Program 58: 3.1
- Integration of Variable Generation and Controllable Loads - Program 173: 4.0
- Enabling Integration of Distributed Renewables - Program 174: 3.4
- Energy Storage - Program 94: 3.9
- Environmental Aspects of Renewable Energy – Program 179: 3.3
Summary

• EPRI renewable energy activities growing rapidly
  – Unique “niche” representing end-use consumer/utility

• Numerous projects and programs in development pipeline
  – Cost and performance
  – Integration and storage
  – Environmental sustainability

• Opportunity for collaboration between electric industry leaders, technology vendors, national labs, trade groups
  – Participation in EPRI research programs
  – Partnership through demonstration projects