NEWEEP Webinar: Wind Power and the Electric Power System -- Introduction



Ed DeMeo
Renewable Energy Consulting Services, Inc.
Technical Advisor: Utility Wind Integration Group
(EPRI Renewable Energy Programs, 1976-1998)

New England Wind Energy Education Project Webinar
October 26, 2010 *1 to 3 pm EST*

Background

- Step back in time to 2001-2002
  - Utility operators beginning to notice wind
  - Several hundred MW wind in some systems
- Wind variability and uncertainty impacts?
  - System must work harder to maintain balance between demand and supply
  - What's the operating cost impact?
  - Would it exceed the value of the wind energy?

Northern States Power – Xcel Energy (MN): at the leading edge of wind power

- Partnered with Utility Wind Integration Group (UWIG) in 2002 to quantify wind integration costs
  - Initial assessment at 3% energy from wind
  - Result: 0.2¢/kWh (or $2/MWh) of wind energy (<10% of wholesale value)
- Report published by UWIG, May 2003
  - Also published by EPRI later in 2003

2003 through 2010: Many Wind Integration Studies Across the Nation

- Examined larger and larger regions
  - Electric utility systems don't operate in isolation
  - Basic result has held up: wind integration costs under ~10% of wholesale value
  - Wind energy contributions up to ~30%
- Reason One: Sharing reliability responsibilities over larger regions reduces operating costs (e.g., reduced reserve-capacity needs)
- Reason Two: Aggregating wind over larger regions mitigates wind variability
  - Power from different wind plants generally not highly correlated

System Operating Costs Impacts: Minnesota DOC* Studies ($/MWh)

Study	Penetration (% energy)	Total Impact ($/MWh)
Xcel/NSP (2003)	2.5	1.85
Xcel/MNDOC (2004)	10	4.60
MN/MNDOC (2006)	15	2.11
MN/MNDOC (2006)	25	4.41

Why are the 2006 study impacts lower?

2004: Balancing area -- Xcel NSP MN

2006: Balancing area -- entire state of MN (4 BAs)
Also access to entire MISO footprint

**Department of Commerce*

Xcel Energy Today: Minnesota and Colorado

- Wind now approaching 10% of retail energy generation
- Revising previously approved system expansion plans – with PUC approval
- Replacing planned coal plants with wind and gas plants
- Learning how to deal with wind's natural characteristics

What About the Skeptics?

- Skeptics fight the trend toward wind growth
- Assertions: wind doesn't work, doesn't really displace fossil fuels, doesn't reduce greenhouse-gas emissions, costs too much
- But many power utilities – organizations with tremendous responsibilities – are relying on wind for a significant portion of their energy
- Experience has shown that wind can provide substantial contributions to energy needs while also reducing emissions