

Ohio Clean Energy Transmission Conference

Panel II: The Role of Transmission in Developing New Energy Resources

Presented by: Melissa Seymour
August 6, 2012

Cayuga Ridge Wind Plant, Odell, IL



IBERDROLA
RENEWABLES

Iberdrola Renewables, LLC



A collection of exceptional assets...

#2 owner of wind projects in the U.S.
with over 5.2 GWs owned and
contracted

\$9 billion of U.S. assets at over 50
installed plants

850 employees at the end of 2011

636 MW of CCGT & peaking capacity
on the strategic CA-OR border

Represents 37% of Iberdrola S.A.'s
global wind capacity

US Renewables



Wind

5,200+ MW



Power

536 MW CCGT
100 MW peaking



Solar & Biomass

50 MW Solar
55 MW Biomass

Corporate Support

...focused on operational excellence and selective growth

U.S. Renewables Assets



- 1 - Klondike IIIa
76.5 MW owned
- 2 - Hay Canyon
100.8 MW owned
- 3 - Klondike
24 MW owned
- 4 - Klondike III
223.6 MW owned
- 5 - Star Point
99 MW owned
- 6 - Klondike II
75 MW owned
- 7 - Big Horn
199.5 MW owned
- 8 - Big Horn II
50 MW owned
- 9 - Juniper Canyon
151.2 MW owned
- 10 - Pebble Springs
98.7 MW owned
- 11 - Leaning Juniper II
201.3 MW owned

Simpson Biomass
55 MW PPA



WIND PROJECTS

- 1 - Buffalo Ridge
50.4 MW owned
- 2 - Buffalo Ridge II
210 MW owned
- 3 - MinnDakota
150 MW owned

- 4 - Moraine
51 MW owned
- 5 - Moraine II
49.5 MW owned
- 6 - Elm Creek
99 MW owned

- 7 - Elm Creek II
148.8 MW owned
- 8 - Trimont
101 MW owned
- 9 - Flying Cloud
43.5 MW owned

- 10 - Winnebago
20 MW owned
- 11 - Top of Iowa II
80 MW owned
- 12 - Barton
160 MW owned

- 13 - New Harvest
100 MW owned

Maple Ridge II
45.4 MW owned
(91 MW project)

Maple Ridge
115.5 MW owned
(231 MW project)

Hardscrabble
74 MW owned

Lempster
24 MW owned

Locust Ridge
26 MW owned

Locust Ridge II
102 MW owned

Casselman
34.5 MW owned

South Chestnut
48 MW owned

Blue Creek
304 MW owned

Rugby
149.1 MW owned

Pleasant Valley
144 MW PPA

Twin Buttes
75 MW owned

San Luis
30 MW owned

Colorado Green
81 MW owned
(162 MW project)

Dry Lake
63 MW owned

Dry Lake II
65.1 MW owned

Elk River
150 MW owned

Farmers City
146 MW owned

Streator
Cayuga Ridge
300 MW owned

High Winds
162 MW PPA

Shiloh
150 MW owned

Mountain View III
22.44 MW owned

Dillon
45 MW owned

Copper Crossing
20 MW owned

Barton Chapel
120 MW owned

Peñascal II
201.6 MW owned

Peñascal
201.6 MW owned

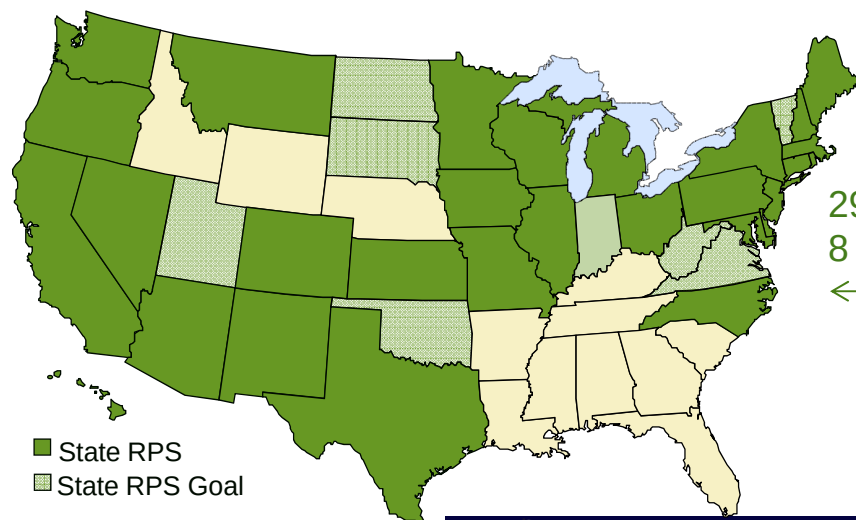
- Wind generation
- Biomass generation
- Solar generation

Renewables and Transmission



- The U.S. has strong domestic renewable energy resources – with hopes to develop them for environmental, economic and energy security goals.
- To develop a market for large amounts of renewables, new transmission must be built to link remote areas rich in renewables with distant population centers.
- Transmission planning, permitting, investment, and cost recovery is so fragmented and complex that furthering the goals above are extremely challenging at best, and elusive at worst.
 - 212 investor-owned utilities, 2,000 publicly-owned utilities, 3 inter-connections, 7 regional transmission organizations, 131 control area operators (BAs), 304 Indian reservations, countless acres of federal lands, regulators in 50 states and D.C.

U.S. Market for Renewables



29 states + D.C. with Renewable Portfolio Standards ("RPS")
8 states with nonbinding goals



Those states ~50% of
US KWh (map shows
population density)

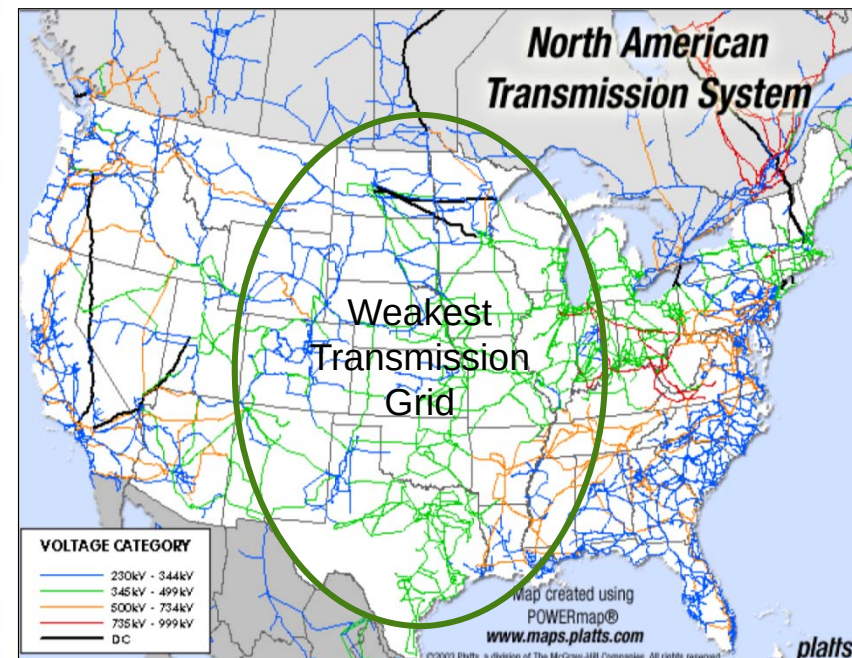
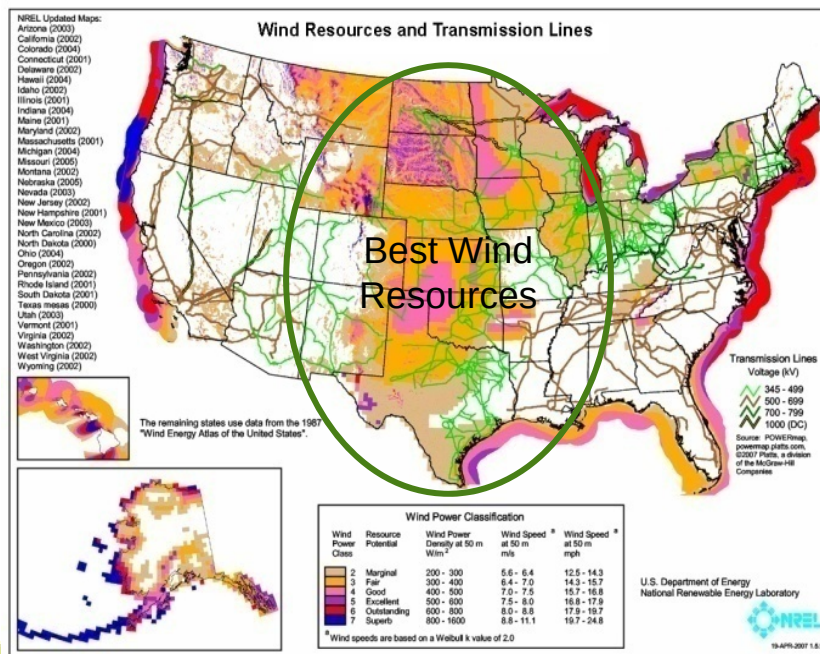


States with circles:

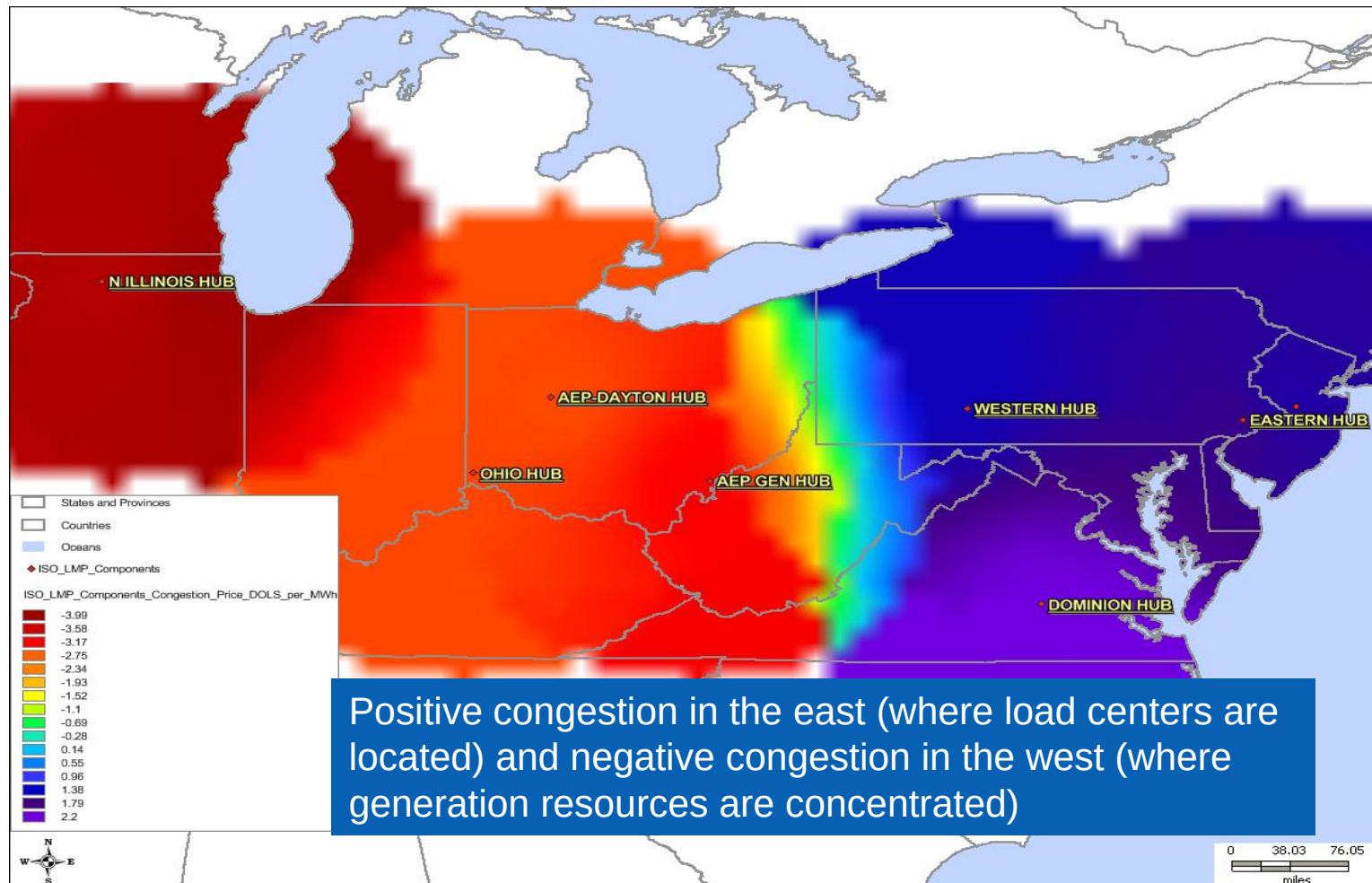
- RPS
- high KWh use
- high electricity price

Practical Realities for Wind Resources

- Unlike natural gas & coal, wind cannot be transported or stored
- Wind development has outpaced transmission expansion
 - 70% of transmission lines and power transformers are 25+ years old
 - Less than a dozen interstate transmission line projects have been constructed in the last 20+ years



PJM Marginal Cost of Congestion Contour (Annual Day-Ahead Peak Hours)



Congestion and Curtailment

- Lack of transmission infrastructure coupled with high wind output, minimal load and lack of existing area generation can result in:
 - inability to reduce the output of another generation unit to enable more wind generation
 - increased transmission congestion (no ability to move excess generation)
- The inability to move excess energy out of a constrained area could lead to:
 - minimum generation situations: more supply than load
 - overloading of a Bulk Electric System element
- If the system conditions mentioned above threaten the reliability of the system, system operators will curtail wind generators

Financial Impacts of Curtailment

- When a wind farm is curtailed uneconomically, revenue can be lost, for example:
 - Reduced market/PPA energy payment, Renewable Energy Credits, or Production Tax Credits
 - Imbalance charges for differences between Day-Ahead schedules and actual output
- Simplified Example
 - Wind Facility: 100 MW unit with 30% Capacity Factor
 - PPA: 20 year PPA @ \$50/MWh
 - Impact of 2% Wind Curtailment: 80 - 110 Basis Points

Integrating Wind in PJM



- ✓ Robust regional interconnections; flexible transmission services
 - Transmission is financial, not physical - maximized use of transmission system
- ✓ Day-Ahead and Real-Time markets, with access to intra-hour flexibility (load and resources)
 - Economic Congestion Signals
 - Wind generators follow dispatch, set real-time price, and are curtailed based on economics
- ✓ Robust regional transmission planning and cost allocation processes
 - Working toward implementation of FERC Order 1000 reforms
 - Amend tariff to describe procedures by which transmission needs driven by Public Policy Requirements will be identified in the planning process and how potential solutions to the identified transmission needs will be evaluated
 - Transmission to meet public policy-driven needs “must be eligible for selection in a regional transmission plan for purposes of cost allocation”

Thank You

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