NECPUC SYMPOSIUM

Value of the Integrated Grid
June 17, 2014
DISCLAIMER

Comments are my own and do not necessarily represent the views of First Wind, its management or ownership.
INTRODUCTION TO FIRST WIND
First Wind develops renewable energy projects and delivers clean energy throughout the U.S. First Wind’s customers include large energy utilities, municipal electric companies, and institutional off-takers. First Wind is committed to environmental stewardship and community outreach at every stage of project development and facility operations.

Quick Facts

- **200+** employees
- Operations in **10** U.S. states
- **1 GW** developed, built and operating
- **2,000+ GWh** delivered to customers in 2013
- **1.3 million** tons of CO\(_2\) emissions avoided by 2013 generation
- **$523k** provided in community and charitable funding in 2013

1Through 2Q 2014
2U.S. average of 1,293 lbs CO2 emission per MWh, EPA EGRID 2010

Facility Locations

Portfolio and Pipeline (MWs)

- Existing Wind
- Existing Solar
- Wind Construction
- Solar Construction
First Wind: Anchored in New England

A Local Partner

- Headquartered in Boston with regional office in Portland, ME and ~100 New England employees
- Developed first modern utility scale wind project in New England: Mars Hill
- 6 wind (259 MW) and 2 solar projects (17 MW ac) operating in New England, plus 3 wind projects in NY
- Emera Energy owns a 49% interest in the operating wind facilities in ME, VT, and NY.
- 148 MW of wind currently under construction in Oakfield, ME
- >1,500 MW in NE development pipeline, including projects that are construction-ready or in the permitting process
CHALLENGES TO INTEGRATING RENEWABLE RESOURCES
A DEVELOPER’S PERSPECTIVE
Challenges to Integration: A Developer’s Perspective

The Grid is evolving:

- Generation becoming more remote and more distributed
- Demand becoming more responsive.

Market Rules and Processes for System Planning & Interconnection need to evolve to match needs of evolving Grid, but often not keeping pace . . .

Not keeping pace has Consequences

Not keeping pace has adverse consequences for consumers, for generators and generation developers, and for achieving public policy goals.

Two Examples:
- Renewable Energy Curtailments
- Variable Resources still not in integrated into wholesale economic dispatch
Challenges to Integration: Examples

Two Examples:

- **Renewable Energy Curtailments**
  - Current Transmission Planning for system reliability does not offer solutions –
    - Largely not replacing benefits provided by aging and retiring generation, e.g., inertia
    - Does not assess economic and public policy benefits at a practical level
    - Imposes costs of emerging system deficiencies on generation developers
  - Generator & Elective Transmission Interconnection Processes
    - Long and Expensive
    - Does not identify Curtailment risks
    - Not designed to identify optimal or “right size” solutions (bring me a rock analogy)

- **Variable Resources NOT integrated into wholesale economic dispatch**
  - Cannot submit price based offers
  - Gives competitive advantage to other resources
Recent ISO-NE economic studies have shown that wind and hydro provide large ratepayer savings across ISO-NE through energy price suppression

- Effects of wind and hydro are analyzed in 2011 and 2013 Economic Studies
- Curtailment reduces price suppression, resulting in increased ratepayer cost

An extrapolation from the ISO-NE Economic Study* suggests that wind curtailment at Keene Rd alone may have cost New England ratepayers more than $17 million over a 16 month time period.

Assuming pro-rata treatment, hydro curtailment at Keene Rd is likely to have a similar additional effect

### Ratepayer Cost of Keene Road Curtailment

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<th>FCA5 Case</th>
<th>Active Queue Case</th>
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<tr>
<td>New England Wind Generation, GWh</td>
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<td>11,565</td>
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<td>New England Ratepayer Energy Cost, $M</td>
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<td>&quot;Production Cost&quot;, $M</td>
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<td>Keene Rd Wind Curtailment Jan 2012 - Apr 2014, GWh</td>
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<td>Estimated Ratepayer Cost, $M</td>
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<td><strong>$17.8</strong></td>
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<td>Estimated Increase in &quot;Production Cost&quot;, $M</td>
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<td><strong>$7.4</strong></td>
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Solving Challenges – Hope on the Horizon

➢ Markets
   • Wind Integration coming – 2015?
   • Overlapping Impacts – more problematic – may require regulatory action

➢ Transmission Constraints
   • ISO opening stakeholder discussions on Generator Interconnection and Elective Transmission Upgrade processes
   • FERC Order 1000 incorporates “public policy” in transmission planning

➢ But . . . a lot more work to be done. Need to start now!
QUESTIONS?