Wind Industry Perspectives on Wind Integration

NE Region System Operators' Wind Integration Seminar

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Overview

- Context for wind in the Northeast
  - Current and projected capacity
  - Interconnection vs. integration
- Why the interest in regional integration?
  - Where developers are running into problems
  - Benefits of increased integration for developers, system operators and utilities
- Strategies to improve integration (Mike Jacobs)
  - Strategies in the short term
  - Strategies in the longer term

Context for Wind in the Northeast

Current Installed Wind Capacity

- Canada - Eastern Provinces:
  - Quebec 422 MW
  - Nova Scotia 61 MW
  - New Brunswick 0 MW
  - Prince Edward Island 72 MW
- United States – New England States:
  - Connecticut 0 MW
  - Maine 42 MW
  - Massachusetts 5 MW
  - New Hampshire 1 MW
  - Rhode Island 1 MW
  - Vermont 6 MW

Projections – Wind / Renewable Energy Targets

- Canada - Eastern Provinces:

– Quebec:	~6% by 2015 (4,000 MW) – wind only
– Nova Scotia	10% by 2013 (~580 MW) – all RE
– New Brunswick	10% by 2016 (~550 MW) – all RE
– Prince Edward Island	15% by 2010 (60 MW) – wind only

- United States – New England States:

– Connecticut	23% by 2020
– Maine	10% by 2017
– Massachusetts	4% by 2009
– New Hampshire	16% by 2025
– Rhode Island	15% by 2020
– Vermont	10% by 2013

What this tells us

- A lot of wind is about to come on line very quickly:
  - Eastern Canadian Provinces going from 627 MW to more than 5,000 MW of wind within 7 years
  - Demand in New England states ramping up even quicker
  - In NBSO control area alone, expect 1100 MW of wind by 2013, representing 19% of peak, 46% of low

- Jurisdictions with high demand aren't necessarily those with high resources:
  - Requirements may exceed ability to satisfy requirements with local resources (wind and other sources)
  - Will be most felt in smaller, densely-populated states

What this tells us

- Regional markets will play a key role:
  - Substantial amounts of wind will likely be built to serve markets (and RPS obligations) in other jurisdictions
  - Eastern Canadian and New England grids are already well interconnected – opportunity to build on existing assets
  - Forums such as this will play a critical role in facilitating process

Interconnection vs. Integration

- Need to distinguish between interconnection and integration
- Interconnection:
  - How can we maintain grid reliability?
  - Primarily a technical issue
  - Linked to grid codes, and the need for wind to behave as "a good citizen on the grid"
- What we know:
  - Turbines able to provide base support to the grid: LVRT, voltage tolerance, frequency tolerance
  - Higher requirements also possible: voltage control, reactive power control, frequency response

Interconnection vs. Integration (cont.)

- Integration:
  - How can we integrate wind at the lowest cost while maintaining grid reliability?
  - Primarily an economic issue
  - Need for integration studies both within and across jurisdictions
- What we know:
  - Wind certainly not intermittent, but it is variable
  - Variability is less than expected:
    - Typical step changes of 0.1% rated capacity in seconds time frame, 3% in minutes and 10% in hours
  - Forecasting and geographic diversity greatly reduce variability
  - Able to go to relatively high penetrations without incurring substantial system costs

Why the interest in regional integration?

Challenges faced by developers

- Within jurisdictions:
  - High ancillary costs reduce wind's competitiveness
  - Possibility of market caps greatly increases uncertainty
- Across jurisdictions (regional):
  - Difficulties in commercial transactions across tie-lines
  - Access to other markets is challenging
  - "Pancaking" of tariffs reduces competitiveness

- … so who benefits from greater regional integration?

Benefits for system operators

- Larger balancing area greatly reduces overall variability
  - Geographic diversity reduces variability of output
  - Regional cooperation particularly important among smaller, interconnected jurisdictions
  - Depends greatly on size and management of tie-lines
- Reduced ancillary requirements
  - Cooperation allows for more effective use of resources – less spinning reserve, regulation reserve
- Shared experience
  - Learning by doing

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Benefits for utilities and governments

- Less costly compliance with RPS requirements
  - Lower ancillary costs makes wind more competitive
  - Ability to source renewables from other jurisdictions with a better resource
- Ability to better exploit local resources
  - Allows jurisdictions to develop renewable resources abundant in that area for markets elsewhere (wind, hydro, biomass, tidal)
- Hedge against fluctuations:
  - Resource diversification: Increased wind acts as a hedge against fossil fuel price volatility and long-term hydro reservoir level fluctuation

Benefits for developers

- More competitive:
  - Lower ancillary costs make for a more competitive and a more flexible product
  - Reduced pancaking of tariffs increases competitiveness in other markets
- More flexible:
  - Ability to satisfy market requirements in one jurisdiction with wind built in another
  - Ability to optimise site selection for best winds

Looking forward

- Two critical issues
  1. Reliability must be maintained
  2. System operators and utilities have to be comfortable with wind

- The devil is in the details
  - Takes a great deal of detailed work to ensure the above
  - Must recognise differences between jurisdictions … but also the similarities

Looking forward

- Three key elements to increased integration
  - More effective use of existing transmission and tie-lines (Non-Firm/Conditional Firm/ Dynamic Rating)
  - Get more transmission and stronger tie-lines
  - Integration support (grid codes, forecasting etc.)
- CanWEA and AWEA keen to provide assistance
  - Forums such as Canadian Wind Interconnection Working Group (CWIWG)
  - CanWEA model grid code (developed by Garrad Hassan)
  - Transmission workshop – Detroit March 18-19
  - Facilitate dialogue with developers