

National Policy Perspective on Wind Related Transmission

James H Caldwell Jr

Policy Director

American Wind Energy Association

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Significant Current Events

- Rise in gas prices makes wind competitive at the bus bar.
 - Highlights interconnection/tariff/transmission issues.
 - Industry response: “Wind pipeline” messaging
- Political weakening of the FERC clouds “restructuring.”
 - Will power devolve to regions, states, or utilities?
 - Industry response: “Think globally, act regionally”
- East Coast blackout puts transmission on center stage.
 - Does this help or hurt a new/different technology like wind?
 - Industry response: “Wind Grid Code”

New Energy Bill

Real Time Update on

- Generation technology incentives
- Portfolio Standard
- “Electricity Title”

Will it pass? What does it mean?

AWEA Wind Grid Code

- Wind industry must take responsibility for accelerating development of “good utility practice.”
- Codify world wide “best practices” on:
 - Voltage support/reactive compensation
 - Fault ride through
 - Telemetry/control (minimum load dispatch down, ramp rate clipping, active voltage control)
 - Output forecasting--unit dispatch and unit commitment timeframes
 - Capacity valuation
- Accelerate model development/validation
- Align tariffs/standards/protocols

Integration of Wind on a Utility Grid

Conclusions So Far

- Limits are economic, not technical (reached at ~40% penetration on annual energy basis)
- “Costs” are de minimus (<\$2/MWH) at “low” penetration, modest (<\$6/MWH) at “medium” penetration, and mitigatable at “high” penetration levels with “hockey stick” shape.
- Order of mitigation actions is generally: software/IT/forecasting; then off-peak curtailment; then transmission; then generation; then storage.
- Value of “low,” “medium,” “high” principally depend on:
 - Size of “region” [PNW is large]
 - Type of tariff [PNW is not good for wind]
 - Stiffness of grid [PNW is not good]
 - Flexibility of other generation [PNW is exceptional]
- PNW is “above average” on this scale. Should have no difficulty reaching 15-25% penetration without major capital investment to deal with intermittency – if tariffs/protocols are adjusted.
- Highest costs/most problems are at minimum load hours, not on-peak; economic limit is reached when curtailment is too high and next reasonable transmission investment is not justifiable.