An Update on Wind Energy Research at Marshall University







DOE Research

Market Impact Issues:

- 1. Can we say whether or how property values are affected by proximity to wind turbines?
- 2. Do state siting policies affect the rate of wind development?
- 3. What are the recommendations to efficiently integrate large quantities of wind generation in our region?
- 4. Are there any opportunities to develop wind resources on surface-mined land in WV? (with MU CEGAS)



Property Values

- There is no indication that wind turbines cause a persistent negative impact on property values in the area (5-mile radius) around a wind facility.
 - Properties more than 2 miles from turbines much less likely to be impacted.
 - Small amounts of data in shorter radii are overwhelmed by data further away.
- Not enough data has been collected on home sales very near wind turbines to establish how turbines impact these homes compared to homes further away.
 - Sparsely populated areas, with few transactions
 - Data indicates both positive and negative impacts (and none)
 - Turbines are located closer to homes in East and Midwest
 - Studies look at different elements (time of comparison, groups of properties, property features, geography, distance)



Property Values II

- It is possible to have relatively depreciating home values while living near wind turbines, and some depreciation may be attributed to the turbines.
 - Both positive and negative impacts found in some studies (NY).
 - Condition of the property is important.
 - Turbines generally not sited on highly valued property.
 - Impacts may be temporary.
- It is possible to have appreciating home values while living near wind turbines, even within one mile of a turbine, and some appreciation may be attributed to the turbines.
 - Properties hosting turbines and receiving lease payments may increase in value
 - Wind development can influence values positively due to direct property purchases.



Property Values III

- Other home or area features are probably just as important in influencing resale price as are the presence of wind turbines.
 - IAAO standards include site nuisances
 - Turbines are sometimes sited on or near marginal property.
- Evidence from high-voltage transmission lines (HVTLs) can provide some insight.
 - More impact if a scenic area, custom home or close to poorly maintained properties.
 - Whether or not a view is impacted matters.
- It is too early to make generalized conclusions about the impact of wind turbines on individual home values.
 - Comparison must occur between "suitable substitutes" (IAAO)
 - Turbines are getting taller and potentially more impacting



Siting











State-Imposed Siting in PJM

- Most states in PJM region do not regulate wind siting. States that do: OH (>5 MW), KY (>10 MW), MD (>70 MW), WV.
- States with central siting generally treat wind similarly to other electric generating plants.
- Localities usually have autonomy over siting requirements (DE, IN, IL, MI, NC, PA)
- Local zoning seems to discourage more than encourage wind development
- Even with state siting, local approval very important; local is what is affected



State-Imposed Siting II

- What do states do to promote siting of wind?
 - Disallow "restrictive" ordinances (Delaware)
 - Develop "permit by rule" standards for siting (Virginia)
 - Allow expedited permitting (OR, VA PBR)
 - Create "renewable energy zones" (OR/WA). Really local.
 - Socialize transmission upgrades (TX)
 - Set maximum setback limits from property lines (DE, IL end user)
 - Develop model ordinances for localities (PA, NC)
 - Disallow "conditional use" requirement to site (DE)
 - Allow wind to opt out of the state approval channel and use local instead (WA, OR)



State Comparisons

State	Actual MW (2010)	Potential Installed MW	Windy Land Area (km2)	% of State Available	Actual MW as % of Potential	KW/ sq mi	KW/ km2 windy area
West Virginia	431	1,883	1,495	0.60%	22.9%	17.90	288
Pennsylvania	748	3,307	2,124	0.56%	22.6%	16.70	352
Washington	2,206	18,479	11,933	2.12%	11.9%	33.15	185
Oregon	2,104	27,100	17,110	2.16%	7.8%	21.92	123
New Jersey	8	132	281	0.14%	6.1%	1.08	28
Maryland	70	1,483	568	1.18%	4.7%	7.16	123
Illinois	2,047	249,882	70,764	34.25%	0.8%	36.83	29
Indiana	1,339	148,228	46,255	31.63%	0.9%	37.33	29

AWS TruePower and NREL for potential capacity and windy land area.



Wind Integration

- ∞ How does wind impact the electricity delivery system?
 - Real-time: wind impacts system voltage and frequency; other generators compensate
 - Near-term (hour-to-hour): wind output is not constant; other resources must change output to compensate
 - Short-term (day-ahead) most units commit to being available the day before
 - Long-term (years) system planning requires firm capacity to meet future demand



Hour of Daily Peak Load & Wind Output in PJM, 2010 (# of Days at Hour - HE)

Wind Load





Max Hourly Load per Day & Wind as Max % in PJM, 2010





Wind Integration

 ∞ What are some solutions to problems?

- Real-time: use electronic controls to make wind turbines like conventional generators; add more fast-acting reserves.
- Near-term (hour-to-hour): add more flexible generation including demand response
- Short-term (day-ahead): forecast wind output accurately to optimize unit commitment
- Long-term (years): prove the capacity value of wind, demand response and flexible resources







Surface Mines on Revoked Permits



Buffalo Coal: 11 permits 7 to 9 m/s

Map by Jamie Wolfe



Surface Mines on Revoked Permits



Royal Scot Minerals: 3 permits 7 to 8 m/s

