



Quantifying and Understanding Effects from Wildlife, Radar, and Public Engagement on Future Wind Deployment

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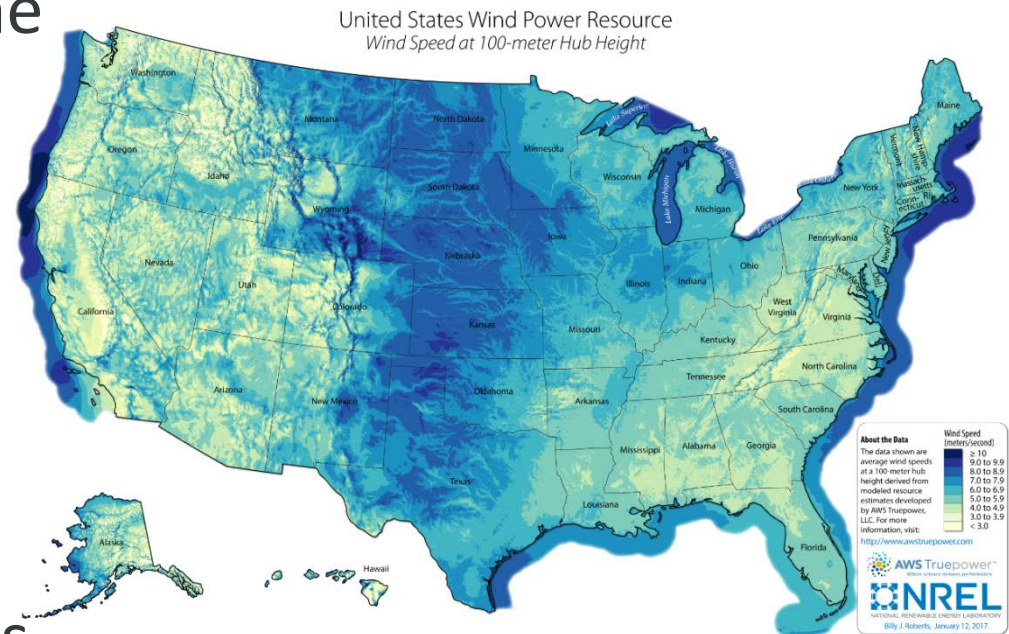
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NREL/PR-5000-68519

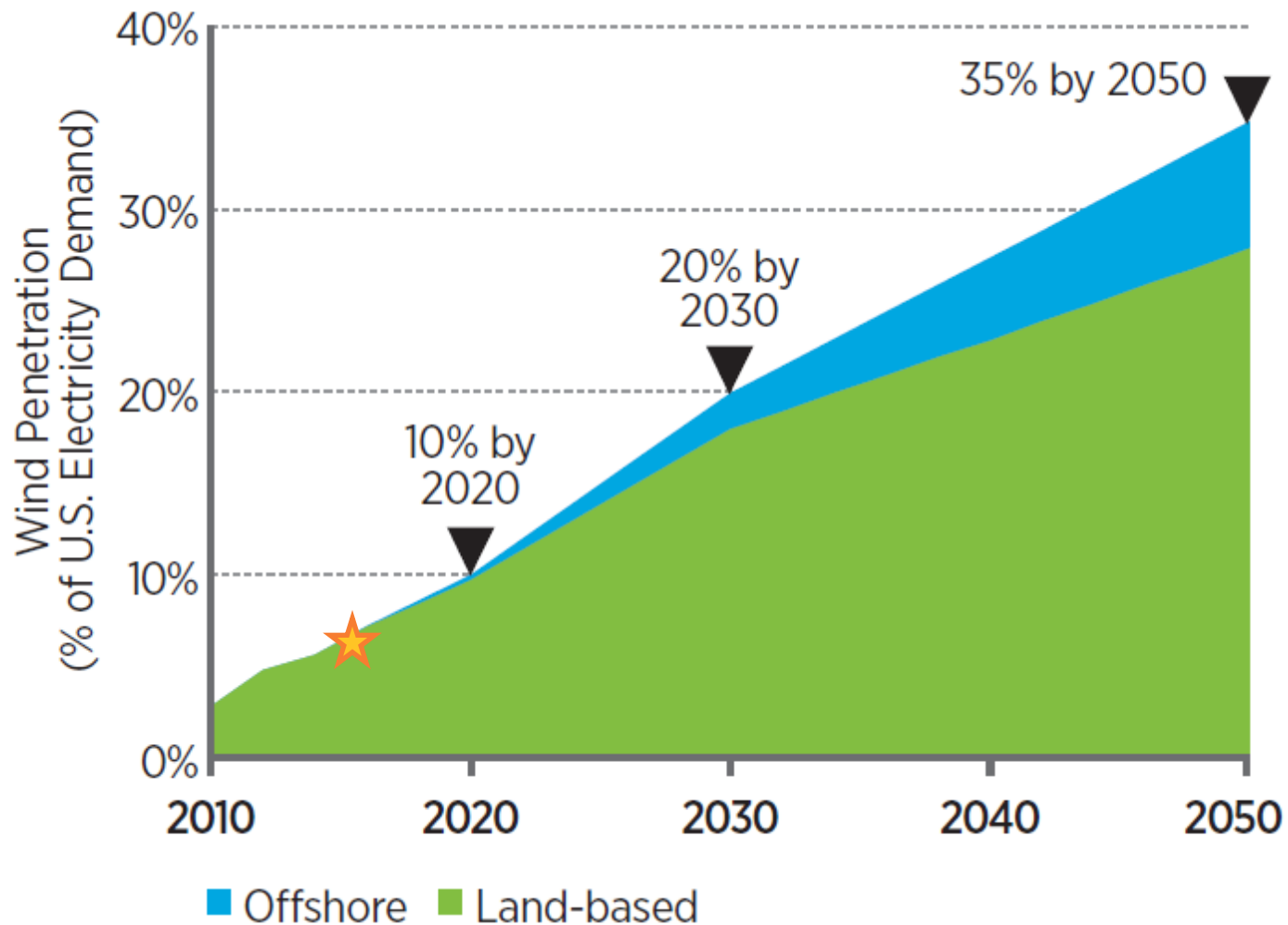
Background for Research

Objective was to quantify impacts of addressing wildlife, radar, and community engagement considerations on:

- Costs incurred by developers to overcome siting constraints
- U.S. wind energy resource potential
- Future deployment scenarios of U.S. wind potential, based on Department of Energy's *Wind Vision*. <https://energy.gov/eere/wind/wind-vision>



The DOE Wind Vision Study Scenario



<https://energy.gov/eere/wind/wind-vision>

- Performed in-depth interviews with representatives from 7 major U.S. wind development and permitting consulting companies
- Examined the time and costs to developers of three siting considerations: radar, wildlife, and public engagement
- Estimated land area and resource potential that could be impacted by these three siting considerations
- Analyzed data using NREL's ReEDS model and *Wind Vision*:
 - 1) How would wind deploy between now and 2050 given constraints on developable land imposed by the three siting considerations?
 - 2) What would happen with the Wind Vision Study Scenario if we added the assumed costs of these three siting considerations and removed some of the developable land?

Siting Considerations

- **Radar:** The potential for wind turbines to interfere with radar signals. Modeled by proximity to weather radars, airport and others (including long-range radars)
- **Wildlife:** Avian and bat species that live in or near, or migrate through, potential wind development area. Modeled by proximity to habitat distribution for key species that could be impacted by wind turbines (air or land space)
 - Species whose habitat can be at risk of fragmentation: greater prairie chicken, lesser prairie chicken, and greater sage-grouse
 - Species at risk of air space interference: Indiana bat, northern long-eared bat, little brown bat, tri-colored bat, whooping crane, golden eagle, and bald eagle
- **Public engagement:** Interaction with the public regarding concerns or considerations that stakeholders or communities near existing or proposed wind power projects may have. Modeled by proximity to at least three residences at 1,500 ft. and at 2,500 ft.

Research Results

Costs Associated with the Three Siting Considerations

The costs of addressing siting considerations include not only the direct costs required to satisfy concerns but also the hidden costs of failed projects (76% to 82% of total pipeline) and the risk of future requirements. *Ranges below are for successful projects.*

Not included are the costs to companies for all of the unsuccessful projects. Although not a big part of LCOE, siting considerations can completely halt a project.

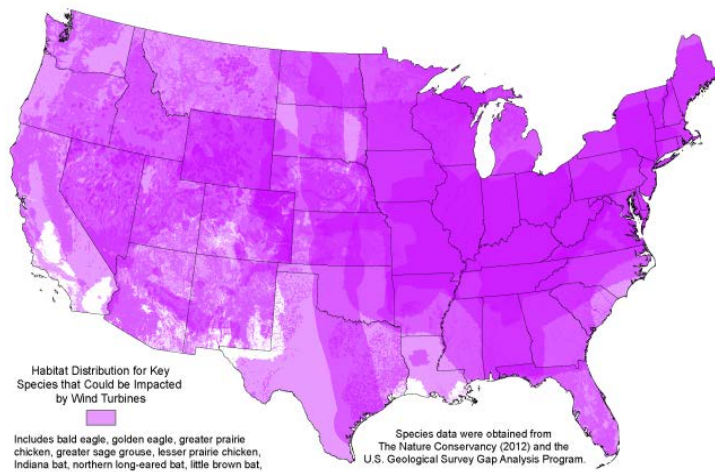
Direct Cost Ranges Associated with Siting Considerations for a Typical 100-MW Wind Project (2013\$)

Siting Consideration Category	Standard Project	Higher-Cost Project
Public Engagement	\$1,319,000	\$5,581,000
Wildlife	\$1,623,000	\$6,697,000
Radar	\$30,000	\$710,000

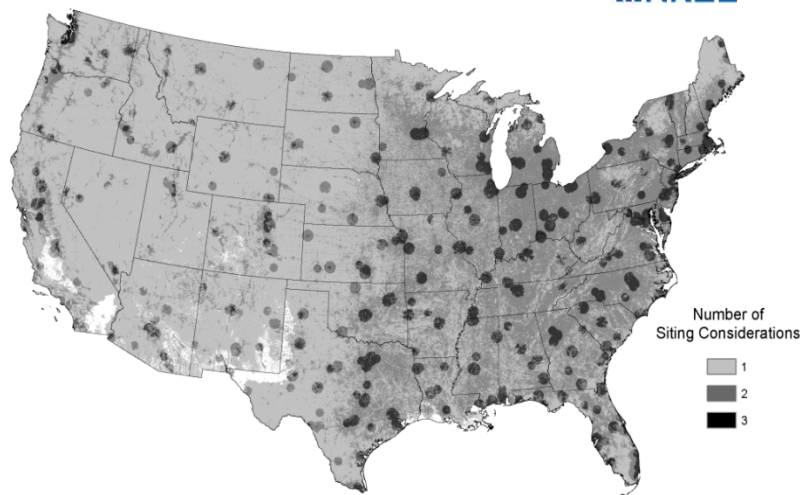
Impact on Technical Potential Could Be up to 80%

Combined high restriction reduces technical potential by 80%.
Major issues vary regionally.

High
Wildlife
Scenario



Combined
High
Scenario



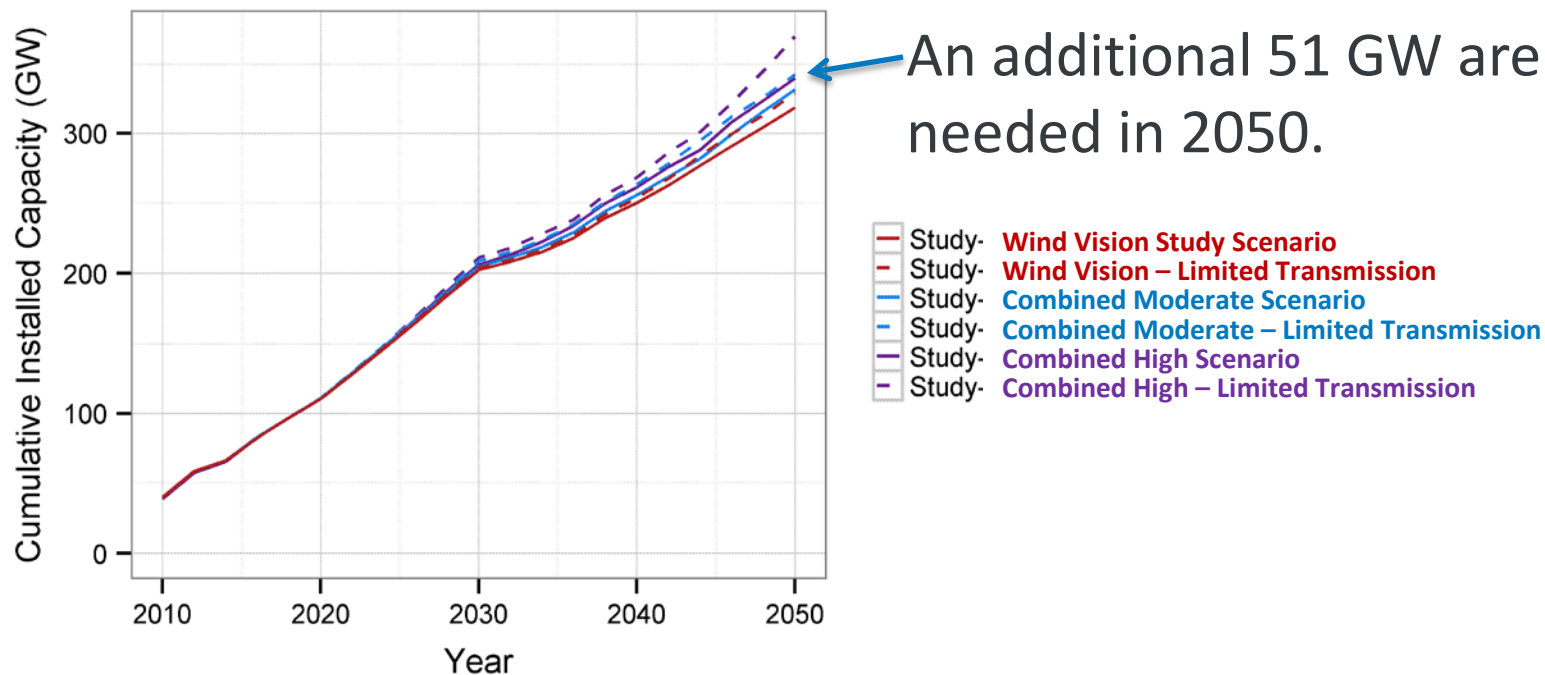
Scenario	Reduction from base
Baseline	--
Moderate Wildlife	56%
High Wildlife	73%
Moderate Public Engagement	6%
High Public Engagement	14%
Moderate Radar	1%
High Radar	4%
Combined Moderate	63%
Combined High	80%

Research Results: We Can Still Get to 35% Wind by 2050

We looked at future scenarios in two ways:

First, we modeled 35% wind energy by 2050.

This end goal requires greater installed capacity and higher system costs if siting considerations are taken into account.

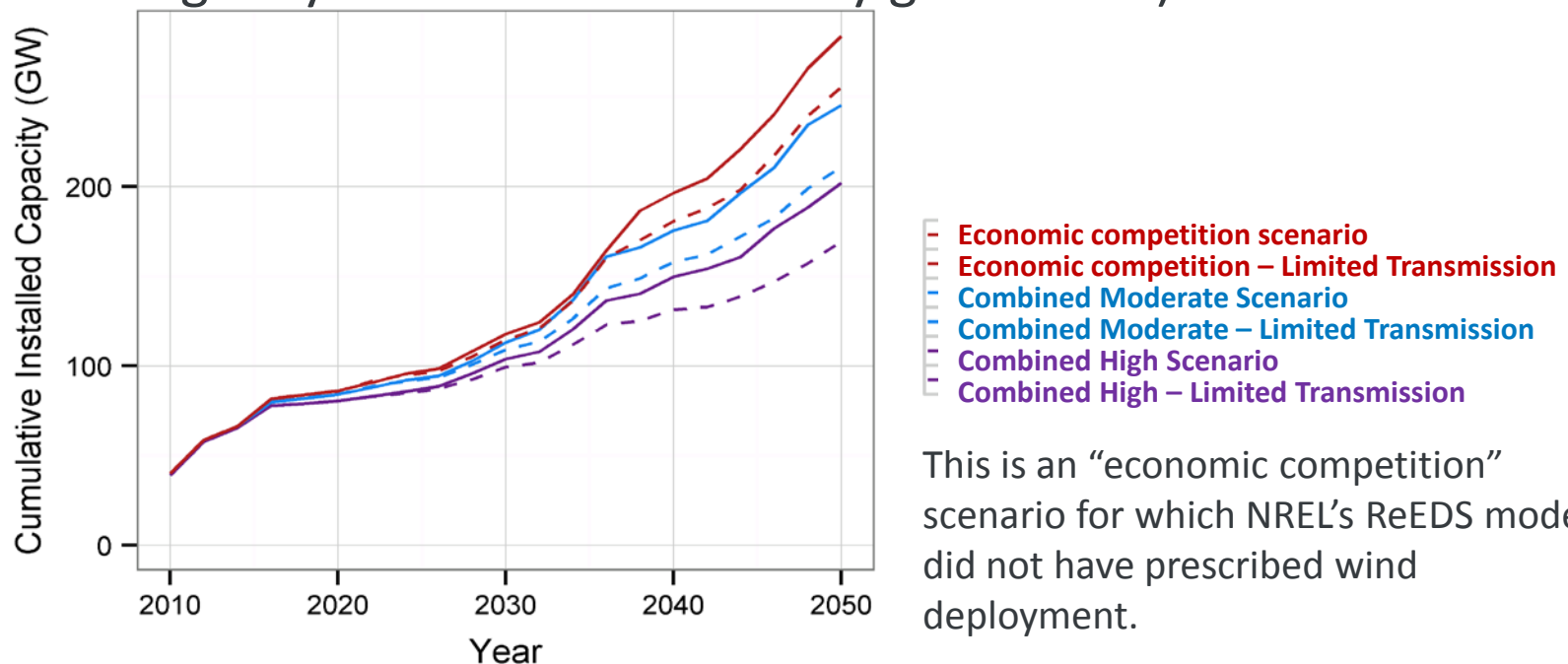


<https://energy.gov/eere/wind/wind-vision>

Wind Vision Scenarios Are More Difficult in Out-Years

Second, we let the ReEDS model choose the next power plant to install (without setting an end goal of 35% wind by 2050) and also examined limiting new transmission lines.

- Siting considerations have a limited effect in 2030 (14% less capacity installed).
- There are significant differences by 2050 (28% less capacity serving only 24% of U.S. electricity generation).



Siting Considerations Matter. So What?

- The immensity of the U.S. wind resource still leaves more than 1,000 GW of wind potential that may be much less affected by the three siting considerations examined.
- Developers must weigh cost vs. risk for these considerations, throughout the deployment process. The majority of projects are lost between prospecting and mid-stage development.
- Although impact on LCOE from the 3 siting considerations is low nationwide, the impact from even 1 siting consideration can halt a project – the issues can be black and white.
- Successes occur when developers get involved with the local community early and stakeholders feel they have had a say in the process.
- Threats or barriers to wind energy projects vary by region, and developers should be prepared for them across the country.

Thank you

Team: Eric Lantz, Maureen Hand, Jessica Lin-Powers, Bob Thresher,
Trieu Mai, Eduardo Ibanez, Karin Sinclair, Donna Heimiller, KC Hallett

Siting considerations report published July 2016

<http://www.nrel.gov/docs/fy16osti/61750.pdf>

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