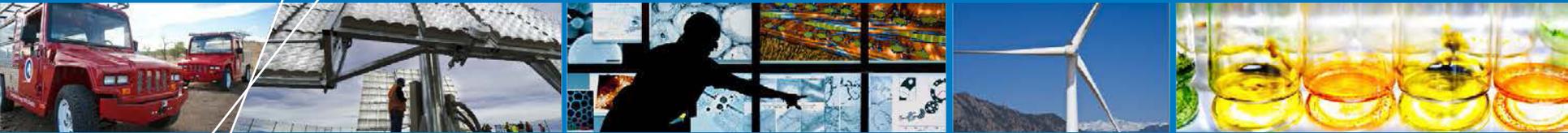


# Wind Energy Deployment Process and Siting Tools



**Suzanne Tegen, NREL**

**WINDEXchange Webinar**

**February 18, 2015**

# Background on Current Research

- **Regardless of cost and performance, some wind projects cannot proceed to completion as a result of competing multiple uses or “siting considerations.”**
- **Even if wind energy projects were unquestionably competitive on purely economic grounds, developers would not build in many places in the United States due to various non-technical issues.**
- **Current methods for understanding non-technical issues facing wind developers fail to:**
  - Accurately characterize the costs to the industry from siting considerations (as a result of project delays, increased permitting times, and failed projects)
  - Define the extent of the challenges faced by the industry
  - Tell the whole story (make sure “competing uses” are given a voice).
- **Wind energy siting issues must be better understood and quantified.**

**Goal: Appropriate wind energy siting.**

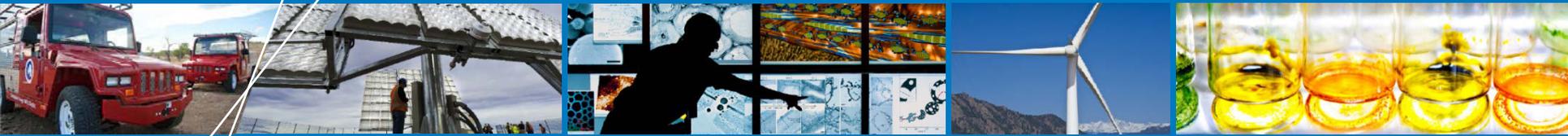
# Research Questions and Method

DOE tasked NREL to depict the wind energy deployment process and to research wind energy deployment considerations. Questions:

- How much money and time do developers spend on competing uses?
- Are there some areas no longer developable due to these siting considerations: Radar, public engagement, wildlife (birds and bats)?

## NREL:

- Performed in-depth interviews with wind developers and consulting firms
- Aggregated developer data and used it to determine cost adders for model runs and impacts to developable land for GIS-based maps
- Created maps of the U.S. wind resource overlaid with different siting considerations
- Created supply curves based on real data
- Used supply curves as inputs to ReEDS scenario modeling (to 2050)
- Consulted with developers to make sure our conclusions match what they meant to convey
- Is currently finishing an NREL technical report on results.



# Wind Deployment Process

# I. PROSPECTING

Desktop Review of Important Parameters

Are there fatal flaws?

YES

NO

# II. EARLY DEVELOPMENT

- Site visit and acquisition
- Initial data collection
- Communication with agencies and stakeholders

Any new unresolvable issues? Or unacceptable changes to project economics or timeline?

YES

NO

# III. INTERMEDIATE DEVELOPMENT

- Continued monitoring and data collection
- Perform portion of required studies
- Complete resource and financial modeling efforts
- Ongoing issue resolution

Any new unresolvable issues?

YES

NO

# IV. ADVANCED DEVELOPMENT

- Project design
- Project financing
- Equipment procurement
- Ongoing issue resolution
- Active permitting and negotiations (*land use, PPA, wildlife, construction, interconnection, transportation*)

Any remaining issues that alter project economics or timeline?

YES

NO

# V. CONSTRUCTION & OPERATIONS

- Fulfill pre-construction environmental obligations
- Obtain building permits
- Groundbreaking
- Turbine erection and commissioning
- Ongoing public outreach
- Ongoing operational forecasting
- Environmental monitoring and reporting compliance

Review another site

OR

OR

OR



Discard Project ("dead on arrival")

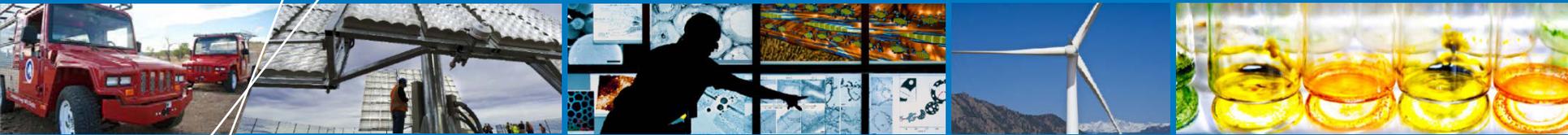
Hold

Save for Future Consideration

# Development Time Horizon Is 5+ Years

- **The typical project is planned on a 5-year time horizon.**
  - 12 years is the maximum we've heard; however, given the market, it is increasingly difficult to justify a project timeline of more than 5 years.
  - Interconnection alone can require 3 to 4 years.
  - Timelines are likely extended if:
    - Projects include post-construction work (additional 2-4 years)
    - NEPA or state processes are triggered (additional years - unknown)
    - Land management plans need revision (additional 1-2 years)
    - Litigious opponents are present (additional 1-2+ years).
- **FWS guidance indicates movement toward longer lead times and more up-front data collection. As a result, some developers are reluctant to develop on federal land.**
- **More time required for permitting = higher capital investment.**

Development timeline ranges vary greatly. Reducing project timeline uncertainty, *even without reducing the actual timeline*, could greatly benefit developers and accelerate appropriately sited wind deployment.



# Tools and Resources for Wind Energy Siting Decisions

# Wind Prospector

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[http://maps.nrel.gov/wind\\_prospector](http://maps.nrel.gov/wind_prospector)

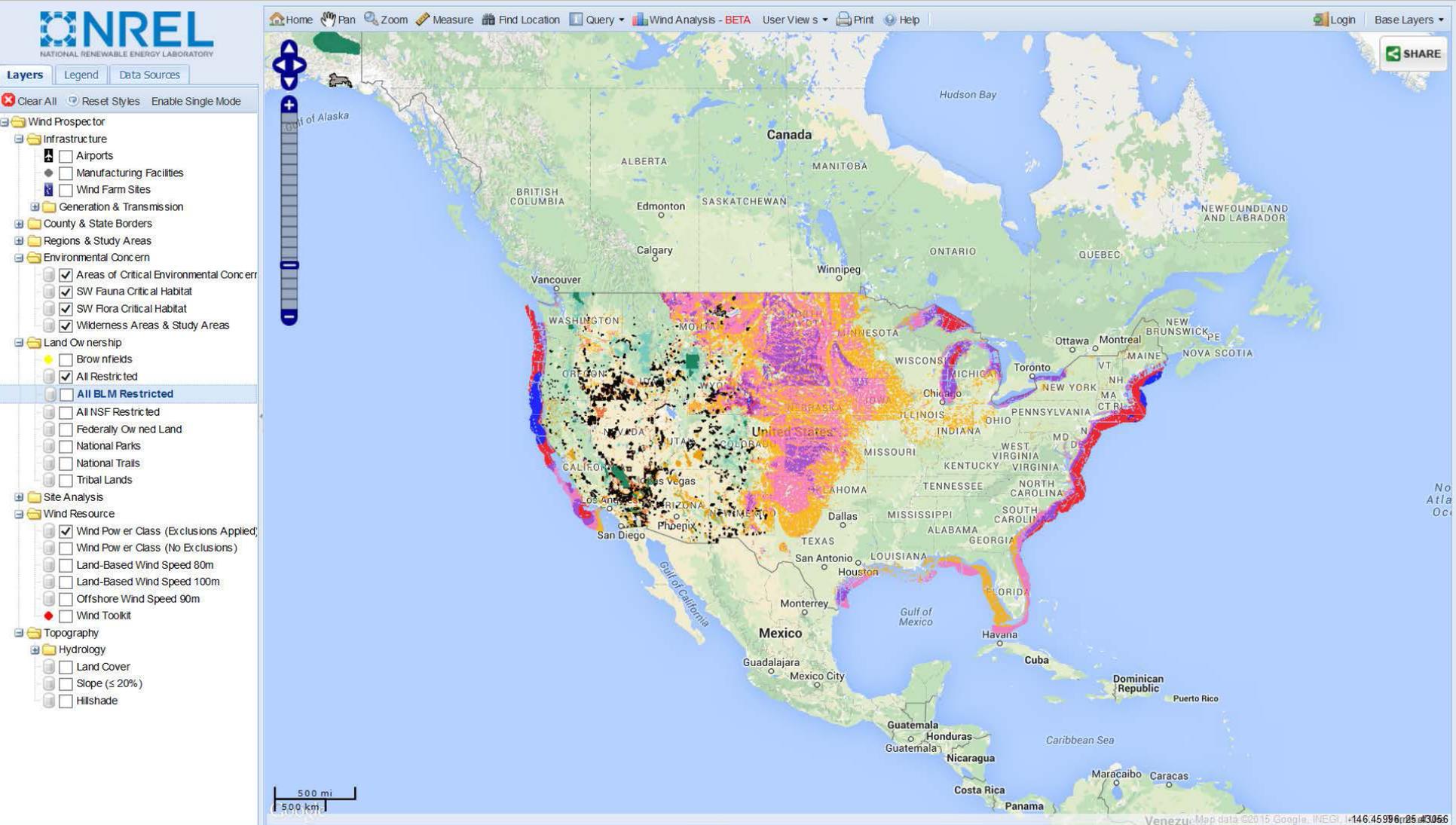
## Purpose

The purpose of this work is to make GIS-based data layers available to DOE, other agencies, wind energy stakeholders, and the interested public. Data are overlaid onto wind resource maps of the United States to visually display where siting issues are located, in relation to areas with good wind energy potential.

## Objective for Wind Prospector

Wind Prospector provides data, visualization, querying, and analysis capabilities that allow users to explore many factors at a site that affect project development potential. Examples include land ownership, proximity of transmission lines, available wind resources, permitting stipulations, and exploration activities.

# Wind Prospector



# System Advisor Model (SAM)



## SAM can display information from the Wind Prospector as “Siting Considerations”

Siting Considerations

**Siting Considerations**

Information downloaded from the NREL Wind Prospector for latitude: 40, longitude:-105.  
Information shown here is for reference only. It will not be used in any simulations, nor is the accuracy of the information guaranteed.

Siting Consideration	Details	Percentage of Input Area Affected
Department of Defense	Lowry Air Force Base (Closed): Air Force DOD	0.06%
Fish and Wildlife Service	ROCKY FLATS NATIONAL WILDLIFE REFUGE	0.49%
Fish and Wildlife Service	ROCKY MOUNTAIN ARSENAL NATIONAL WILDLIFE REFUGE	2.00%
Bureau of Land Management	Colorado: Front Range: Royal Gorge	0.25%
State-Owned Land	Not available	1.15%
Locally-Owned Land	Not available	0.43%
U.S. Forest Service	Arapaho and Roosevelt National Forest	0.63%
Fish and Wildlife Service	TWO PONDS NATIONAL WILDLIFE REFUGE	0.01%
Department of Defense	Fitzsimons Army Medical Center (Closed): Army DOD	0.07%
Other	General Services Administration GSA: Denver Federal Center	0.00%
Species Present: bald eagle	N/A	N/A
Species Present: golden eagle	N/A	N/A
Species Present: whooping crane	N/A	N/A

SAM 2015.1.30

+ New untitled

Wind, Single owner

- Wind Resource
- Wind Turbine
- Wind Farm
- System Costs
- Degradation
- Financial Parameters
- Time of Delivery Factors
- Incentives
- Depreciation

Combine Cases

Create a Tornado Chart

**Siting Considerations**

Weather File Checker

Weather File Converter

Run macro >

**Siting Considerations**

This macro allows you to download siting considerations from the National Renewable Energy Laboratory's Wind Prospector for your potential project site. Some of the information provided by this website is intended for wind installations, but much of the information it provides (such as federal land ownership) is relevant for all project types. The information downloaded is for user reference only; SAM does not use this information in any simulations or calculations.

You may visit the Wind Prospector site directly at: [http://maps.nrel.gov/wind\\_prospector](http://maps.nrel.gov/wind_prospector)

**Please note that this information is available for U.S. locations only.**  
The macro will still run for locations outside of the U.S., but it will not return any information.

**Instructions:**

Location to look up: Enter latitude and longitude

Radius (miles): 20

Latitude input: 40

Longitude input: -105

Simulate >

Parametrics Stochastic

P50 / P90 Macros

# Other Resources

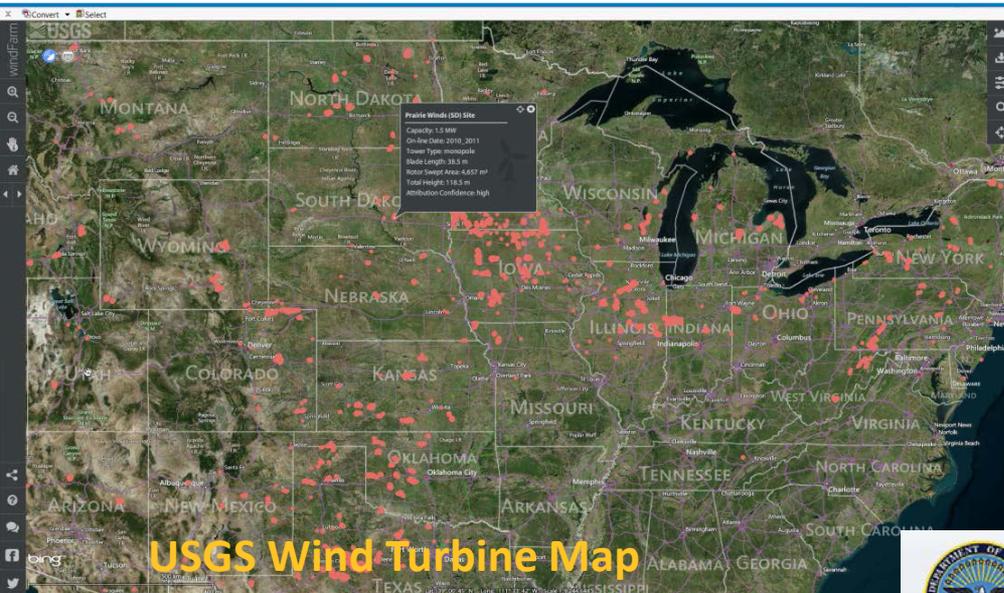
Important: It is vital to confer with all appropriate federal agencies, such as the Environmental Protection Agency and Department of Defense when developing a project:

<http://www.acq.osd.mil/dodsc/>

See OpenEI for Wind Project Siting Tools and Resources

[http://en.openei.org/wiki/Wind\\_Project\\_Siting\\_Tools](http://en.openei.org/wiki/Wind_Project_Siting_Tools)

[http://en.openei.org/wiki/Siting\\_Wind\\_Energy](http://en.openei.org/wiki/Siting_Wind_Energy)



There are helpful sites like the USGS wind turbine map, showing almost every utility-scale turbine in the country (above):

<http://eerscmap.usgs.gov/windfarm/>



**DoD Siting Clearinghouse**  
Office of the Deputy Under Secretary of Defense  
Installations and Environment

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## DoD Siting Clearinghouse

The Department of Defense (DoD) is committed to maintaining an effective, consistent, transparent, and timely process for evaluating the impact of energy projects on its military test, training, and operational missions. This is the core responsibility of the DoD Siting Clearinghouse.

Created by DoD in 2010, and further shaped by Congress in the Ike Skelton National Defense Authorization Act for Fiscal Year 2011, the Siting Clearinghouse provides a "one-stop-shop" for comprehensive, expedited evaluation of energy projects and their potential effect on DoD operations.

The Clearinghouse's formal review process applies to projects filed with the Secretary of Transportation, under section 44718 of title 49, U.S. Code (Federal Aviation Administration obstruction evaluation process), as well as other projects proposed for construction within military training routes or special use airspace, whether on private, State, or Federal property (such as Bureau of Land Management lands).

### Our Mission

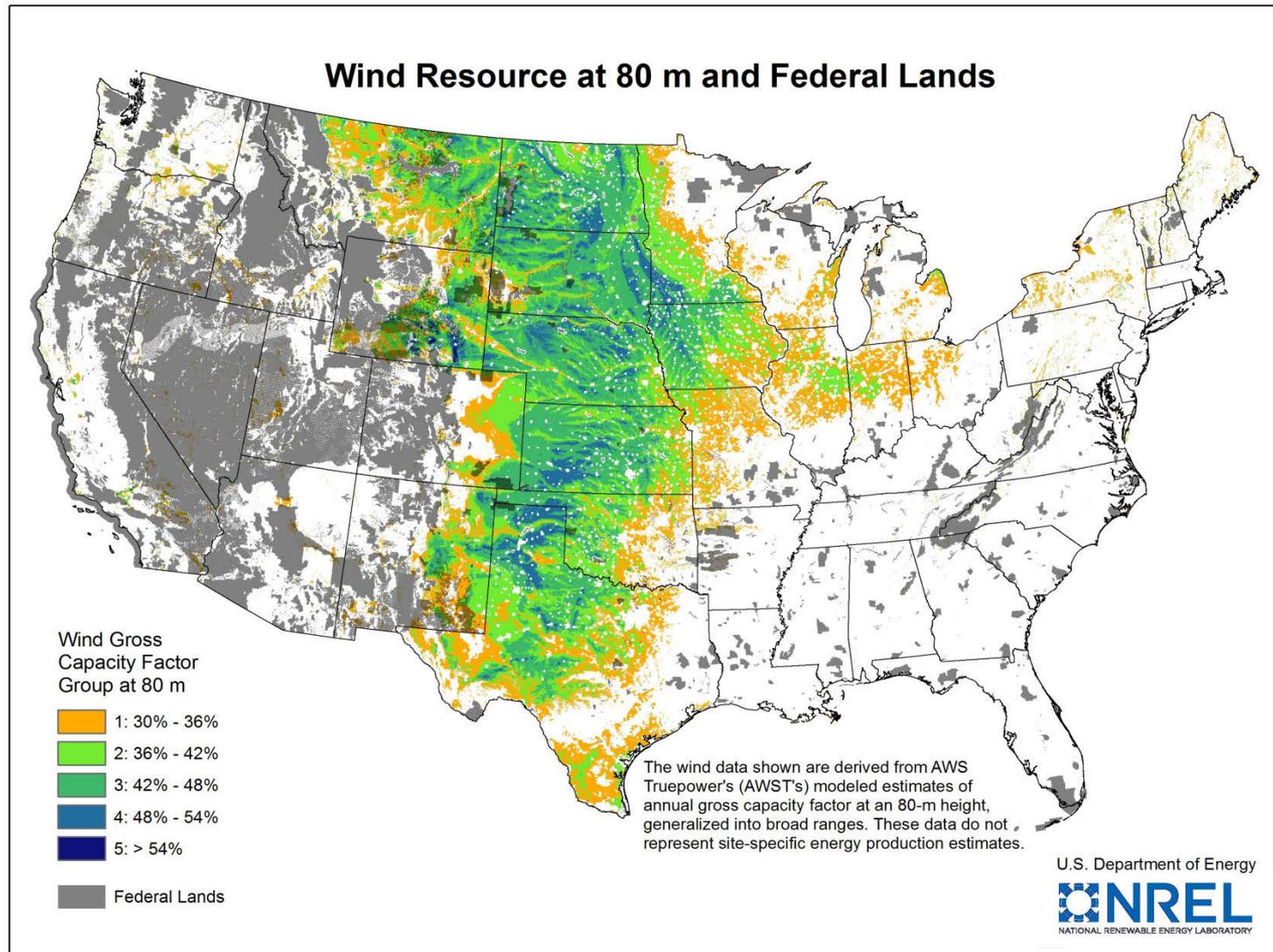
Protect DoD mission capabilities from incompatible development by collaborating with DoD Components and external stakeholders to prevent, minimize, or mitigate adverse impacts on military operations, readiness, and testing.

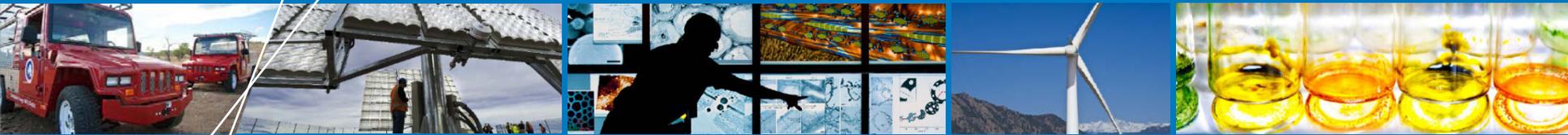
[Installations and Environment \(I&E\) Home](#)



Argonne National Laboratory's  
EISPC: <http://eispctools.anl.gov>

# Federal Land Overlaid with Wind Resource





**Thank you.**  
**Suzanne Tegen**  
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