

A06 - Wind Analysis for Priority Needs

Modeling & Analysis – Modeling & Analysis

Eric Lantz

National Renewable Energy Laboratory (NREL)

August 2, 2021



FY21 Peer Review - Project Overview

Project Summary:

- This project provides quick response analytic support at the request of the Wind Energy Technologies Office to meet needs that arise from executive leadership and Congress.
- A dedicated task to support novel and high impact communications and dissemination.
- Analysis is typically executed in-house; subcontracts may be executed on a case-by-case basis.

Project Objective(s) 2019-2020:

- Critical capabilities updates, specifically for offshore wind JEDI
- Educate stakeholders about program activities and opportunities (e.g., Floating OSW 101)
- Addressing emerging topics of criticality including blade recycling and end-of-life opportunities

Overall Project Objectives (life of project):

- Provide subject-matter expertise in economic, technological, policy, and other analysis, in direct support of the wind program.

Project Start Year: [2019]
Expected Completion Year: FY [22]
Total expected duration: [4] years

FY19 - FY20 Budget: \$1,869,004
(approx. \$500k per year in primary costing)

Key Project Personnel: Eric Lantz (PI), Trieu Mai, Carol Laurie, Jeremy Stefek, Garrett Barter, Annika Eberle, Anthony Lopez, Owen Roberts

Key DOE Personnel: Patrick Gilman

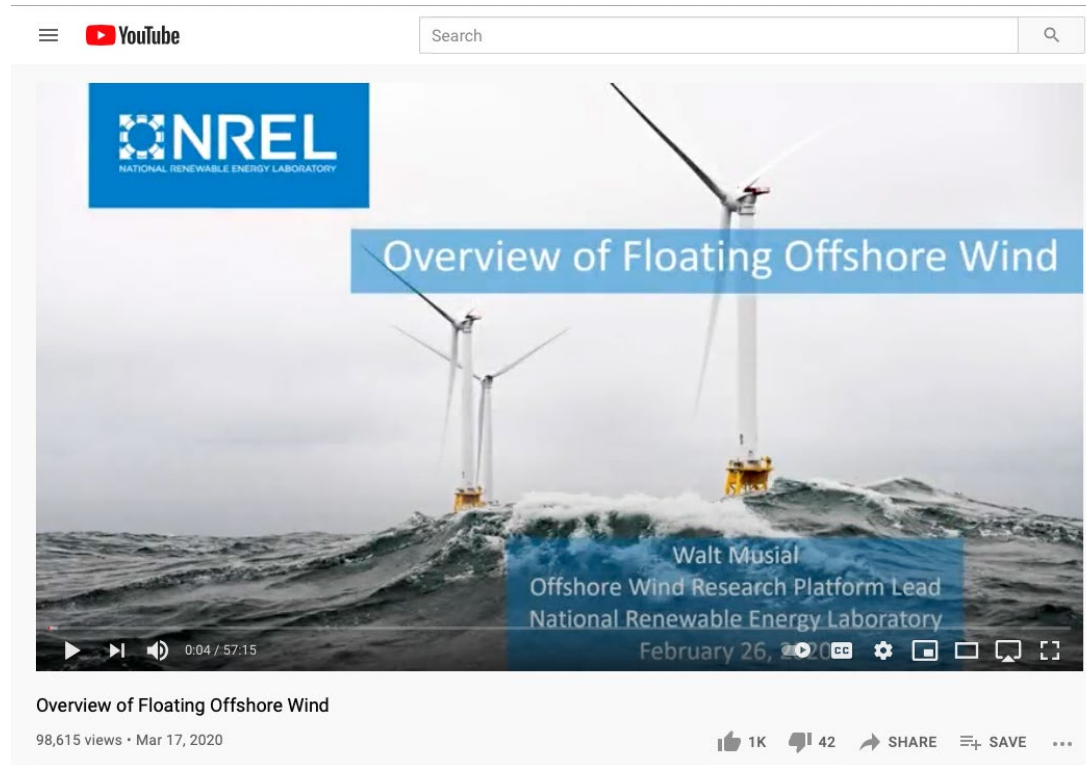
Project Impact: Thought Leading Analysis

Resources provide internal and external research insights on emerging issues

- This activity quantified future blade waste streams in terms of mass and volume
- We estimated costs and summarized the status of circular economy possibilities

IMPACT: this work has been used as a foundation for continued R&D planning on questions of blade disposal and regularly passed to the press as an objective summary of the state-of-the-art in this domain

Project Impact: Outreach and Education



Resources provide critical information and content to key stakeholders and the public; this webinar created under this project is one of NREL's highest impact videos ever

Webinar IMPACT Stats:

- Most viewed video on NREL's YouTube channels for FY2020; more than twice as many views as the top video on the main NREL channel
- Added more than 400 subscribers to NREL Learning channel's total of 2,640
- By end of FY20: 22,745 views constituting 2,906 hrs of viewing time; watch time to-date was more than 400x that of a typical video on the NREL Learning Channel
- **June 2021 views: more than 102k**

Program Performance – Scope, Schedule, Execution

- **Formal milestones are listed in narrative summary of project**
 - All milestones were met, in one case a modest no cost delay was incurred but this did not preclude work completion
- **Often milestones are “dynamic” and established once priorities are known and articulated**
- **In practice, additional deliverables may be completed beyond formal milestones, or funds may be carried over into future years**
- **Typical analyses are weeks to months with scope and timing depending on the urgency of the request**
- **10-20 significant requests per year (2 weeks to 3 months per request) is typical**
- **Smaller requests (e.g., how should fellow government researchers and regulators think about the evolution of technology to inform radar system design and evolution?) taking hours to days can easily double the total number of requests**

Program Performance – Scope, Schedule, Execution

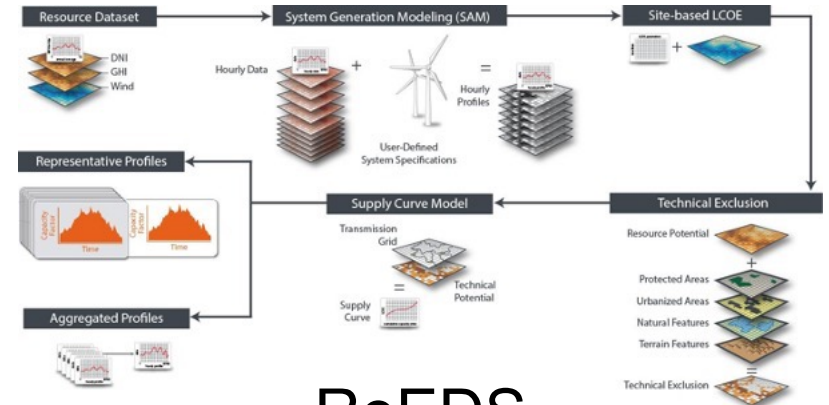
Approach/Methods Applied

- Techno-economic cost modeling
- Capacity expansion modeling
- Cash-flow analysis
- Wind power system analysis
- Semi-structured interviews
- Policy analysis
- Case study synthesis

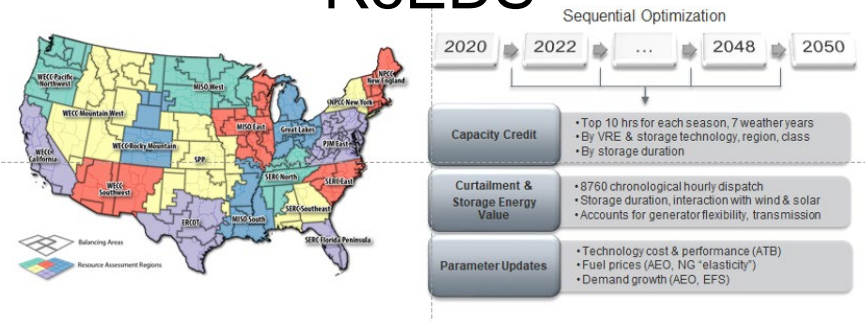
Typical Project Lifecycle and Execution Plan

- Identify priority
- Coordinate planning and timeline with WETO staff
- Complete analysis, publish if applicable
- BONUS for specific activities, disseminate via newsletters, social media, youtube etc.

Tools Include: reV



ReEDS



JEDI

JEDI:
Jobs & Economic Development Impact Models



About Models Publications Contact Us

Energy Analysis > Jobs and Economic Development Impact Models > JEDI Wind Models

And many others

Program Performance – Accomplishments & Progress



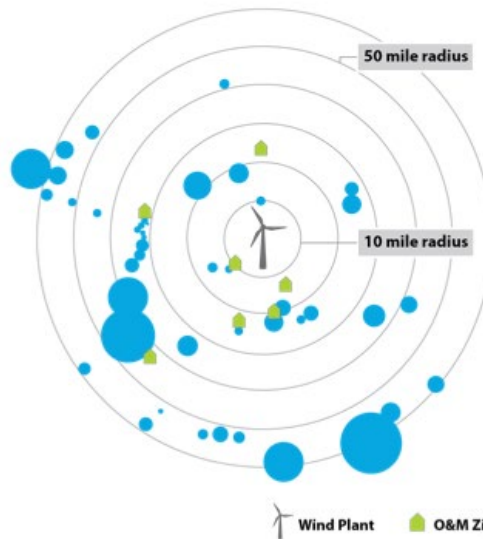
Workforce and Economic Development Considerations from the Operations and Maintenance of Wind Power Plants

Matthew Kotarbinski, David Keyser, and Jeremy Stefek

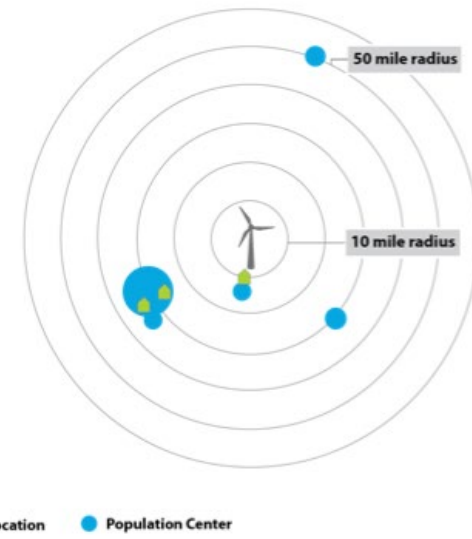
National Renewable Energy Laboratory

- This work reflects a ‘deep dive’ into Economic and Workforce operating period impacts
- The granular insights we gleaned are critical in understanding the flow of economic benefits within and between communities over the plant’s lifecycle
- Example outcome: 80% of workers spend money in the community they work in; 87% spend most of their money where they live

Wind Plant 1 - Shows more dispersion where O&M workers live around the wind plant because there are more communities with populations greater than 1,000 residents.



Wind Plant 2 – Shows less dispersion where O&M workers live around the wind plant because there are fewer communities with populations greater than 1,000 residents.



NREL is a national laboratory of the U.S. Department of Energy
Office of Energy Efficiency & Renewable Energy
Operated by the Alliance for Sustainable Energy, LLC
This report is available at no cost from the National Renewable Energy
Laboratory (NREL) at www.nrel.gov/publications.

Contract No. DE-AC36-08GO28308

Technical Report
NREL/TP-5000-76957
December 2020

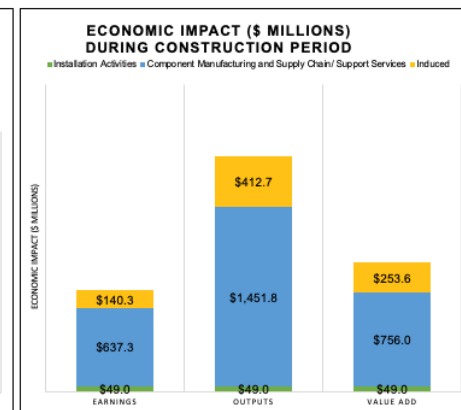
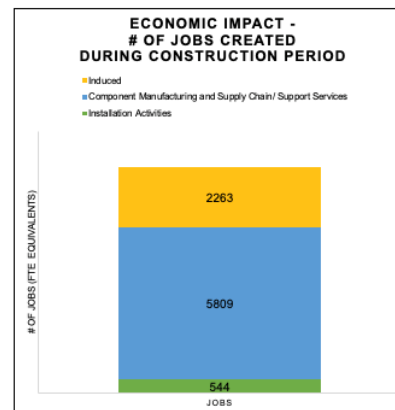
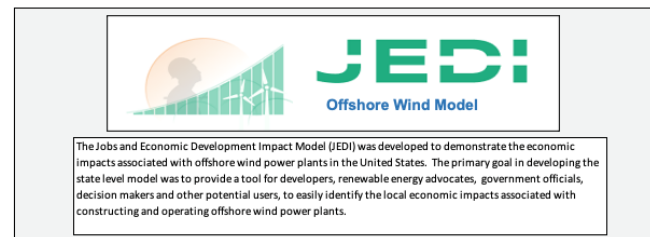
Program Performance – Accomplishments & Progress

- Priority needs may also involve core capabilities, especially those with a prominent external user base, like JEDI
- This accomplishment involved a major overhaul for our OSW JEDI model by incorporating:
 - New cost data
 - New economic multipliers
 - New user interface and data presentation
 - AND, linking JEDI with our OSW BOS cost model ORBIT
- We expect this new model to serve users in industry and academia as well as regulators and policymakers

Jobs and Economic Development Impact Model - JEDI

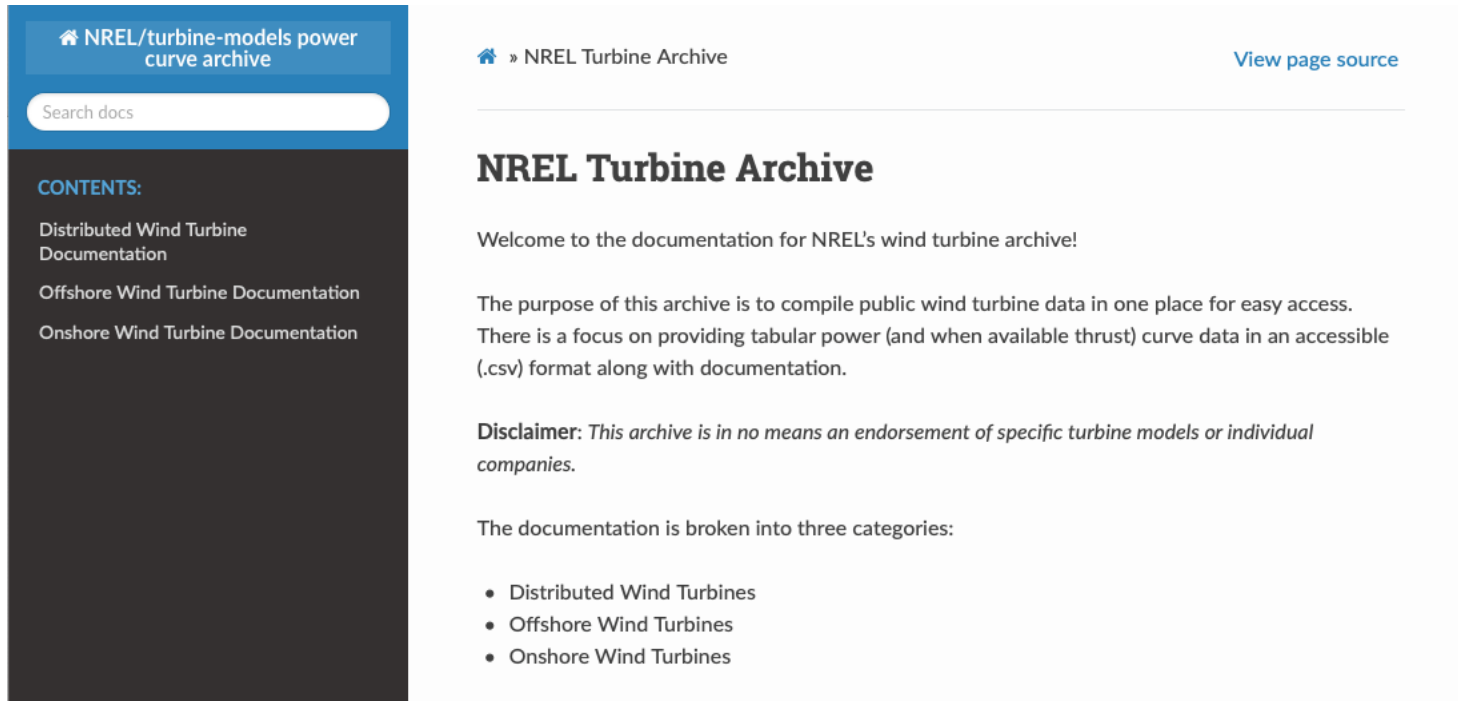
Offshore Wind Tool

Single Wind Plant Scenario



Program Performance – Accomplishments & Progress

- Occasionally priority needs involve supporting external researchers and collaborators
- In FY20, we created a centralized public repository for historical and current wind turbine power curves
- These data serve both wind energy and power system research and analysis needs and our archive provides readily accessible documented data internationally

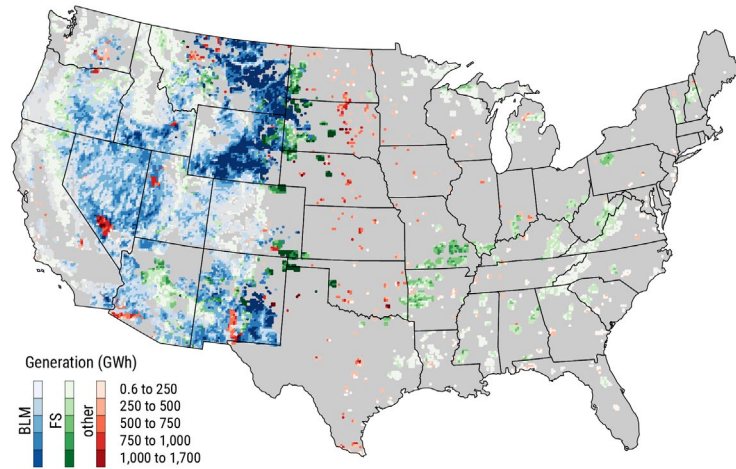


The screenshot displays the NREL Turbine Archive website. On the left is a dark sidebar with a blue header containing a home icon and the text 'NREL/turbine-models power curve archive'. Below the header is a search bar labeled 'Search docs'. Underneath, the word 'CONTENTS:' is followed by three links: 'Distributed Wind Turbine Documentation', 'Offshore Wind Turbine Documentation', and 'Onshore Wind Turbine Documentation'. The main content area has a light blue header with a home icon, a breadcrumb '» NREL Turbine Archive', and a 'View page source' link. The main heading is 'NREL Turbine Archive'. The text below reads: 'Welcome to the documentation for NREL's wind turbine archive! The purpose of this archive is to compile public wind turbine data in one place for easy access. There is a focus on providing tabular power (and when available thrust) curve data in an accessible (.csv) format along with documentation.' A disclaimer follows: 'Disclaimer: This archive is in no means an endorsement of specific turbine models or individual companies.' The final text states: 'The documentation is broken into three categories:' followed by a bulleted list: 'Distributed Wind Turbines', 'Offshore Wind Turbines', and 'Onshore Wind Turbines'.

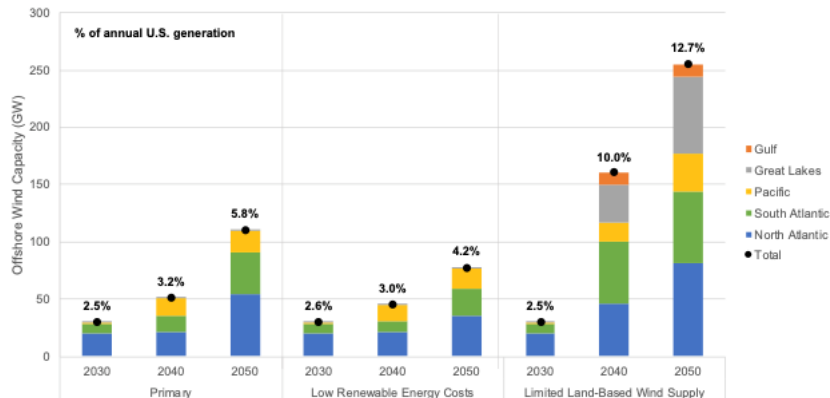
<https://github.com/NREL/turbine-models>

Project Performance - Upcoming Activities

Wind GWh Potential on Federal Lands



OSW Expansion through 2050, sensitivity results



- In FY21 the list of Priority Needs has grown tremendously and now includes:
 - Analysis of the intersections among
 - Innovation and cost
 - Critical wildlife habitat
 - Future wind deployment locations
 - Energy potential on Federal Lands
 - WETO Support on critical actions
 - OSW Report to Congress
 - Airborne Wind Report to Congress
 - OSW 30 GW by 2030 target implications
 - Wind technology future characterizations to inform
 - Radar technology development and siting dialogues
 - R&D needs for floating OSW
 - WETO Support on high priority topics
 - Critical materials assessments and circular economy initiatives
 - OSW to Hydrogen techno-economic and gaps analysis
 - Explainer video on wind and renewables curtailment

Stakeholder Engagement & Information Sharing: “BONUS” Activities Specific to Some Requests

Like all analysis projects Wind Analysis for Priority Needs engages a diverse set of stakeholders through multiple forums and products, including reports, presentations, multi-media, social media, press releases

• 102k and counting Youtube views!
• 4,250 technical report downloads!



Stakeholders engaged:

- ✓ WETO and DOE Offices
 - Portfolio-wide outreach amplification through social media, news stories, etc.
 - Visualization and Graphics support for partners inside and outside of NREL
- ✓ FOA Partners
 - Wind Industry Members
 - External Researcher Partners
- ✓ Decision-makers and General Public
 - State governments and regulators
 - Social media outreach
 - News interviews and press coverage

List includes products released primarily during FY19-20 or based on work conducted during that period.