U.S. DEPARTMENT OF ENERGY
Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

2021 PROJECT PEER REVIEW
U.S. DEPARTMENT OF ENERGY
WIND ENERGY TECHNOLOGIES OFFICE

T14 – Data Archive and Portal

Program – Technology RD&T-Atmosphere to Electrons (A2e)
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Pacific Northwest NATIONAL LABORATORY

FY21 Peer Review – Project Overview

Project Summary:

The Data Archive and Portal (DAP) provides state-of-the-art data services for the advancement of critical research, communication, and knowledge discovery for the Wind Energy Technology Office (WETO)

Project Objective(s) 2019–2020:

DAP provides data management capabilities that advance the science and enable research conducted by projects funded by WETO

Overall Project Objectives (life of project):

DAP provides secure, timely, easy, and open access ***to all laboratory, field, and benchmark model data produced by the land-based and offshore demonstration projects***

Project Start Year: 2015
Expected Completion Year: FY 2025
Total expected duration: 10

FY19 - FY20 Budget:$950,000

Key Project Personnel:
Chitra Sivaraman (Principal Investigator [PI])
Matt Macduff (Architect)
Sherman Beus (Web Developer)
Tonya Martin (Operation Lead)

Key DOE Personnel: Patrick Gilman

Project Impacts

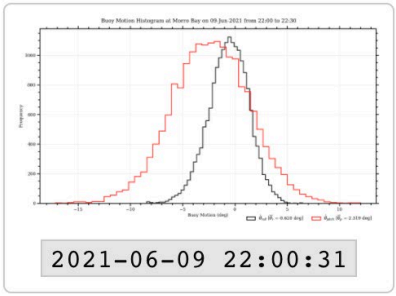
- Improved deployment effectiveness of buoys and lidars stationed off the coast of California by enabling near real-time assessment of data quality
- Advanced the science and promoted collaborations by providing quick and easy access to large standardized datasets for WFIP2 project
- Enabled pre-construction assessments by providing a secure data-sharing platform for wind industry partners, consultants, and researchers for the WP3 project
- Enabled international collaboration to validate tools and compare models used to design offshore wind systems for the Offshore Code Comparison Collaboration, Continued, with Correlation and unCertainty project (OC6) project

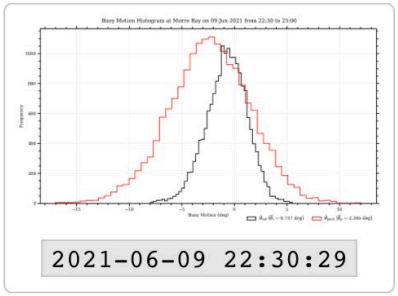
"…we regularly conduct large-scale field campaigns, which collect several terabytes of data. The DAP is a secure and safe archive for all the data collected,…which can be shared publicly with everyone." --Raghavendra Krishnamurthy, Earth Scientist, PNNL Atmospheric Science and Global Change Division.

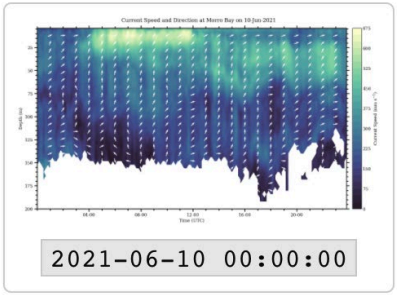
Program Performance – Accomplishments & Progress

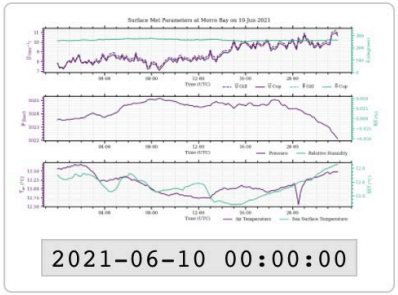
Improved effectiveness of buoys and lidars deployed off the coast of California by enabling near real-time assessment of data quality

Near real-time data collection and visualization enabled early detection of data quality and issues with instruments deployed for the Buoy project







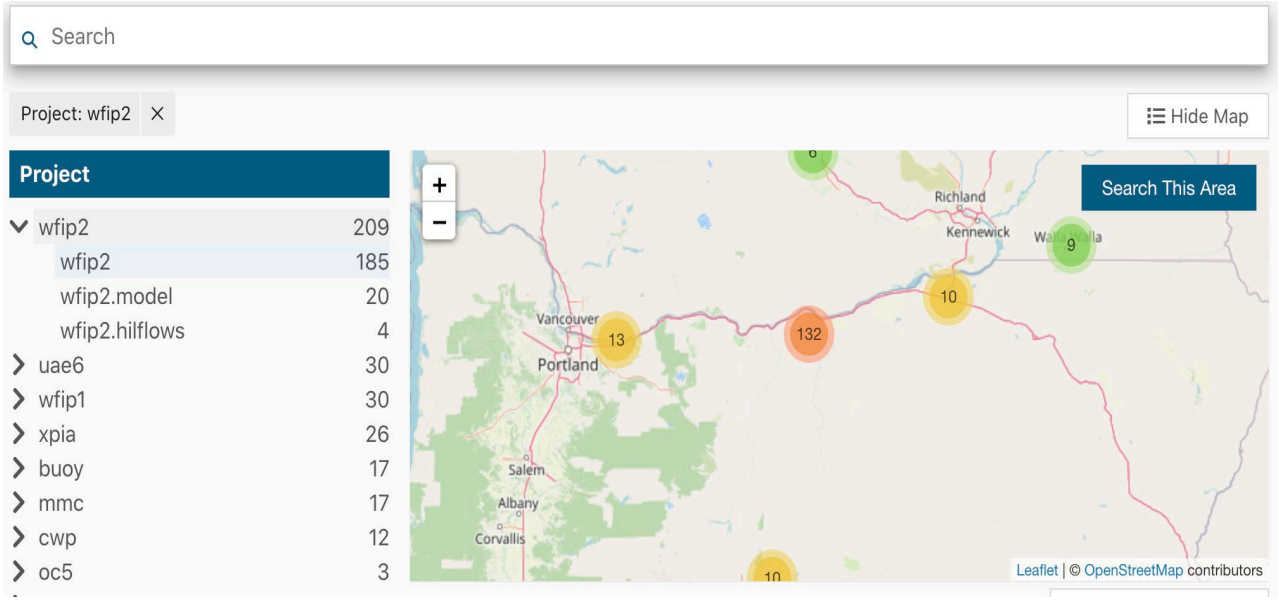


Program Performance – Accomplishments & Progress

Advanced the science and promoted collaborations by providing quick and easy access to large standardized datasets for WFIP2 project

DAP hosts ~200 terabytes of WFIP2 model and observation data and provides automated tools to download large data orders

Developed search criteria based on geolocation as shown (right)



Program Performance – Accomplishments & Progress

Enabled pre-construction assessments by providing a secure data sharing platform for wind industry partners, consultants, and researchers for the WP3 project

- Conducted periodic security scans
- Monitored and reviewed operational dashboards to maintain security
- Quarterly validation of users of proprietary data
- Improved state-of-the-art authentication service

Program Performance – Scope, Schedule, Execution

- ✓ DAP met milestones and deliverables
- ✓ DAP mitigated challenges to enable research
  - Improved security (migrating to new services and conducting periodic security scans)
  - Improved user-facing workflows, including better on-screen guidance
  - Improved search criteria based on geolocation for better data discovery, download, and use

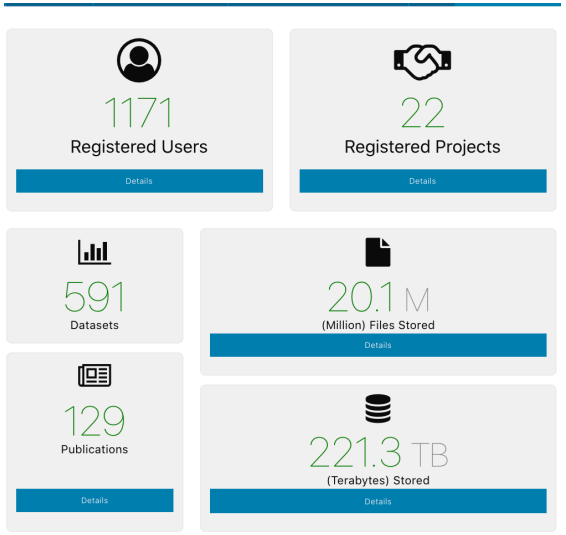
Wind measurements and units across datasets meet DAP data standards, as shown below. Data standards save users time and effort when conducting their analyses

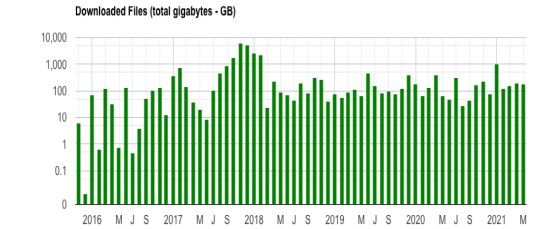
Measurement	
☑ Wind direction (degrees)	65
☑ Wind speed (m/s)	65
☐ Air pressure, surface (mbar)	36
☐ Relative humidity (%)	31
☐ Wind speed, vertical (m/s)	30
☐ Temperature, air (degC)	22
☐ Temperature, sonic (degC)	18
☐ Precipitation (mm)	16
☐ Height (m)	14
☐ Shortwave radiation, downwelling, surface (W/m^2)	13
☐ Total solar irradiance (W/m^2)	11
☐ Longwave radiation, downwelling, surface (W/m^2)	7

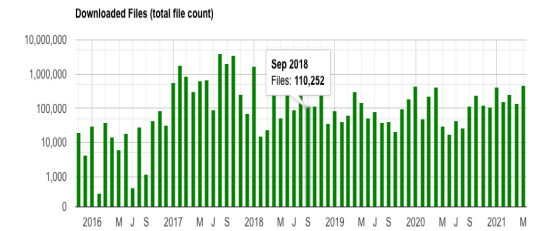
Key Metrics

Usage and Engagement Metrics:

- Provided centralized access to the nearly 600 datasets, field studies, and model output for 22 projects
- Enabled collaboration for more than 1100 users
- Provided a centralized dashboard for all project publications within WETO (129 publications)



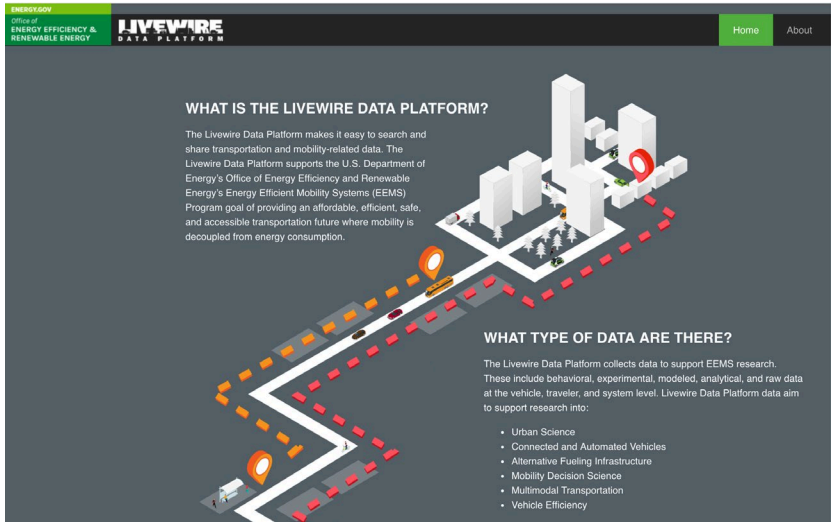




Stakeholder Engagement & Information Sharing

- Collaborated with IEA Task 42 – Wind Digitalization Effort to advance digitalization in wind
- Collaborated with Swiss Wind Energy R&D Network on information about data standards and data sharing

- WETO DAP has led the way to operate and maintain a data management platform for EERE.
  - Same code base is being leveraged by other programs within EERE
  - Buildings Benchmark Data Hub (a resource of the Building Technologies Office)
  - Livewire Data Platform (Vehicle Technologies Office)



"The DAP has proven to be an invaluable resource in both current and past research projects, serving dual roles as both a data archive and discovery tool. The web interface is backed by a responsive and helpful support team…." -- Eliot Quon, National Renewable Energy Laboratory

Upcoming Activities:
AWAKEN (American Wake Experiment) and Machine Learning

AWAKEN

- Provide detailed observation of wind plant and atmospheric interactions for understanding of complex flow physics
- Advance instrumentation by collecting and visualizing data for international use
- Accelerate science and reduce quality issues by providing easy access to near-real time data

Using Machine Learning

- Provide centralized infrastructure for projects to develop and share machine learning (ML) models
- Provide data analysis tools using ML-friendly formatted data