

Lidar Buoy Program

The lidar buoy program facilitates meteorological and oceanographic data collection using validated methods to support the U.S. offshore wind industry.

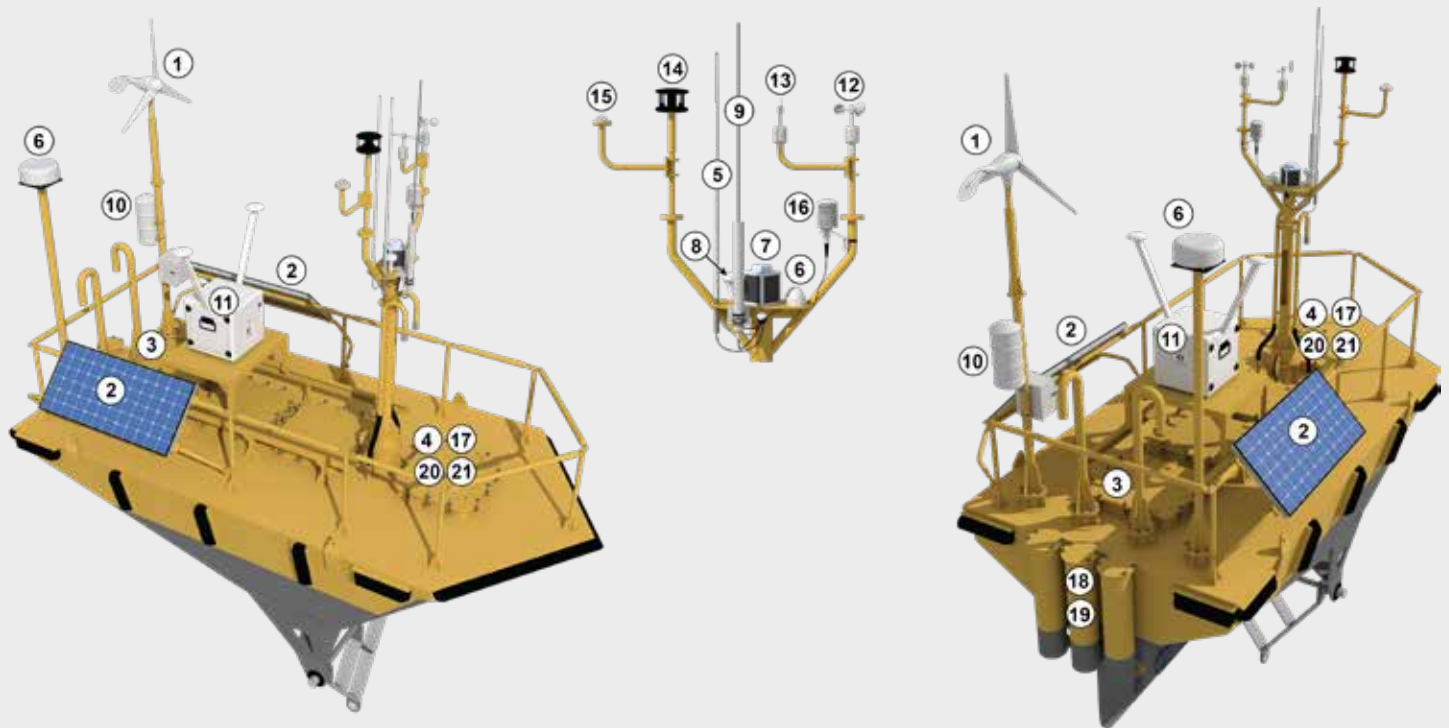


Pacific Northwest National Laboratory (PNNL) manages two lidar buoys for offshore wind resource characterization on behalf of the U.S. Department of Energy’s Wind Energy Technologies Office (WETO). WETO oversees a large portion of the nation’s offshore wind research to advance the scientific understanding of offshore wind and help industry advance offshore wind plant technology.

Using atmospheric and oceanographic measurement capabilities, the lidar buoys capture data such as wind speed and direction at multiple heights using wind profiling lidar, air and sea surface temperatures, ocean current speeds and directions, and wave heights and directions.

The centerpiece instrument on each buoy is a wind profiling lidar that provides wind information up to 250 meters above the sea surface—where offshore wind turbines would be located. The lidars received an independent performance validation documenting that the offshore lidars received Stage 2 (pre-commercial) certification in compliance with the [recommended practices](#) of the International Energy Agency (IEA) Wind Technology Collaboration Programme.

The buoys are equipped with advanced scientific instrumentation, including the following:



Power, Data, Communication, & Navigation

- 1. Turbine
- 2. Solar panels
- 3. Diesel generator (compartment)
- 4. Data loggers (compartment)
- 5. Cellular antenna
- 6. Satellite antenna
- 7. Navigation light
- 8. AIS GPS antenna
- 9. AIS VHF antenna
- 10. Radar reflector

Meteorological

- 11. Wind profile
- 12. Wind speed (cup anemometer)
- 13. Wind direction
- 14. Wind speed & direction (ultrasonic anemometer)
- 15. Solar radiation
- 16. Air temperature & relative humidity
- 17. Barometric pressure (compartment)

Oceanographic

- 18. Water velocity profile (moonpool)
- 19. Salinity and water temperature (moonpool)
- 20. Wave spectrum (compartment)
- 21. Water temperature (compartment)

BUOY LOAN PROGRAM

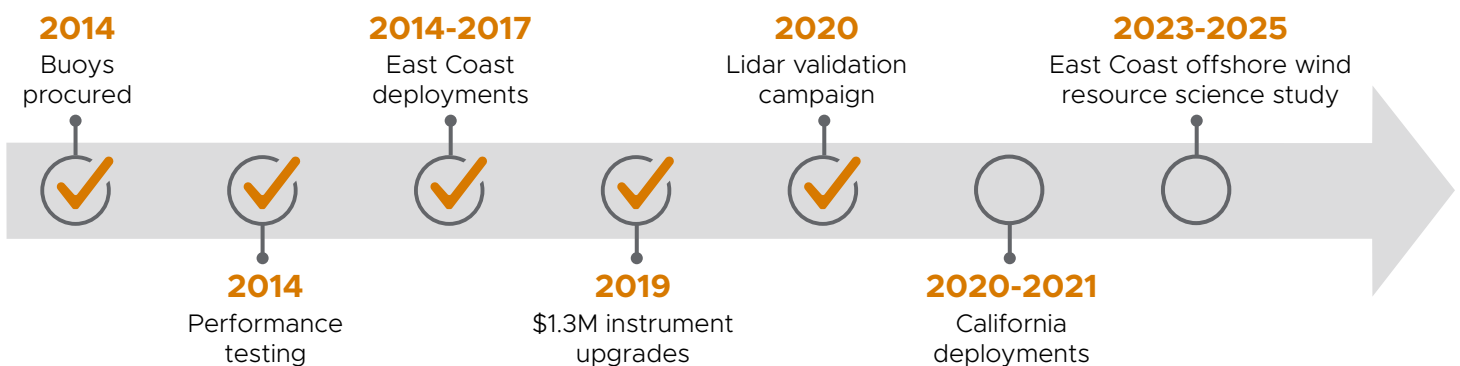
PNNL administers a buoy loan program through which the buoys may be loaned to qualified parties for the purpose of acquiring wind resource characterization and oceanographic data in areas of interest for offshore wind energy development in the U.S. The program represents an opportunity for WETO and organizations with an interest in offshore wind energy to work

together, providing valuable and focused offshore data to the wind energy community in high-priority locations.

Organizations that want to use the buoys for their research should submit an application to the buoy loan program for evaluation. Selected applicants will be invited to negotiate loan agreements.

BUOY ACTIVITY

The lidar buoys have been deployed on the East Coast (Virginia and New Jersey) and West Coast (California) to support U.S. offshore wind development. The buoys have undergone performance testing, significant upgrades, and a lidar verification campaign, as shown in the timeline below.



ANALYZING BUOY DATA

Buoy data are used to validate wind models, improve the understanding of air-sea interactions, and reduce uncertainty and risk in characterizing offshore wind resources. Data analysis includes:

Wind profile: Lidars aboard the buoys provide wind information at twelve heights from 40 m to 250 m above the sea surface, including gusts and vertical winds by season and time of day, depending on the length of deployment.



Near-surface measurements: Near-surface horizontal wind speed, direction, temperature, pressure, relative humidity, and solar radiation.



Sea state: Significant wave height, wave period, wave direction, and profiles of ocean current speed and direction.





DATA ACCESS

The collection and dissemination of buoy data for the benefit of the public and industry is critical to the program. Data obtained from lidar buoy deployments are stored in the Atmosphere to Electrons (A2e) [Data Archive and Portal](#), which is managed by PNNL data management and computer scientists.

THE PORTAL IS DESIGNED TO:



collect



store



curate

collect, store, curate, catalog, preserve, and disseminate the massive amounts of experimental and computational results generated by wind research.



catalog



preserve



disseminate

The system provides the wind research community with secure, timely, easy, and open access to the wind data, including laboratory, field, benchmark modeling, and offshore wind data.

ABOUT PACIFIC NORTHWEST NATIONAL LABORATORY

Pacific Northwest National Laboratory draws on signature capabilities in chemistry, Earth sciences, and data analytics to advance scientific discovery and create solutions to the nation's toughest challenges in energy resiliency and national security.



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