Balloon-Borne, Barge-Mounted Wind Measurement Platform

SAND2019-8110R

Applicant Name: Sandia National Laboratories (SNL)

Project Title: Development of a Balloon-Borne Barge-Mounted Wind Measurement Platform

Area of Interest: Innovative offshore wind resource assessment system that can achieve data accuracy comparable to a met tower and autonomy comparable to a floating lidar system for a significantly reduced cost.

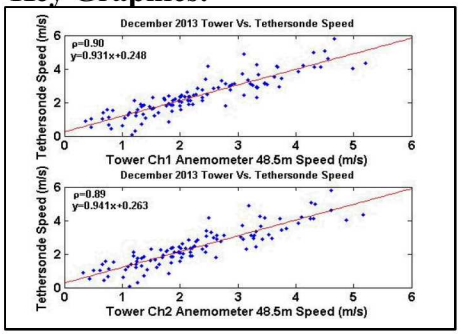
Proposed Total Project Cost:

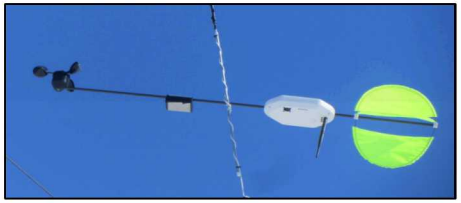
- Requested NYSERDA Funds: $1,500,000

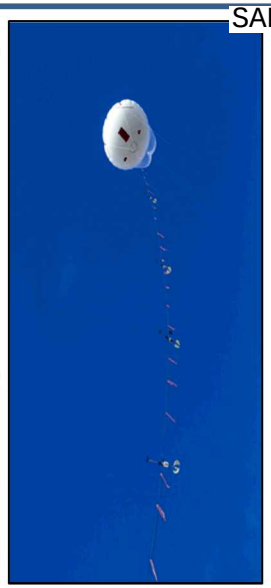
Proposed Project Duration: 30 months

Proposed Deployment Site: Terrestrial testing at existing SNL U.S. sites, BOEM offshore lease area within the Atlantic Ocean

Key Graphics:







Technology Summary: Atmospheric measurements are collected from anemometer modules (cup-version pictured) that are attached to a tether line between a balloon and barge at user-specified intervals. Each module samples wind speed, wind direction, pressure, temperature, relative humidity, and GPS-derived latitude, longitude, and altitude in situ at 1 Hz or faster and transmits the data wirelessly to a base station on a barge. Fiber-optic based distributed temperature sensing (DTS) also provides an almost continuous atmospheric temperature profile with a vertical spatial resolution of 0.25 m.

Description of the Technology's Impact: The system is more easily and quickly relocated, deployed, and less environmentally-invasive than offshore met towers. Compared to existing offshore lidars the in situ data from the proposed system are less subject to impacts from wave-induced motion and reductions in recovery rate from higher altitudes and during certain atmospheric conditions.

Proposed Project Objectives/Goals: SNL will develop a barge-based, balloon-borne atmospheric measurement platform that operates autonomously in all but the most severe weather conditions, provides data of comparable accuracy to a tower, is more robust than floating lidar and half the cost.

Project's Key Idea/Takeaway: The end system will be capable of functioning autonomously for extended periods of time to meet customer requirements, will provide in situ measurements of wind speed, wind direction, meteorological parameters, and turbulence of comparable quality to an offshore met tower at reduced cost, provide second-scale temporal data that are not provided by existing offshore wind model datasets, and may be used to improve marine boundary layer modeling parameterization schemes and inform offshore turbine design standards. Estimated annual equipment and operating costs for the system are <= $1,000,000, which constitutes a 50-90% reduction in current offshore wind resource assessment costs.