Sustained, Sustainable, Atmospheric Research At UNH

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APPLEDORE ISLAND, MAINE -- The wind turbine off in the distance is flopped over on its side – the 11-foot blades suspended just above the ground at one end and a 2,000-pound, bulbous, galvanized steel counterbalance pitched into the air at the other.

The unique turbine isn't broken; it was lowered from a height of 80 feet to test the ability to bring it down at the drop of a hat should foul weather set in or should the migratory songbirds and nesting seabirds that frequent this 95-acre island run afoul of the whirling blades.

Indeed, that the newly installed wind turbine can be lowered with ease by one person at the flip of a switch is the key reason local, state, and national permits were granted for its construction on Appledore – the largest of the nine Isles of Shoals some six miles off the coast of New Hampshire and Maine and the site of the Shoals Marine Lab (SML) operated by Cornell University and the University of New Hampshire.

The island is also home to one of the six atmospheric observatories run by UNH in the region as part of its AIRMAP program, which funded $83,000 of the $120,000 price tag for installing the turbine, the balance coming from SML operating revenues.

AIRMAP, funded by the National Oceanic and Atmospheric Administration, is housed at the Climate Change Research Center within the UNH Institute for the Study of Earth, Oceans, and Space. The nine-year-old air quality and climate program seeks to unravel fundamental chemistry-climate connections in New England directly downwind from major U.S. urban emission sources.

The AIRMAP observatory here on Appledore is largely housed in a monolithic, concrete, World War II surveillance tower that rises 60 feet into the air (120 feet above sea level) and once stood vigil for German U-boats. The tower roof is now agleam with state-of-the-art scientific instrumentation. The wind turbine delivers its power to a 7,000-pound rack of batteries in the tower and is then converted from DC to AC power.

For the past seven years the observatory has gathered an ever-growing wealth of scientific data on continental and marine air masses that co-mingle over the ocean and change chemically and physically. But until now, with the wind turbine poised to generate as much as 7.5 kilowatts of power, scientific study was conducted only during the summer months when the island's diesel generators churned away before being shut down in late summer.

"We just don't have a picture of what happens in the atmosphere out here in the winter, and that really led us to evaluate an alternative energy source," says AIRMAP project director

Kevan Carpenter.

After pondering the alternatives, Carpenter suggested a collapsible wind turbine as the most practical and sustainable method of keeping the observatory operating year-round. It took nearly two years of paperwork to get the turbine up and running because of the complexities involved with placing the 80-foot tower on the small, remote island where the SML has operated a bird-banding station since the 1970s.

In addition to allowing the AIRMAP observatory to operate year-round, Carpenter notes that the wind turbine is helping to spawn greater possibilities for the application of sustainable technologies and related educational opportunities through the SML. This summer the lab installed eight solar panels that generate some 2.2 kilowatts of power. In the future, more panels could be installed and, should all fare well with the island's bird population, a larger wind turbine could be installed to bump up the kilowatts generated.

As far as AIRMAP's need for year-round air quality and climate data, the program's principal investigator, Robert Talbot, notes that in order to accurately look at and understand the complexities of the atmosphere in this region where marine and continental air masses converge, data from all seasons are needed.

"With just five months of data, you get a snapshot and it doesn't provide the type of information you need to understand the big picture," Talbot notes.

Long-term, year-round data from other land-based AIRMAP observatories have provided this bigger picture view. But gathering data at sea, typically by boat during a short-term scientific cruise, is prohibitively expensive and makes continuous measurements impossible.

Says Talbot, "To really look at how climate change is affecting air quality, you need to look at the variability from year to year, that's how you figure out the climate impacts."

More information on the wind turbine and the AIRMAP program can be found at http://airmap.unh.edu.

Photograph available to download here: http://unh.edu/news/img/IMG_6761_2_2.jpg.

Caption: AIRMAP project director Kevan Carpenter, left, and Robert Pechie, engineer and CEO of Northeast Wind Energy, work on the wind turbine recently installed on Appledore Island. Pechie designed the custom-built tower. Photo by David Sims, UNH-EOS.