FAQ’s about Shoals Marine Laboratory’s Green Energy Program November 2011

Q: How much green electrical power can SML’s wind and solar systems generate?
A: The Bergey wind turbine is rated at 7.5 kW. The best output is at wind speeds between 12 and 14 m/s (27 to 31 miles/hour) and will produce 7 kW. Our solar array of 31 panels is rated at 7.5 kW.

Q: How does SML use green power?
A: Our wind turbine and solar panels charge a battery bank located in the Tower, which powers the Tower (including year-round power for AIRMAP’s instruments on the tower) and Dorms 2 and 3. In 2011, Kingsbury House joined the green grid.

Q: Can this green power be integrated directly into SML’s island power grid?
A: Yes, but this will require more investment. An alternative is to store power in high capacity fuel cells.

Q: What are SML’s total electrical needs? Would it be possible to generate most of SML’s electrical needs using wind and solar power systems?
A: SML’s base electrical load on Appledore Island is about 30kW, which we currently generate using diesel generators. To ensure continuity of supply from alternative electrical systems that are not connected to a mainland grid, a good rule of thumb is to install enough capacity to double the base load, i.e., we would need about 70kW of capacity from a combination of wind and solar systems. This is feasible to do, based on our successful demonstration of wind and solar technologies on Appledore.

Q: How much did it cost to install the wind turbine?
A: When we installed it in 2007, the 7.5 kW wind turbine system cost about $95,000. This included the turbine, mast, inverters, batteries, cables, parts, and labor. Most of the expense of turbine purchase and installation was funded by a grant from NOAA to UNH’s AIRMAP program.

Q: Where did SML’s solar panels come from? How much did that installation cost?
A: SML’s first solar panels were part of a donation to Cornell from MOOG Corporation organized by Cornell Alum Dick Aubrecht. Since then, we have purchased additional panels with support from NSF and SML donors. Solar installation occurred in three phases: phase 1 in 2007, phase 2 in 2008, and phase 3 in 2010. Excluding panels, installation cost about $40,000 in parts and labor.

Q: How much would similar panels cost in today’s market?
A: The price of panels fluctuates, but our most recently purchased panels cost about $700 each.

Q: What were the sources and costs for the other needed components?
A: Cables, combiner boxes and brackets came from Berkshire Photovoltaic Services. Inverters, charge controllers and electrical panels came from GroSolar (http://grosolar.com/).

Q: How much diesel fuel does SML burn each summer to generate electricity?
A: Over the last 15 years, SML purchased an average of 9,700 gallons per year (146,000 gallons total) for a total cost of $240,000. Diesel consumption – whether measured by total gallons or by gallons per day – decreased over the last four years (see charts on other side of this sheet). This resulted from conservation (e.g., compact fluorescent lighting), removal of Dorms 2 and 3 from the island power grid, use of our smaller generator whenever possible, and shortening our operating season. We also work to time our fuel purchases to save as much as possible.

Q: How much would it cost to greatly reduce or eliminate SML’s reliance on fossil fuels?
A: We need a mix of wind and solar power to provide a base capacity of at least 70kW. This could be done in several ways. For example, we could install four more wind turbines of similar size and four solar arrays of similar size to our existing system. Other combinations and ratios of wind to solar power are possible, but $800K is a good high-end estimate for the mixed systems we would need.
How were these diesel fuel savings achieved?
A. Conservation (e.g., compact fluorescent lighting)
B. Removal of Dorms 2 and 3 from the island power grid
C. Use of our smaller generator whenever possible
D. Shortening our island operating season
E. Carefully planning fuel purchases

How can we save more diesel fuel in the future?
A. Conservation (e.g., LED lighting, more efficient appliances, and pumps)
B. Add more solar and wind power
C. Add battery storage capacity to reduce peak loads
D. Use additional freshwater sources to limit need for reverse osmosis of saltwater