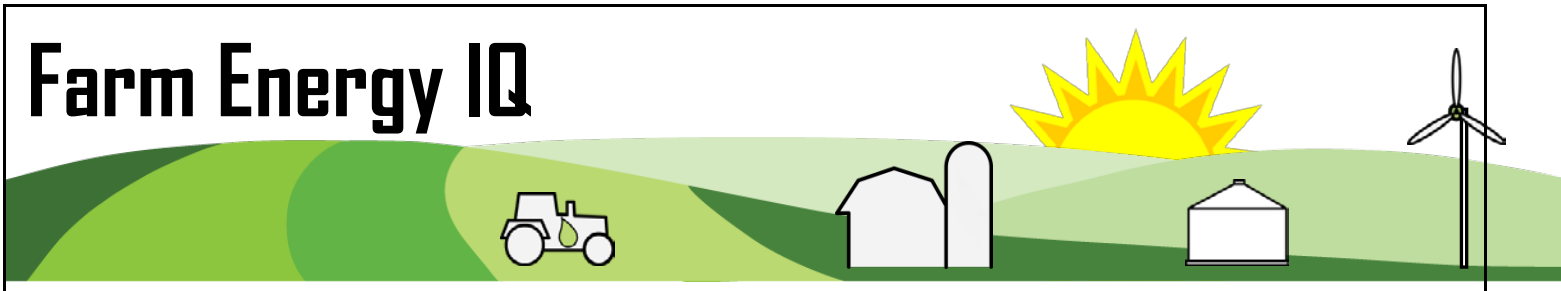
Farm Energy IQ



Wind Energy on Farms – Agricultural Service Provider Presentation Script

The intent of this lesson is to provide information and skills to the attendees who have an interest in wind energy applications as a means to reduce farm energy costs.

Slide 1: Title.

Slides 2 and 3: Introduction. The presenter introduces self and points out that wind applications are necessarily technical in nature. Present objectives of the module.

Slide 4: Graphic of large scale wind turbines.

Slide 5: Some of the frequently asked questions related to wind power.

Slides 6 and 7: Introduce wind energy principles including what makes the wind blow.

Slide 78The Wind Rose graphic, which is often used to evaluate potential wind generation locations.

Slide 9: Instruments used to collect wind data to determine a site's suitability for wind power. Unfortunately, this illustration shows the instruments improperly installed. The instruments should be installed at the elevation being considered for a wind turbine and away from trees and buildings that would negatively impact a wind turbine installation.

Slides 10 and 11: Data collected from a potential wind turbine site. Slide X shows the graph including the data for a year. Slide X summarizes this data as how many hours the wind speed reaches each full speed increment in m/s during the year.

Slide 12: Wind map for Pennsylvania at 80 m (about 260 ft) above the ground. Note two things: 1) 80 meters is pretty high and 2) even at 80 meters, there are few locations where the 5 m/s (minimum) wind speed occurs. Clearly the ridge(s) and the region adjacent to Lake Erie are the best choices for wind power in Pennsylvania.

Slides 13 through 15: The quantitative relationship between wind speed and height above the ground affects performance. The slides are intended to help participants understand the effects of height above the ground mathematically, to supplement the wind map concepts.

Slide16: Introduces the concept of the Betz Limit—which defines how much energy may be extracted from the wind by a turbine.

Slide 17: Illustrates a large scale wind turbine so the student can visualize the components employed in producing electricity from the wind.

Slide 18: Limits to how much energy may be produced. Turbines are designed to shut off for safety and to protect the equipment when wind conditions occur beyond equipment design conditions.

Slides 19 through 21: The efficiency of the converting wind energy into electricity, including the meanings of capacity factor, efficiency aspects, and difference between average output and peak output are described. It is important to keep in mind that a wind turbine does NOT produce its rated output all the time.

Slides 22 through 26: The effect of the height of the wind turbine above the ground affects performance. Since average production is estimated assuming a 5 meter/second average wind speed, figuring out what the average wind speed at a particular location (and height) is an essential factor in producing an economic analysis.

Slides 27 through 29: Photographs of various wind installations: at the office, at the shore, and in Minnesota.

Slides 30 through 32: Energy estimation based on manufacturer's ratings and expected wind conditions on site, including a revisit to the 30 m wind map.

Slides 32 and 33: The development of a simple payback calculation for a small wind turbine installation.

Slides 35 and 36: A basic wind calculator that can produce a rough cost benefit estimate for a small wind installation. Slide 35 provides the URL for the calculator.

Slide 37: Legislation affecting the economics of small wind installations in PA.

Slide 38: Place holder for questions.

This project supported by the Northeast Sustainable Agriculture Research and Education (SARE) program. SARE is a program of the National Institute of Food and Agriculture, U.S. Department of Agriculture. Significant efforts have been made to ensure the accuracy of the material in this report, but errors do occasionally occur, and variations in system performance are to be expected from location to location and from year to year.