

SDSM&T Wind/Solar Energy Initiative

May 2009

Introduction:

Dr. Robert Wharton became president of South Dakota School of Mines and Technology on July 1, 2008. One of his first initiatives was to appoint a campus-wide task force to make recommendations regarding the establishment of a Renewable Energy presence on campus.

Dr. Wharton supports the recommendation of the task force to install wind turbines and an array of photovoltaic (PV) panels on Smelter Hill (the hill southeast of the main campus overlooking the football stadium). These wind turbines and PV panels will provide an opportunity to incorporate renewable energy into engineering and science curricula, provide meaningful research opportunities for engineering and science students, and establish collaborative outreach activities for the community and K-12 teachers and students. Discussion among the task force members identified potential involvement by the following programs: Chemical Engineering, Atmospheric Science, Metallurgical Engineering, Mechanical Engineering, Civil Engineering, Environmental Engineering, Electrical Engineering, Computer Engineering, and Interdisciplinary Sciences. As the facility is installed and becomes more widely known on campus, more programs will likely find a way to incorporate the facility into their curricula. The knowledge of renewable energy principles is going to be an increasingly important skill for students as they compete for technology jobs in the future.

Community Outreach and K-12:

The wind/solar facility will provide opportunities for the South Dakota School of Mines and Technology to collaborate with K-12 teachers and students as well as other segments of the community. The most logical start for the K-12 partnership is the *Wind for Schools* program which operates under the direction of NREL and DOE. This program uses wind energy to help K-12 students learn about math and science. Opportunities will exist for Mines' students to visit local schools and deliver engineering and science programs centered around the wind/solar facility. There will also be opportunities for summer program involvement and internships for students interested in wind power engineering with national laboratories, states and private industry.

Black Hills State University and Western Dakota Technical Institute are interested in installing wind facilities on their campuses. The School of Mines will be able to provide complementary education at those facilities and, by collaborating with them, cover a range of technical skills that will be needed as renewable energy becomes more established in the region.

The Proposal Components:

The wind/solar facility will consist of three components: a single 20 KW ReDriven Wind Turbine (79' hub height and 40' blade rotation diameter), a single 2.4 KW Skystream 3.7 Wind Turbine (33' hub height and 12' blade rotation diameter), and 3 EnPhase Photovoltaic panels. Each of the components will be tied to the grid system; however, the main purpose of the facility will be to support and enhance educational opportunities. Both wind turbines will be tilt-down units for easy access to the turbine hub and blades.

The design methodologies for wind turbine foundation systems are lacking and very over-conservative. The ability to perform full-scale instrumentation research affiliated with foundation designs is a primary reason for choosing the 20 KW ReDriven Wind Turbine. Instrumentations will provide data to determine allowable bearing capacity, settlement characteristics, and rotational stiffness characteristics of the soil.

The ability to use software packages to assist with wind turbine blade design is a primary reason for choosing a 2.4 KW Skystream 3.7 Wind Turbine. Blade design and blade fabrication are two areas that provide educational and research opportunities at South Dakota School of Mines and Technology.

The time table for project expected completion is September 2009.