**STUDY PROJECT ON RENWEABLE WIND ENERGY RESOURCES**

**ABSTRACT:**

Wind energy installations are leading all other forms of new energy installations in the United States and Europe. In Europe, large wind plants are supplying as much as 25% of Denmark’s energy needs and 8% of the electric needs for Germany and Spain, who have more ambitious goals on the horizon. Although wind energy only produces about 2% of the current electricity demand in the United States, the U.S. Department of Energy, in collaboration with wind industry experts, has drafted a plan that would bring the U.S. installed wind capacity up to 20% of the nation’s total electrical supply. To meet these expectations, wind energy must be extremely reliable. Structural health monitoring will play a critical role in making this goal successful. Currently, commercially available condition monitoring systems are used in all multi megawatt turbines. Site maintenance crews are learning how to best process and use the complex information provided by these systems in their operational strategies. Those who can best synthesize the huge volumes of raw data are able to improve their maintenance efficiency, schedule just-in-time repairs, minimize downtime, and maximize their energy production. However, wind turbines operate in very stochastic environments with dynamic loading. This makes damage rate prediction very difficult. Drive trains are monitored today because of their notorious failure rates and cost to repair. Blades and other major components require unexpected maintenance as well, but they are not monitored. This is due to the lack of a cost-effective and viable monitoring method. There may be other health monitoring opportunities for wind plants. For example, is it possible to use condition monitoring systems to synthesize the huge volumes of data for the full turbine operating behavior and correlate it with turbulent wind conditions that are leading to premature damage? Is it possible for real time control strategies to adapt to these conditions and extend the life of major components? These are the challenges for structural health monitoring in the wind industry.