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Chapter 1 : @ Renewable Energy Handbook :> More Information

The use of renewable and alternative energy sources can save us money, assure that our grandchildren and great grandchildren will have enough energy, and free us from the uncertainties of depending on energy supplies outside the United States. Types of Renewable and Alternative Energy There are several renewable energy sources that are in use today.

Protect your investment before the damage begins! AeroTorque RE Handbook For wind-turbine drivetrain applications, some designs are better suited than others. Flexible couplings in wind turbines are used on the high-speed the output shaft of the gearbox to drive the generator. While the gearbox and generator are bolted to a frame, it is not the large concrete inertia base frequently used in ground-level production settings. Regarding misalignment, the couplings must accommodate it in considerable radial, angular, and axial form without wear and maintenance. In addition, couplings should provide electrical insulation, an ability to handle loads well beyond the normal application needs, and weigh as little as possible for easy installation. One such coupling, from Zero-Max, provides an example of the features useful to a wind turbine. For instance, it is available as an upgrade replacement for existing wind turbines and for OEM applications. The company says the design has been tested under conditions simulating a year load spectrum of continuous operation. In addition, the turbine couplings are said to handle torque spikes and high misalignment issues. The coupling comes with composite disk packs the elements that let it flex at both ends of a center spacer that is made of composite or steel. The coupling further protects the generator and gearbox bearings by transferring lower reaction loads. Designed for onshore and offshore turbine drivetrains with capacities up to 5 MW, the couplings are said to provide extreme endurance in a lightweight package. Lastly, the units are easy to install either on the production floor or in the cramped, up-tower environment and they operate well in new OEM turbines or existing drivetrains. Standard models and sizes include single and double flex models with clamp style hubs with or without keyways. The torque capacities range from 40 Nm to 1, Nm and beyond with speed ratings that start about 4, rpm. Established designs for slip torque values ranging from 4, to 50, Nm. The encoder has been mounted on a slip ring for installation in a wind turbine. Key attributes to consider when choosing encoders include electrical characteristics such as operating voltage and output configuration , shock and vibration resistance, operating temperature, lightning protection, and maximum shaft load. Turbine generators also rely on precise feedback to properly control and synchronize energy output with line frequency. Disruption of these processes can lead to poor turbine performance, downtime, or costly repairs. Encoders are small devices that play a big role in productive wind-turbine operations. These sensors provide reliable feedback for wind speed, control, over-speed protection, and position. Absolute encoders, which measure the absolute rotation angle, are typically used to provide feedback on blade pitch and the azimuth or yaw angle of a nacelle. But weather and environmental concerns are also an issue. Wind turbines present harsh conditions for instrumentation, including extreme temperatures, moisture, dust, and other contaminants. Safety is also an important consideration. For yaw positioning, choose encoders with integrated end switches, says Fell. Because these end switches are derived from the encoder position, a safety rating of at least SIL2 is necessary. Granted, this is assuming a wind technician is set and ready to safely climb uptower. But the wind industry is slowly beginning to incorporate another option. Magnetic encoders are available in incremental and absolute versions. These sensors can detect a change in magnetic field and convert this information to a sine wave. They are ideal for use in wind turbines because of how well they withstand high temperatures and environments with extreme shock and vibration. This reduces wear and prolongs longevity â€” the goal for any turbine owner or manufacturer. That trend may continue with global wind capacity predicted to double in the next five years, according to the Global Wind Energy Council. This growth trend is thanks, in part, to a developing offshore wind market and larger wind turbines with longer blades. Kirk attributes materials and manufacturing for letting turbine blades keep up with ever- Advanced materials and manufacturing processes means blades can efficiently and cost-effectively keep up with the installation of taller towers and larger wind turbines. CompositesOne 34 growing towers. Composites are made of two or more materials with different

physical or chemical properties that when combined, do not fully blend but together become stronger and more durable. Materials for the wind-turbine blade market include resins of glass fiber reinforced polyester, glass fiber reinforced epoxy, and carbon fiber reinforced epoxy. In addition to these mechanical properties, the finished product must offer excellent corrosion resistance and a high-temperature tolerance. The materials can also be used for other turbine components. Rotor blades are arguably one of the most influential pieces in terms of the cost of energy. The new process extends the rotor diameter by attaching variable tip lengths, without the added expense of building a new blade mold. The first is to inspect the land and determine whether it is possible to obtain construction permits. Next, a developer must analyze the wind resource at the site. This involves measuring wind speed to ensure it can generate enough energy to create revenue, and deciding on which turbines will work longest and require the least possible maintenance. A developer then has to examine the grid connection, which is necessary to export power and earn revenue. The costs and capacities of a grid connection vary depending on location. Finally, environmental restraints must be weighed. Constraints may include ecological concerns, noise, shadow flicker, and visual impact. When siting a location for a wind farm, several protocols are worth observing for success. Most important is conducting a professional wind-measurement campaign. To obtain the most reliable data possible, developers should use quality instruments to collect data at the wind-turbine hub height for at least one full year prior to installation. As wind turbines get taller and blades longer, it is critical to measure wind speeds at hub height and within the vertical profile of the swept area of the blade. Failure to obtain accurate wind measurements could jeopardize the chances of getting turbines certified for a site. These surveys consist of studying the ecology and ornithology of the site, peat probing a soil analysis , noise modeling, and visual studies. The goal is to avoid or minimize potential impacts on the environment. The available transmission capacity is also important to inspect, said Haley. Depending on the upgrades or additions necessary to accommodate the wind farm, the transmission connection could be a major cost item, which feeds into the financial feasibility of the site. Parcell explained several other sensitive features worthy of consideration in siting protocols, such as the internal track layout and access points to the site based on its topography and site survey results. Together, all of this information can help accurately determine the optimal turbine layout for the site. Developers are often met with challenges when performing site assessments. To help combat issues that arise, it is important to plan ahead and devise specific plans of action. Another important task for developers is to strategically identify and solve challenges early on in the development process. Common issues include reducing the effect of wind turbines on aviation radar, managing forestry to maintain the safety of animals, and compensating residents on or near a proposed wind farm, said Parcell. Developers must also understand the requirements of banks and lenders whom they are working with to avoid costly delays. During the development of a wind farm, it is also necessary to involve the community in the process. It is common to see a planning committee determine wind-farm planning applications. These committees are typically made of elected members of the community who will represent the views of their constituents, which emphasizes the importance of gaining local support. Wind development comes with its own unique and often subtle development challenges that can easily make or break a project. A full understanding of those subtle industry differences can save time, cost, and potential pitfalls when developing a new wind farm. In a nutshell, the trends have been working to trim time and cost from the work that goes into a wind farm and that has led to new equipment and construction methods. The principles of lean manufacturing are being applied to trim waste time and labor as it is found in construction activities. On the financial side, the big stimulus to get things done as quickly as possible has been the Production Tax Credit. It provides about 2. Before that, however, the wind construction industry will remain working at full speed using modern construction equipment and methods. The notable new feature on the crane is the variable position counterweight that shortens work time. The weight moves on a track either away from the crane cab or toward it to keep the center of gravity over the crane tracks. The capability has several plusses. For one, the crane need not set up for every lift on a jobsite. It can be erected and set up once and then the crane adjusts itself for different lifts. The moving counterweight means less overall counterweight is needed for work. On conventional high-lift cranes, counter weights some in ton A tower and rotor are ready for assembly at the Tucannon River Wind Farm during construction in the summer of One piece of equipment

in particular is the MLC crane from Manitowoc. The VPC MAX option increases the cranes capacity from to tons, and the luffing jib adds to the standard ft. Building on the ground is easier than lifting and fastening each blade to a hub ft. Also, a wider track than the in. Another factor that has improved wind farm construction is the application of lean construction principles. These come from lean manufacturing principles that have the goal of identifying and eliminating waste from every step in a project. Modular Fire Suppression to select the areas you want to protect. Wind turbines present a unique challenge for fire suppression. Airflow, vibration, dust and temperature all work against traditional fire protection and suppression. And, they do it faster and more productively so you save time and money! Call or visit www. One construction crew leader, for example, says that after each project, subcontractors and other bosses gather to discuss what slowed things down and how to eliminate them in the next job. For instance, the wind farm was sited to avoid all wetlands and surface water, floodplains, steep slopes, and other potentially fragile or hazardous terrain.

Chapter 2 : @ Handbook Of Renewable Energy Technology :> More Information

Bill is a leading expert in small and mid-scale renewable energy technologies. He is the author of the best selling books The Renewable Energy Handbook and Biodiesel: Basics and Beyond. Mr. Kemp is a co-author of the David Suzuki Foundation report Smart Generation; Powering Ontario with Renewable Energy.

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