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2014 Renewable Energy
Handbook

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Towers

A few of the factors that drive development and selection of towers and foundations include larger rotors, increased turbine capacity, cost-of-energy reduction initiatives, repowering existing wind farm sites, and increased hub heights systems.

The tubular steel tower and conventional cast-in-place foundation has been the go to system since the industry set its sights on the 60 to 80 m hub height for 2.0 to 2.5 MW turbine. The advance to 3.0 MW and larger turbines and 100 m and higher hub heights has opened the door for many tower design alternatives that have been deployed, and more in various stages of development. There is no end in sight as long as turbine and blade technology continue to advance.

The menu of tower solutions now includes hybrid (steel and precast concrete) systems, full height, precast-concrete towers, lattice steel towers, and wood and composite systems. However, the tubular steel tower remains the predominant choice.

No single component of a turbine installation is independent in terms of function and performance of the entire system. What this means for towers and foundations is that as turbine output increases by generator technology, rotor diameter, hub height, or other contributing variables, the tower and foundation will play a larger role in the overall system. Consequently, it will be tuned more precisely to become more interdependent and integrated with the other elements of the installation along with performance requirements of specific systems, and specific geographic and regulatory considerations.

The next evolution of towers and foundations has begun and is evidenced by the installations of systems not exclusively tubular steel on conventional foundations. One German turbine manufacturer has developed both hybrid and full height concrete towers in addition to their tubular-steel towers for their proprietary turbine systems. Other examples of a higher degree of integration of tower and foundation is a U.S. hybrid tower system and the recently developed Atlas Tower of full height precast concrete tower.

The hybrid system supplements the capabilities of the tubular steel tower and at the same time, increases the hub height and uses an efficient ring foundation that reduces the investment required in a foundation. This full height, precast concrete tower is for hub heights of 100 m and higher that provide static and dynamic support needed for turbine installations. It also provides a portion of the mass required for vertical stability of the turbine installation that would otherwise be part of the foundation. The efficient use of materials and integrated systems reduces the investment that would be required in the concrete foundation and the overall installation.

For every tower and foundation design, there are new developments in materials technology, manufacturing techniques, and logistics. There is no end is sight to the demand for electrical power, demand will translate into future towers and foundations that support higher output turbines, larger rotors, and greater hub heights. Their components are likely to be fabricated near site or are modular and easily transported to the turbine site. The tower systems may include more exotic materials and more efficient methods of installation.

By Chris Palumbo, VP of Business Development, Tindall Corp.