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Large Wind Turbine Machines for Generation of Electricity

Current popular design

Single tubular tapered tower

Three bladed axial turbine attached to:

The top of the tower with a nacelle containing generator, associated gearing and controls designed to turn automatically to have the turbine face the wind. (yaw control)

Concerns with this design:

The heavy assembly mounted atop the tower necessitates keeping weight to a minimum. Moving all or part of this unit to ground level would be advantageous by:

- 1. Reducing the cost of the gearing and generator which now require aircraft type light weight construction and its associated tolerances, costs and long delivery times.**
- 2. Reducing cost of tower. (Strength requirements reduced).**
- 3. Making service to the generator/gearbox accessible from the ground.**
- 4. Reducing the diameter of the tower to lessen its shadow effect on the wind striking the turbine.**

Suggested design changes

Use a vertical shaft generator and gearbox and mount it inside the base of the tower at ground level.

Mount a simple gearbox at the top of the tower containing two 45 degree bevel gears attached to the horizontal turbine shaft and connecting to a vertical tubular shaft reaching down to the gearbox/generator shaft.

Advantages in addition to those above.

- 1. The current design necessitates rotating a heavy assembly**

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to steer the turbine to face the wind. The steering motors must be sturdy enough for this mass and they also contribute to the mass of the structure. The suggested gearbox is inherently steerable to permit 360 degrees of rotation and it would be much lighter than the current tower-top assembly.□

2. With the present design and the need for steering the turbines electrical output power must be fed through slip ring type devices to reach the ground. With the proposed generator/gearbox fixed in the base of the tower these slip rings would not be needed.□

Possible Disadvantages:

1. The present design allows the heavy generator/gearbox assembly to counterbalance the weight of the three bladed turbine keeping the mass at or near the centerline of the tower.□

(Would a dual pair of smaller turbines opposing each other on opposite sides of the tower work ? Or is the off-center mass a problem ?) □

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