



KINGDOM COMMUNITY WIND FACT SHEET

Green Mountain Power partnered with Vermont Electric Coop to build 21 wind turbines in Lowell, VT as a new source of renewable energy in Vermont. The project began generating electricity in November, 2012.

About the Turbines

1. *How many turbines are there?* 21
2. *What's the make and model of these turbines?* 3 MW VESTAS V112
3. *How much energy is made by KCW?* About 180,000 MWh per year, enough to power 24,000 homes
4. *Where does the power go?* All of the energy is used by GMP and VEC customers
5. *How much CO2 is displaced by KCW?* About 75,000 tons each year
6. *Where were the turbines manufactured?* The towers and blades: Colorado. The nacelle: Denmark
7. *How tall are these wind turbines?* The tower is 273 feet tall. From the ground to the blade tip is 443 feet.
8. *How much does a turbine weigh?* About 500 tons
9. *What are the towers made of?* Steel
10. *What is the diameter of the tower at the base?* Approximately 12 feet
11. *How long are the blades?* 170 feet
12. *What are the blades made of?* Carbon fiber skeleton with a fiberglass cover
13. *How much do the blades weigh?* About 15 tons each
14. *Are there elevators inside the towers?* There are ladders and two-person lifts
15. *How are the tower sections joined together?* They are bolted together on the insides of the towers
16. *Why is the tower door so high off of the ground?* The space between the bottom of the tower and the door contains electrical switch gear. For safety, specifically the avoidance of arc-flash, personnel in the tower are physically separated from this switchgear.

Turbine Operations

17. *How fast do the blades spin?* The blades rotate at up to 14 RPM. At 14 RPM, the outside tip travels at 170 MPH
18. *At what wind speed do the turbines start to turn?* About 8 MPH
19. *At what wind speed do you reach the maximum power generation of 3 MW per turbine?* About 29 MPH
20. *At what wind speed do you have to shut down the turbines?* About 55 MPH
21. *Do the towers sway in the wind?* The tower is intentionally flexible and sways as much as 10 feet at the top.
22. *What happens when there's lightning?* Personnel leave the mountain top; the turbines continue to operate
23. *Do the turbines have lights?* The FAA requires lights. KCW has 8 red LED lights that blink slowly and do not create glare, similar to the ones atop communications towers. We are awaiting FAA approval to use Obstacle Collision Avoidance System (OCAS) radar, which allows the lights to stay off unless aircraft are in the area.
24. *What are you doing to protect bats?* The operation of the turbines is regulated based on the atmospheric conditions that affect the behavior of bats, include the season, time of day, wind speed, and temperature.
25. *Have any birds or bats been killed?* As of August 26, 2013, 30 birds and 11 bats have been killed by the turbines. None of these have been on the endangered list. To put this into perspective, each year about 33,000 birds are

- killed by wind turbines in North America. In that same period, about one billion birds die flying into buildings or windows, and a half billion birds are killed by cats. Source: www.sibleyguides.com and US Fish and Wildlife Service.
26. *What are the painted rocks?* They guide the wildlife team in making a complete search for dead birds and bats.
27. *How loud are the turbines?* Vermont has strict standards for wind projects: no more than 45 db outside the nearest residence--roughly the noise level of a quiet library. The two nearest homes to this project are 0.7 miles and 0.9 miles. After thousands of hours of sound monitoring, the project has been in compliance 99.9% of the time. We are installing new equipment so that we reach 100% compliance.

Construction and Conservation:

28. *When was the project built?* The project took about 18 months to build, and came on line in November, 2012.
29. *How many people worked on the project?* Over 200. More than 100 Vermont firms were involved in various phases of the project. At the height of construction, more than 150 Vermonters were working on the mountain.
30. *Who did the crane work?* Reed and Reed
31. *How much land was disturbed?* About 135 acres. Of this, about 40 acres is being re-vegetated using mulch produced from the project itself. This re-vegetation is visible on the side slopes of the roads and turbine pads.
32. *How many mitigation acres did GMP secure?* About 2,800 acres
33. *How far from the Route 100 are the turbines?* About 1 to 2 miles, depending on the turbine
34. *How long is the crane path from T1 to T21?* About 3.8 miles
35. *How much concrete is in the turbine pad?* About 90 cubic yards. Other applications of the V112 require 500 cubic yards of concrete per turbine pad. Our amount is significantly less because we quickly hit bed rock.
36. *How many tower bolts are there?* 70 on the outside plus another 70 on the inside
37. *How deep do the tower bolts and anchor rods go?* Tower bolts: about 12 feet. Anchor Rods: about 40 feet
38. *Where did you get the blade that is in front of the O&M building?* This blade was damaged during construction and had to be replaced.
39. *How will the development affect water quality and the environment?* We worked closely with the Vermont Agency of Natural Resources to ensure the smallest possible impact on water quality and the environment during construction and operations. This includes hydrology, water chemistry, and aquatic biota, specifically fish and aquatic insects. We conduct extensive monitoring under ANR supervision to ensure compliance.

Financial Facts

40. *How much did the project cost?* About \$168 million
41. *What is the cost of the power generated?* Between 9 and 10 cents per kWh, levelized over 25 years
42. *How many people work at KCW now?* Eight full-time employees
43. *What is the payment to the Town of Lowell?* The project will pay \$535,000 annually to the Town of Lowell, increasing by \$32,500 every 5 years, for 25 years.
44. *Will the surrounding towns receive money?* GMP has established a Good Neighbor fund for Westfield, Albany, Craftsbury, Irasburg, and Eden for the first 10 years of the project. The fund will yield approximately \$180,000 annually; payments are prorated according the amount of land each town has in a five mile radius of KCW.
45. *How much will the State Education Fund receive?* More than \$500,000 annually for the life of the project.

For more information about Kingdom Community Wind, visit www.greenmountainpower.com
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