



## Unsustainable: Wind Turbine Blades Are Piling Up In Landfills

Afterthought: these giant windmill blades cannot be recycled so they end up in landfills. Some are as long as a football field and can only be transported one at a time. How many? Over 8,000 get buried every year in the U.S. □ TN Editor

A wind turbine's blades can be longer than a Boeing 747 wing, so at the end of their lifespan they can't just be hauled away. First, you need to saw through the lissome fiberglass using a diamond-encrusted industrial saw to create three pieces small enough to be strapped to a tractor-trailer.

The municipal landfill in Casper, Wyoming, is the final resting place of 870 blades whose days making renewable energy have come to end. The severed fragments look like bleached whale bones nestled against one another.

"That's the end of it for this winter," said waste technician Michael Bratvold, watching a bulldozer bury them forever in sand. "We'll get the rest when the weather breaks this spring."

Tens of thousands of aging blades are coming down from steel towers around the world and most have nowhere to go but landfills. In the U.S. alone, about 8,000 will be removed in each of the next four years. Europe, which has been dealing with the problem longer, has about 3,800 coming down annually through at least 2022, according to BloombergNEF. It's going to get worse: Most were built more than a decade ago, when installations were less than a fifth of what they are now.

Built to withstand hurricane-force winds, the blades can't easily be crushed, recycled or repurposed. That's created an urgent search for alternatives in places that lack wide-open prairies. In the U.S., they go to the handful of landfills that accept them, in Lake Mills, Iowa; Sioux Falls, South Dakota; and Casper, where they will be interred in stacks that reach 30 feet under.

"The wind turbine blade will be there, ultimately, forever," said Bob Cappadona, chief operating officer for the North American unit of Paris-based Veolia Environnement SA, which is searching for better ways to deal with the massive waste. "Most landfills are considered a dry tomb."

"The last thing we want to do is create even more environmental challenges."

To prevent catastrophic climate change caused by burning fossil fuels, many governments and corporations have pledged to use only clean energy by 2050. Wind energy is one of the cheapest ways to reach that goal.

The electricity comes from turbines that spin generators. Modern models emerged after the 1973 Arab oil embargo, when shortages compelled western governments to find alternatives to fossil fuels. The first wind farm in the U.S. was installed in New Hampshire in 1980, and California deployed thousands of turbines east of San Francisco across the Altamont Pass.

The first models were expensive and inefficient, spinning fast and low. After 1992, when Congress passed a tax credit, manufacturers invested in taller and more powerful designs. Their steel tubes rose 260 feet and

sported swooping fiberglass blades. A decade later, General Electric Co. made its 1.5 megawatt model—enough to supply 1,200 homes in a stiff breeze—an industry standard.

Wind power is carbon-free and about 85% of turbine components, including steel, copper wire, electronics and gearing can be recycled or reused. But the fiberglass blades remain difficult to dispose of. With some as long as a football field, big rigs can only carry one at a time, making transportation costs prohibitive for long-distance hauls. Scientists are trying to find better ways to separate resins from fibers or to give small chunks new life as pellets or boards.

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