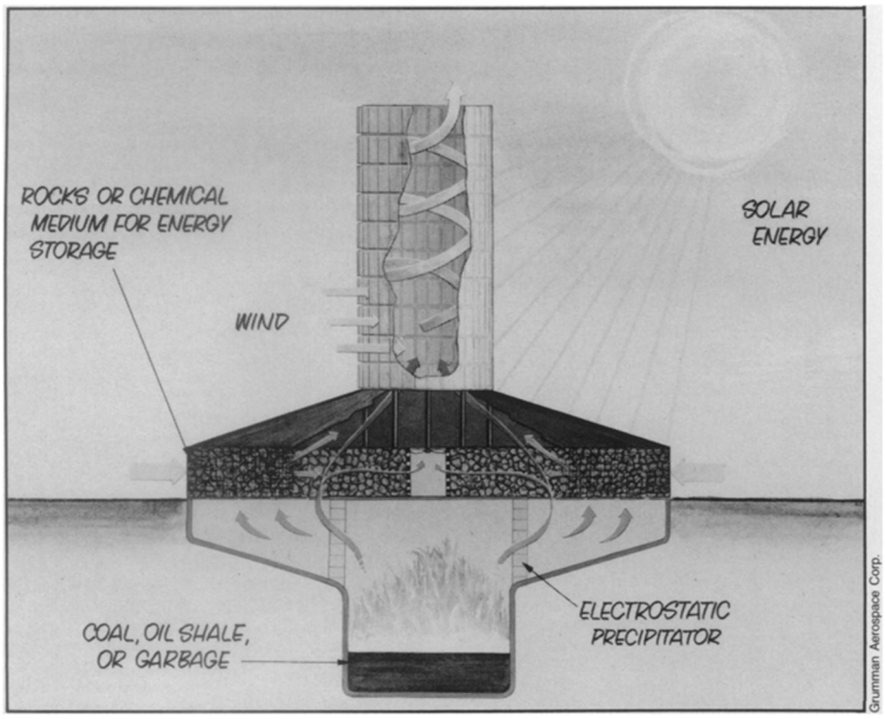
WIND ENERGY FROM THE YEN TORNADO

A novel solution is proposed to the cost, power storage and efficiency problems of wind energy converters

BY JOHN H. DOUGLAS



Wind whipped into controlled vortex inside high tower would turn generator turbines.

They have sown the wind,
and they shall reap the whirlwind.
—Hosea 8:7

The metaphor is particularly apt for a desert prophet who would often have watched a gentle breeze suddenly stir up whirling dust devils. In these miniature cyclones the wind is "sown" in a column of rising hot air, and the whirlwind "reaped" as wind speed increases, approaching the center of the column. Even a tornado is only a complex, destructive example of the simple principle that allows a ballerina to twirl faster by drawing her arms closer to her body while turning.

This principle of concentrating wind energy in a vortex may soon find another, more useful application, as scientists try to solve the problems that have plagued designers of wind energy converters. By whipping the wind into a controlled vortex inside a large tower, one creates a vacuum at the bottom, increasing the velocity of air driving a turbine by several times. Such a turbine could produce much more electrical power than a single windmill-type energy converter, and would appear to have other advantages over conventional systems.

The pioneer in developing and promoting this kind of wind-energy machine is James T. Yen of Grumman Aerospace Corp. He recently received a $200,000 contract from the Energy Research and Development Administration to test the concept. George P. Tennyson, ERDA program manager, told SCIENCE NEWS his agency wants Yen to build "a demonstration model to see if the system can really produce power cheaper than conventional wind systems."

One cost savings will come from the ability to build larger plants—in Yen's words, "to break through the one-megawatt limit" facing conventional wind devices. He foresees power generating plants of 100 megawatts or more, using the more efficient turbines possible in a vortex-type wind converter. Also, unlike windmills, the huge towers needed to shape the vortex could be prefabricated, thus saving production and erection costs. Yen estimates that while conventional, one-megawatt wind systems could produce electricity for 2.9 cents per kilowatt hour, a 100-megawatt vortex system could produce power at 0.5 to 2.7 cents per Kwhr. (By comparison, the energy cost of fuel oil at $10 a barrel averages out at around 2.0 cents per Kwhr.)

In a study commissioned by the National Science Foundation, Frank R. Eldridge of the Mitre Corp. estimated that conventional wind systems should become competitive with fossil-fuel plants in many parts of the country when the cost of fuel oil is $10 to $15 a barrel—depending on average wind speeds in an area. For vortex systems, he concluded, construction costs might be lower, resulting in even more competitively priced electricity.

But Yen did not stop there. Even while waiting for ERDA funds to demonstrate the feasibility of his tornado idea, he set about trying to find a solution to the problem that has always plagued wind-energy enthusiasts—what to do when the wind dies down. He recently demonstrated his answer to that question with a flair that has worked well in promoting his other ideas.

Invited by SCIENCE NEWS to demonstrate a one-foot-high model of his vortex machine, he bustled about unpacking an electric fan from his suitcase, pouring chemicals and talking nonstop about power factors. Just as a hapless editor was asking whether the chemicals might eat through his new rug, Yen lit a match and whoosh! up shot a vortex of fire beside a desk. Beaming with pride, but without

Yen and his vortex model.

stopping for a breath, he began to explain that even in a gentle breeze a fire at the base of a tower could sustain the vortex and keep the generator going.

In practice, the fuel for creating this updraft could be any low-grade coal or oil shale, or even garbage, he says. Also, no cooling water would be required. During periods of low electricity demand and high wind, excess energy could be converted back to chemical energy.

Several uncertainties, of course, remain. The towers required for large power plants might be as high as New York's World Trade Center, and the whirling wind inside would roar like a jet plane. But Yen is confident that these obstacles can be overcome, and increasing attention is being paid to the man who would reap the whirlwind. □