

S

W

E

N

TURBINE TOWER: Latest plans for the Freedom Tower, the tallest of the buildings to be erected on the World Trade Center site in New York City, call for an array of wind turbines at the top. The building was codesigned by Daniel Libeskind and David Childs, while the turbine array was drawn up by Guy Battie.



Energy Answer— Blowing in the Wind

Big wind projects announced for New York Trade Center site, offshore generation in Great Britain

It will come as no news to *IEEE Spectrum* readers that wind energy has been the fastest-growing part of power generation in recent years. Two recent developments, however, put the outlook for wind in a whole new perspective. On 18 December, British authorities issued contracts to build 15 huge offshore wind farms, to provide most of the added electricity England will need in the coming two decades. And almost simultaneously, New York City officials unveiled a concept for putting an array of wind turbines atop the Freedom Tower, the main new build-

ing to be erected later this year on the World Trade Center site.

The idea for the Freedom Tower is to put about 25 turbines into a cage-like structure at the top of the building, between the main body of the structure and its TV and radio antenna, a combination intended to vaguely echo the Statue of Liberty [see artist's conception, "Turbine Tower"]. There also is some notion, inspired by Tibetan Buddhism, of incorporating cylinders containing mantras or prayers written on thin paper into the turbine systems. Perhaps this could be of some com-

LOWER MANHATTAN DEVELOPMENT CORP.

Digital Television Wins Holiday Sweepstakes

THE END-OF-YEAR HOLIDAY SEASON was expected to produce big gains for digital television and related equipment—and it did. The only qualification had to do with the split character of the U.S. consumer market, reported across all sectors. Expensive, “high-end” products, including plasma and liquid-crystal displays (LCDs), did very well, while extremely cheap offerings, like the US \$30 DVD players that Wal-Mart advertised, did pretty well. Just about everything in between did very poorly. These were some of the television shopping highlights:

DIGITAL TELEVISION SALES SOARED in the final months of 2003, according to initial data from the U.S. Consumer Electronics Association. Over 500 000 units were sold in November, up 54 percent over the same month in 2002.

REAR-PROJECTION SETS, most using digital light processing technology developed by Texas Instruments, have sold especially well. One of the main manufacturers, South Korea’s Samsung, was unable to meet all holiday orders despite doubling production at factories in South Korea and Mexico. A 43-inch Samsung rear-projection set went for \$3500, about half the price of similar-size LCD and plasma flat-panel receivers.

RECORD-BIG FLAT PANELS were rolled out by Samsung at the booming Consumer Electronics Show, which opened in Las Vegas on 8 January. Its 80-inch plasma model goes for a cool \$70 000.

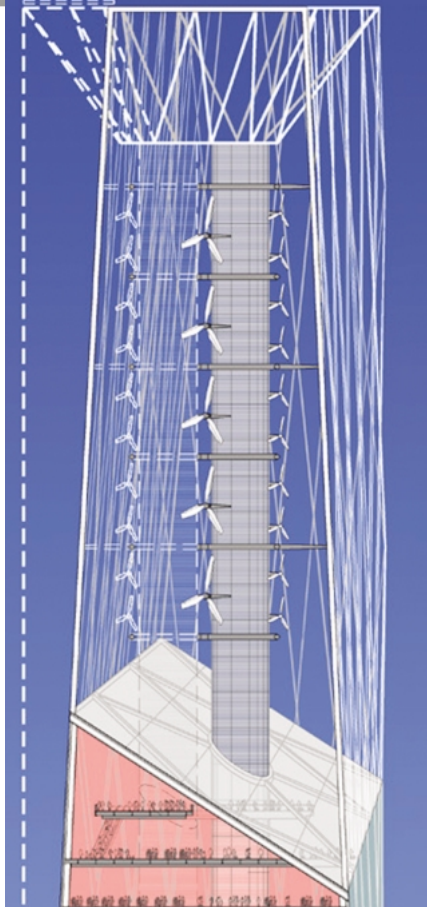


ENTRY OF COMPUTER MAKERS such as Dell, Gateway, and Hewlett-Packard into the flat-panel digital television (DTV) business will put more downward pressure on prices, as flat computer monitors already are much cheaper than similar-size TV monitors. Other factors making flat panels cheaper include economies of scale, improved manufacturing techniques, and lower materials costs.

MANUFACTURERS BENEFITING FROM THE BOOM include the Netherlands’ Philips Electronics, which has a joint LCD manufacturing

venture with South Korea’s LG Electronics. Together, LG, Philips, and Samsung account for close to 45 percent of the world’s LCD flat-panel sales. France’s Thomson, which once openly proclaimed its intention of dominating the world HDTV market—based on the now-defunct European HD-MAC standard—largely missed the boat when all the action shifted in the 1990s to digital television and flat panels. But now Thomson is girding its loins for another push, having merged its television manufacturing business with China’s TCL Electronics.

WORDS OF WARNING to the consumer: not all digital receivers are capable of receiving or displaying high-definition television, and even those labeled “HD-ready” sometimes require installation of an HD tuner. Per square inch, plasma displays are cheaper than LCDs and often provide more vivid color and better viewing angles. But plasma displays deteriorate more over the years and can suffer “burn-in” of images that linger too long.



fort to September 11 survivors, who have complained that designs for the site have been impersonal and have not included relics from the downed towers.

The overall design for redevelopment of the Trade Center site reflects a compromise between the principal architect, Daniel Libeskind, best known for the Berlin Holocaust Memorial, and David Childs of Skidmore, Owings, Merrill. Childs was brought in at the property owner’s insistence to see that practical considerations would not be neglected in fleshing out the details of Libeskind’s Freedom Tower, resulting in some acrimony between the two architects and, some would say, a compromised final design. But it evidently was Childs’s idea to cap the Freedom Tower with an array of windmills.

If that concept is adopted and actually built, it will be a world first and, to many, more than a little startling. But the idea of capping skyscrapers with windmills to produce some of the buildings’ electricity has been under development for more than a decade by academic groups like the Stuttgart School of Architecture and City Planning in Germany and by firms like the Richard Rogers Partnership in London.

NEWS BRIEFS

NASA'S ROBOTIC ROVER, Spirit, bounced to a landing in Mars's Gusev crater on 3 January and was expected to be joined on 24 January by its twin, Opportunity, on the opposite side of the Red Planet. Meanwhile, Europe's Mars Express Orbiter started to survey Mars for minerals, weather, and underground water, despite its disappointing failure to make contact with the Beagle 2 lander. The team managing the NASA probes includes, as science manager and deputy project scientist, respectively, John Callas and Albert Haldeman, both at the Jet Propulsion Laboratory in Pasadena, Calif., and both IEEE members. For images, go to: <http://marsrovers.jpl.nasa.gov/home/index.html>.



MURDOCH GETS DIRECTV. In late December, the U.S. Federal Communications Commission (FCC)

approved the somewhat controversial acquisition of Hughes Electronics Corp. and its successful DirecTV division by Rupert Murdoch's News Corp. Murdoch paid US \$6.6 billion to merge the DirecTV satellite television service with his Fox television network, TV studios, pay television networks, and 35 local TV stations. The stage was set for the acquisition by the News Corp. 15 months earlier, when the FCC nixed a proposed merger between DirecTV and EchoStar Communications Corp., the other big U.S. satellite television provider.

MILLION-EURO TECHNOLOGIST. By the deadline of 31 December, more than 70 nominations had been received for what will be the world's largest technology award, the first Millennium Technology Prize. The €1-million award will be conferred in Helsinki, Finland, every two years on an individual or team of up to three individuals for technological achievements in the last decade that promote sustainable development and improve the quality of life. Winners will be announced in April.

In the early 1990s, the Rogers partnership developed detailed designs for tall buildings to be built in Tokyo that were configured to concentrate and accelerate wind both to ventilate the structures and to drive propellers. Though never built, those designs got wide notice, since they came from a top-name architectural firm. The senior partner, Sir Richard Rogers, was a student of the London architect Norman Foster—also a pioneer in thinking about how to integrate windmills into high-rise designs—who codesigned the Pompidou Center in Paris with Renzo Piano.

The initial design work for the Freedom Tower turbines was done by Guy Battle, of Battle McCarthy Consulting Engineers in London, which has worked closely on projects with Foster and the Rogers partnership, among others. It was Battle's idea to include prayer wheels in the turbine systems.

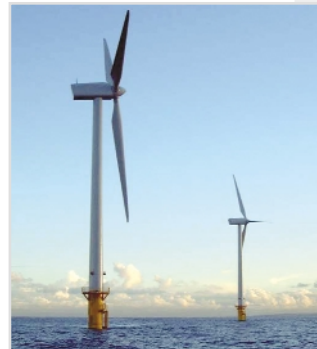
With the latest developments in wind, the British seem to be stealing a march on the Germans and Danes, who so far have led the way in promoting large-scale wind generation. About the same time New York authorities were publicizing the idea of topping the Freedom Tower with wind turbine technology largely developed in London, the British government announced an enormously expanded program of offshore wind farm construction. On 18 December, Britain's Crown Estate—the organization that manages a large chunk of the monarchy's far-flung holdings, including its offshore continental shelf—announced the winners of contracts to build 15 wind farms at three locations off Great Britain's coasts.

The wind farms, with hundreds of turbines each, will have a total generating

capacity of 5.4–7.2 GW and cost, in all, upwards of 7 billion British pounds (about US \$13 billion). The project, said the UK's energy minister, Stephen Timms, puts Great Britain on course to be producing 10 percent of its electricity from renewables by 2010 and 20 percent by 2020, compared with 3 percent now. It represents the second round of windmill con-

The British seem to be stealing a march on the Germans and Danes, who so far have led the way in promoting large-scale wind generation

Of course, anything as large-scale and visionary as England's wind program does not go without critical comment. The Royal Society for the Preservation of Birds has worried about the impact of the farms on species that feed at the sites. Onshore wind farms already have come under heavy fire in parts of England, with residents complaining about their



struction spearheaded by British energy authorities.

The new turbine towers, which will be about 80 meters tall, are to be installed in three main areas: the river Thames estuary; the Greater Wash, 30–40 kilometers off the Lincolnshire coast; and the North West, extending from the north Wales coast to the Solway Firth and out into the Irish Sea. Developers, which had until 20 January to accept offers from Crown Estate, will be granted leases of 40–50 years. They include Warwick Energy Ltd., Airtricity (an Irish renewables company), the construction group Amec, Powergen (owned by Germany's E.ON AG), RWE Innogy (owned by the German utility RWE), and the oil companies Total and Royal Dutch/Shell. GE Wind Energy, a growing presence in Europe and worldwide, already is building a big farm at Gunfleet Sands off the Essex coast, as part of the first round.

noise, unsightliness, and even light effects. Janet Wadham, a resident living near one of the first wind farms, complained to the *Dallas Morning News* that as a result of sunlight reflecting off turbine blades, her living room “lit up like a discothèque.”

Papers like the *Financial Times* have been inundated with letters from taxpayers worrying about the added cost of producing electricity from wind. The price of electricity generated by offshore wind turbines is still higher than market prices for electricity from fossil fuels, which means that one way or another British citizens and businesses will be paying significantly more for electricity in the next two decades.

For now, though, the British consensus seems to be that the price is worth paying to obtain an adequate future energy supply while reducing greenhouse gas emissions without resorting to new nuclear power.

—WILLIAM SWEET