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Cheaper Battery Is Unveiled as a Step to a Carbon-Free Grid

By Ivan Penn

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Lithium-ion batteries have become essential for powering electric cars and storing energy generated by solar panels and wind turbines. But their drawbacks are also by now familiar: They use scarce minerals, are vulnerable to fires and explosions, and are pricey.

A plentiful, safe and more affordable alternative would be worth a lot.

On Wednesday, an energy company headed by the California billionaire Patrick Soon-Shiong announced that it had developed a rechargeable battery operating on zinc and air that can store power at far less than the cost of lithium-ion batteries.

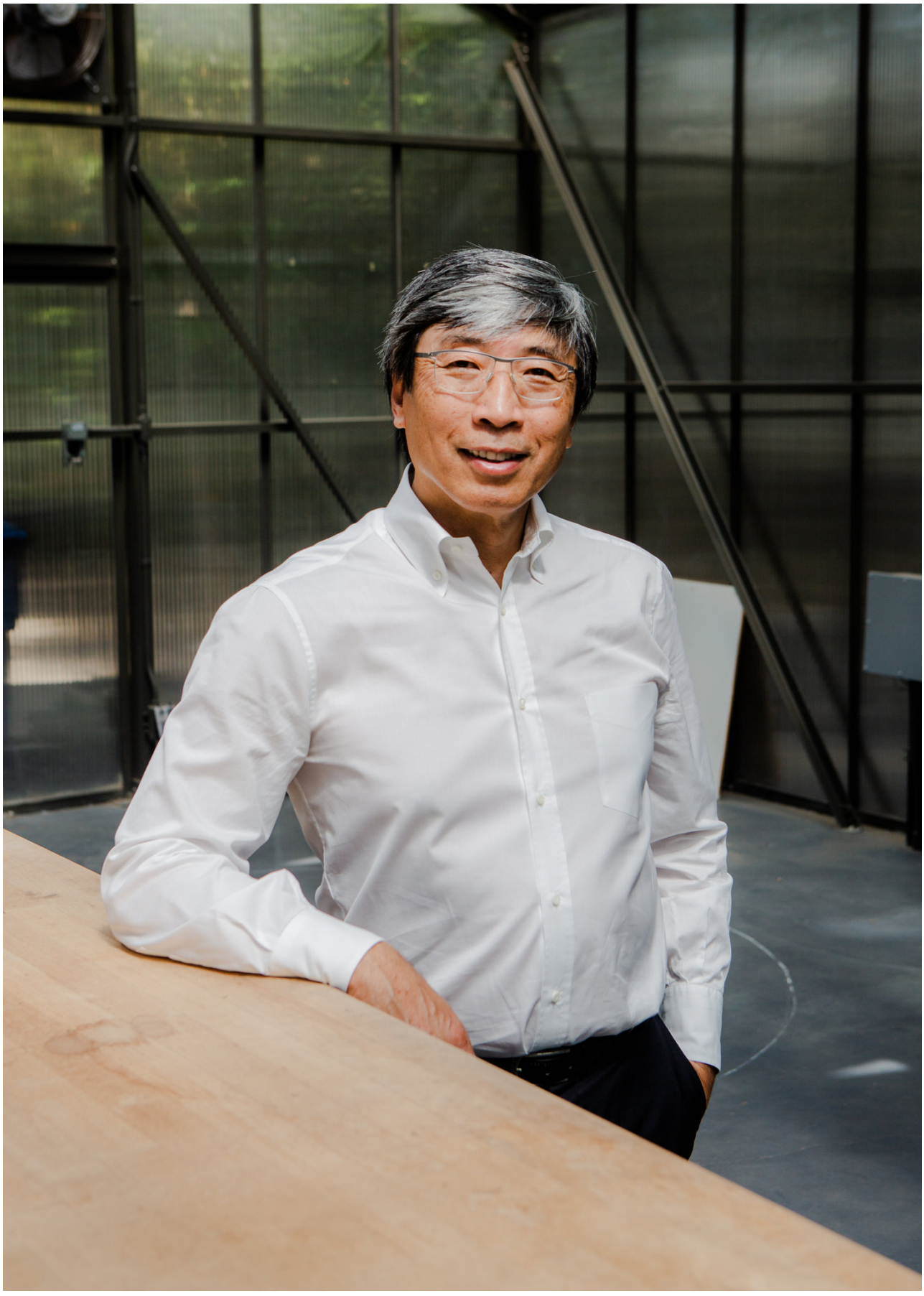
Tests of the zinc energy-storage systems have helped power villages in Africa and Asia as well as cellphone towers in the United States for the last six years, without any backup from utilities or the electric grid, Dr. Soon-Shiong said.

“It could change and create completely new economies using purely the power of the sun, wind and air,” Dr. Soon-Shiong, a surgeon and a biotechnology entrepreneur, said in an interview in Los Angeles before the announcement.

[Read more: Sizing up zinc air batteries on cost, environmental safety and potential.]

Dr. Soon-Shiong and his company, NantEnergy, made the announcement in conjunction with the One Planet Summit in New York, an event meant to further the goals of the Paris climate accords. He developed the technology with support from the World Bank.

The battery units, in conjunction with solar arrays, can be combined to create a microgrid system powering a village or a larger area, Dr. Soon-Shiong said. They have been deployed to support 110 villages in nine countries in Asia and Africa — including places that otherwise relied on generators or even lacked electricity, he said.



Dr. Soon-Shiong amassed a fortune as a biotechnology entrepreneur. His energy company says it is the first to commercialize the use of zinc air batteries.
Alex Welsh for The New York Times

The International Finance Corporation, an arm of the World Bank fostering private-sector projects in developing countries, was an early investor in NantEnergy, and an agency representative sits on the company's board.

The United States Department of Energy made development grants to NantEnergy (formerly known as Fluidic Energy) totaling $5 million, Dr. Soon-Shiong said.

NantEnergy, based in Phoenix and in El Segundo, Calif., says it expects to expand the use of its product in telecommunications towers and eventually extend it to home energy storage, beginning in California and New York. Beyond that, it anticipates use in electric cars, buses, trains and scooters.

Dr. Soon-Shiong, who recently acquired The Los Angeles Times and is a part owner of the Los Angeles Lakers, made a fortune from the development of drugs to fight diabetes and breast cancer and the sale of pharmaceutical companies he had created.

His energy company says it is the first to commercialize the use of zinc air batteries and has more than 100 related patents. It is taking orders for delivery next year and sees the potential for a $50 billion market.

Dr. Soon-Shiong said the cost of his zinc air battery had dropped steadily since development began. NantEnergy says the technology costs less than $100 per kilowatt-hour, a figure that some in the energy industry have cited as low enough to transform the electric grid into a round-the-clock carbon-free system.

The prevailing cost of lithium-ion technology varies, depending on the scale and application. Yogi Goswami, distinguished university professor and director of the Clean Energy Center at the University of South Florida, estimated that it is most likely $300 to $400 a kilowatt-hour.

“This is a game changer,” Dr. Goswami, who was not involved in the effort, said of the advances claimed by NantEnergy. “You have to have storage.”

Dr. Goswami said he warned in congressional testimony a quarter-century ago that storage advances would be needed as the use of solar and wind power grew. That imperative has been somewhat overshadowed as the fracking boom made natural gas plentiful.

“Until recently it didn’t make any sense to worry about storage because we had cheap gas,” said Mark Cooper, senior research fellow for economic analysis at the Institute for Energy and the Environment at the Vermont Law School.

But energy storage is increasingly needed to manage the ebb and flow of solar and wind energy that sometimes forces places like California to pay other states to take surplus power. And that need is driving innovation and decreasing cost.

“Obviously it comes at a point where everyone is already looking for storage,” Mr. Cooper said. “Capitalism isn’t going to deal with a problem where there isn’t scarcity. In capitalism what we get is relentless reductions in cost.”

As part of the climate event on Wednesday in New York, the World Bank announced a $1 billion program to promote deployment of battery storage in the developing world, a move that it said could unleash another $4 billion in investments.

In addition to their deployment in Asia and Africa, NantEnergy’s batteries have been used to power more than 1,000 communications towers in the United States, Latin America and Southeast Asia. They include a Duke Energy location in North Carolina

that withstood the effects of Hurricane Florence recently and Hurricane Irma last year.

The storage unit consists of plastic components and shell casing, a circuit board and zinc oxide. Alex Welsh for The New York Times

Sherif Abdelrazek, a senior engineer at Duke Energy, said that because the zinc air battery does not pose fire hazards as lithium-ion batteries can, it does not need external cooling systems to prevent overheating.

The system's success means the Duke tower no longer needs to be connected to the electric grid, he said. As a result, 13 acres of land in the Great Smoky Mountains that was used for power lines is being turned over to the National Park Service.

NantEnergy's announcement that it had reached the $100-per-kilowatt-hour threshold made the device even more attractive, Mr. Abdelrazek said.

The product design is simple: plastic components and shell casing, a circuit board and zinc oxide, all in a package the size of a briefcase.

In charging the batteries, electricity from solar installations is stored by converting zinc oxide to zinc and oxygen. In the discharge process, the system produces energy by oxidizing the zinc with air.

The NantEnergy battery can provide power for up to 72 hours on a single charge, meaning it could have lasted throughout the period of cloud cover and stormy weather from Hurricane Florence in the Carolinas.

Dan Reicher, an assistant secretary of energy in the Clinton administration, said successful development of a rechargeable zinc air battery could be a milestone in energy storage. He said the challenge had been to make such batteries reliable for continuous use. "That's an attractive characteristic if it's true," he said.

NantEnergy says it expects to expand the use of its product in telecommunications towers and eventually apply it to home energy storage. Alex Welsh for The New York Times

But he cautioned that a battery's cost per kilowatt-hour depended on the application and scale. And he said the company's technology would have to live up to scrutiny. "People do make claims and offer what they feel like is a legitimate set of data," he said. "I'm always elated to hear progress in storage, but you have to be careful."

Batteries are not the only form of energy storage that the power industry is pursuing. Other technologies include compressed air in caves and the long-used pumped hydroelectric plant storage. The Los Angeles Department of Water and Power is proposing to turn Hoover Dam into a type of giant battery to manage excess solar and wind electricity at a cost of $3 billion.

Lyndon Rive, a co-founder of SolarCity — now a part of his cousin Elon Musk's company, Tesla — said recently that solar and storage innovations were likely to transform the electricity market. "Over all, the trajectory is for solar to be the No. 1 source," said Mr. Rive, who left Tesla after the two companies merged two years ago.

Dr. Soon-Shiong said he knew Mr. Musk — a fellow South African native — and considered him a visionary for his accomplishments in electric vehicles and energy storage. "We both are trying to make the world a better place," Dr. Soon-Shiong said.

Tesla has based its businesses on lithium-ion technology, and Mr. Musk has told shareholders that the company may get the cost of lithium-ion cells down to $100 a kilowatt-hour this year.

NantEnergy made its announcement weeks after California mandated 100 percent carbon-free electricity in the state by 2045. Legislators have also approved a bill providing about $1 billion in subsidies for residential energy storage.

“California is obviously in need of that kind of breakthrough to meet our goals,” said Bernadette Del Chiaro, executive director of the California Solar and Storage Association, a trade group. “I cannot claim to be in absolute certainty that this is everything they say it is, but it’s exciting. It’s this kind of breakthrough that we expect from our innovators.”

Correction: *September 26, 2018*
An earlier version of this article referred incorrectly to the status of a California move to provide subsidies for energy storage. Such a bill has been approved by legislators; it has not been signed into law.

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