Zero-carbon bitcoin? The owner of a Pennsylvania nuclear plant thinks it could strike gold

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Could bitcoin mining be the salvation of the embattled nuclear energy industry in America?

The owners of several nuclear power plants, including two in Pennsylvania, have formed ventures with cryptocurrency companies to provide the electricity needed to run computer centers that "mine" bitcoin. Since nuclear energy does not emit greenhouse gases, the project's investors say, the zero-carbon bitcoin would address climate concerns that have tarnished the energy-intensive cryptocurrency industry.

Talen Energy, the owner of the Susquehanna Steam Electric Station near Berwick, Pa., announced this week that it has signed a deal with TeraWulf Inc., an Easton, Md. cryptocurrency mining firm, to build a giant bitcoin factory next to its twin reactors in northern Pennsylvania. The first phase of the venture, dubbed Nautilus Cryptomine, could cost up to $400 million.

Talen's project could eventually use up to 300 megawatts—or 12% of Susquehanna's 2,500 MW capacity. It's the second bitcoin-mining venture in the last month that involves owners of Pennsylvania nuclear facilities.

Last month Energy Harbor Corp., the former power-generation subsidiary of First Energy Corp., announced it signed a five-year agreement to provide zero-carbon electricity to a new bitcoin mining center operated by Standard Power in Coshocton, Ohio. Energy Harbor owns two nuclear units in Ohio and the twin-unit Beaver Valley Power Station in Western Pennsylvania.

A nuclear fission start-up, Oklo, also announced last month it signed a 20-year deal with a bitcoin miner to supply it with power, though the company has not yet built a power plant.

In recent years, commercial nuclear operators have struggled to compete in competitive electricity markets against natural gas plants and upstart

renewable sources such as wind and solar. Unfavorable market conditions have hastened the retirements of several single-unit reactors, such as Three Mile Island Unit 1 in Pennsylvania. Lawmakers in New Jersey, New York and Illinois have enacted nuclear bailouts, paid by electricity customers, to stave off early retirement for other plants.

The cryptocurrency deals would provide nuclear generators with reliable outlets for their power, and bitcoin miners with predictable sources of power at cheap prices, along with a zero-carbon cachet.

"Nuclear energy is uniquely positioned to provide power to crypto mining companies and other major energy users who have committed to a carbon-free future," John Kotek, senior vice president of policy development and government affairs at Nuclear Energy Institute, said in an email.

The nuclear industry views the crypto craze not as a crutch but as a launching pad for expansion. "U.S. nuclear power plants are ready and able to supply miners with abundant, reliable carbon-free power while also providing new business pathways for the nuclear developers and utilities, increasing their operating profits, and potentially accelerating the deployment of the next generation of reactors," Kotek said.

Nuclear producers aren't the only power generators getting in on the trend. Stronghold Digital Mining, a bitcoin miner that registered last month for a $100 million initial stock offering, plans to build its bitcoin mining operation in northwestern Pennsylvania, powered from Venango County waste coal. While its bitcoin would not be zero-carbon, it would reduce environmentally harmful piles of waste coal.

Energy and cryptocurrency experts say several trends are shifting the market in favor of U.S. nuclear power producers.

In May, Chinese regulators announced new measures to limit bitcoin mining in several regions that failed to meet Beijing's energy-use targets. Bitcoin production levels have fallen since then, forcing bitcoin producers to relocate to places with low operating costs and cool climates to reduce the costs of cooling the bitcoin data centers. The state of Washington, which has lots of inexpensive hydroelectric power, has undergone a huge boom in bitcoin mining.

How mining is done

Bitcoin is a peer-to-peer virtual currency, operating without a central authority, and which can be exchanged for traditional currency such as the U.S. dollar. It is the most successful of hundreds of attempts to create virtual money through the use of cryptography, the science of making and breaking codes—hence, they are called cryptocurrency.

Bitcoin mining is built around blockchain technology, and it involves generating a string of code that decrypts a collection of previously executed bitcoin transactions. Successful decryption is rewarded with a new bitcoin. The supply of bitcoins is limited to 21 million—nearly 90% have already been mined. So the remaining bitcoins become increasingly scarce and more difficult to extract.

Data centers operated by bitcoin miners randomly generate code strings, called "hashes," to solve the puzzle and earn new coins. Worldwide, miners on the bitcoin network generate more than 100 quintillion hashes per second—that's 100,000,000,000,000,000,000 guesses per second, according to Blockchain.com. The first phase of the Nautilus project in Pennsylvania would generate five quintillion hashes per second.

Such guesswork requires muscular computing power, robust internet connections, and lots of electricity. Smaller bitcoin miners have teamed up in consortiums to pool their computing power. Bigger players have

built huge data centers devoted exclusively to producing lines of random code.

"Mining cryptocurrency is an international, profitable, and energy-intensive business," ScottMadden, a management consulting firm, said in a paper it published last year. Bitcoin mining consumes an estimated 0.5% of the electricity produced worldwide or about as much as the country of Greece.

Some lawmakers have called for greater regulation of cryptocurrency, citing the enormous amount of resources required to produce it. "There are computers all over the world right now spitting out random numbers around the clock, in a competition to try to solve a useless puzzle and win the bitcoin reward," Sen. Elizabeth Warren (D., Mass.) said in June, calling for a crackdown on "environmentally wasteful cryptocurrencies."

Why possible numbers look good

But as a business proposition, bitcoin has appeal. ScottMadden, the consulting firm, suggested last year that nuclear operators in some states were in a unique position to profit from cryptocurrency ventures.

Diverting 1 megawatt of power to an efficient mining operation could conservatively generate top-line revenue of $900,000 a year and profits of $650,000, not accounting for cooling, repairs, or technicians, according to ScottMadden. Its analysis predicts that a project could break even in about 15 months.

The consulting firm's conceptual project was based upon a bitcoin price of $9,275. The price of a bitcoin last week varied between $38,000 and $42,000.

Such numbers no doubt got the attention of Talen Energy, which plans to

divert about 180 MW to the first phase of the Nautilus Cryptomine, which would be producing bitcoin at the Susquehanna plant in Luzerne County.

"I think it's a great opportunity for our plant," said Dustin Wertheimer, vice president and divisional chief financial officer of Talen Energy. He is based in Allentown, home to Talen's previous owner, PPL Corp. Talen is now based in the Woodlands, Texas.

Unlike other crypto projects in which the power generator is an arm's-length electricity supplier, the Nautilus Cryptomine is a 50-50 venture between Talen and TeraWulf. The project would be directly connected to the Susquehanna plant—"behind the meter," in industry parlance—and would avoid any transmission costs from the grid.

The direct connection also guarantees that the operation is sourced exclusively with carbon-free energy, Wertheimer said.

"You've seen some of the press and the negative publicity that bitcoin has received recently and the impact of fossil fuel," Wertheimer said. "So that's a great thing for us to have a direct connection into a carbon-free power source."

The cryptomine would be located inside a 200,000-square-foot building—about four football fields. The mining operation would be built on a data center campus that Talen is developing next to the Susquehanna plant. The data center would generate about 1,000 construction jobs, Wertheimer said. The cryptomine would employ about 50 people to operate.

The first phase of the project would cost about $350 million to $400 million. The Nautilus venture is negotiating with fiber-optic providers to bring in super-charged internet connections required to transmit and

receive the huge amounts of code it generates, Wertheimer said.

"As you look across the United States, and you look at kind of the challenges that are facing nuclear plants, I think this is a great opportunity to prolong the life of a lot of plants," he said.