
What to know about Cryptocurrency Mining

What has changed?

Over the last several years the soaring price of cryptocurrencies, such as Bitcoin, has led to an increase in cryptocurrency mining operations around the world, most notably in China. Due to increased regulation in Asia, mining operations have been moving to other regions, including the U.S. and Canada. The mining is very energy-intensive and some areas with lower power prices are seeing dramatic increases in requests for power. In many cases these operations are discovered after the fact, when the utility sees changes in meter reads, or worse when the intense power draws cause accidents or fires.¹ Some of these operations have grown from a few computers in a garage to large configurations of specialized “rigs.” Many utilities, including cooperatives have put moratoriums on mining while they figure out the best pricing options. While there is still some debate about the potential uses and future viability of cryptocurrencies, many electric utilities are facing very real operational challenges. Getting prices and terms right will be the key to meeting the challenges and possibly benefiting from the new mining loads.

What is Cryptocurrency Mining?

Wikipedia defines cryptocurrency as “a digital currency in which encryption techniques are used to regulate the generation of units of currency and verify the transfer of funds, operating independently of a central bank.” The first widely-used cryptocurrency, Bitcoin, was created in 2009. Now there are more than 4,000 cryptocurrencies. Applications range from financial transactions, real estate deals, and records transfers.

Cryptocurrency mining uses complex algorithms to solve equations that verify and encrypt transactions, which are then added to a digital ledger known as “blockchain.” While there are many cryptocurrencies, blockchain is the underlying data structure that holds encrypted transactions. The encryption algorithms use large amounts of energy on multiple servers and computer processors to solve complex math equations. The difficulty of generating solutions is typically designed to increase in complexity. As a result, they require more energy to solve over time. Miners compete to solve the equation and are rewarded with a unit of currency. The currency can be converted into dollars via financial exchanges. In addition, the electricity used to perform the calculations generates thermal energy, which increases the cooling demand in warmer climates or seasons. For this reason, regions with low electricity rates and cooler weather are becoming the preferred location for cryptocurrency mining.

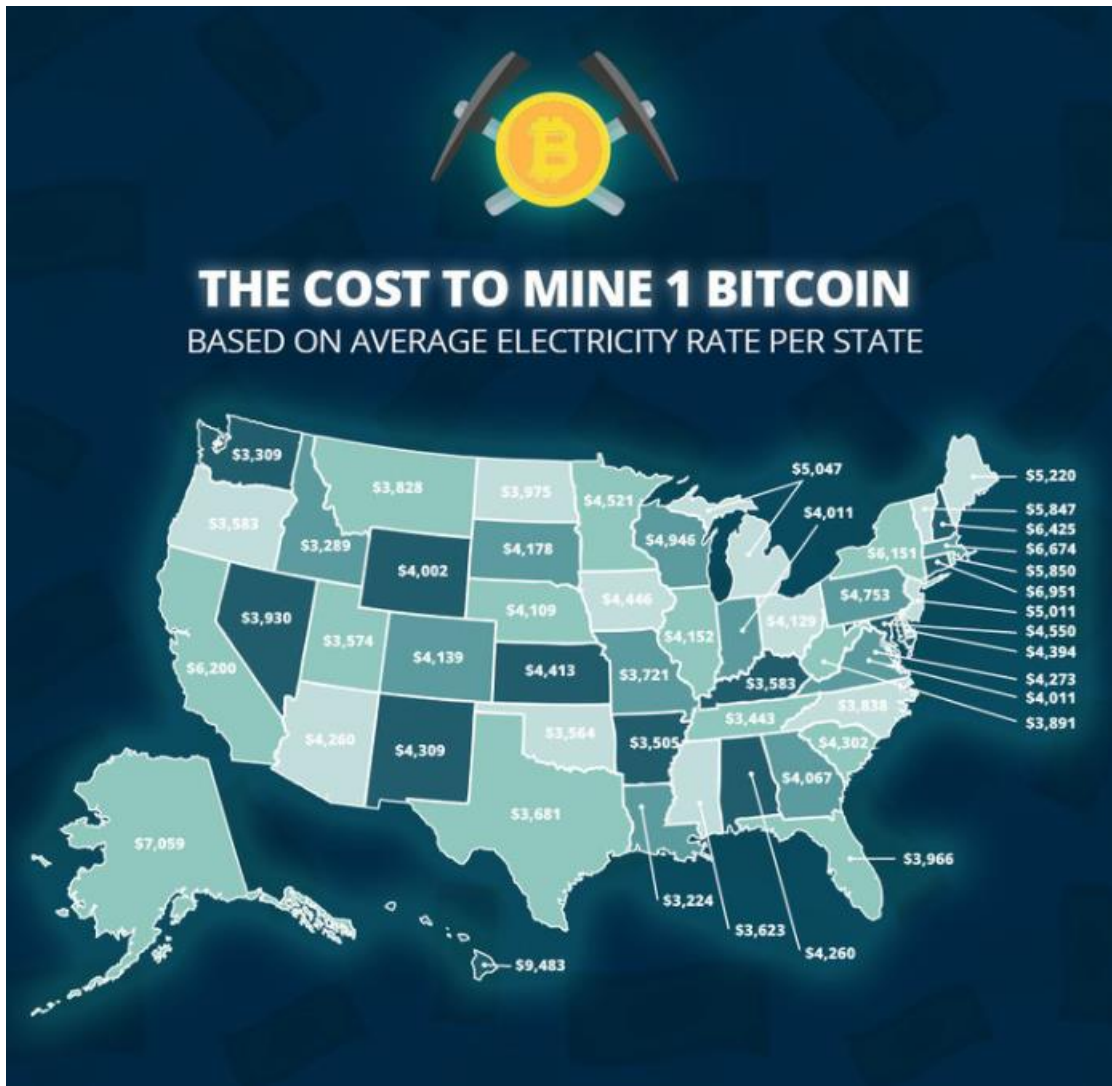
In early 2018, Crescent Energy Supply Company did a study on what it costs to mine a single Bitcoin in each state.² The five lowest cost states were Louisiana, Idaho, Washington, Tennessee, and Arkansas, based on average kWh rates from the EIA and the estimated time to harvest a single unit of currency. However, with Bitcoin reaching highs of almost \$20,000, mining can still be profitable even in the states with higher rates. Also, there are many municipal and cooperative utilities situated in pockets of states whose geographic location and rates may be attractive to miners. For example, upstate New York benefits from lower hydro-

¹ <https://cryptoticker.io/bitcoin-fever-drives-miners-rural-washington/>

² <https://blog.cesco.com/blog/bitcoin-mining-costs-per-state>

electric prices and a cooler climate and certain areas have seen an influx of miners. Plattsburgh, NY, was one of the first U.S. municipalities to place a moratorium on the mining operations after seeing dramatic price spikes for power after the miners arrived. See Figure 1 for details on the costs of mining across the country.

Figure 1: Cost to Mine One Bitcoin by State



What is the impact on cooperatives?

In a webinar³ “Service Demands Cryptocurrency Mining” that originally aired on May 29, 2018, the Public Utility District (PUD) of Chelan County in central Washington discussed the challenges of the cryptocurrency mining influx in their service area. Chelan County PUD operates three hydropower projects and generates over nine million MWhs for just 50,000 meters with an average total load of about 200 MWs. The average retail rate hovers around 3 cents per kWh. Some of the requests the utility is getting for cryptocurrency mining are for 100 MWs or more. On March 19, the utility imposed a moratorium on cryptocurrency mining until it could determine how to serve the load and price the

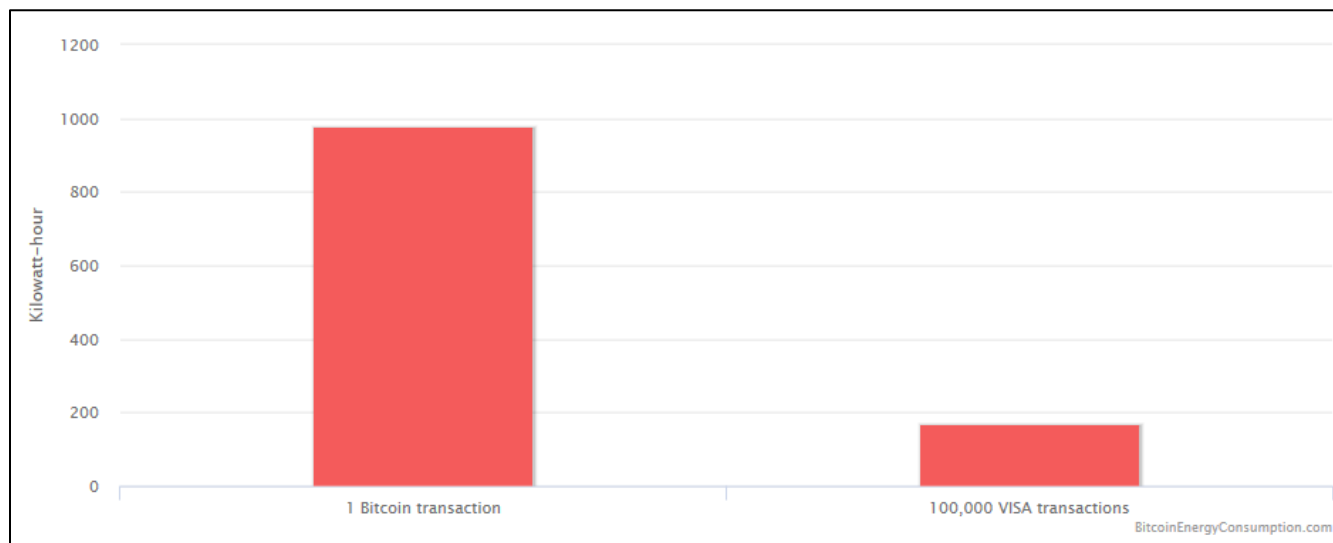
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energy and other services. Other utilities, including Flathead Electric Cooperative in Northwest Montana, have imposed moratoriums and are watching closely as Chelan PUD and other utilities grapple with these issues.

Cryptocurrency mining loads are not like other loads⁴

Mining activities require a significant amount of continuous power, usually at lower voltages connected at the distribution level. Murphy Electric Power Board in western North Carolina said it expects to see load factors in the 90 percent range. To put it in perspective, the Digiconomist compared the energy used to create one Bitcoin to Visa credit card transactions (see Figure 2):

Figure 2: Bitcoin Network versus Visa Network Average Consumption⁵



Reliance on a Volatile Commodity

Cryptocurrency value is tied to a volatile commodity. For example, Bitcoin (BTC-USD) has traded between \$1,809 - \$19,870 on the Cryptocompare Currency (CCC) exchange over the last year⁶. Cryptocurrency miners are typically looking for a return on investment within months, whereas electric utilities earn a return on investment over a span of 20 or 30 years.

Physical Constraints

While the supply of low-cost power may be plentiful in some areas, the transmission and distribution capacity may not be. In order to serve these loads, the utility might have to build out its infrastructure, which poses a significant risk if the loads are not here to stay.

Safety Issues

The increased load on lower voltage power lines creates potential hazards for the distribution system. Chelan County PUD experienced at least one fire and some equipment degradation. These usually occur in spaces that are leased or rented, often remotely operated.

⁴ Not all cryptocurrencies are alike, Ethereum uses about a quarter of the energy as Bitcoin.

⁵ <https://digiconomist.net/bitcoin-energy-consumption>

⁶ <https://finance.yahoo.com/quote/BTC-USD?p=BTC-USD>

Could there be some benefits?

While many utilities are grappling with the challenges of cryptocurrency mining, some view the loads as an opportunity. Murphy Power Board in Western North Carolina, where the Tennessee Valley Administration (TVA) supplies low cost hydropower and access to transmission facilities, started seeing the cryptocurrency miners on their system about 3 years ago. Manager Larry Kernea described the cryptocurrency miners as the “perfect load,” with high load factors and low impact on power quality. With flat to declining loads in most regions, this could be an opportunity for utilities to grow load. He said the trick is to remember three things:

- Capacity (How much do you have?)
- Location (Where is it?)
- Price (How much does it cost?)

Grid operators and power suppliers know how much and where the excess capacity is on their system. Since the mining loads have more mobility than most homes or businesses, the utility can direct them to areas with access to the cheapest power and where the grid can accommodate them without the need for costly upgrades. Chelan County did an analysis to identify areas with excess transmission and distribution capacity that would require the least amount of investment in infrastructure.

In Plattsburgh, they are exploring the idea of recycling the heat generated by the mining operations to use in other facilities, for example greenhouses, spas, or community centers.⁷ A Canadian cryptocurrency miner is using the excess heat to grow edible plants and fish. The operation uses nitrate-rich water from the fish tanks to feed the plants. A Czech cryptocurrency exchange is repurposing the excess heat from its mining operations to grow tomatoes, or “cryptotatoes,” as they call them.⁸

What do cooperatives need to know or do about it?

So what did Chelan County do? First it came up with a schedule of fees to address unauthorized service and equipment degradation (see Figure 3 on the following page).

Then, they evaluated using special rates structures or contracts with high density loads. They decided to use a special rate structure for loads under 5 MWs and a contract structure with loads over 5 MWs. They wanted to be careful not to incent larger or smaller loads, so they wanted the contract terms to provide a similar compensation outcome as the new rate structure.

Chelan County is still working out the details of the contract terms. One of the considerations is whether they want to be a direct supplier or an intermediary and purchase the power on the customer’s behalf, reducing some of the risk exposure. They are also considering the impact of contract terms based on embedded costs versus marginal costs.

Murphy Power Board worked with the miners and explained the costs and permits required to connect to the system and draw such dense loads. While this transparency drove many of the miners away, the ones that stayed became valuable partners willing to assume the risks without driving up prices for other customers. One of the bigger operations has hired local residents to provide construction services. Mr. Kernea of the

⁷ <https://www.pbs.org/newshour/show/cheap-power-drew-bitcoin-miners-to-this-small-city-then-came-the-backlash>

⁸ <https://cryptbuzz.com/recycling-crypto-mining-heat/>

Murphy Power Board believes that blockchain technology is here to stay, whatever its future applications may be. Utilities that can be proactive and work with the miners could see great benefits in terms of increased loads and community development.

Figure 3: Chelan County PUD Fees¹

<p>The new fees are:</p> <p><i>For all unauthorized service</i></p> <ul style="list-style-type: none">• \$1,400 – metering & monitoring• \$2,000 – investigation & enforcement <p><i>In addition, for unauthorized operations in homes</i></p> <ul style="list-style-type: none">• \$1,000 – residential security deposit• \$1,750 – residential equipment degradation <p><i>Or, in addition, for unauthorized operations in commercial and industrial spaces</i></p> <ul style="list-style-type: none">• \$4,700 – Commercial equipment degradation (overhead service)• \$8,000 – Commercial equipment degradation (underground service)
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Contact for More Information

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