

TESTIMONY BEFORE THE
SUBCOMMITTEE ON
OVERSIGHT AND
INVESTIGATIONS

HOUSE ENERGY AND COMMERCE
COMMITTEE

HEARING: CLEANING UP
CRYPTOCURRENCY: THE ENERGY
IMPACTS OF BLOCKCHAINS

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Introduction

Chair DeGette, Ranking Member Griffith, Chairman Pallone, and Ranking Member McMorris-Rodgers, members of the Subcommittee.

Thank you for the invitation to participate in today's hearing. My name is Steve Wright. I am a former CEO of Chelan County Washington Public Utility District and the Bonneville Power Administration as well as a former Board member of the American Public Power Association and the Alliance to Save Energy. BPA is a federal agency that operates roughly 75% of the high voltage transmission and markets 1/3 the electric generation in the Pacific Northwest. Chelan owns and operates 1100 aMW of hydropower and serves roughly 50,000 customers with 200 aMW of load. Chelan is customer-owned, has some of the lowest electric rates in the country and has built an extensive high-speed internet system available to approximately 75% of residences in the county.

Early Engagement with Crypto Miners

Around 2014 Chelan PUD began to notice cryptocurrency miners establishing a presence in the Chelan service territory. These were small operations operating out of shipping containers, vacant small businesses, and residential properties. The load was substantially greater than normal for those locations creating risk for distribution and transmission operations. Chelan's systems in residential and commercial areas, like most around the country, are not designed for intensive 24-hour a day operations. We experienced a significant increase in miners asking where there was adequate transmission and distribution capacity to locate. In some cases, Chelan would discover that mining operations had been established without staff knowledge. This would become obvious due to dramatic increases in bills and unusual failures of distribution infrastructure.

When we asked why miners were coming to Chelan County, we generally heard two answers: (1) low electric rates and (2) availability of high-speed internet.

Human health and safety issues were among the issues that led to temporary moratoriums on new connections in 2014 (December) and again in 2018. Two cases in particular provide relevant examples. In one instance overloaded distribution infrastructure led to a fire in a vacant lot bordered by residential dwellings. Fortunately, the fire was near a fire station and did not lead to property damage. This was particularly disturbing because we live in a high fire risk area. Second, a unit in an apartment complex was filled with mining machines without knowledge of the PUD or the apartment owner creating a severe fire risk due to potentially overloaded wires. The mining operation was operated remotely.

Chelan began to discuss issues associated with cryptocurrency mining in public meetings. We used this as an opportunity to inform the community and educate ourselves. As part of this effort, Chelan hosted public discussions about the underlying business model of cryptocurrency production. Unfortunately, this appeared to leave most customer-owners more perplexed than satisfied.

In late 2015 a large aluminum plant in our county curtailed operations leading to interest in supporting economic development. But while not unanimous, we heard substantial reservations from our community about supporting cryptocurrency mining due to a variety of factors:

- Stranded asset risk, due to the portability of the mining machines, which could be borne by the PUD's customer-owners
- Relatively low number of local jobs per unit of electricity consumed
- Uncertain tax benefit that appeared modest relative to the electric system cost/risk
- Frustration with the lack of regard for local health and safety risk by some miners
- Interest in potential uses for blockchain technology applications, while also concern about whether cryptocurrency is being used for nefarious purposes
- Questions regarding how future government regulation would impact the sustainability of the cryptocurrency business model
- Questions regarding whether cryptocurrency mining represented the highest and best use of hydropower as we transition to carbon emission reduction strategies

Around 2016 we began to receive service requests for larger mining operations that would use potentially tens to hundreds of MW per location.

It appeared the total could double or possibly be many multiples of the total loads in Chelan County. This appeared to be the result of quick gains early adopters experienced and the increased computing power required over time to solve Bitcoin equations per the protocols established when Bitcoin was created. There was also a dramatic increase in the value of Bitcoin from roughly the \$1000 range up to \$19,000 in late 2017 with substantial volatility in between. Operations of this size could only locate through an application for service to the PUD. Chelan did a substantial amount of work to identify where service for this magnitude of load was even feasible given the way our transmission system operates. Loads of this magnitude would also require a newly developed strategy for procuring electricity as Chelan does not maintain an off-the-shelf inventory of this magnitude.

The PUD has the obligation to serve within its service territory. The only means available to manage the risk of these dramatic and potentially volatile load increases is through rates. Based on public comment and the evolution of the mining industry toward larger loads Chelan was in practically a continuous ratemaking environment from 2016-2018. Chelan used cost of service based ratemaking taking into account risk, based on the Washington state statutory standard that requires rates must be fair, reasonable and not unduly discriminatory. Chelan rates are developed through a public process based on Public Utilities Regulatory Policy Act requirements. Over 35 public meetings were held on cryptocurrency education, policies, and ratemaking between 2015-2018.

There were four elements that made mining unique compared against other loads:

1. Each mining machine is small, roughly the size of a shoebox. This translates into capability to fit into lots of different sized spaces that uses up available capacity in the transmission and distribution system.

2. The energy use intensity index is very high. EUI for cryptocurrency miners was frequently more than 500 kWh/sq ft/yr versus a typical grocery store at less than 50 kWh/sq ft/yr.
3. Small mining machines also translates into easy portability that can move on short notice for many reasons. This is challenging when the electric infrastructure necessary for service is generally associated with long-life, capital-intensive assets
4. Cryptocurrency prices are volatile leading to substantial risk that operations will fluctuate up or down or even operate and then leave town.

The rates that were adopted address the unusual risks to an electric power system associated with cryptocurrency mining. The new schedule 36, specifically designed to apply to cryptocurrency mining loads of any size includes:

- Upfront payment to avoid stranded asset risk for transmission and distribution capital as the influx of cryptocurrency mining was driving system expansion that may not be recovered over time through rates
- Market rate based on forecasted electricity market index prices
- Pricing for risks such as electric market price volatility leading to a disconnect between established rates and timing of bill collection, bond rating due to single industry concentration, value of green power premiums and others

In December 2018 Chelan completed the ratemaking process, and the PUD Board adopted the rate.

During the public comment process, we heard some interest in the concept of modulating cryptocurrency production loads in order to reduce the rate. Modulating loads based on value to the power system, a form of demand response, would have value to the power system. There are various values

associated with different timeframes beginning at 4 seconds, then 5 minutes, hourly, daily, weekly, monthly, or seasonal based on what generation can be displaced. This would require special metering, which is becoming more common, a new rate schedule based on commitments the miner is willing to make in advance and access to wholesale power markets that value these characteristics. Chelan did not however receive inquiries that led to serious discussions about how to make such an arrangement work. We heard that a problem with this approach is the relatively short timeframe for amortizing mining machines (5 years or less) making it difficult for miners to commit to not operating for periods of time. It would also have been challenging to implement a modulation option due to the lack of an organized market in the Pacific Northwest that transparently values modulation characteristics. Such a market would help better determine benefits and risks that could be allocated between the utility and the cryptocurrency miner. Cryptocurrency load modulation is an area though that deserves further discussion.

At the time the rate was adopted we were not sure whether it would create price certainty that would lead to flourishing cryptocurrency mining in our area or prices that would be unattractive. It appears the latter has occurred. Chelan now has less than 9 MW of cryptocurrency mining operating on our system.

Update

Since 2018 there have been three relevant events. In 2019 Washington state adopted the Clean Energy Transformation Act establishing very aggressive requirements for clean energy deployment and eliminating the use of coal generation by 2025. This has increased the value of carbon-free resources like hydropower while decreasing the value of fossil fuel generation. There is some evidence this has moved cryptocurrency miners away from hydropower.

There has been increasing interest in recent years from data server farms to locate in central Washington. Although similar in nature, data server farms appear to have a different business model than cryptocurrency miners that is more long-term focused based on our experience. It may be that the large data server companies have watched the community response to cryptocurrency production. We are seeing data server applicants more willing to acknowledge and address the cost/risk profile for an electric power system (transmission, distribution and clean generation) with a long-term approach that limits risks for local communities of data server expansion.

From a customer satisfaction perspective, the vast majority of Chelan's customers have been supportive of the PUD's approach to cryptocurrency mining loads. Achieving high customer satisfaction is the primary objective for a consumer-owned utility. The result has been maintaining low rates for existing customers, experiencing growth that can be managed, seeing other more attractive economic development opportunities appear while avoiding unusual reliability and safety issues.

BULK POWER SYSTEM ISSUES

The following observations are offered regarding the impacts of cryptocurrency production on the bulk power system based on Chelan's experience.

- Accomplishing the clean energy transition in an affordable and reliable manner drives decision-making in the electric industry today, especially on the west coast. So, the key issues regarding crypto production impacts on the bulk power system are assessed in light of carbon emissions reductions strategies.
- Cryptocurrency production can be accomplished in different ways that have dramatically different electricity usage per coin produced. For example, it is reported that the proof of work approach requires more

than an order of magnitude more energy per coin produced than proof of stake. Given the national commitment and substantial utility funding dedicated to energy efficiency for economic and environmental reasons, there is merit in considering mechanisms to assure cryptocurrency production is encouraged toward efficient outcomes as early as possible. Even efficient levels of crypto production represent potential significant additions of load that will require new clean generation.

- Clean energy resources are gaining value in electricity markets while carbon-emitting generation is losing value. Because electricity costs appear to be the primary component of overall cryptocurrency production costs, this is likely to push crypto production, which is very portable, toward fossil-fired resources in at least the near term.
- The ability to modulate cryptocurrency production and load has been discussed as a potential value particularly in a system that is increasingly reliant on variable output electricity resources. There is potentially large value in modulating load (increasing or decreasing electricity usage based on electricity supply/demand within a market) from the 4 second to hourly, daily, seasonal, or even annual timeframes. Chelan did not receive serious offers to modulate which may be related to the reportedly short amortization period of the mining machines. Organized wholesale power markets that transparently value demand response would make load modulation a more feasible alternative. But load modulation is an intriguing form of demand response that could add value to bulk power system operations.
- The portability of cryptocurrency operations could be a benefit in terms of locating operations based on underutilized transmission and distribution capacity availability as long as it does not crowd out all other opportunities for serving load growth. However, with the

tremendous national challenge to expand transmission in order to increase and integrate large amounts of carbon-free emitting generation, substantial collaboration and coordination will be necessary to avoid cryptocurrency mining exacerbating an already very difficult problem.

CONCLUSION

Cryptocurrency mining was a very immature industry when it arrived in Chelan County in 2014. The industry went through a growth evolution over the next four years that unveiled a unique set of load growth challenges for an electric system at both the local distribution and wholesale levels. Not managing these risks can lead to significant cost exposure for a utility's other customers. With appropriate risk assessment and mitigation this exposure can be managed. Whether cryptocurrency mining provides adequate value to overcome the cost of this necessary risk mitigation is a question yet to be answered from Chelan's experience.

There are national, regional, and state level bulk power system issues raised by Chelan's experience including how to:

- Encourage electricity efficient production of cryptocurrency,
- Achieve wholesale pricing promoting active use of demand response that may be able to take advantage of cryptocurrency production flexibility,
- Address transmission planning and expansion cost allocation procedures for new, easily portable large loads, and
- Consider the impact on carbon emission reduction strategies from cryptocurrency miners focused on least cost production strategies.

Finally, whether cryptocurrency's value to society is sufficient for a community to want mining operations based in their area was debated in Chelan County and at best left many of our customer-owners perplexed. This created a more complex question for a consumer-owned utility seeking to enhance the quality of life for the people we serve as they define it.

Thank you for the opportunity to share thoughts with the Committee. I look forward to your questions.