Bitcoin Miner Heating: Evaluating Cost Efficiency and Practical Application

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Introduction

Heat is a standard need for occupied structures, luxury needs, and industrial uses making it a significant recurring expense. In colder and more northern areas this need becomes greater taking up a large portion of utility costs. In fact, space heating accounts for roughly 28% of residential energy use in the U.S. and about 32% in commercial buildings (Center for Sustainable Systems, 2022: U.S. Energy Information Administration [EIA], 2022).

At the same time, Bitcoin mining requires large amounts of energy, effectively all of which is converted into heat. Recent data from Cambridge Centre for Alternative Finance (2025) places Bitcoin's annual electricity consumption at approximately 138 TWh, roughly 0.5% of global electricity use. Historically, Bitcoin mining companies removed the heat waste through cooling systems. However, this thermal energy can be captured and reused to offset unavoidable heating costs, offering a potential dual purpose use of energy.

The purpose of this study is to test whether the heat generated from Bitcoin mining can effectively heat water or be utilized for other thermal applications. By comparing the results of the two immersion-based heating setups, this study examines both the technical performance and economic outcomes of such systems relative to traditional heating methods

Hardware Configurations

The machines used in this study were a set of two Antminer S19j Pro and six Antminer S21. The S19j Pros were rated for 100 Th at 3 kW and the S21s were rated at 200 Th at 3.6 kW. All machines were programmed with BraiinsOS firmware to improve efficiency and enable immersion cooling with Dynamic Performance Scaling (DPS). DPS automatically adjusts the power consumption of the server based on the temperature of the circuit board.

Air-Cooling

Air-cooled miners are the standard configuration of mining hardware. These systems rely on fans built into the mining server to blow air through the machine while moving heat generated by the circuitry. For example, the Antminer S21 and S19j Pro series miners used in this study each come equipped with five fans each. Two larger fans move air over the chip boards and three smaller fans move air over the power supply unit. Air cooling is simple and time efficient with no additional setup. It requires no additional equipment beyond electricity to operate. However, this configuration of the miner cannot effectively heat water or other liquids.

Additionally, “forced air furnaces” must be UL listed according to the International Mechanical Code, Section 918 (International Code Council [ICC], 2024), making use of these industrial machines in homes and businesses more complicated. Running in open air results in exposure to dust, humidity, and other airborne contaminants which can reduce its reliability and performance. Over time, the consistent vibration of fans may also contribute to wear on internal components.

For this study, air cooling was not utilized or considered.

Immersion-Cooling

Immersion cooling completely submerges the machines in dielectric fluid after they have been modified to remove the moving parts. The miners are first disassembled, and in the case of used machines the dust and debris is blown out of the boards. All fans are removed because they are unnecessary when the machine is submerged. It minimizes the power consumption from fan operation and removes unnecessary moving parts, which increases the reliability rate.

The dielectric fluid is a clear non-conductive fluid capable of transferring heat away from the circuit boards in a manner that is significantly more efficient than air cooling (Stevens, 2025). This allows the machines to run more efficiently, which increases the amount of Bitcoin earned per watt utilized (Softwarm LLC, 2023-2025). Fluid circulates through the miners, absorbing the heat and transporting it to the appropriate type of heat exchanger for the material being heated. Heat exchangers are generally either a brazed plate type or radiator type. The combination of brazed plate or radiator type heat exchangers in a fluid circuit enables the heating of fluids and spaces, whilst enabling control of the temperature for the immersion fluid loop.

Comparison of Air and Immersion Cooling

Both air cooled and immersion cooled systems could (in theory) be used for heating systems in both residential and industrial applications. However, each method presents unique advantages and trade-offs. Air-cooled systems are less expensive to install and require minimal setup, but are more susceptible to environmental factors, component wear, and code compliance scrutiny. Immersion cooling enables a greater concentration of equipment and power consumption in a given area because the fluid provides a more stable environment. Heat transfer with fluid is simple, effective, and quiet. The trade-off is higher upfront cost and increased complexity due to the installation and routing of the necessary infrastructure.

The Experiment

First a site for the experiment needed to be found. With the help of Softwarm LLC located in Central Idaho, we were able to find a location that already had a miner based immersion heating system in place that we would be able to compare against other heating methods. The location used was the local concrete company as they were using an immersion heater to heat a 2500 gallon water tank, which contained 2256 usable gallons. After obtaining permission from the company we began our experiments. The water tank was located inside of a building, which ensured a stable environment and allowed us to put an exact number on how much energy was used to complete a set task. The tank was filled and refilled with well water that was at a consistent temperature.

The water tank was built with an external circulation pipe set and its own pump, which was directed to flow through the heat exchangers tied to the mining tanks.

Two immersion-heat reuse systems were tested:

C1 System

The Fog Hashing C1 tank is an external closed loop fluid tank that holds one miner on its own. The tank has an internal pump that circulates dielectric oil through the computer and the rest of the system which consists of a brazed plate heat exchanger and external radiator heat dump. Heat is transferred to different locations by moving dielectric oil used to cool the computers through a defined loop.

The first system in the experiment used two Fog Hashing C1 tanks holding one Antminer S19j Pro each. The heated fluid was pumped from the immersion tank, then through a heat exchanger for each C1 tank, then to an external radiator for each tank. The external radiator fans were configured via thermostat to regulate the temperature of the dielectric fluid loop, which enabled consistent operation of the mining computers even after the water tank reached target temperature. After the dielectric fluid was cooled in the heat dump radiator, it returned to the cold fluid intake on the C1 tank to cool the operating miner and reheat the fluid for utilitarian use.

The brazed plate heat exchanger moved thermal energy to the water without any cross contamination. The water was then continuously circulated in its own independent circuit with its own pump until the target temperature was reached.

B6 System

The Fog Hashing B6 tank is an internal closed loop fluid tank that holds six miners. The tank circulates fluid through the miners and then through a heat exchanger built into the tank, heat is transferred to different locations by moving the water. The water is used to cool the dielectric oil then the oil cools the computers.

The B6 system for this configuration contained six Antminer S21. In this configuration, the heat exchanger was located inside the immersion tank, minimizing the amount of immersion fluid required because there was no “external” fluid loop. Cold water was circulated on its own loop, then was heated via the heat exchanger, and then moved through an external temperature control radiator to remove any excess heat before being recirculated into the storage tank.

The two systems, C1 and B6, varied in the way they conducted and controlled heat. The C1 passed dielectric fluid through an external radiator, while the B6 setup relied on the external water loop to pass the heated water through the external radiator. Both systems had a maximum fluid target temp of approximately 55C, so when the immersion fluid reached maximum temperature the heat had to be released to avoid shutdown of the machines. The general heat transfer process is below:

(Oil loop) C1 Miner -> Brazed Plate HX -> Heat Dump -> C1 Miner

(Oil loop) B6 Miner -> B6 Brazed Plate HX -> B6 Miner

(Water loop) Water Tank -> B6 Brazed Plate HX -> Heat Dump -> Water Tank

Transferring heat with water from the B6 tank was generally less efficient due to a smaller relative heat exchanger and the removal of a direct heat dump from the oil loop. This resulted in a lower peak water temperature when using the B6 with similar machines.

Water Tank

The water tank that was being heated contained 2256 gallons of usable water. This was verified by measuring the flow with a meter while draining a full tank. The tank is filled with a ground source well and water is constantly around 16°C when pumped. The tank was located in the same room as the two types of immersion mining tanks. The water tank was made of steel and configured with a water circulation pump fitted on a 1” pipe manifold. The tank is also still capable of being operated on a propane heating system but the propane heater was deactivated for this experiment.

The water tank already had a preconfigured set of two C1 mining tanks which had been in operation for approximately two years. It was the first configuration ready to operate so it was tested first. In order to measure the temperature of the tank and miners, four thermocouples were attached to a datalogger. One of the thermocouples was placed on the inlet pipe to the heat exchanger a couple inches from the water tank in order to log the temperature of the fluid leaving the tank. Two thermocouples were used to measure the temperature of the fluid in the immersion tanks one in each tank. The last thermocouple was suspended in the air to measure the ambient air temperature.

After the data logger was set up, the kWh count on the electrical meter was reset and the miners in the two C1 tanks were activated. Throughout the experiment the data was monitored, and it was determined that approximate max temp was reached between 48 and 56 hours of operation. The tank was drained and refilled with well water, the power meter was reset, and the process was restarted. The company continued to use the heater system for operational purposes after the data was captured.

The B6 tank was set up to take the place of the two C1 tanks and data was collected for approximately 30 days. The B6 system differed from the C1 system because the immersion fluid never left the tank and it relied on transferred water for cooling. Additionally, the B6 tank contained one heat exchanger for a machine group rated at 21.6 kW, while the C1 tanks had two heat exchangers for a machine group rated at 6 kW. Temperature was logged with thermocouples on both the inlet side and outlet side of the heat exchanger in the tank and the temperature of the water was logged in the same way as before, insulated to the outgoing water pipe. The last thermocouple measured ambient air temperature. The purpose of this extended run was to see how the heating system could hold up over time as water is actively being removed and replaced in the tank. The B6 was logged to show instances of the tank actively being used and illustrated temperature fluctuations as water was added and removed. The amount of energy used over that period of time to maintain the temperature in the tank was also logged.

The energy cost consumed by the miners was compared to the equivalent cost of other heating methods, including propane, natural gas, and electric resistance heating. By directly measuring electrical consumption, the cost of operating the system and heating the tank could be calculated. On top of analyzing raw energy efficiency, this study emphasizes the difference between cost efficiency and energy efficiency. While conventional heating systems that are more energy efficient are usually also more cost efficient, Bitcoin miners are unique because they generate additional value in the form of mined Bitcoin. *As a result, miner-based heating may be less energy efficient but more cost efficient.*

The goal of this project was to determine if heating with Bitcoin miners can compete with traditional heating methods in terms of cost efficiency. This study also examines the point at which electricity prices make miner heating less cost effective than propane, natural gas, electric resistance heating, or heat pumps. By considering both technical performance and the financial outcomes, this work aims to show whether Bitcoin miner heating systems could play a role in future residential or commercial heating solutions.

To be able to compare the financial performance of the miners, the total energy consumed was recorded and converted into the equivalent heating output of other heating methods. Since electricity is measured into kWh it can be translated into other units of measurement such as BTU or Therms. It can then be calculated how much of other heating resources are needed to produce the same amount of heat. Using that information it can be determined how much an alternative energy source would cost for the equivalent amount of heat energy.

Cost Efficiency Consideration

Cost efficiency is the consideration of the net expense/revenue after the heat has been generated. This is a new concept because heaters have historically not paid revenue to operate. The ongoing cost of energy to operate business processes that require heat must be considered as a business expense independent of mining costs. Therefore, if an ongoing heat requirement exists, the cost to mine Bitcoin is effectively zero given that the demand for heat is being met and not exceeded. Generated revenue must now be considered as a factor in determining the most cost efficient method.

In order to show the maximum cost efficiency, gross Bitcoin production is considered with unavoidable energy consumption for heat. The minimum cost efficiency for the location compares Bitcoin production with energy costs when there is no heat demand, and therefore no unavoidable heating cost. Energy consumption calculations include the energy consumed by all mining computers along with any auxiliary energy demands needed, including immersion fluid pumps and any other systems tied to the tanks. Because these components are vital to the system's operation, every kilowatt-hour measured by the power meter is considered part of the mining cost.

The relevant factors to determining cost efficiency are:

- Capital Cost
- Energy cost
- Hashprice https://data.hashrateindex.com/network-data/bitcoin-hashprice-index
- Heating system efficiency (kWh/Th)
- Consumer value proposition
    - KYC free sats vs non KYC free sats
    - Mandatory heat items like a home or city apartment.
        - Is electric heat my only option?
        - What am I willing to spend on luxury heat items?
    - Cost of other fuel sources such as natural gas

Capital Cost - The cost of equipment to produce the heat. Consider the cost comparison of a "dumb" electric boiler or fuel burning boiler to an array of computers, either new or used. What is the cost of each one in a new build, if retrofit is not a consideration?

Energy Cost – The cost of energy regardless of source or type. Consider other available heating fuels such as propane, natural gas, fuel oil, diesel, and other sources.

Hashprice – The amount of revenue made for work performed.

Heating System Energy Efficiency – The amount of usable heat output produced per kWh of energy input. Consider higher energy efficiency of heat pumps, comparable efficiency of resistive heaters, and lower efficiency of fuel burners.

Consumer Value Proposition – The benefit provided to the consumer is an opinion based on individual factors that can not be predicted. What external benefits can the consumer gain from the higher cash flow? This includes external benefits such as tax reductions, dividends from electrical co-ops, and cash back on cards.

The value of miner heating ultimately depends on the consumer's priorities, which can be grouped into four general categories (Softwarm LLC, 2023-2025).

1. **Electrical essential heat users**– use only as required to replace costs that are unavoidable. Electrical rate is irrelevant if electrical heat is preferred over other options.
2. **Comfort-focused users**– apply the system on an on-demand basis to non-essential heating such as hot tubs, pools, or heated sidewalks. The customer value proposition is determined by electrical cost and what the cost to heat is worth to them.
3. **Profit-driven users**– run miners when market conditions justify operation resulting in net profit. Excess heat is not utilized and is dumped.

4. **Ideologue users**– operate the system to support the Bitcoin network without the consideration of profit or cost.

For the first two groups of consumers the primary comparison is between miner heating and alternative heating methods available in their location. In locations where electricity is the only practical heating option, such as a large city building where other heating methods besides electricity are unavailable, miner heating offers a straightforward advantage. In these situations the comparison is direct: either pay for electricity to generate heat with no return, or pay close to the same for heat and a digital asset. Even at relatively low hash prices, this dual-purpose use makes miner heating favorable.

In regions where fuels such as natural gas, propane, or even fuel oil are readily available, the economics become more complex. Natural gas in particular can deliver heat at a much lower cost per unit of energy than electricity in many states. In these cases miner-based heating may not be directly competitive if only cost is considered. It still may provide value if Bitcoin production offsets part of the expense. Additionally hybrid systems can be used where effective, providing a base-load of heat while a gas or propane system can cover higher demands if necessary. This makes miner heating viable in moderate climates or places where a steady low-grade heat is needed, such as water, snow melt systems, or greenhouse heating.

Regional electricity pricing also plays a major role. States with relatively low power costs present stronger opportunities for miner heating compared to states with high electricity costs. In high-cost electricity markets, miner heating would only be competitive in situations where the alternative methods cost the same or less than electricity plus the cost offset by mining Bitcoin. This makes adopting miner-based heating location-dependent, except for people who are willing to run the miners to earn Bitcoin with little to no regard for profit.

Dual C1 Tank

Immersion Fluid Route: C1 Tanks—>Heat Exchanger—>Outside Heat Dump/Radiator—>C1 Tanks

Water Route: Water Tank—>Heat Exchanger—>Water tank

Logged information

- Timeframe: July 11th 18:44 to July 14th 12:39(Roughly 65 hours 55 minutes)
- Equipment: Two FogHashing C1 tanks, Two S19j Pro miners, heat exchanger, radiator, 2256-gallon water tank
- Logged totals:
    - Energy: 371.69 kWh
    - Average draw: 5.76 kW (≈24 amps)

  - Local electricity cost: $0.058/kWh

Mining Info

- Hashrate: two S19j Pros ≈ 0.2 PH/s (Pettahash a second) combined
- Hashprice: ≈$60 per PH/s per day during the run according to https://data.hashrateindex.com/network-data/bitcoin-hashprice-index

- Revenue equation:

  Revenue = Hashrate (PH/s) * Hashprice ($/PH/day) * Days

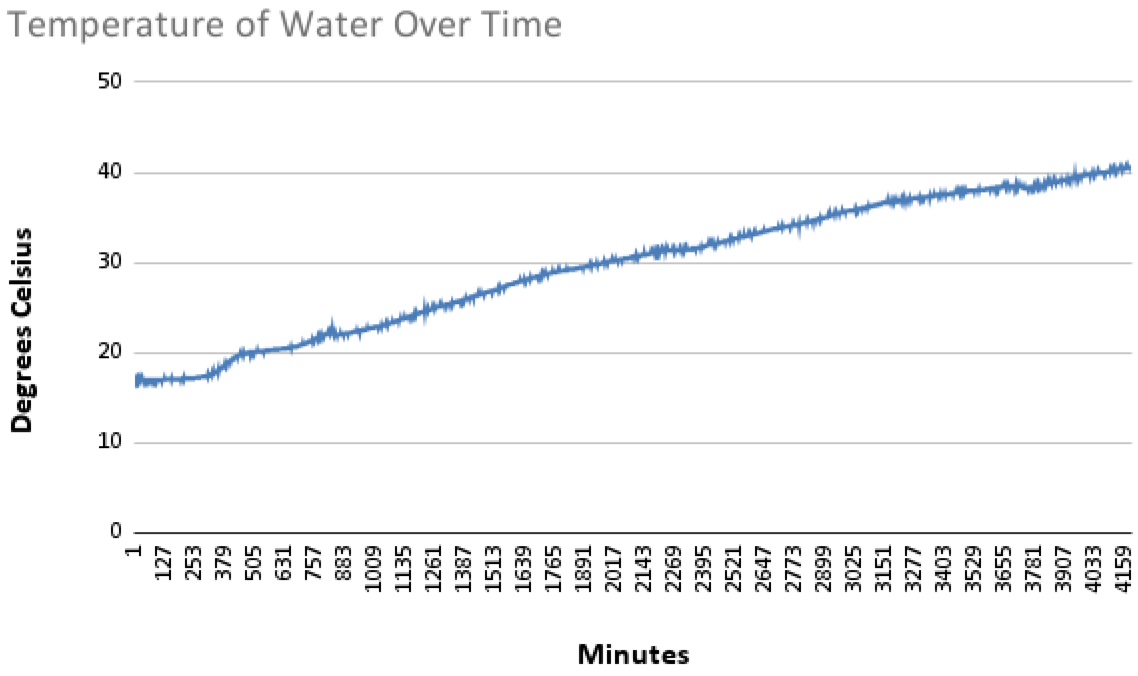
- Cost equation:

  Cost = Energy (kWh) * Electricity Rate ($/kWh)

- Net Profit

  Net Profit = Revenue - Cost

Runtime	65h 55m
Energy used	371.69 kWh
Electricity Cost	$21.56
Miner Hashrate	0.2 PH/s
Hashprice	$60/PH/day
Mining Revenue	$32.96
Net Profit	$11.40
Profit per kWh	$0.0307



This graph shows the incline in temperature over a period of 4159 minutes or roughly 69.32 hours. Using only two miners over the course of that time the temperature was able to be raised from 16.7℃ to 40.6℃.

The results of this particular experiment shows that for this particular use case miner-based heating systems not only fulfilled its given heating objective but also generated a measurable financial return. Over a 65-hour, 55-minute test period, two S19j Pro miners and their supporting system used 371.69 kWh with a local electricity cost of $0.058 a kWh. The cost to run the system came out to $21.56 while at the same time with a combined hashrate of 0.2 PH/s and a rough hashprice of about $60 PH/s per day. This resulted in the system earning approximately $32.96 in about 65h 55m as of July of 2025. This produced a profit of $11.40 or roughly $0.0307 per kWh. Using this information in order to break even in this particular situation power would have to cost around $0.0887 per kWh. Furthermore, unlike a conventional water heater or boiler that would have only incurred the $21.56 cost, this secondary use system converted the same energy expense into both useful heat and a digital asset improving the overall value proposition of the energy consumed.

Values to different user types were defined by Cade Peterson from Softwarm LLC (Softwarm LLC, 2023-2025).

Essential heat users (Type 1)

These users require electrically produced heat for daily life or business operation as an unavoidable cost. Since electricity would have been used to produce the heat regardless, all Bitcoin revenue can be considered without a cost. The energy cost is incurred to produce heat, not Bitcoin, but use of Bitcoin miners does not induce costs over and above essential heat requirements. In this case, $32.96 worth of Bitcoin was mined during the test period with zero cost to produce the Bitcoin, only to produce the heat.

Comfort-focused users (Type 2)

These users apply miner heat towards non-essential or luxury heating needs such as hot tubs, pools, or sidewalks. For them, the system's value depends on the users' perception of that value. This can vary from it being perceived as Essential (Type 1) to completely Profit-driven and non-essential (Type 3). For these types of users in this scenario the value of the Bitcoin produced could be as much as $32.96 or as little as $11.40 depending on the criticality of the heat needed.

Profit-driven users (Type 3)

These users operate the system for the purpose of mining profitability. They will track revenue and the cost of power to only run the system when it is profitable. In this experiment the total energy cost was $21.56 while the revenue was $32.96, leaving a net profit of $11.40. This comes out to $0.0307 per kWh making heating with miners useful to this individual as long as the electricity price remains below $0.0887/kWh for this particular case.

Ideologue users (Type 4)

These users mine Bitcoin for reasons other than financial return, such as supporting the Bitcoin network or accumulating BTC regardless of cost. For them all $32.96 worth of Bitcoin mined is considered a gain, expenses are ignored, and heat production is undesired or completely out of consideration.

B6 Tank

Immersion Fluid Route: B6 Tank—>Heat Exchanger—>B6 Tank

Water Route: Water Tank—>Heat Exchanger—>Outside Heat Dump/Radiator—>Water Tank

Logged information

- Timeframe: August 6th at 18:50 through September 7th at 15:23 (Roughly 31 days and 20 hours)
- Equipment: One FogHashing B6 tank, Six S21 miners, radiator, 2256-gallon water tank
- Logged totals:
    - Energy: 13844.4 kWh
    - Average draw: 19.44 kW
    - Local electricity cost: $0.058/kWh
    - Peak temperature recorded while in use 42.8℃

Mining info

- Hashrate: Six S21 miners ≈ 1.2 PH/s capable combined

- BTC Mined 0.0149481
- BTC Market Price (September 2025): Approximately $116,747
- Mining Revenue: 0.0149481 BTC * $116,747 ≈ $1,743.55

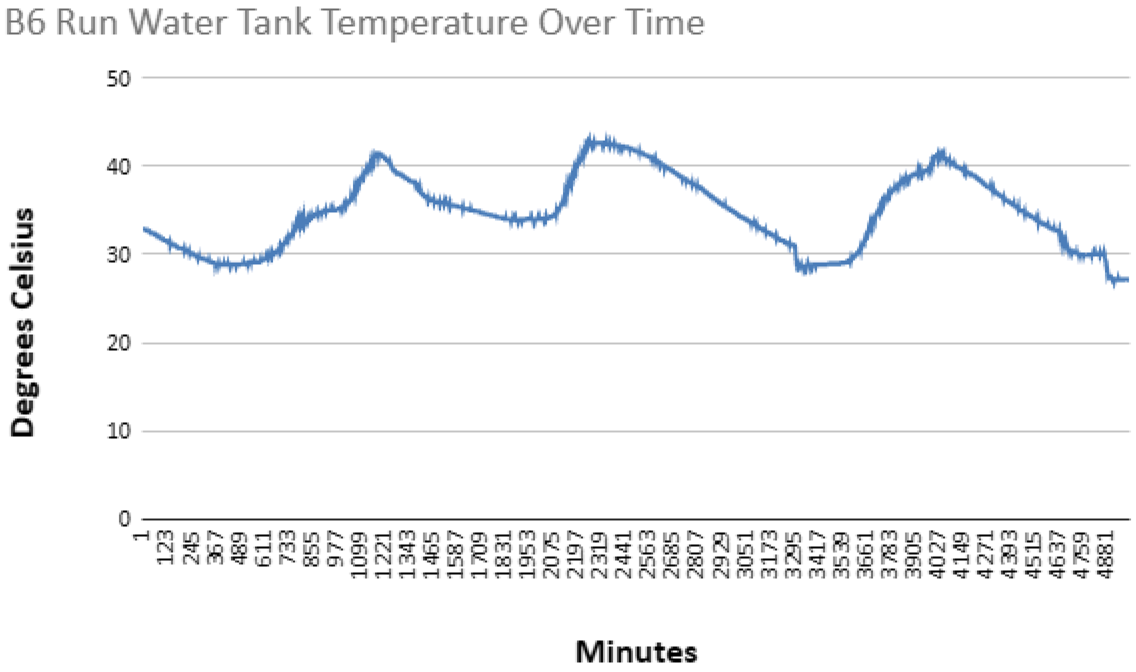
Cost Equation

- Cost: Energy Used (13,844.4 kWh) * Electricity Rate ($0.058/kWh)
- Cost: 13,844.4 * 0.058 = $803.17

Net Profit

- Net Profit: Revenue - Cost
- Net Profit: $1734.55 - $803.17 = $940.38
- Profit per kWh: Net Profit/Energy Used
- Profit per kWh: $940.38/13,844.4 ≈ $0.0679/kWh

Runtime	31 Days 20 Hours (≈ 760 hours)
Energy Used	13,844.4 kWh
Electricity Cost	$803.17
Miner Hashrate	1.2 PH/s
BTC Mined	0.0149481
BTC Market Price	$116,747 (Sept 2025)
Mining Revenue	$1,743.55
Net Profit	$940.38
Profit per kWh	$0.0679



This graph shows the temperature over a period of 4,881 Minutes or roughly 81.35 hours. During this time period water was removed and replaced with cool well water that had a temperature of approximately 16.7℃. This shows as water was periodically removed and new cold water was added how the temperature changed over time. Throughout the day the miners were able to keep the water warm enough to meet the needs of the concrete plant.

The results of the B6 experiment demonstrate that miner-based heating systems can be used to maintain water temperature under real-world operating conditions while also producing a financial return. Over the 31-day, 20-hour test period, six S21 Antminers and their supporting system consumed 13,844.4 kWh of electricity at a local cost of $0.058 per kWh, totaling $803.17 worth of electricity. During the same time, the system mined 0.0149481 BTC valued to approximately $1,743.55 at the time this experiment was conducted in through September of 2025. After all energy expenses were subtracted the net profit came out to be $940.38 or roughly $0.0679 per kWh used. In this case, the system would only fail to break even if the electricity prices exceeded $0.126 per kwh and even then it would be able to operate at a reduced cost to standard electrical heating methods. Unlike a conventional heating system that would have $803.17 of electricity into only heat, the B6 setup provided the same heating benefit while simultaneously generating a digital asset, further strengthening the value proposition of miner-based heating in practical applications.

Value to different user types (Softwarm LLC, 2023-2025).

Essential heat users (Type 1)

The heated water tank is an unavoidable heating demand. In this scenario, the $803.17 spent in electricity would have been spent regardless to maintain the water temperature. Because the system mined 0.0149481 BTC or roughly $1,743.55 at that time, the net benefit is $1743.55.

Comfort-focused users (Type 2)

The heated water tank is used for luxury needs not critical to daily life but desired. Maybe the convenience of washing equipment with warm water in the winter time is worth something to the owner. A total of about $1,743.55 was produced with required heat, $940.38 in net profit is produced with profit-driven operations. The value to the comfort-focused user is subjective and variable between those two amounts.

Profit-driven users (Type 3)

The mining is occurring without consideration of heating the tank, and only when profitable. After power costs, net profit is $940.38 or about $0.0679 per kWh used. Profit driven users would continue to operate the system until the Bitcoin hashprice to energy price ratio becomes unprofitable.

Ideologue users (Type 4)

These users are less motivated by the idea of offsetting costs but more by the desire to support the Bitcoin network. They view any revenue from mined Bitcoin as a benefit, while the useful heat is simply an added bonus. For this group, the 0.0149481 BTC earned would be considered the primary value. The realized value equivalent derived from personal satisfaction of supporting the network is a function of the individual user’s opinion and unpredictable.

The alternative heat for both the C1 and B6 tanks

The results from both the C1 And B6 systems demonstrate that immersion-cooled Bitcoin miners can be used as a dual purpose technology, generating heat and revenue from mining. The C1 run showed how the miners can complete a defined heating task while the B6 run showed that miner based heating systems can be used to maintain needed temperatures in real-world conditions over extended periods of time.

The miners consumed the following amounts of electricity over their monitored periods of work:

- C1 system: 371.69 kWh over 65 hours and 55 minutes.
- B6 System: 13,844.4 kWh over 31 days and 20 hours.

When compared to propane as an alternative heat source at the local price of $2.05 per gallon, electricity proved to be more cost effective to heat in both cases. In the C1 run the equivalent heating output would have required 13.8-17.3 gallons of propane, costing between $28-$35 depending on the efficiency of the heater. This is $6.8-$13.9 more expensive than the $21.56 electricity used. For the B6 run in order to reach the same output propane would have required 516-645 gallons costing roughly $1,057-$1,322 compared to the $803 electricity bill.

Under local prices electricity was already cheaper than propane in order to provide the same amount of heat output for a given kW of consumption and miner heating further improved the value proposition.

The cost performance of the miner heating depends on the electricity and market conditions. In the C1 experiment, the system generated a net profit of $11.40 over the testing period, while the B6 equipped with newer machines produced a much larger net profit of about $940.38. Both systems provided heat at a lower effective cost than electric resistance heating, while also producing revenue. Given the conditions both systems were ran in the break even point for the C1 tank showed it would be profitable up to a rate of $0.0887/kWh, while the B6 system needed a rate as high as $0.126/kWh to reach a point where it was no longer profitable. However this does not mean that the system provides no value, this only means that when the electrical rate is paid no value will be left in excess.

It is important to make the distinction between energy efficiency and cost efficiency when interpreting these results. Conventional heating systems such as high efficiency propane furnaces or heat pumps may achieve higher thermal efficiency than Bitcoin miners, which simply convert nearly all electrical input into heat. However, miners uniquely generate additional value in the form of Bitcoin, which can outweigh differences in energy efficiency in the form of cost efficiency. As shown by both experiments, miner heating systems were less about achieving maximum energy efficiency and more about achieving a better cost efficiency, by transforming unavoidable energy consumption into a dual purpose output.

Finally, the consumer value proposition depends on the type of user. Essential heat users will treat miner heating as a way to reduce unavoidable heating expenses, since the electricity cost would have been incurred regardless and Bitcoin production offsets part of that expense. Comfort-focused users benefit by applying miner heat to optional luxury uses, where the value lies in convenience and additional amenities, with mining revenue serving as a secondary advantage. Profit-driven users evaluate miner heating strictly in terms of financial outcomes, running systems only when Bitcoin revenue exceeds electrical costs, as demonstrated in both experiments. Ideologue users, on the other hand, are motivated primarily by their support for the Bitcoin network, viewing the production of digital assets as the central benefit, with usable heat as an added byproduct. This shows that the miner heating can appeal to different consumer groups for different reasons, from maximizing profit, to simply reducing unavoidable heating costs, and satisfying personal ideological concerns.

Conclusion

This study set out to determine whether Bitcoin mining hardware could serve as an effective and economically competitive heat source compared to traditional methods. Through controlled experiments using the Fog Hashing C1 and B6 immersion systems, the results showed that miners not only provided sufficient heat for a 2,256-gallon water tank but also generated additional revenue in the form of mined Bitcoin. In both cases, the systems delivered heating at a lower effective cost than electric resistance methods and, under local pricing conditions, even outperformed propane.

The analysis further demonstrated that the value of miner-based heating is highly dependent on user type and local energy markets. Essential heat users gain direct cost offsets, comfort-focused users capture flexible benefits, profit-driven users operate at market-optimized conditions, and ideologues contribute to the Bitcoin network regardless of financial outcome. This range of value propositions illustrates the versatility of miner heating in serving diverse consumer motivations.

While miners are not the most energy-efficient heating devices compared to alternatives such as heat pumps, their ability to convert unavoidable electricity use into both heat and digital assets reframes how energy efficiency should be considered. The findings of this study suggest that Bitcoin miner heating is most viable in locations with competitive electricity rates or unavoidable heat demand, and adoption could expand further as mining hardware evolves to operate at higher chip temperatures and integrate more seamlessly into thermal systems.

Overall, Bitcoin miner heating represents a dual-purpose technology that bridges the gap between energy use and financial return (Stevens, 2025; Softwarm LLC, 2023-2025).With continued innovation and strategic application, it has the potential to complement existing heating infrastructure in both residential and commercial settings while contributing to the broader discussion on sustainable energy use.

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