

# Electricity & Mining Monitor Dashboard Documentation

## 1. Project Summary

Mining Monitor Dashboard is an interactive data visualization and analytics platform tailored for crypto mining farm operators and energy analysts. It offers real-time monitoring of mining machine statuses and electricity price dynamics, providing users with actionable insights to maintain operational efficiency and manage energy costs.

This system will integrate status filtering, device management, static IP-based regional performance analysis, and electricity price trend visualization (using Plot). I am also considering adding a predictive analytics feature to assess potential future risks—for example, triggering emergency shutdowns when electricity prices peak.

## 2. Key Features

- Upload Your CSV Files

Mining Machine Table: Upload a machine status table with fields like status, temperature, hash rate, etc.

Electricity Price Data: Upload daily/hourly electricity price data in .csv format (e.g., Date, Time, Electricity Price (\$/kWh)).

- Mining Monitor Widget

Filter machines by status and location

Visualize counts with a stacked bar chart

See a live table with ID, Temp, hash rate, Uptime...

Get statistics on average temperature, hash rate, uptime

Toggle "Show more" to expand results

- Electricity Price Analysis

Set an interactive threshold slider to mark high-price periods

View a summary panel with average/min/max price

Alert box for all times exceeding the threshold (with color-coded risk)

Interactive line chart showing price trends and breaches

- Future Price Forecast

Generates predicted electricity prices for the next 5 days

Two price points per day: 00:00 and 12:00

Mark whether each predicted point exceeds the threshold

Abstracted into a reusable function `electricityPriceForecastTable` & `predictFuturePrices`

### 3. Component Structure

|                                               |                                                   |
|-----------------------------------------------|---------------------------------------------------|
| <code>fileInput</code>                        | Upload field for machine status                   |
| <code>uploadedMachines</code>                 | Processes an uploaded CSV file into an array      |
| <code>MiningMonitorWidget(config)</code>      | Reactively renders machine summary and filters    |
| <code>filters</code>                          | Checkbox and dropdown for machine status/location |
| <code>fileInputElectricity</code>             | Upload field for electricity prices               |
| <code>parsedResult</code>                     | Asynchronous generator to parse CSV file          |
| <code>priceThreshold</code>                   | Range slider to set alert threshold               |
| <code>dataOverview</code>                     | Card-based summary: avg, min, max, breach rate    |
| <code>priceTrendChart</code>                  | Line chart with thresholds and dot alerts         |
| <code>priceAlertTable</code>                  | Table listing all breached entries                |
| <code>createElectricityForecastTable()</code> | Predicts and renders future price table           |

### 4. External Libraries Used

|                 |                                   |
|-----------------|-----------------------------------|
| <code>d3</code> | CSV parsing and data manipulation |
|-----------------|-----------------------------------|

|                               |                                                                                                                                   |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| @observablehq/plot            | Trend visualizations                                                                                                              |
| @observablehq/inputs          | Range sliders, selects, checkboxes                                                                                                |
| @john-guerra/reactive-widgets | Interactive input-to-visual feedback                                                                                              |
| electricityPriceForecastTable | Generates a styled forecast table showing predicted electricity prices with threshold-based status indicators                     |
| predictFuturePrices           | Generates a simple electricity price forecast by simulating future prices based on historical averages and time-of-day variation. |

## 5. Expected CSV Format

For Electricity Prices:

| Date     | Time  | Electricity Price (\$/kWh) |
|----------|-------|----------------------------|
| 2025/3/1 | 00:00 | 0.341                      |
| 2025/3/1 | 12:00 | 0.207                      |
| 2025/3/2 | 00:00 | 0.209                      |
| 2025/3/2 | 12:00 | 0.269                      |
| 2025/3/3 | 00:00 | 0.216                      |
| 2025/3/3 | 12:00 | 0.172                      |
| 2025/3/4 | 00:00 | 0.393                      |
| 2025/3/4 | 12:00 | 0.231                      |

For Mining Machines:

| id             | status          | temperature | hashrate | uptime | location |
|----------------|-----------------|-------------|----------|--------|----------|
| 10.34.247.80   | Online          | 65          | 85       | 240    | Line I   |
| 10.34.247.28   | Offline         | 52          | 0        | 0      | Line I   |
| 172.200.56.192 | Overheated      | 82          | 45       | 180    | Line I   |
| 172.200.56.192 | Online          | 68          | 92       | 720    | Line F   |
| 172.200.55.203 | Underperforming | 71          | 35       | 120    | Line F   |
| 172.200.54.100 | Maintenance     | 60          | 0        | 0      | Line C   |
| 172.200.53.202 | Online          | 63          | 88       | 340    | Line A   |
| 172.200.54.73  | Online          | 66          | 76       | 520    | Line A   |
| 172.200.55.23  | Offline         | 55          | 0        | 0      | Line G   |
| 172.200.56.112 | Overheated      | 84          | 38       | 90     | Line F   |
| 10.34.247.8    | Overheated      | 39          | 340      | 0      | Line H   |
| 10.34.247.128  | Online          | 40          | 520      | 0      | Line H   |

## 6. Observable Notebook

Electricity & Mining Monitor Dashboard Share Link:

<https://observablehq.com/d/17ad2f133c3f874a>

The Electricity & Mining Monitor Dashboard is the central part of the project, providing an interactive interface for monitoring mining machine status and electricity-related risk alerts. It includes components such as `MiningMonitorWidget()` for real-time device status filtering and visualization, and `priceTrendChart` for tracking electricity price fluctuations over time. These tools enable mining farm operators to identify abnormal machine behavior, monitor power cost trends, and respond to threshold breaches promptly.

electricity-forecast-shuhan Share Link:

<https://observablehq.com/d/b8ad004b090ff363>

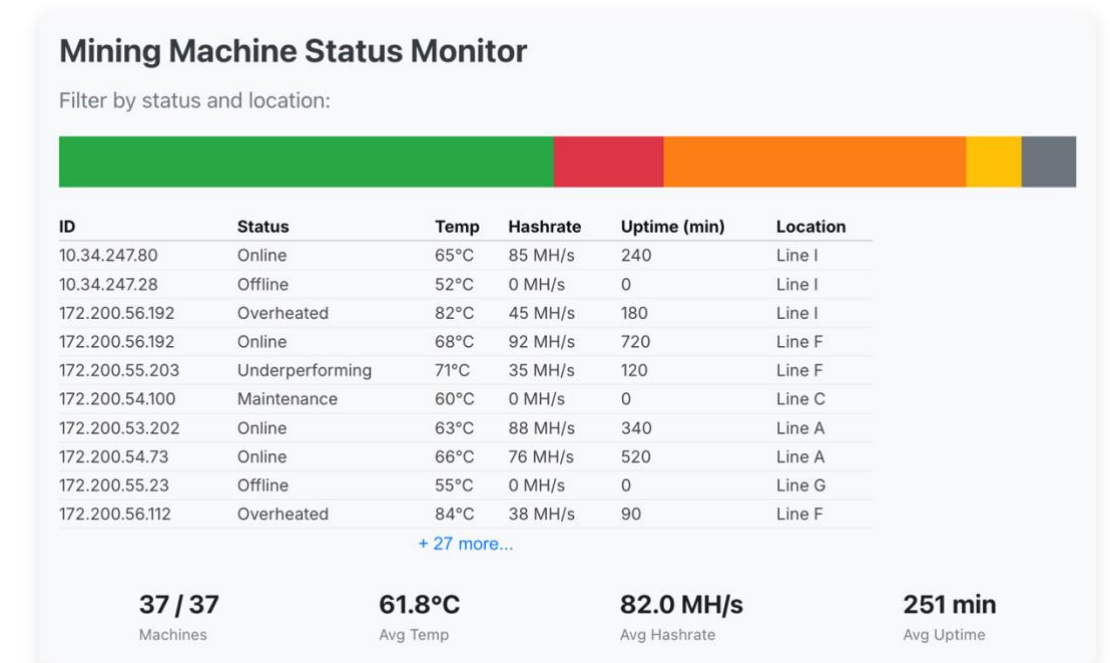
In addition, the electricity-forecast-shuhan module abstracts reusable forecasting logic into two key functions: `electricityPriceForecastTable()`, a styled and configurable component for displaying predicted electricity prices along with status indicators, and `predictFuturePrices()`, a utility function that generates future price estimates based on historical data and typical daily variations. This module is designed for easy reuse across notebooks, allowing developers and analysts to plug forecasting functionality into various dashboards or reporting tools with minimal setup. Together, these modules form a robust solution for intelligent mining operations and proactive energy cost management.

## 7. Project Usage

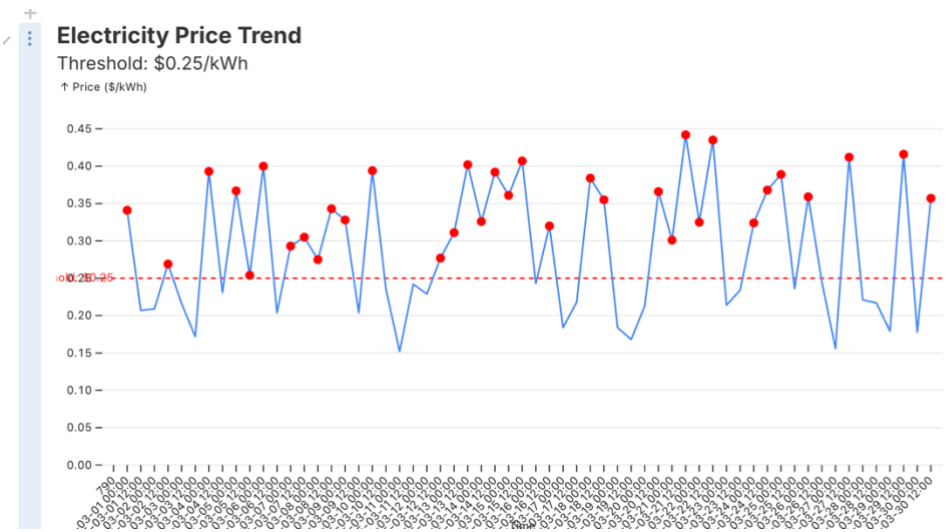
This Observable Notebook project is an interactive dashboard for monitoring mining machine status and analyzing electricity price data. Users can upload CSV files containing mining machine and electricity price records, filter machines by operational status and location, and set a price threshold to highlight risky time periods. The system displays summary statistics, visual charts, and detailed alert tables. It also includes a forecast module that predicts electricity prices for the next five days based on historical trends. All inputs are reactive, allowing real-time updates. The project is modular, uses Observable's built-in Inputs, Plot, and d3 libraries, and includes a reusable forecasting function that can be imported into other notebooks.

## 8. Project screenshot

### Mining Machine Monitor Dashboard



### Electricity Price Trend



## Electricity Price Overview

| Electricity Price Overview                            |                                                       |                                                       |                                                               |
|-------------------------------------------------------|-------------------------------------------------------|-------------------------------------------------------|---------------------------------------------------------------|
| <div>\$0.2897</div> <div>Average Price (\$/kWh)</div> | <div>\$0.1520</div> <div>Minimum Price (\$/kWh)</div> | <div>\$0.4420</div> <div>Maximum Price (\$/kWh)</div> | <div>34</div> <div>Time periods above threshold (56.7%)</div> |

## Electricity Price Threshold Alerts

| Timestamp        | Price (\$/kWh) | Exceeds Threshold | Risk Level |
|------------------|----------------|-------------------|------------|
| 2025-03-21 12:00 | \$0.4420       | +\$0.1920         | Medium     |
| 2025-03-22 12:00 | \$0.4350       | +\$0.1850         | Medium     |
| 2025-03-29 12:00 | \$0.4160       | +\$0.1660         | Medium     |
| 2025-03-27 12:00 | \$0.4120       | +\$0.1620         | Medium     |
| 2025-03-15 12:00 | \$0.4070       | +\$0.1570         | Medium     |
| 2025-03-13 12:00 | \$0.4020       | +\$0.1520         | Medium     |
| 2025-03-06 00:00 | \$0.4000       | +\$0.1500         | Medium     |
| 2025-03-10 00:00 | \$0.3940       | +\$0.1440         | Medium     |
| 2025-03-04 00:00 | \$0.3930       | +\$0.1430         | Medium     |
| 2025-03-14 12:00 | \$0.3920       | +\$0.1420         | Medium     |
| 2025-03-25 00:00 | \$0.3890       | +\$0.1390         | Medium     |
| 2025-03-18 00:00 | \$0.3840       | +\$0.1340         | Medium     |
| 2025-03-24 12:00 | \$0.3680       | +\$0.1180         | Medium     |
| 2025-03-05 00:00 | \$0.3670       | +\$0.1170         | Medium     |
| 2025-03-20 12:00 | \$0.3660       | +\$0.1160         | Medium     |
| 2025-03-15 00:00 | \$0.3610       | +\$0.1110         | Medium     |
| 2025-03-26 00:00 | \$0.3590       | +\$0.1090         | Medium     |
| 2025-03-30 12:00 | \$0.3570       | +\$0.1070         | Medium     |

Electricity Price Forecast for the Next 5 Days

Electricity Price Forecast for the Next 5 Days

| Date       | Time  | Predicted Price (\$/kWh) | Status          |
|------------|-------|--------------------------|-----------------|
| 2025-04-22 | 00:00 | \$0.2719                 | Above Threshold |
| 2025-04-22 | 12:00 | \$0.3259                 | Above Threshold |
| 2025-04-23 | 00:00 | \$0.2668                 | Above Threshold |
| 2025-04-23 | 12:00 | \$0.3532                 | Above Threshold |
| 2025-04-24 | 00:00 | \$0.2616                 | Above Threshold |
| 2025-04-24 | 12:00 | \$0.3617                 | Above Threshold |
| 2025-04-25 | 00:00 | \$0.2763                 | Above Threshold |
| 2025-04-25 | 12:00 | \$0.3417                 | Above Threshold |