Batteries into Profit :
A Lucrative Energy Arbitrage Facility

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What is Energy Arbitrage?

Buying low and selling high, with electricity.

Power can be purchased when the demand is low, stored until it increases, and then sold for profit.

In Texas, the demand/cost/usage of power is tracked and regulated by **ERCOT**: the **Electric Reliability Council of Texas**. On the ERCOT power market, electricity can be bought/sold, and Texas will pay power storage facilities for backup power.

Modern Power Storage Facilities

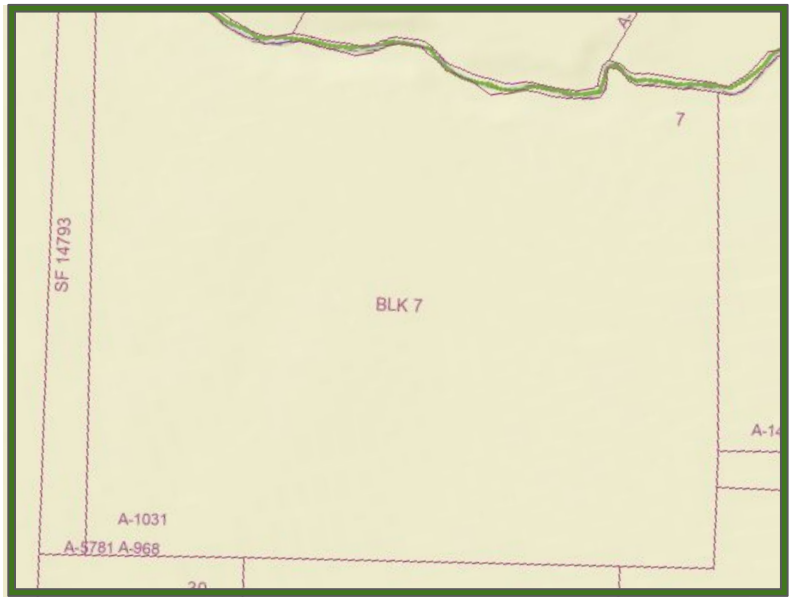
Facilities like the one pictured have recently become more popular.

Ten foot tall batteries sit in rows, operated remotely and cooled by fans.

They charge up with energy, and eventually send it back into the grid.

Our Proposed Facility

We possess five acres of land in Reeves County, West Texas. This land is perfect for a **state-of-the-art**, **grid-connected**, and **profitable** large-scale **battery storage facility**.



What We Need Most: Capital

To profit from this facility, we need enough initial capital for battery units, interconnection to the West Texas power grid, and site construction.

This is where you come in: investment.

Why Should You Invest?

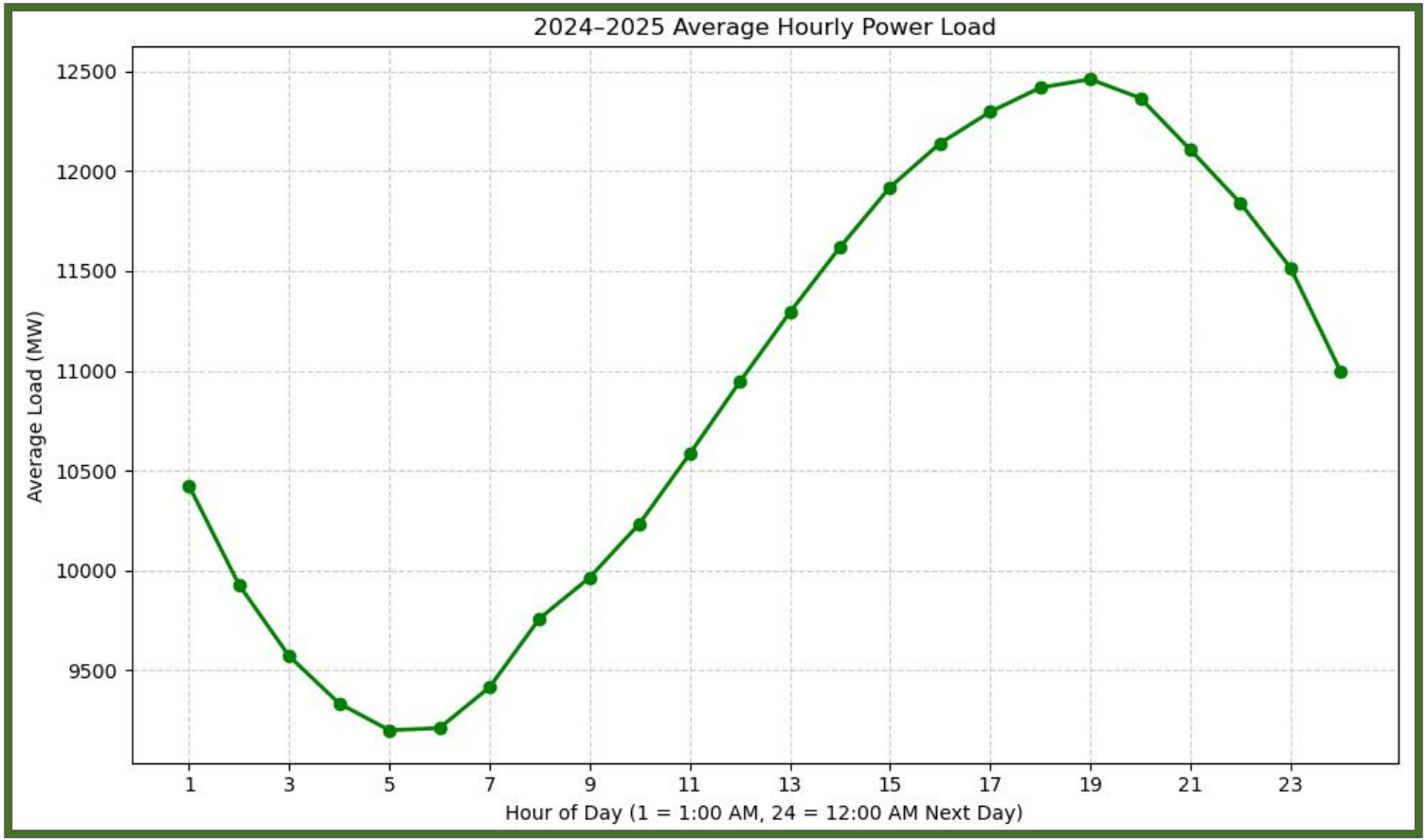
We want to ensure a return on your investment into this venture.

So, using, state-wide data sets of real-world Texas power data, I'll demonstrate the optimal strategy for buying and selling power to maximize profit.

Profit-Maximizing Trading Strategy:

We'll use data on the hourly grid load and power prices for the state of Texas to find the best hourly/monthly time to charge/discharge energy.

What Time of Day Should We Charge?



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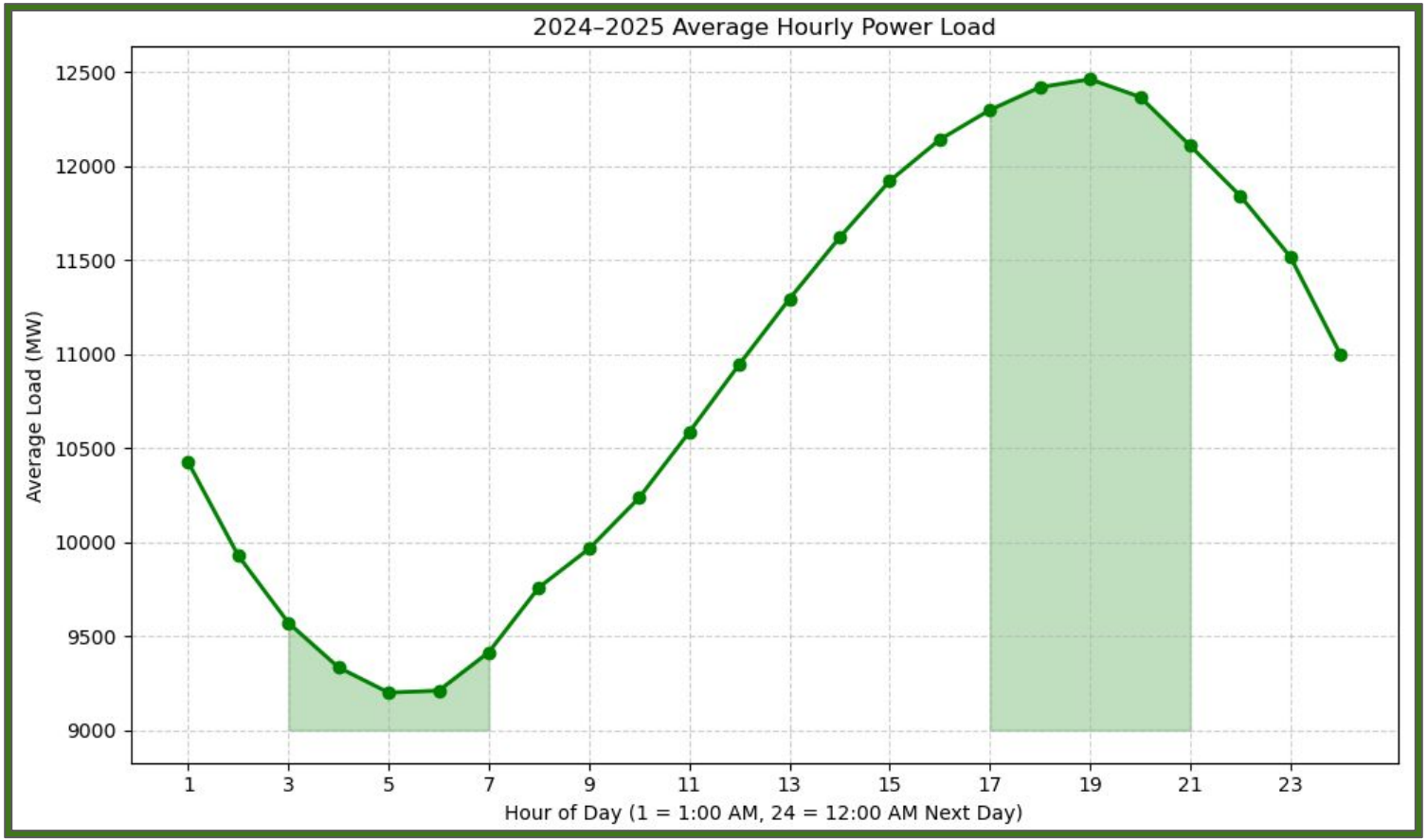
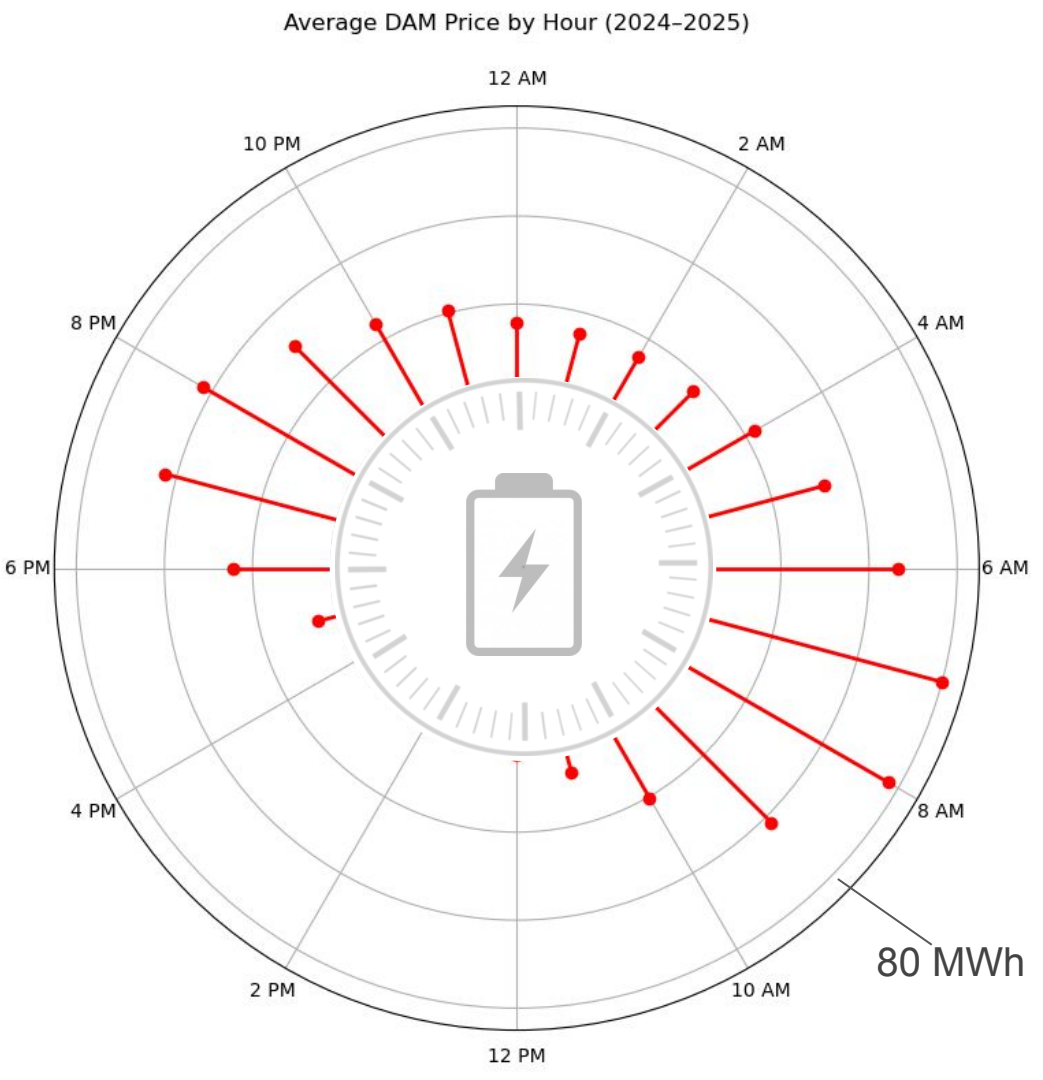


What Time of Day Should We Charge?

The graph shows lower demand for power from the hours of **3-7 AM**, and higher demand from **7-10 PM**. This mirrors temperatures and waking times, and thus the use of A.C. and other facilities.

Does this mean we should charge from 3-7 and discharge from 7-10 for optimal profit? Not necessarily; while those times get us closer, it ultimately depends on the price.

This graph shows that the **price** spikes not only in the heat of the afternoon, but also in the morning; this is likely due to the energy use of waking people with a lack of wind and solar power.

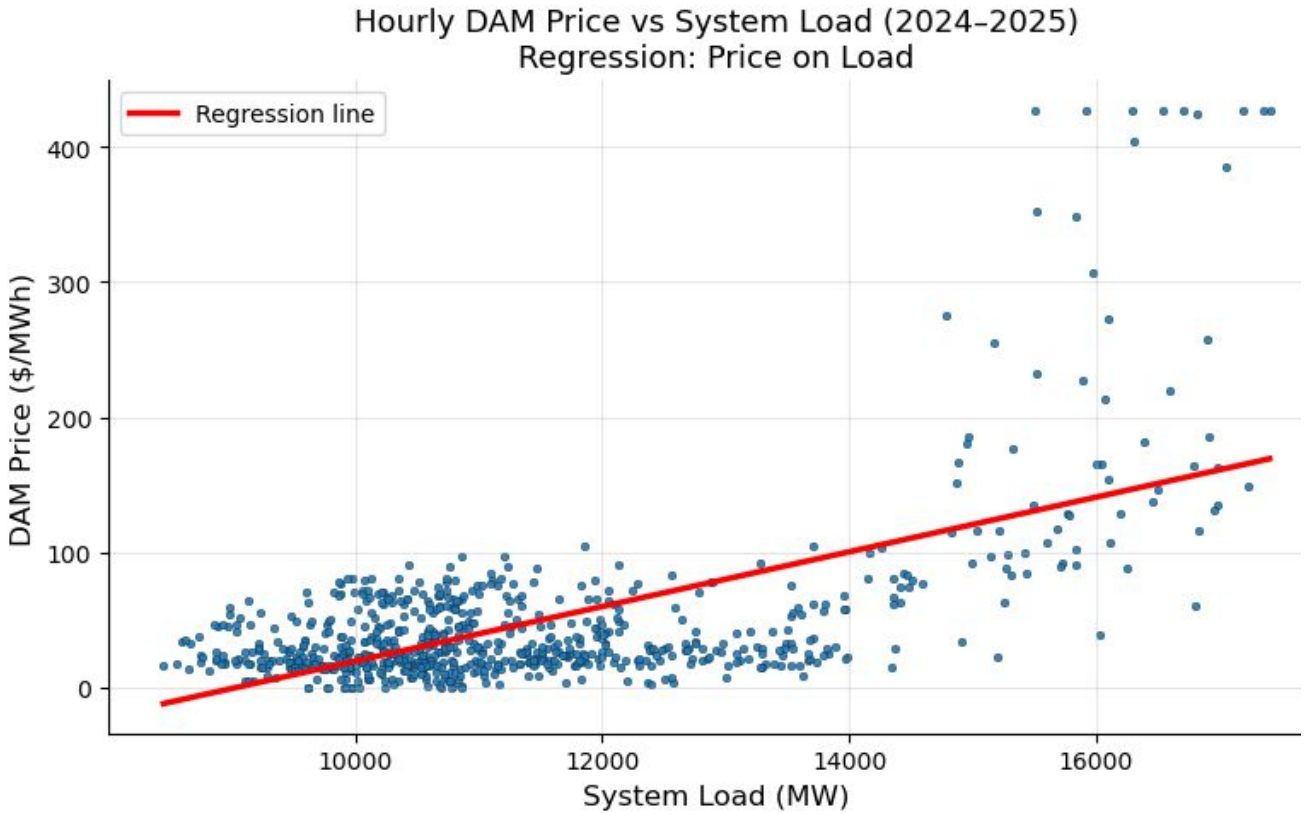


Price and Demand suggest slightly different strategies. To know which one is more reliable, we'll take a closer look at their relationship using a simple linear regression.

Linear Regression of Price and System Load

The intercept is price at 0 MW, and the slope means the price of power increases by $20 per kilowatt.

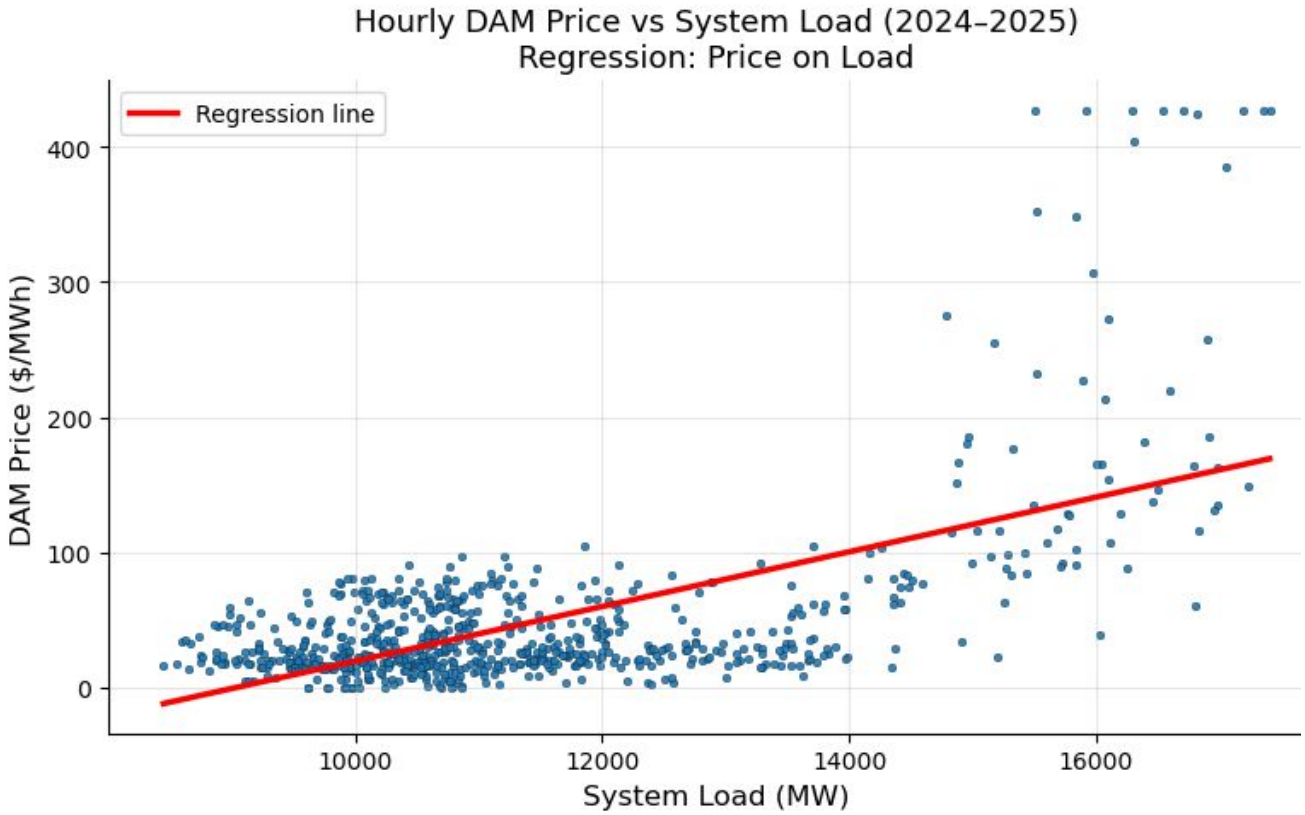
This ensures profit at large scales when using an effective strategy.



Linear Regression of Price and System Load

About 40% of the variation in price is explained by the system load.

Why aren't they correlated more closely? Primarily because of fluctuation in wind and solar power.



So, trusting the price data, optimal timing is to charge from **1-3 AM & 12-4 PM**, and discharge around **8AM and 8PM.**
Next, we'll find out which month is best to focus on.

What Months are Best for Arbitrage?

This table shows the average margins for a perfect 1 MWh battery each month, and their day-to-day volatility.

May has a high earning potential of $34/MWh, but it is very volatile.

April and June earn a bit less, but they are safer bets, and they almost guarantee profit at large scales.

Daily Arbitrage by Month ('25)

Month	Mean	Std Dev
May	34	41
Feb	15	39
Jun	15	8
Apr	13	9
Aug	13	16
Mar	12	11
Oct	11	5
Jul	10	14
Nov	9	<NA>
Jan	8	8
Sep	7	4

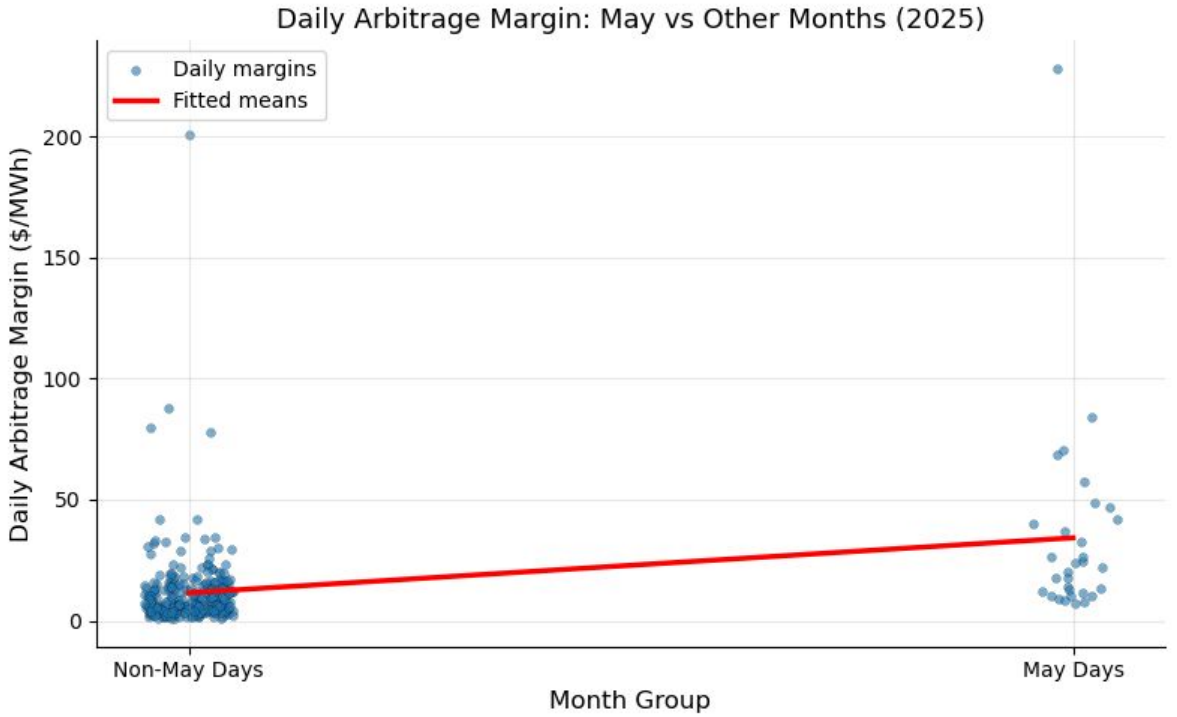
To fully optimize, we need to determine if May is really a lucrative month when other factors have been accounted for. To do this, we'll start with a regression.

Linear Regression: May vs. Other Months

This simple regression shows clearly that May has higher margins than other months.

The intercept here is the average daily arbitrage in non-May months.

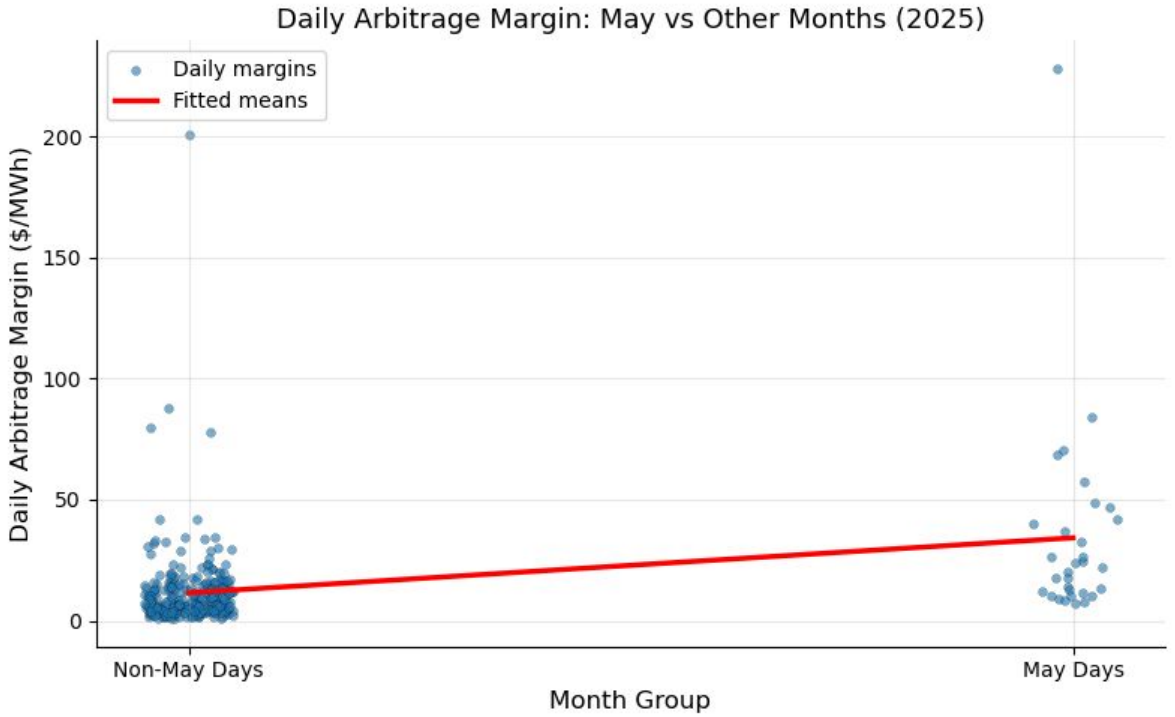
The coefficient means the May mean is $32.4/MWh higher than other months.



Linear Regression: May vs. Other Months

The R^2 = 0.108, meaning ~11% of daily margin variation is explained by whether or not it is May.

To check if May truly is the best month for profit margins, ensuring its numbers aren't inflated due to high variation, we can conduct a hypothesis test.

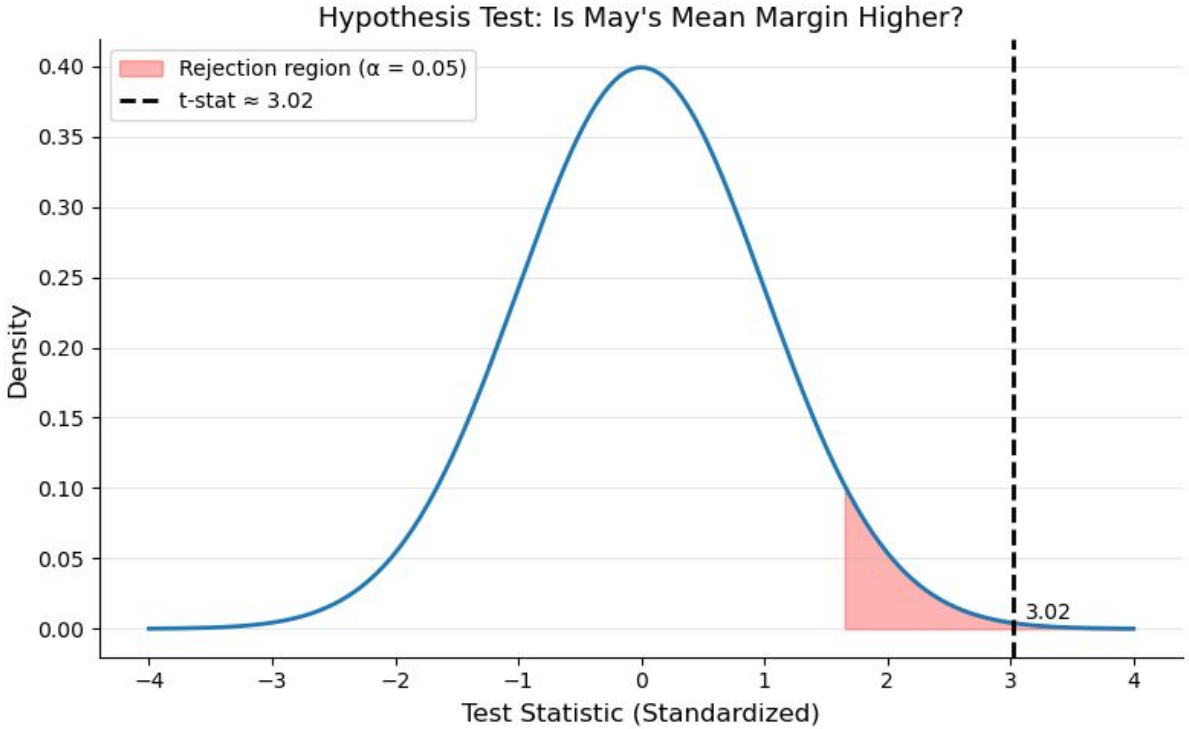


Hypothesis Test

H_0: May and non-May days have the same average daily margin.

H_a: May has a higher average margin than the rest of the year.

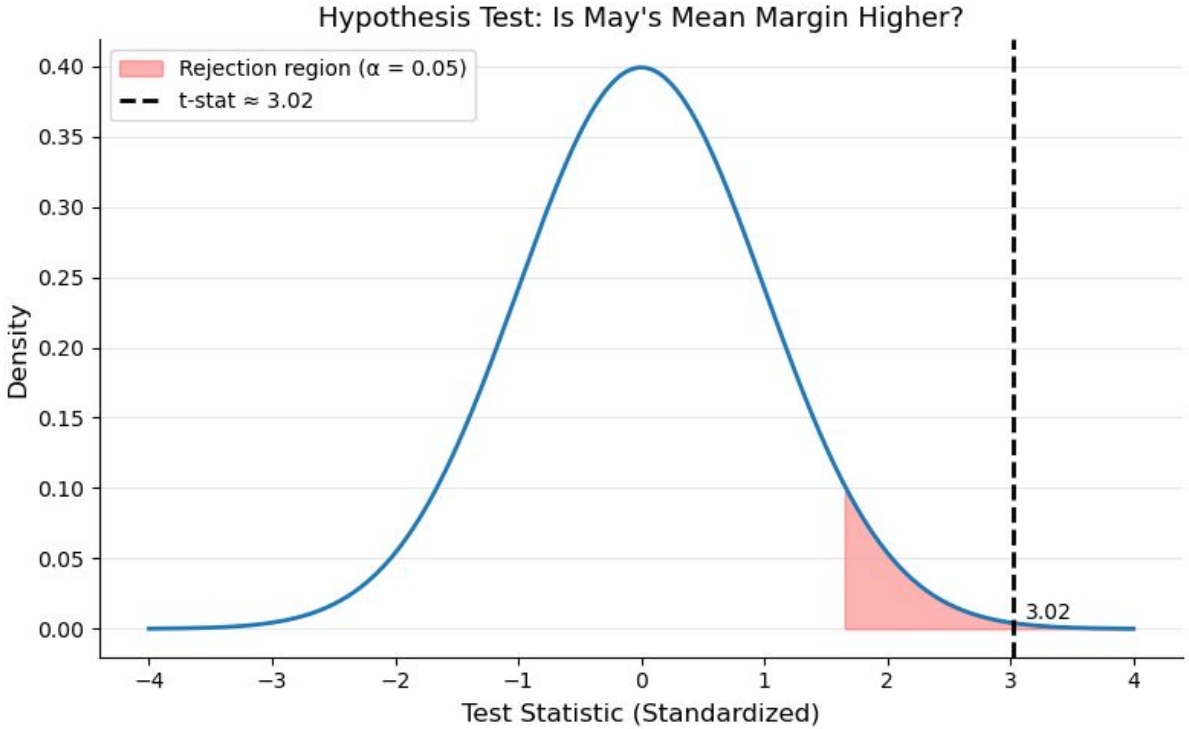
Our test statistic is t ≈ 3.0, and the one-sided p-value is about 0.005, well below 0.05.



Hypothesis Test

We reject the null:
The avg. margin in May is **statistically significantly higher** than other months.

This supports using May as the main month to focus on, take risks, and spend more on arbitrage.



Profit-Maximizing Trading Strategy:

So, according to the data, the best strategy is to:

Charge from **1-3 AM and 12-4 PM**, and discharge around **8AM and 8PM**.

And to increase charging and risk taking around

May, with safer options in **June and April**.

Conclusion & Invitation

ERCOT's data shows clear patterns. We've found the best strategy to harness them for profit, and we're going to use it to make our 5 acres into a state-of-the-art money-printing battery farm.

Get involved early; invest in our facility, and see well-tested returns based on real-world data.

Thank you.

Sources Cited

Texas Land Zoning Maps

Google Earth

ERCOT Power Data

Tesla Battery Information