# Does Price Change in Electricity Affect Usage?

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# General Info

* Project Proposal: Does price change in electricity affect usage?

# Hypothesis

* Usage will drop due to price increases.

# Questions

* Do energy sales as a utility overall match the supply and demand curve?
* At what price point does it stop being profitable to sell energy?
* At what price point do people reduce energy usage by region?
* Compared to the energy cost, at what price point does it stop being profitable to sell energy?

# Data Sources

* <https://www.eia.gov/opendata/qb.php>

# APIs

* EIA API
* Google Maps API

# Data Cleaning

* **energy\_price\_data notebook:** Pulled the data from API and organized into one dataframe by state and made four sub dataframes sorted each by region (North, West, South, and Mid-west).
* **EnergyConsumptionData notebook:** Gathered the data from API and extracted the series from. For each state, called the coal consumption, petroleum consumption and natural gas tables from EIA.
* **ProductionPriceData notebook:** Gathered the data from API for production cost of coal, petroleum, and natural gas energy. And organized the data into data frames for every region and per energy type.

# Data Visualization

* **EnergyByPriceTrendline notebook:** Compares the Trendline Graph of each region by Energy Usage and Energy Price. The final graph projects the trend of Energy Price vs Energy Usage.
* **EnergyConsumptionTrendLines notebook:** Compares the Trendline Graph of each region by Energy Usage over Time. The final graph projects the trend of Energy Consumption.
* **EnergyProductionTrendLines notebook:** Created data to show the costs of production for each Region over time.

# Reports

## Retail Price of Energy

We are comparing the retail price over time. Generally, we see the data trends upwards.

Chart, scatter chart

Description automatically generatedThe monthly rate of increase of Consumption Costs for Region North : 0.21%

Chart

Description automatically generated

The monthly rate of increase of Consumption Costs for Region Mid-West : 0.26%

Chart, scatter chart

Description automatically generated

The monthly rate of increase of Consumption Costs for Region South : 0.24%

Chart

Description automatically generated

The monthly rate of increase of Consumption Costs for Region West : 0.26%

When we compare each of the regions, the north has maintained higher prices. This seems to imply Geographic location has a larger impact on the price of energy.

This supports our null hypothesis.

## Retail Price of Energy (cont’d)

Chart

Description automatically generated

Throughout the US, we see that Prices for Electricity has maintained a steady downward trend, with all regions experiencing a different rate of decrease.

## Production Cost

Production costs are decreasing.

Chart, scatter chart

Description automatically generated

The monthly rate of increase of Production

Costs for Region North : -4.00%

Chart, scatter chart

Description automatically generated

The monthly rate of increase of Production

Costs for Region South : -3.89%

Chart, scatter chart

Description automatically generated

The monthly rate of increase of Production

Costs for Region Mid-West : -1.64%

Chart, scatter chart

Description automatically generated

The monthly rate of increase of Production

Costs for Region West : -0.74%

Chart, line chart

Description automatically generated

Production costs do vary for every region, but they all show a decrease production costs. We can determine why but could be due to cheaper raw material and solar

## Energy Usage and Consumption

Just taking a quick glance at a summary of our collected data for energy usage.

Table

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## Energy Usage and Consumption (cont’d)

Just taking a quick glance at a summary of our collected data for energy usage.

Chart, scatter chart

Description automatically generated

The monthly rate of increase of Energy Usage for Region North : 1.71%

Chart, scatter chart

Description automatically generated

The monthly rate of increase of Energy Usage for Region South : 1.21%

Chart, scatter chart

Description automatically generated

The monthly rate of increase of Energy Usage for Region Mid-West : 2.54%

Chart, scatter chart

Description automatically generated

The monthly rate of increase of Energy Usage for Region West : 1.38%

Chart, line chart

Description automatically generated

## Energy Usage vs Price

A quick look at how Usage compares to Price using an average over ten years.

Usage Heatmap

Chart, bubble chart

Description automatically generated

The heatmap clearly shows the hotspots for usage, over the past ten years, is the South, including, California and Pennsylvania.

Price Heatmap

Map

Description automatically generated

But despite the usage, prices are still overall lower in the South compared to the Northern Region. Could this be why usage is clearly higher in the Southern region? With Texas seemingly enjoying a lower average rate over the past ten years.

## Energy Usage vs Price(cont’d)

We are comparing the average monthly Usage of Electricity vs the average monthly Price of Electricity.

Chart, scatter chart

Description automatically generated

Chart, scatter chart

Description automatically generated

Chart, scatter chart

Description automatically generated

Chart, scatter chart

Description automatically generated

Usage continues to rise despite the consistent price going higher.

Chart, line chart

Description automatically generatedChart

Description automatically generated

# Team

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