Electricity Prices Increase

Parents recently have been complaining about electricity prices in our home. Living in NY, I want to see what the reason for this increase is.

Question and Hypothesis

1. Has Electricity prices in New York been steadily increasing in the past decade?

Hypothesis: Yes. So much so that parents are complaining about it

1. Has there been more electricity usage among homeowners?

Hypothesis: Yes. With people using more products requiring Electricity, there should be a steady increase of electrical usage. There should also be an increase in electricity usage in the summer months due to air conditioning.

1. Are the higher electricity prices influenced by the amount of electricity used?

Hypothesis: Yes. As demand of electricity increases, there will be less electricity overall which would increase the price of electricity.

1. Are the products used for electricity generation increasing in price (Fossil fuel, Nuclear Energy, Renewable)?

Hypothesis: New York Electrical power Generation is produced by mainly three outlets: Natural Gas (44%), Nuclear (30%) and Hydro (18%). Prices of Natural Gas may have gone up during the past few years. Nuclear and Hydro may have gone up as well, but there can be many factors impacting these sources.

1. Are electricity prices only increasing in NY or is it country wide?

Hypothesis: If prices gone up for the materials needed for Electrical Power generation, It should impact the entire country.

Data: The data will be gathered using U.S. Energy Information Administration’s (EIA) API. The data gathered will be put into a pandas Data Frame and reviewed to see if there any errors. After cleaning the data, we will use statistical analysis and visualizations via Seaborn and Matplotlib to see potential trends and answer the questions.

The data we will be getting is from 2001 to May of 2022. It will be monthly data to see trends throughout the years

Some challenges:

Cost of Electrical generation from renewable sources was not found. We will not know in what way these renewable sources impact the cost of electricity.

API documentation had a mix of two different format at the time of the project. Had to quickly distinguish which was the correct format, otherwise the API would not work.

The efficiency of burning different type of fossil fuel is unknown. Natural gas may be more efficient thus used more. Coal might be more efficient and cost less but has potentially has more environmental problems. These are some stuffs we don’t know

The price of Natural gas only goes back to 2008 and not 2000 like the others.

Observations:

Q1: Price of Electricity is indeed going up in NY throughout the year. It has started going up from 2000 to 2009 and slowly decreased before increasing in price again at around 2021.

Chart, line chart

Description automatically generated

Q2: Sales of electricity to homeowners have not really changed much in the past 20 years. It always peaks at around summer but are around the same amount throughout each year.

Chart

Description automatically generated

Q3: The amount of electricity homeowners uses, and the price of electricity are not related to each other. The amount of electricity use continued to stay the same throughout the year, but price has been increasing. The scatterplot showing this has no obvious patterns. This is also shown with the calculated correlation coefficient being 0.277422, indicating no relationship between the two variables.

Chart, scatter chart

Description automatically generated

Q4: Fossil Fuel usage has been changing throughout the years. Usage of Petroleum liquids has basically decreased a lot since the 2000s. There only have been spikes of usage in the recent years during the winter months. Although this is the case, this means petroleum liquids are not being used as much for electrical production.

Chart, histogram

Description automatically generated

Coal has also been seeing a huge decrease of usage in electrical production in the past 20 years. Since the middle of 2020, there has essentially no coal usage for electrical production.

Chart

Description automatically generated

Petroleum Coke has basically never been used since late 2011 for electrical production.

Chart, histogram

Description automatically generated

Natural gases, on the other hand, has been increasing in usage for electricity production. There We seem to be using more natural gas every year for production.

Chart, histogram

Description automatically generated

Prices of natural gas seems to be high as of recently reaching 10$ per mcf as of January 2022. This year’s price increase is probably due to the increase of natural gas price. It is possible that the increase of price throughout the years was due to the decrease of usage of other fossil fuels and reliance on natural gases

Chart, line chart

Description automatically generated

Although these are some analyses that are seen, we do not know the effects of renewable energy on the price of electricity.

Q5: California and Louisiana

Cali:

Price has consistently gone up within the past 20 years.

Chart

Description automatically generated

Energy usage has stayed stagnant throughout the years expect for at summer months where they are spiking higher in the past 5-7 years.

Chart

Description automatically generated

Just like in NY, California’s electrical usage has no relationship to the price of electricity. It has a correlation coefficient of 0.3708 which is low.

Chart, scatter chart

Description automatically generated

Similarly, like NY, California only uses Natural gases for their energy production, but since they are lowering their usage throughout the years, their renewable sources may be more reliable for electrical production compared to New York’s. The price of the gas is also extremely like how NY’s graph is. Although this is the case, the electricity prices in California continues to go up, indicating there is another reason for this price increase, potentially passing of certain laws.

Chart

Description automatically generatedChart, line chart, histogram

Description automatically generated

Louisiana:

Louisiana Electrical price has remained cheap normal for the last few years. It has only really gone up a cent or two since the start of 2020 but besides that, the price is extremely stable at an average of 7-9 cents.

Chart

Description automatically generated

The amount of electricity used in Louisiana has gone up since 2008. Every year, there seem to be an increase of electrical use as the graph is going up slowly.

Chart, bar chart

Description automatically generated

Just as shown in NY and California, there is no correlation between the price and demand of electricity. The correlation coefficient is at .232 and there is no noticeable relationship seen in the graphs. Although it is that is the case, it is seen that no matter what happens to sales, the price will usually range from 7 to 9 cents.

Chart, scatter chart

Description automatically generated

Unlike NY and California, Louisiana uses multiple types of fossil fuels such as Petroleum coke, Coal, and Natural Gas to generate electricity

Louisiana uses natural gas just as much as NY and California. Although this is the case, the price for Natural gas has been historically much cheaper than in NY and California until recently. In the past two years, the price of natural gas has also increased just like NY and California, indicating this is price increase is impacting most states. These price increase may also be the reason gas has been higher than average in Louisiana.

Chart, histogram

Description automatically generatedChart, line chart

Description automatically generated

Louisiana has also started to lower its coal uses, but still uses it fair amount for electricity production. Since the early 2010s, coal usage has gone down significantly. The reason for this may be due to the increase in price. When coal usage started to decrease, there was also an increase in the price of coal. Recently, the price has been very cheap, which may mean more reliance on coal in energy production

Chart

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Louisiana has consistently used Petroleum Coke for electrical generation. The price of has had huge fluctuations since 2008 ranging from the low of 20s to highs of 180s. No matter what the price, there are still a lot of usage of petroleum coke.

Chart

Description automatically generatedChart, line chart

Description automatically generated

Final Thoughts:

Q1. Prices in New York is indeed increasing.

Q2. There also is an increase in electrical usage in residential homes.

Q3. No. As electrical usage increases, the price of electricity does not increase. We found a correlation coefficient of .277 in New York for price and electricity usage which indicates no relationship between the two.

Q4. Fossil Fuel Prices has been increasing. In New York’s case, it is heavily reliant on natural gas. Over the years, New York has been decreasing its usage of other fossil fuels such as coal and petroleum coke and liquid. It is possible, since now majority of the energy produced is made by natural gas, the price of natural gas may dictate the price of electricity for homeowners.

Q5. Electricity seems to be increasing nationwide. Places like California, which are in a similar situation as New York has also seen a price increase, with a heavy reliance on natural gas. Places like Louisiana also have increases in price these past few years, but it is only by 1 or 2 cents. This is probably due to the fact Louisiana can switch the fossil fuel they are using to a cheaper one. If natural gas is too expensive, they can switch coal. NY and California are not able to do that since they do not use other fossil fuels anymore.

**Future Considerations:**

* See the impacts of renewables
* Are there laws passed that can affect electricity prices?
* Can we potentially build a model to predict future electricity prices?

Sources:

New York Energy Sector Risk Profile

US Environmental Information Administration