Energy Consumption Dashboard Using Power BI

Name: Mrunal Vaidya

Data Analyst

Problem Statement:

Your company is responsible for supplying energy (water, electricity, and gas) to various buildings across different countries faces the challenge of effectively monitoring and managing energy consumption to ensure efficient operations and cost-effectiveness. However, without a centralized system to track and analyze energy usage data, the company struggles to identify trends, anomalies, and opportunities for improvement, leading to inefficiencies, increased costs, and potential service disruptions.

My Approach:

My approach to effectively monitoring and managing energy consumption involves leveraging Power BI to create dedicated pages for each energy type (water, electricity, gas). Each page will offer detailed insights into consumption patterns, anomalies, and cost-effectiveness metrics specific to that energy source. Additionally, I will have a centralized dashboard summarizing key metrics across all energy types, providing a comprehensive overview for strategic decision-making and operational efficiency improvements.

Process Involved :

Use of Power Query to clean and transform raw data for analysis.

Data Modeling to connect different tables using in power BI.

Creating some measures using DAX for the dashboard.

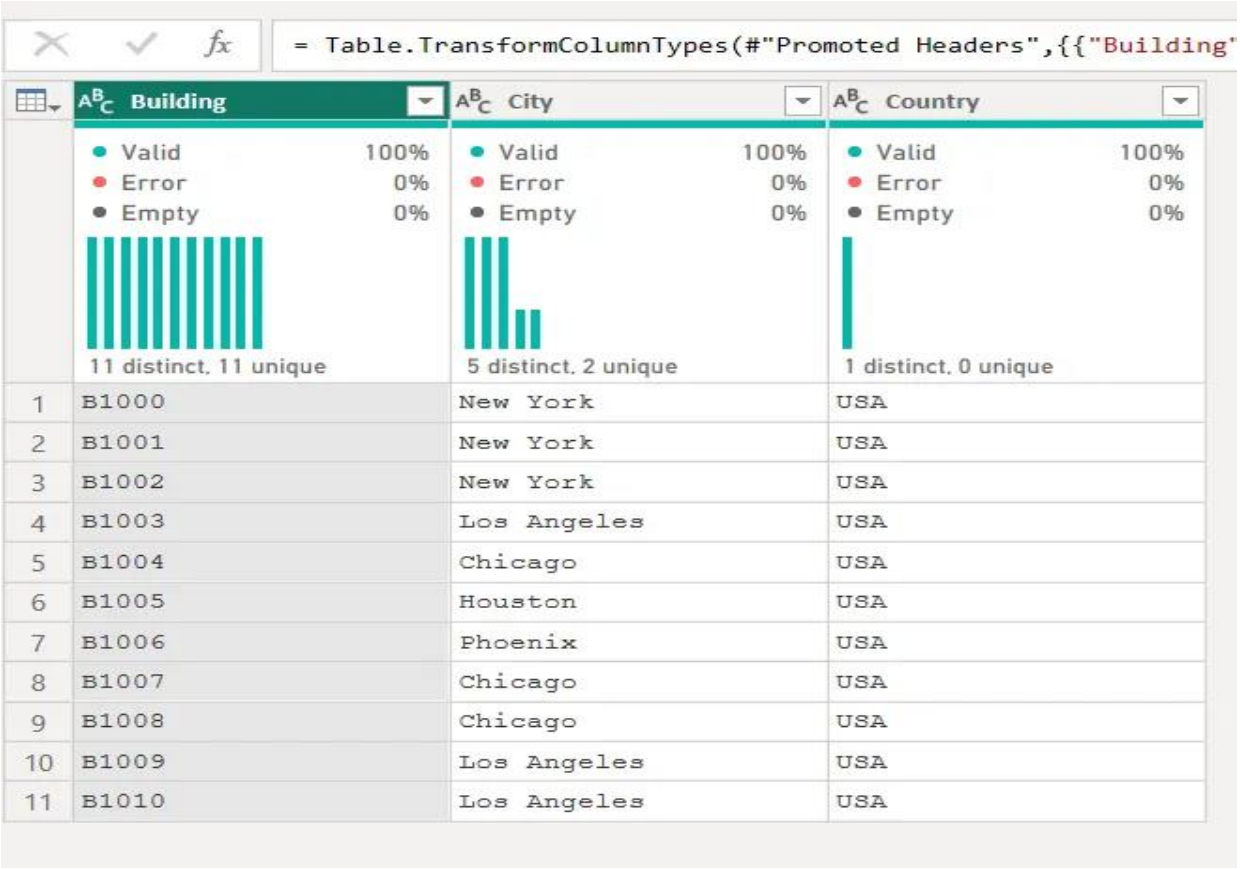
Exploratory Data analysis to find patterns and producing insights.

Use of different visualizations to create a dashboard.

Step 1 : Reviewing the given Data in Power BI

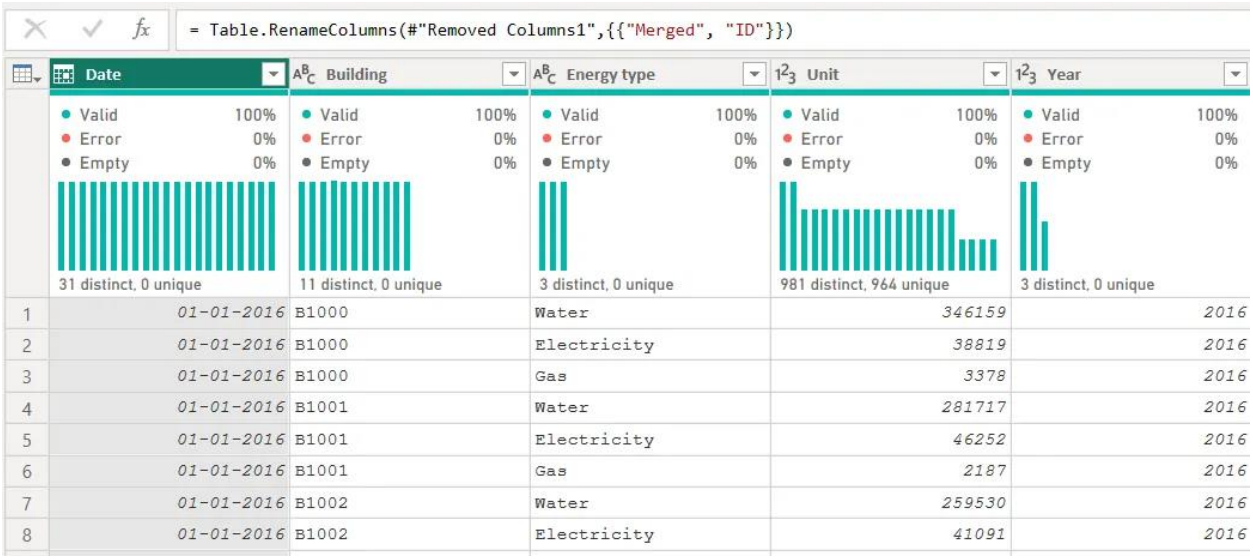
We have given 3 tables for this analysis in file:

Table 1 - **Building Master :** showing that we have data of 11 different buildings.



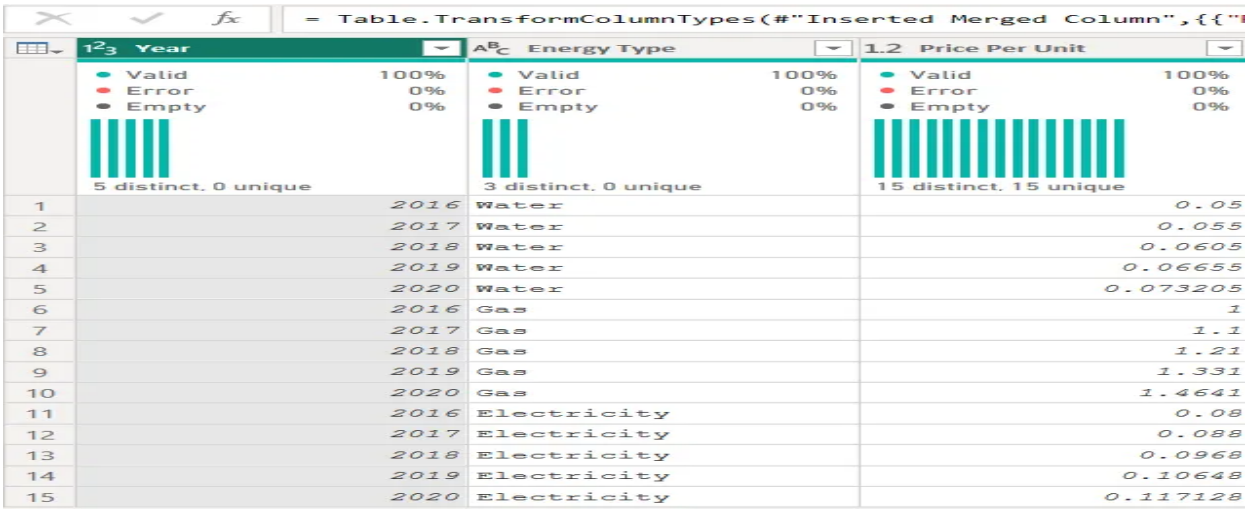
	Building	City	Country
	Valid 100%, Error 0%, Empty 0%; 11 distinct, 11 unique	Valid 100%, Error 0%, Empty 0%; 5 distinct, 2 unique	Valid 100%, Error 0%, Empty 0%; 1 distinct, 0 unique
1	B1000	New York	USA
2	B1001	New York	USA
3	B1002	New York	USA
4	B1003	Los Angeles	USA
5	B1004	Chicago	USA
6	B1005	Houston	USA
7	B1006	Phoenix	USA
8	B1007	Chicago	USA
9	B1008	Chicago	USA
10	B1009	Los Angeles	USA
11	B1010	Los Angeles	USA

Table 2 - Energy Consumptions: showing units consumed by buildings with respective Year (2016–2019).



	Date	Building	Energy type	Unit	Year
	Valid 100% Error 0% Empty 0%	Valid 100% Error 0% Empty 0%	Valid 100% Error 0% Empty 0%	Valid 100% Error 0% Empty 0%	Valid 100% Error 0% Empty 0%
	31 distinct, 0 unique	11 distinct, 0 unique	3 distinct, 0 unique	981 distinct, 964 unique	3 distinct, 0 unique
1	01-01-2016	B1000	Water	346159	2016
2	01-01-2016	B1000	Electricity	38819	2016
3	01-01-2016	B1000	Gas	3378	2016
4	01-01-2016	B1001	Water	281717	2016
5	01-01-2016	B1001	Electricity	46252	2016
6	01-01-2016	B1001	Gas	2187	2016
7	01-01-2016	B1002	Water	259530	2016
8	01-01-2016	B1002	Electricity	41091	2016

Table 3 - Rates : showing per unit cost of energy unit as per the year with respective Energy Type (Water , Gas and Electricity).

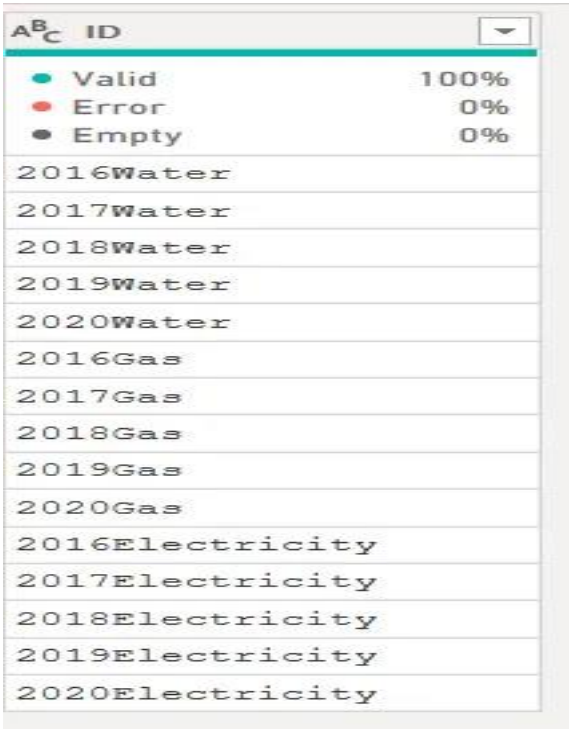


	Year	Energy Type	Price Per Unit
	Valid 100% Error 0% Empty 0%	Valid 100% Error 0% Empty 0%	Valid 100% Error 0% Empty 0%
	5 distinct, 0 unique	3 distinct, 0 unique	15 distinct, 15 unique
1	2016	Water	0.05
2	2017	Water	0.055
3	2018	Water	0.0605
4	2019	Water	0.06655
5	2020	Water	0.073205
6	2016	Gas	1
7	2017	Gas	1.1
8	2018	Gas	1.21
9	2019	Gas	1.331
10	2020	Gas	1.4641
11	2016	Electricity	0.08
12	2017	Electricity	0.088
13	2018	Electricity	0.0968
14	2019	Electricity	0.10648
15	2020	Electricity	0.117128

There were no inconsistencies found in any of three tables.

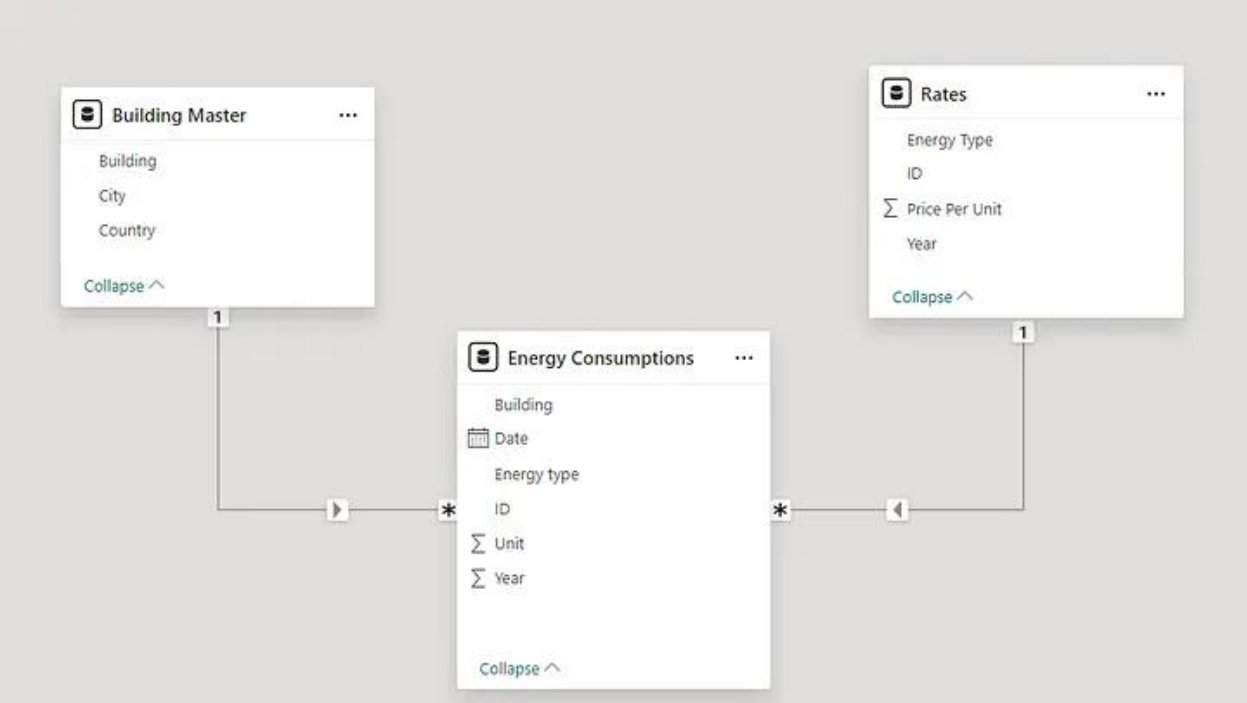
Step 2 : Data Transformation using Power Query

1. Adding a unique “Id” column in both “Rates” Table and “Energy Consumptions” Table to make a relationship between them by merging Year and Energy Type columns so that we can make a relation between them.



Now, required transformation is done and data is loaded.

Step 3 : Data Modeling



Relationships were created between Energy consumption table and Building Master Table using “Building” column and between Energy consumption table and Rates table by “ID” column we created previously.

Step 4: Creating Measures for Analysis

1. **First, I calculate Total cost incurred by the consumption of Energy Units.**

```
Total Cost = SUMX('Energy Consumptions','Energy Consumptions'[Unit]*RELATED(Rates[Price Per Unit]))
```

2. Then, Total Cost as for all Energy types (Water, Gas & Electricity) separately.

```
Water Cost = CALCULATE([Total Cost],'Rates'[Energy Type]="water")

Electricity Cost = CALCULATE([Total Cost],'Rates'[Energy Type]="Electricity")

Gas Cost = CALCULATE([Total Cost],'Rates'[Energy Type]="Gas")
```

3. Total Units consumed

```
Unit consumed = SUM('Energy Consumptions'[Unit])
```

4. Unit consumed by Energy Type

```
Water Unit consumed = CALCULATE([Unit consumed],'Rates'[Energy Type]="water")
```

```
Electricity Unit consumed = CALCULATE([Unit consumed],'Rates'[Energy Type]="Electricity")
```

```
Gas Unit consumed = CALCULATE([Unit consumed],'Rates'[Energy Type]="Gas")
```

5. Now, I have to calculate Percentage of “Energy Type” consumed

```
% of water consumed = [Water Unit consumed]/ [Unit consumed]
```

```
% of electricity consumed = [Electricity Unit consumed]/[Unit consumed]
```

```
% of gas consumed = [Gas Unit consumed]/[Unit consumed]
```

5. Similarly, I calculate Units that are left from total unit consumed each for energy type

```
Water Unit consumed left = [Unit consumed]-[Water Unit consumed]
```

```
Electricity Unit consumed left = [Unit consumed]-[Electricity Unit consumed]
```

```
Gas Unit consumed left = [Unit consumed]-[Gas Unit consumed]
```

Step 5 : Data Visualization and Dashboard making

Dashboard is divided into 4 sections showcasing — Overview , Water , Electricity and Gas consumption Insights and Summary.

Overview Section is shows count of Buildings, Total Cost and Unit consumed with Energy Type breakdown.

Water consumption page contain the following elements:

- **Total Water Consumption:** This section might display a headline figure representing the total amount of water used within a specific timeframe (day, week, month, etc.). The image shows a total consumption of 186,245,327 units.
- **Water Consumption by City:** A chart or table could break down water consumption among different cities. The image shows a chart with New York, Chicago, Los Angeles, Phoenix, and Houston.
- **Water Consumption by Building:** There could be a section that shows water consumption for each building managed by the organization. The image shows a graph with building IDs that don’t correspond to any names.
- **Water Cost by Year:** A chart might illustrate the cost of water over time. The image shows a bar graph with water cost per year from 2016 to 2019.
- **Water Consumption by Year (Units):** Another chart could show water usage over time. The image shows a bar graph with water consumption per year from 2016 to 2019.
- **Timeframe Selector:** This would allow you to adjust the data view for different periods (e.g., daily, weekly, monthly, yearly).

Similarly, for Electricity Consumption, shown below:

Insights :

1. **Water is the dominant resource used, but the cost remains stable despite fluctuations in consumption:**

   Water consumption accounts for a significant portion (88.49%) of the total energy use. While water consumption fluctuates across years, with 2017 having the highest usage, the overall cost shows only a slight increase in 2019 compared to previous years. This suggests potential opportunities for conservation efforts to reduce water use without significantly impacting the budget.

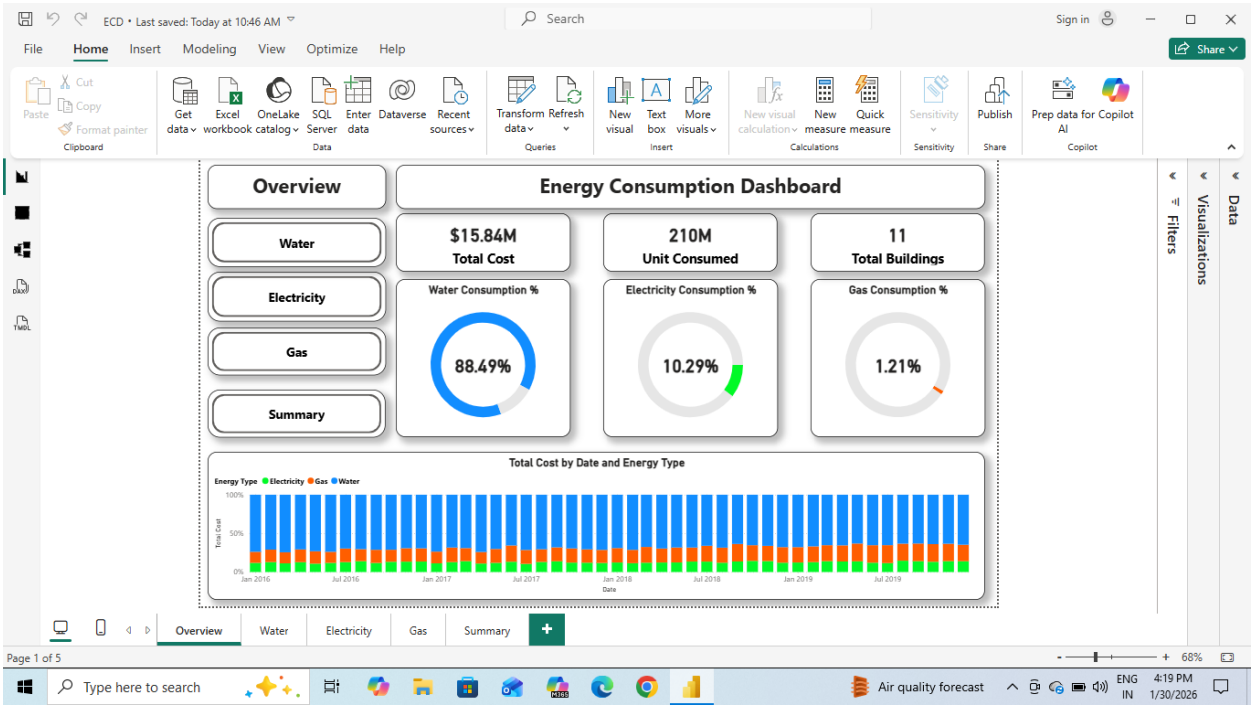
   2. Gas consumption and costs show a downward trend: Gas consumption is the lowest compared to water and electricity but has significantly decreased from 2016 to 2019. This decrease is reflected in the gas cost, which also shows a downward trend during the same period. This could be due to various factors, such as increased efficiency measures or a shift towards alternative energy sources for gas-powered activities.

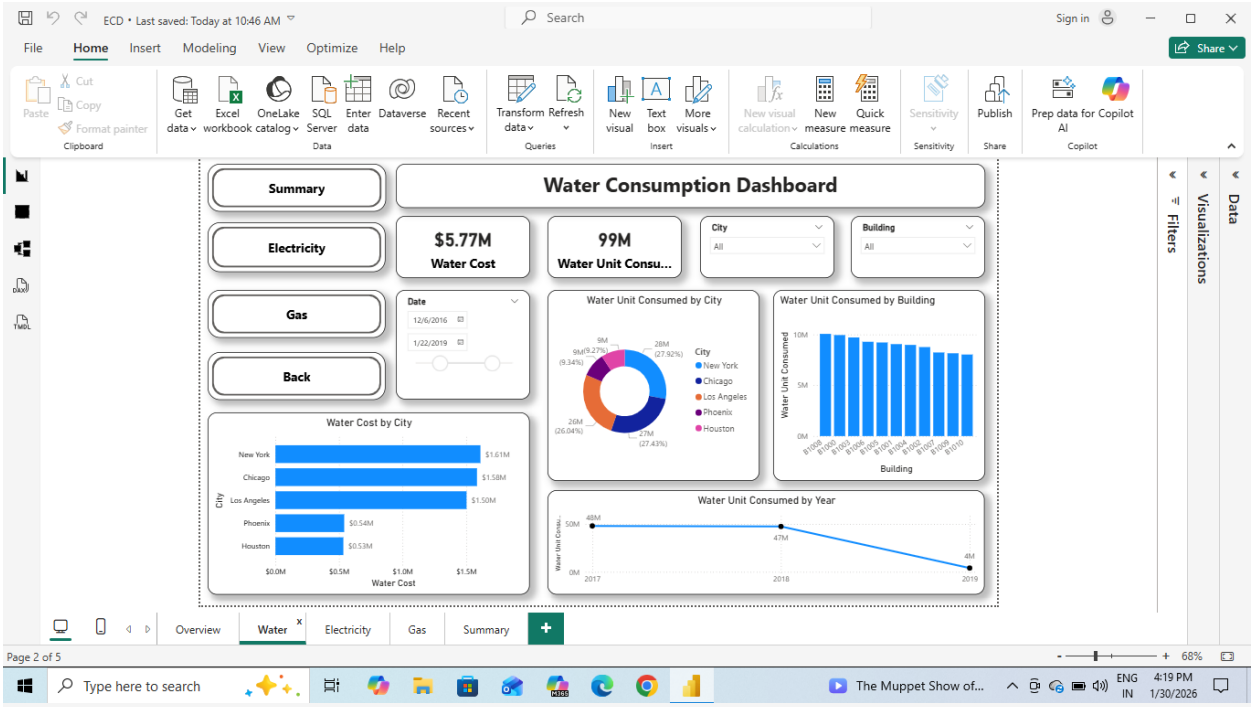
   3. Further analysis is needed to understand the factors behind these trends: While the water consumption data includes a breakdown by building, additional context like building types or activities could offer deeper insights into usage patterns.
   Similarly, understanding the reasons behind the decrease in gas consumption and cost would require further information, such as specific policy changes or infrastructure upgrades.

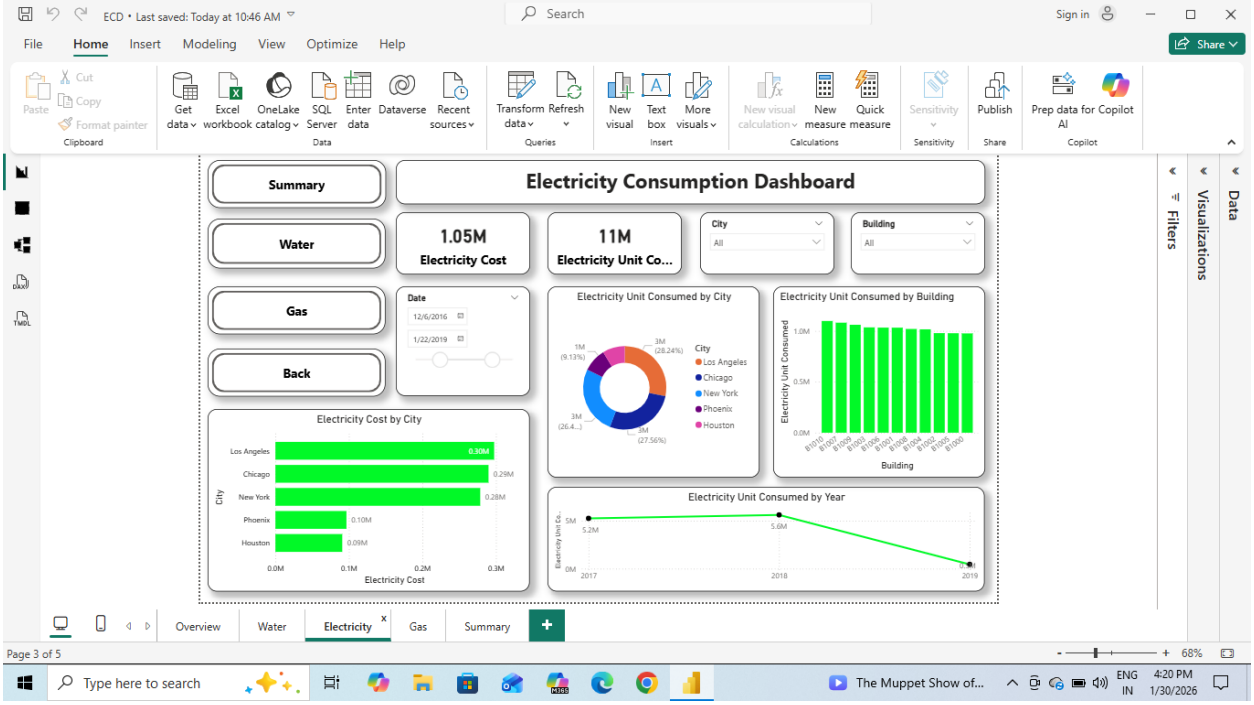
   4. Additional insights can be gained by analyzing other aspects not shown in these images: Comparing energy consumption and costs across different locations (e.g., cities, regions) could reveal valuable insights into potential efficiency

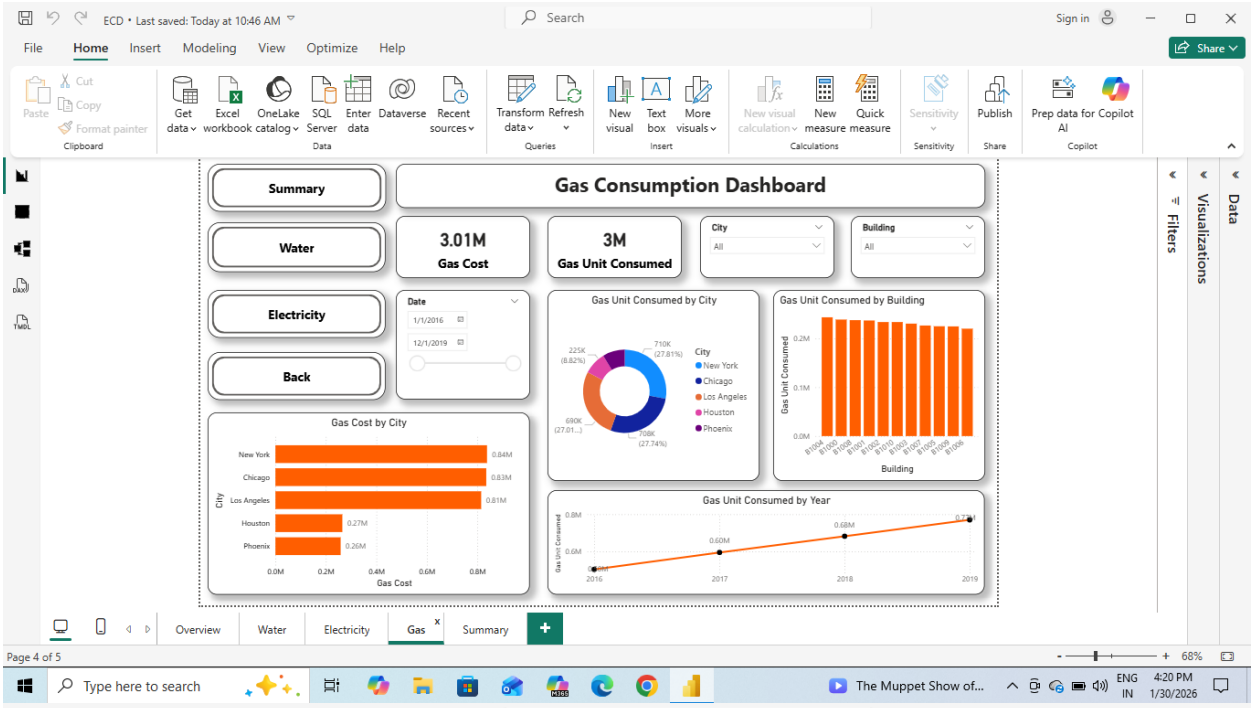
improvements or resource allocation needs. Analyzing the data by time of day or day of the week could help identify peak usage periods and potential areas for targeted conservation efforts. By delving deeper into the data and exploring these additional aspects, a more comprehensive picture of the energy consumption patterns can be established, leading to more informed decision-making towards efficient resource management and cost optimization.

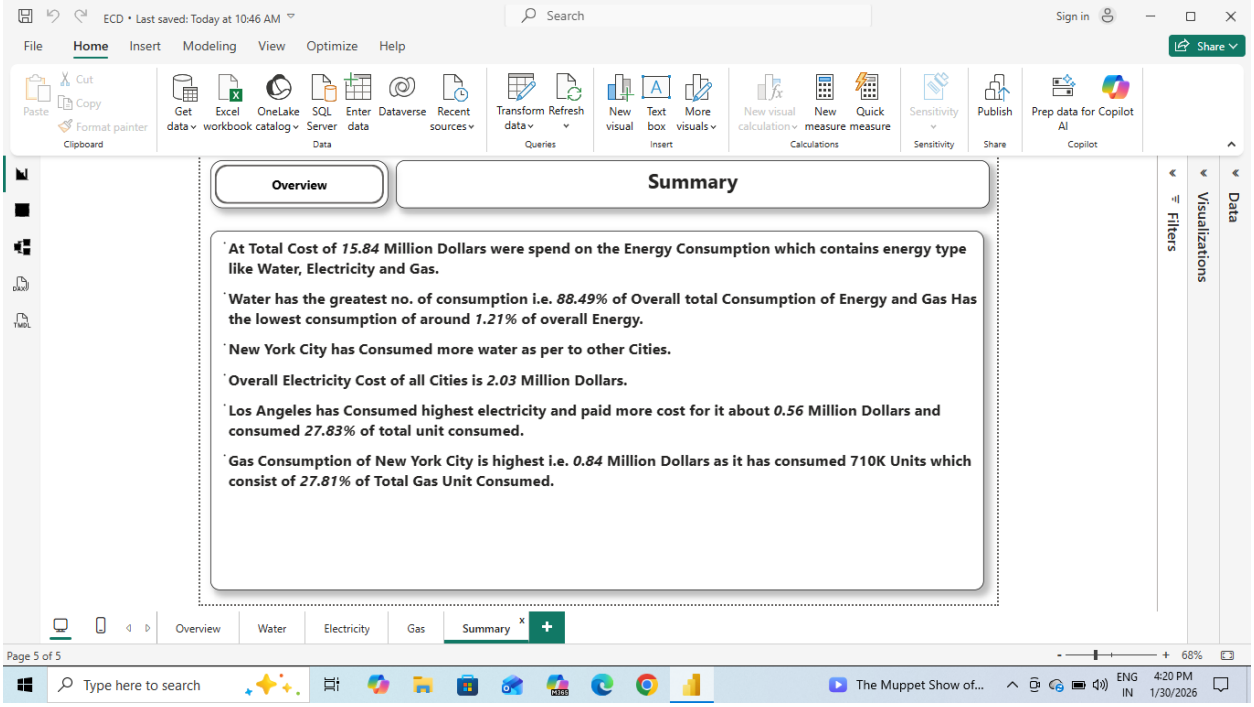
Dashboard:




ECD • Last saved: Today at 10:46 AM
Search
Sign in
File
Home
Insert
Modeling
View
Optimize
Help
Share
Water Consumption Dashboard
Summary
Electricity
Gas
Back
$5.77M
Water Cost
99M
Water Unit Consu...
City
Building
Date
12/6/2016
1/22/2019
Water Unit Consumed by City
Water Unit Consumed by Building
Water Cost by City
Water Unit Consumed by Year
New York
Chicago
Los Angeles
Phoenix
Houston
Water Cost
Water Unit Consumed
Building
Overview
Water
Electricity
Gas
Summary
Page 2 of 5
68%
Type here to search
The Muppet Show of...
ENG
IN
4:19 PM
1/30/2026


ECD • Last saved: Today at 10:46 AM
Search
Sign in
File
Home
Insert
Modeling
View
Optimize
Help
Share
Electricity Consumption Dashboard
Summary
Water
Gas
Back
1.05M
Electricity Cost
11M
Electricity Unit Co...
City
Building
Date
12/6/2016
1/22/2019
Electricity Unit Consumed by City
Electricity Unit Consumed by Building
Electricity Cost by City
Electricity Unit Consumed by Year
Los Angeles
Chicago
New York
Phoenix
Houston
Electricity Cost
Electricity Unit Consumed
Building
Overview
Water
Electricity
Gas
Summary
Page 3 of 5
68%
Type here to search
The Muppet Show of...
ENG
IN
4:20 PM
1/30/2026


ECD • Last saved: Today at 10:46 AM
Search
Sign in
File
Home
Insert
Modeling
View
Optimize
Help
Share
Summary
Gas Consumption Dashboard
Water
3.01M
Gas Cost
3M
Gas Unit Consumed
City
All
Building
All
Electricity
Date
1/1/2016
12/1/2019
Back
Gas Unit Consumed by City
Gas Unit Consumed by Building
Gas Cost by City
Gas Unit Consumed by Year
New York
Chicago
Los Angeles
Houston
Phoenix
Gas Cost
Building
Overview
Water
Electricity
Gas
Summary
Page 4 of 5
68%
Type here to search
The Muppet Show of...
ENG
IN
4:20 PM
1/30/2026


ECD • Last saved: Today at 10:46 AM
Search
Sign in
File
Home
Insert
Modeling
View
Optimize
Help
Share
Overview
Summary
At Total Cost of 15.84 Million Dollars were spend on the Energy Consumption which contains energy type like Water, Electricity and Gas.
Water has the greatest no. of consumption i.e. 88.49% of Overall total Consumption of Energy and Gas Has the lowest consumption of around 1.21% of overall Energy.
New York City has Consumed more water as per to other Cities.
Overall Electricity Cost of all Cities is 2.03 Million Dollars.
Los Angeles has Consumed highest electricity and paid more cost for it about 0.56 Million Dollars and consumed 27.83% of total unit consumed.
Gas Consumption of New York City is highest i.e. 0.84 Million Dollars as it has consumed 710K Units which consist of 27.81% of Total Gas Unit Consumed.
Overview
Water
Electricity
Gas
Summary
Page 5 of 5
68%
Type here to search
The Muppet Show of...
ENG
IN
4:20 PM
1/30/2026