UTILITY USAGE YEAR-OVER-YEAR ANALYSIS REPORT

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Tools Used: Alteryx, Power BI
Dashboard Format: Single page / 4 visuals

1. Executive Summary

The objective of this project was to analyze utility usage trends, Energy, Water, and Waste, across multiple buildings, regions, and building types. The client is specifically interested in year-over-year (YoY) performance, usage distribution across regions, and building-type contribution.

To meet these requirements and maintain the constraint of a 3,4 visual limit on a single page, I designed a focused and strategic dashboard that highlights YoY trends, regional usage, building-type variations, and aggregate KPI metrics.

2. Data Overview

The dataset provided included three utility types (Energy, Water, Waste), building attributes (region, building type, Year), and yearly aggregated usage values.
Key fields include:

- **reporting_year** – Defines the year of measurement

- **TotalUsage** – Annual consumption value for each utility

- **data_type** – Energy, Water, Waste

- **property_region** – Central, East, South, Southeast, West, Northeast

- **building_type** – Office, Retail, Multi-Family, Student Housing, Distribution Warehouse

- **Year** – year classifications (2018 - 2025)

Data was already cleaned but required structuring for analytics.S

3. Data Preparation Workflow (Alteryx)

This section describes the end-to-end Alteryx workflow used to prepare the dataset consumed by Power BI.

3.1 Input Processing

Source dataset was used which I uploaded in Alteryx. By use of Alteryx input tool I dragged source file.

3.2 Sorting

The dataset is sorted on the fields needed for year-over-year pairing and summarization. Sorting ensures that building records align correctly during join operations.

3.3 Summarization

A Summarize Tool aggregates usage and building attributes using the following configuration:

Group By Fields

fund_name, property_region, building_name, building_type, reporting_year, data_type, usage_units, city, state, country, coverage_type, coverage_detail, gross_floor_area (Max), covered_area (Max)

Aggregations

- usage → SUM (Output: TotalUsage)

- gross_floor_area → MAX

- covered_area → MAX

This produces a clean, annualized dataset where each row represents:

Building × Reporting Year × Utility Type × Region.

3.4 Prior-Year Calculation

A Formula Tool is used to calculate the prior reporting year:

prior_reporting_year = reporting_year - 1

This creates a link key for joining the current-year and prior-year usage.

3.5 Join Operation

A Join Tool merges the current-year dataset (left) and the prior-year dataset (right) using the following exact join keys:

prior_reporting_year → reporting_year, data_type, building_name, building_type, fund_name, property_region, usage_units, city, state, country, coverage_type, coverage_detail

Left Input → Contains current-year usage, building metadata, reporting attributes and prior-year

Right Input → Contains same fields in Left Input except Prior- year and no calculated columns.

- prior_totalusage
- building attributes (only for matching)

4.6 YoY Calculations

After the join, a final Formula Tool generates year-over-year metrics.

YoY Amount Change

YoY_Amount = [TotalUsage] - [prior_totalusage]

YoY % Change

IF [prior_totalusage] > 0 THEN

   (([TotalUsage] - [prior_totalusage]) / [prior_totalusage]) * 100

ELSE

   NULL()

ENDIF

Trend Classification

IF [YoY_UsageChange] > 0 THEN "Increase"

ELSEIF [YoY_UsageChange] < 0 THEN "Decrease"
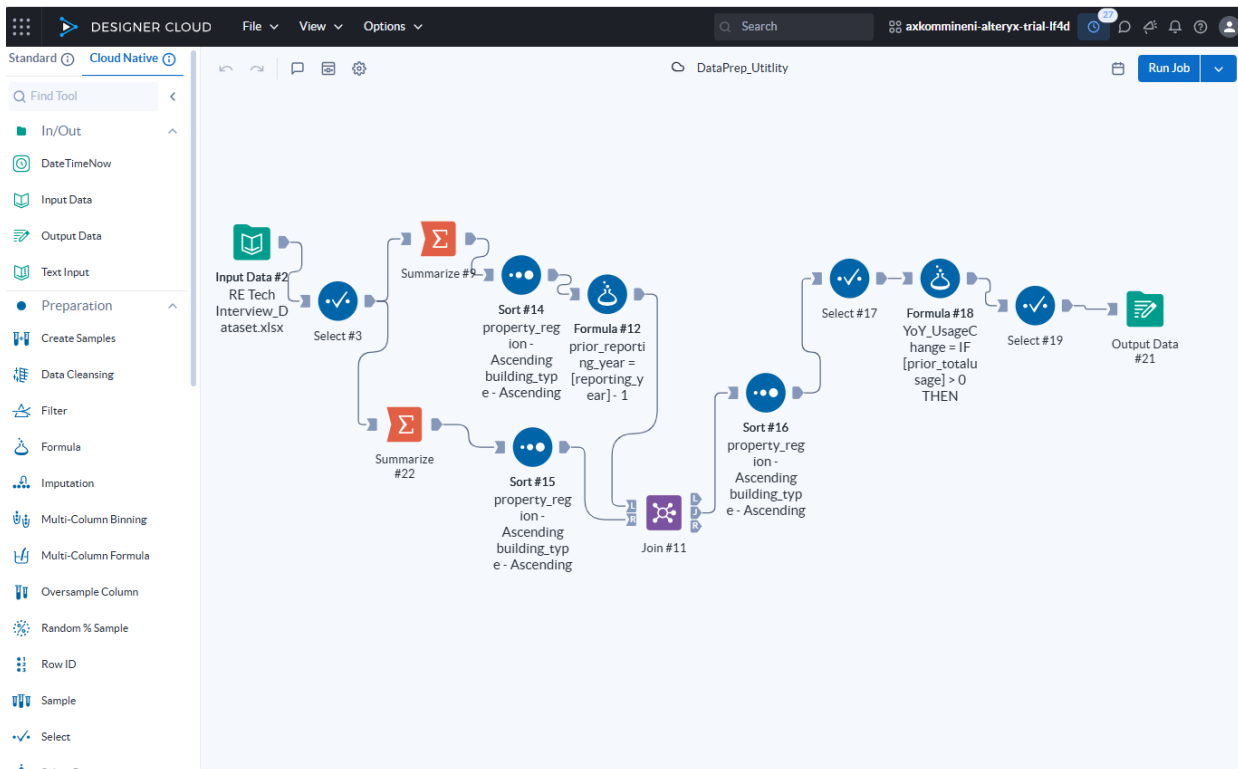
ELSE "No Change"

ENDIF

This produces three additional columns:

- YoY_UsageChange → Percentage change
- YoY_Amount → Absolute usage difference
- UsageTrends → Increase / Decrease / No Change

Output

- Exported processed dataset to .xlsx for Power BI modeling.

6. To support dynamic reporting and unit-aware display formatting, I created a set of core DAX measures. These measures drive the KPI cards and visual interactions on the dashboard.

6.1 Total Usage (Base Measure)

This measure returns the total consumption amount for the selected utility type and filters.

TotalUsage_Measure =

SUM(FactUsage[TotalUsage])

6.2 Total Usage With Units (Dynamic Scaling: K, M, B, T)

This measure formats large numbers into a readable, executive-friendly style using K, M, B, and T. It also appends the correct usage unit (e.g., kWh, Kgal, Tons).

TotalUsage With Unit =

VAR val = [TotalUsage_Measure]

VAR unit = [Selected Unit]

VAR absVal = ABS(val)

VAR scaledValue =

   SWITCH(

      TRUE(),

```
    absVal >= 1e12, FORMAT(val / 1e12, "0.0") & "T",

    absVal >= 1e9,  FORMAT(val / 1e9,  "0.0") & "B",

    absVal >= 1e6,  FORMAT(val / 1e6,  "0.0") & "M",

    absVal >= 1e3,  FORMAT(val / 1e3,  "0.0") & "K",

    FORMAT(val, "0")

  )
```

RETURN

scaledValue & " " & unit

This allows KPI cards to display concise values like:103.0M kWh, 303.1K Kgal, 5.9K Tons

6.3 Selected Unit

This helper measure returns the usage unit associated with the selected utility type (Energy, Water, or Waste).

Selected Unit =

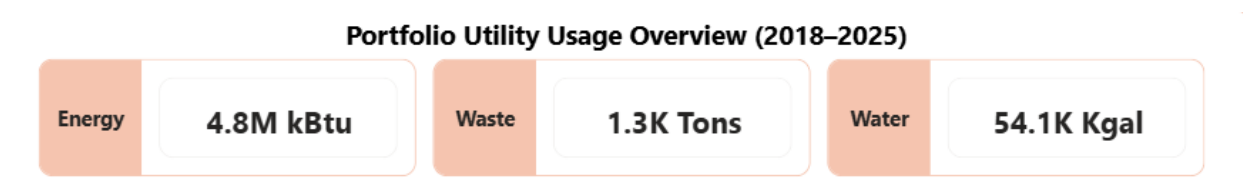SELECTEDVALUE('Sheet1'[usage_units], "")

7. Dashboard Design

To comply with the "single-page, 3–4 visual" requirement, the dashboard layout includes:

7.1 KPI Summary Cards

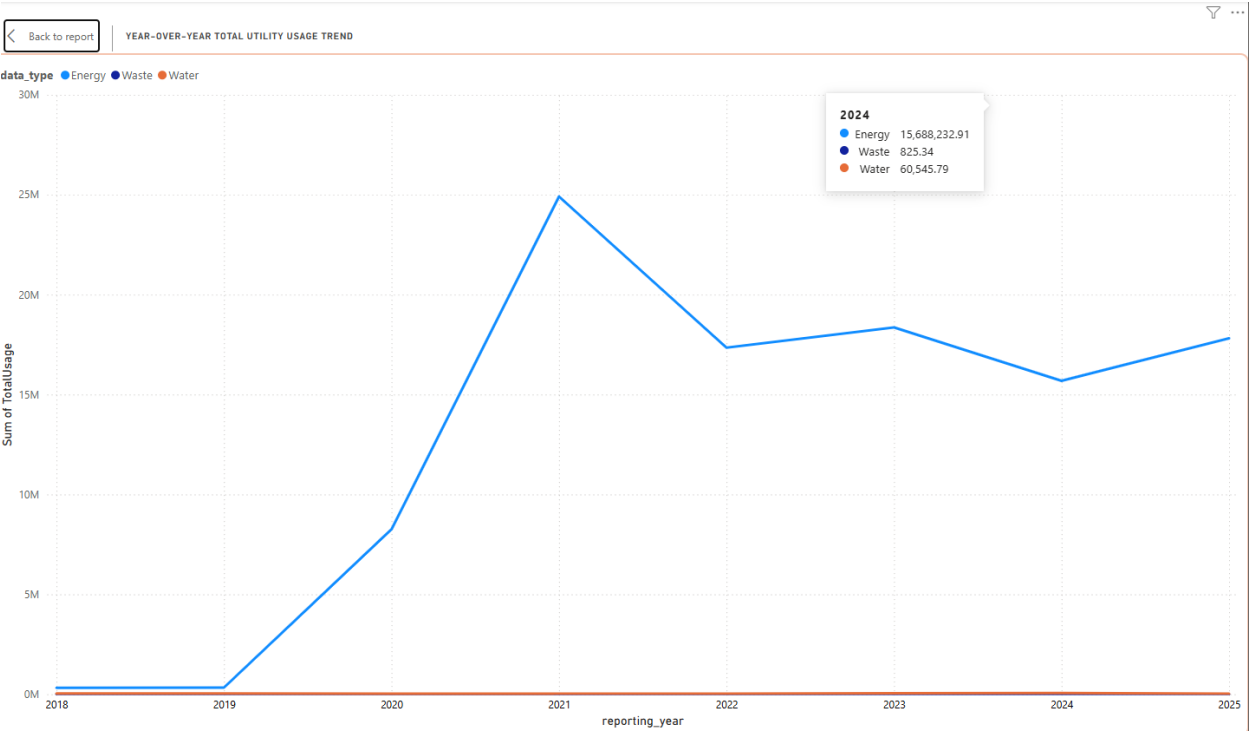Shows aggregate usage since 2017–2025:

- Energy

- Water

- Waste

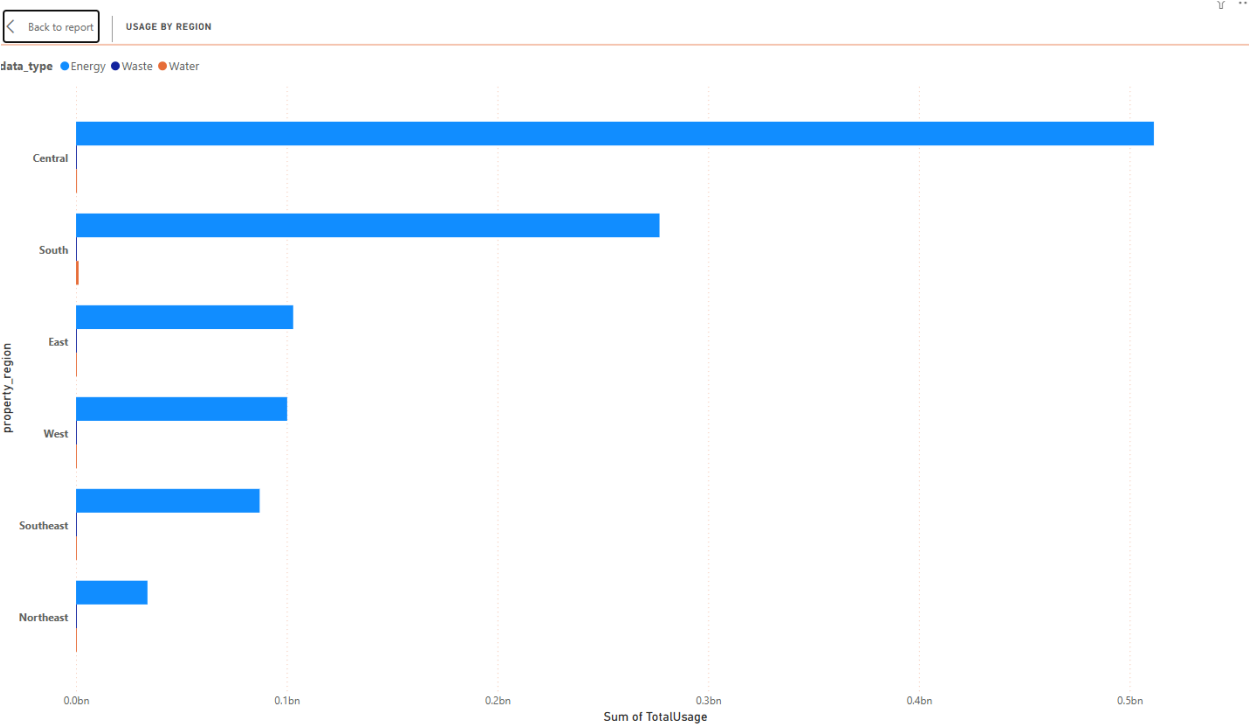These KPIs give executives a quick snapshot of overall consumption scale.

Portfolio Utility Usage Overview (2018–2025)

| Energy | 4.8M kBtu | Waste | 1.3K Tons | Water | 54.1K Kgal |

7.2 Year-over-Year Trend Line

A line chart showing Total Usage by Year.

Purpose: Demonstrates growth, decline, and anomalies.
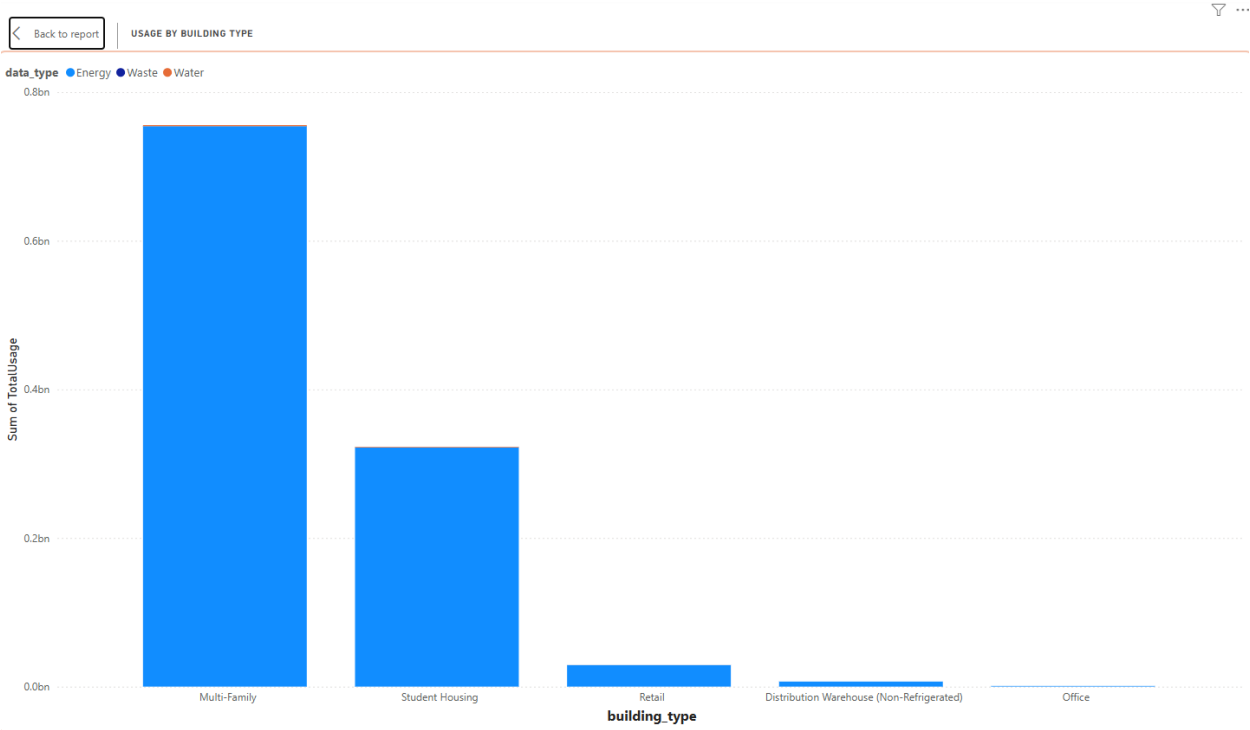

7.3 Usage by Region (Bar Chart)

Highlights which regions contribute most to consumption.

7.4 Usage by Building Type (Bar Chart)

Shows how different facility types consume utilities.

7.5 Slicers Included

- Region

- Building Type

- Utility Type

- Fund

These slice the entire dashboard without overwhelming the page.

8. Key Insights & Findings

1. **Energy usage dominates** significantly higher than water and waste.

2. **2023 shows the highest utility consumption** based on the YoY trend.

3. **The Central region contributes the most usage**, particularly in energy.

4. **Multi-Family properties are the highest consumers** among building types.

5. Downswing in 2024–2025 indicates potential efficiency improvements or operational changes.

9. Assumptions & Limitations

- Dataset appears pre-aggregated; granular meter-level detail was not included.

- YoY calculations assume full year data.

- Missing or zero usage years are treated as BLANK rather than 0 to avoid misleading % changes.

10. Closing Summary

This project demonstrates my ability to combine data engineering, analytical modeling, and data visualization into a cohesive narrative. I designed a simple, clean, and executive-ready dashboard that meets the exact constraints provided: one page, limited visuals, and clear year-over-year insights.