Title :- Integrated Energy & Weather Intelligence Dashboard

Intro :- This Power BI project, titled **"Integrated Energy & Weather Dashboard"**, analyzes how weather conditions impact energy consumption and production. Using two connected datasets—energy and weather—it visualizes key insights like forecast accuracy, renewable energy trends, and climate influence on demand. The dashboard enables quick, data-driven decisions through interactive visuals, slicers, and DAX measures.

Research:- **Energy Consumption in Spain**

Spain's energy consumption is highly seasonal, with demand peaks in both summer and winter. The country has made strong progress toward clean energy, with **renewables like wind, solar, and hydro** now contributing significantly to the energy mix.

Weather conditions play a key role:

- **Solar** peaks on clear summer days.
- **Wind** varies by region and time.
- **Hydro** depends on rainfall and reservoir levels.

Accurate **load forecasting** is essential for balancing the grid and minimizing environmental impact. Spain's grid operator, **Red Eléctrica de España (REE),** publishes real-time and forecasted data to support national energy goals, aligned with Spain's long-term plan for carbon neutrality.

Aim:- The aim of this project is to create an interactive Power BI dashboard that analyzes the relationship between **energy consumption, energy production, and weather conditions** in Spain. The goal is to uncover insights that help monitor energy trends, evaluate forecast accuracy, and support data-driven decisions for sustainable energy management.

Reports:- The first page of the dashboard provides an in-depth view of Spain's energy consumption and production patterns. Key insights include:

- Clear trends in **total load actual vs. forecast**, helping identify forecasting accuracy.

- Visualization of **renewable energy contributions** (wind, solar, hydro) across dates and hours.
- Identification of **peak demand periods** and how energy usage varies by city and time.

This analysis offers a foundation for understanding how energy demand behaves over time and supports efforts to optimize forecasting and resource planning.
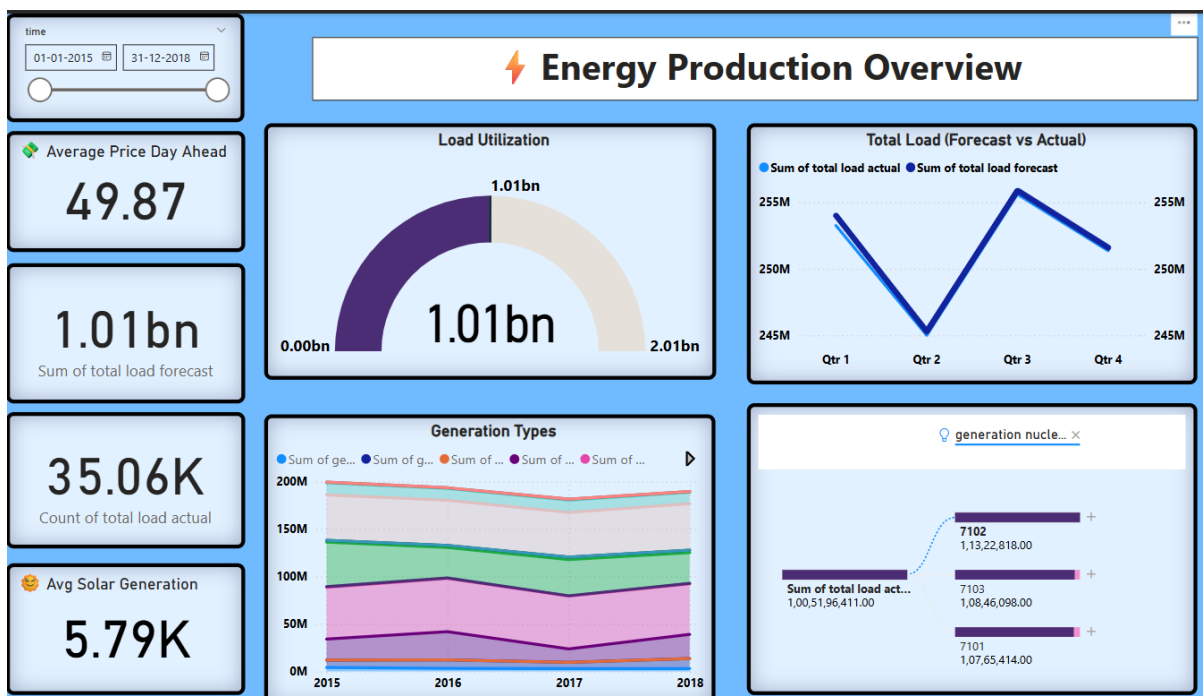

The second page presents a detailed overview of Spain's weather patterns and their fluctuations across different cities and time periods. Key findings include:

- **Temperature, humidity, and wind speed trends** that align with seasonal shifts.
- **City-wise weather comparisons** help identify regions with more extreme or stable weather.
- Visual patterns that can be linked to changes in energy demand and renewable energy generation.

This weather analysis supports the understanding of how environmental conditions influence energy usage, especially in planning for solar, wind, and peak demand readiness.
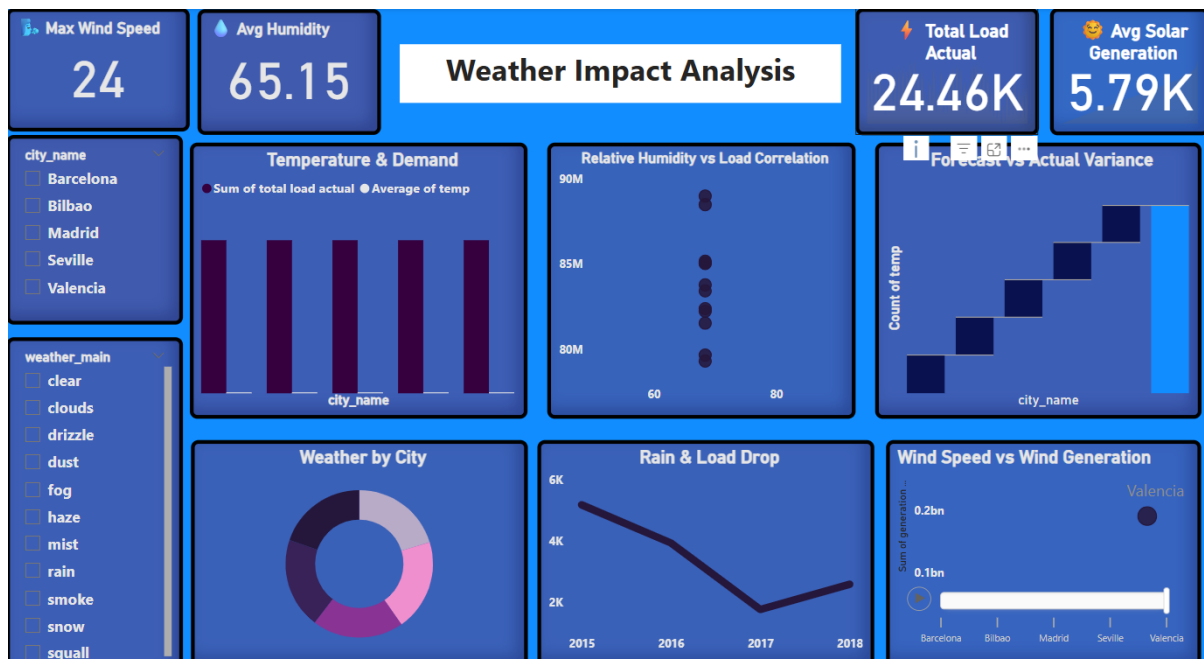
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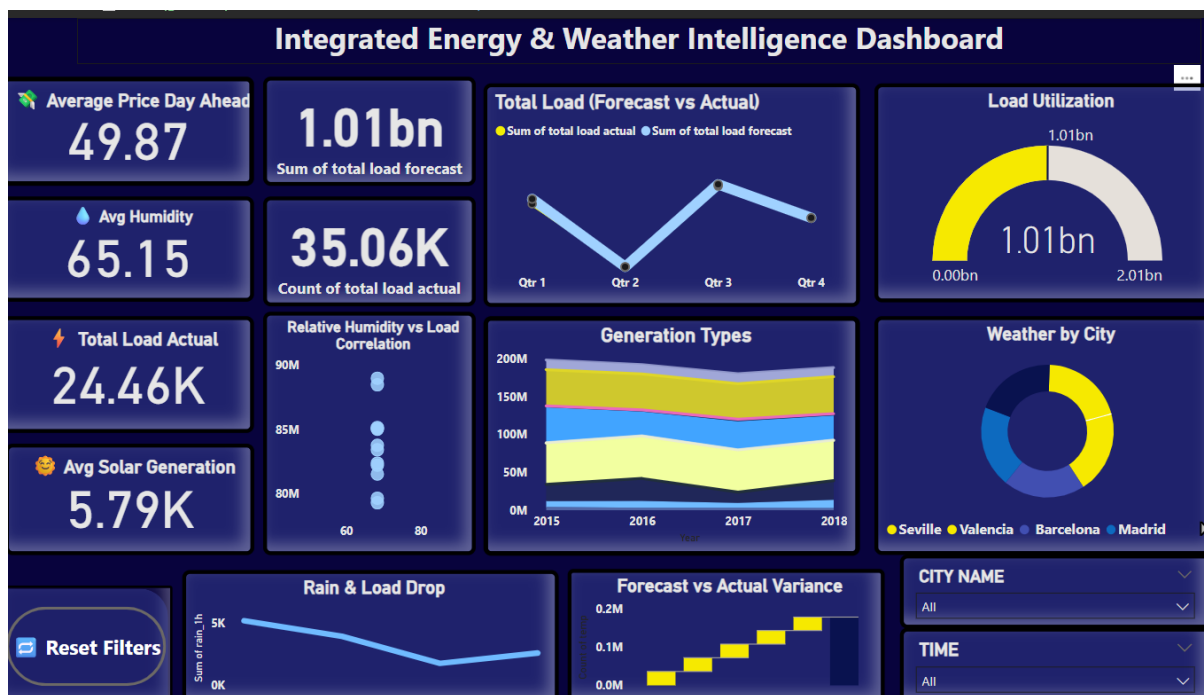
Project Overview: Energy Consumption and Weather Impact Dashboard (Spain)

This Power BI dashboard project analyzes energy consumption patterns, power generation sources, and weather impacts in Spain using two interconnected datasets:

Energy Dataset – includes hourly data on energy generation (by source), forecasted vs. actual load, and electricity pricing.

Weather Dataset – includes detailed weather metrics (temperature, wind speed, humidity, etc.) across multiple cities.

The project integrates these datasets to create interactive dashboards that allow stakeholders to monitor forecast accuracy, renewable energy contributions, and how weather factors influence demand and generation.

Insights and Visualizations

◆ **Page 1 – Energy Overview**

Comparison of forecasted vs. actual load highlights prediction errors.

Stacked area charts show how different sources (solar, wind, nuclear, fossil) contribute to energy production over time.

Key KPIs give quick insights into total demand and pricing trends.

◆ **Page 2 – Weather Impact Analysis**

Reveals correlations between temperature, wind, rain and energy load or renewable generation.

Helps understand how city-level weather affects energy usage.

Scatter plots show wind speed vs. wind energy, highlighting the effectiveness of renewable infrastructure.

◆ **Page 3 – Integrated Dashboard**

Combines energy and weather data to provide a comprehensive real-time view.

Enables filtering by date, city, weather condition, or generation type.

Includes KPI cards, donut charts, and trend lines for interactive exploration.

Conclusion

This project demonstrates how integrating energy and weather data enhances understanding of:

Load prediction accuracy

Renewable energy contributions

Weather's influence on consumption patterns

Cost fluctuations tied to demand and forecast error