

Final Project Report Template

1. Introduction

1.1 Project Overview

This project analyzes global energy trends using historical data and interactive Power BI dashboards. It focuses on energy consumption patterns across countries and continents, as well as the contribution of renewable and non-renewable energy sources over time. The study helps understand how energy demand has changed globally and highlights the growing role of renewable energy in meeting future needs.

1.2 Objectives

- To analyze global energy consumption across countries and continents.
- To identify major energy-consuming regions and countries.
- To compare renewable and non-renewable energy sources.
- To study trends in power generation over the years.
- To visualize energy data using interactive Power BI dashboards.
- To support insights for sustainable energy planning and decision-making.

2. Project Initialization and Planning Phase

2.1 Define Problem Statement

Today, energy demand is increasing all over the world, and many countries are shifting from fossil fuels to renewable energy sources like solar and wind. However, it is difficult to clearly understand energy usage, generation types, and regional differences because the data is large and scattered. Without proper analysis and visualization, decision-makers struggle to identify trends and make sustainable energy decisions.

2.2. Project Proposal (Proposed Solution)

Objective	The main objective of this project is to analyze global energy trends across different regions and energy generation modes using Power BI. The project aims to present energy data in a clear and visual manner to help understand patterns, compare renewable and non-renewable energy sources, and support better decision-making for sustainable energy planning.
-----------	--

Scope	The scope of this project includes collecting and analyzing global energy data related to various regions and energy generation sources such as coal, oil, gas, solar, wind, and hydro. The analysis is performed using Power BI to create interactive dashboards and reports.
Problem Statement	
Description	Understanding global energy trends is difficult because energy data is large, complex, and spread across different regions and sources. Without proper analysis and visualization, it becomes hard to identify patterns, compare renewable and non-renewable energy usage, and understand regional differences. This lack of clarity makes energy planning and sustainability decisions challenging.
Impact	If this problem is addressed, decision-makers will gain a clear understanding of energy trends and generation patterns. It will help governments, organizations, and analysts make informed decisions,

Proposed Solution	
Approach	The proposed solution uses Power BI to analyze and visualize global energy data. The data will be cleaned, processed, and modeled to ensure accuracy. Interactive dashboards and reports will be created to show energy generation trends, regional comparisons, and the share of different energy sources. This approach makes complex data easy to understand.
Key Features	<ul style="list-style-type: none"> • Interactive dashboards for easy exploration of energy data • Clear comparison between renewable and non-renewable energy sources • Region-wise analysis of energy generation and consumption • Visual charts and filters for better insights and decision-making

2.3. Initial Project Planning

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Member	Sprint Start Date	Sprint End Date (Planned)
Sprint-1	Data Collection & Preparation	USN-1	Collected data from Kaggle loaded in Power Bi	2	High	Pradeep Bodul	15 Dec	15 Dec
Sprint-1	Data Preprocessing	USN-2	Cleaned the data using Power Query, Added Index column, Reordered Columns, Filtered rows.	1	High	Pradeep Bodul	16 Dec	16 Dec
Sprint-2	Data Visualization	USN-3	Create visualizations to analyze renewable and non-renewable energy trends, consumption comparison by countries and continents.	2	Low	Pradeep Bodul	17 Decr	18 Dec
Sprint-1	Dashboard	USN-4	Build interactive dashboard	2	Medium	Pradeep Bodul	19 Dec	20 Dec
Sprint-1	Report	USN-5	Create a detailed Power BI report that summarizes global energy trends using charts, tables, and insights for easy understanding and presentation.	1	High	Pradeep Bodul	21 Dec	21 Dec

Sprint -2	Working on Template	USN-6	Created a Pdf template to showcase the overall Project	2	High	Pradeep Bodul	22 Dec	23 Dec
Sprint -2	Project Documentation	USN-7	Prepare final project documentation including problem statement, objectives, data description, methodology, dashboards, and conclusions for project submission.	1	High	Pradeep Bodul	24 Dec	24 Dec

3. Data Collection and Preprocessing Phase

3.1. Data Collection Plan and Raw Data Sources Identified

Data Collection Plan Template

Section	Description
Project Overview	This project focuses on analyzing global energy trends across different regions and countries using Power BI. The main objective is to understand energy consumption and power generation patterns, compare renewable and non-renewable energy sources, and present insights through interactive dashboards and reports to support better decision-making.
Data Collection Plan	The data for this project is collected from publicly available global energy datasets. These datasets are downloaded in CSV format from Kaggle.
Raw Data Sources Identified	The collected data includes continent-wise and country-wise energy consumption, renewable power generation, non-renewable power generation, and top power-producing countries. All datasets are imported into Power BI using Power Query Editor for cleaning and preprocessing

Raw Data Sources Template

Source Name	Description	Location/URL	Format	Size	Access Permissions
Kaggle	The dataset contain a 6 csv format worksheets that contains the data by continent consumption, country consumtion, top 20 countries on total power generation and renewable and non-renewable power generation data.	https://www.kaggle.com/datasets/jamesvandenberg/renewable-power-generation	CSV	130+ records	Public

3.2. Data Quality Report

Data Quality Report Template

The Data Quality Report Template will summarize data quality issues from the selected source, including severity levels and resolution plans. It will aid in systematically identifying and rectifying data discrepancies.

Data Source	Data Quality Issue	Severity	Resolution Plan
Kaggle	Issue with no matching variables to make a relation between the datasets, Large number of columns in country and continent consumption dataset	Moderate	Added an Index column to make a relation between datasets, created new variable for continent and country dataset, filter of column, a decimal change in column.

3.3. Data Exploration and Preprocessing

Data Exploration and Preprocessing Template

Identifies data sources, assesses quality issues like missing values and duplicates, and implements resolution plans to ensure accurate and reliable analysis.

Section	Description
Data Overview	The dataset contains global energy consumption and power generation data by year, region, country, and energy source (in TWh).

Data Cleaning	Unnecessary rows were removed, duplicates were checked, and column headers were standardized using Power Query..
Data Transformation	Data was filtered, unpivoted, and columns were reordered to enable effective analysis in Power BI.
Data Type Conversion	Correct data types were assigned to year, numeric energy values, and text fields to ensure accurate calculations.
Column Splitting and Merging	Columns were split or merged where required to improve data structure and readability.
Data Modeling	Relationships were created between tables, and measures were defined for analyzing energy trends..
Save Processed Data	Cleaned and transformed data was saved for reporting and future use.

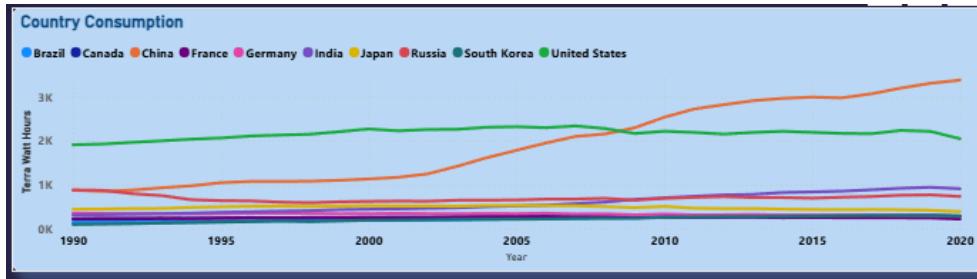
4. Data Visualization

4.1. Framing Business Questions

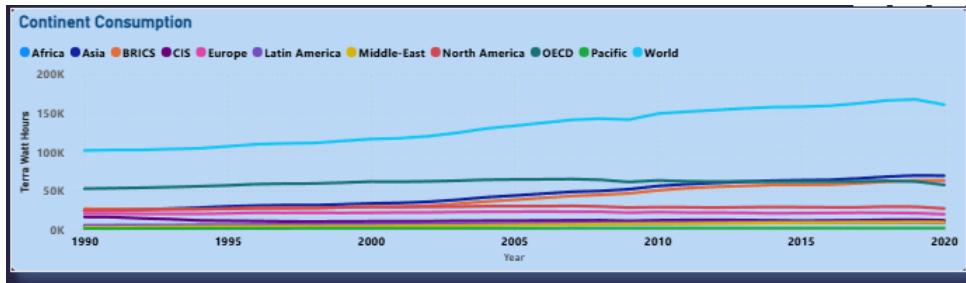
1. Which countries consume the most energy over the years?
2. How does energy consumption vary across different continents?
3. What is the average energy consumption of continent?
4. What is the average energy consumption of selected countries?
5. Which non-renewable energy source contributes the most to total power generation?
6. How has renewable power generation changed over time?
7. What are the overall statistical patterns of renewable energy contribution?
8. Which renewable energy source has the highest contribution?
9. How do different renewable energy sources compare in terms of contribution?
10. How does energy consumption differ among BRICS, OECD, and CIS regions?
11. How is energy consumption distributed among African countries?

4.2. Developing Visualizations

1. *Visualization:* Line chart showing energy consumption for year 1990 to 2020



2. *Visualization:* Line chart shows the energy consumption across different continents



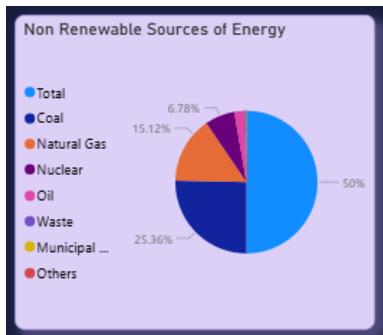
3. *Visualization:* Card visual showcasing the Average consumption of continent



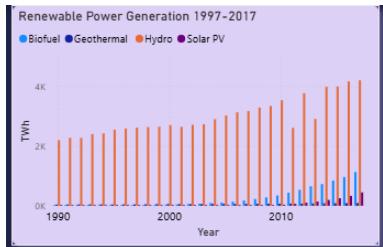
4. *Visualization:* Card Visual shows the countries Average consumption



5. Visualization: Pie chart visual shows the contribution of non-renewable power generation



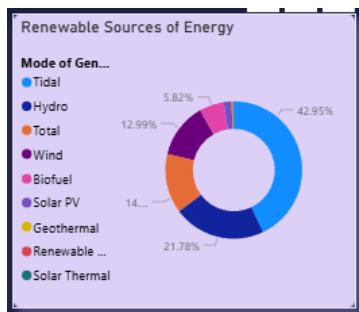
6. Visualization: Clustered column chart shows the power generation of renewable energy over years



7. Visualization: Card visual shows the statistical patterns such as Sum, Median, standard deviation and Variance of renewable total power generation



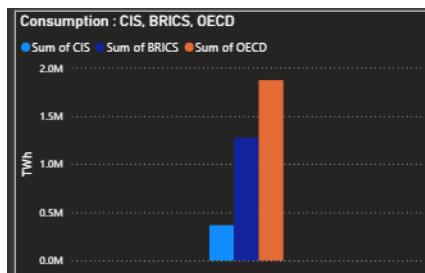
8. Visualization: Donut Chart shows the highest contribution of renewable energy source



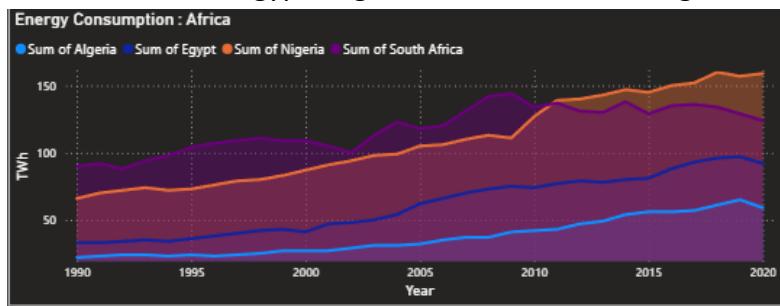
9. *Visualization:* Card visual shows the comparison of renewable sources such as biofuel, geothermal, hydro, solar pv



10. *Visualization:* clustered column chart shows the consumption of BRICS, OECD and CIS

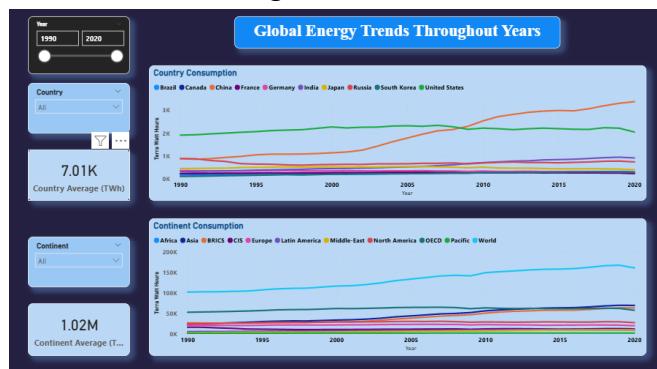


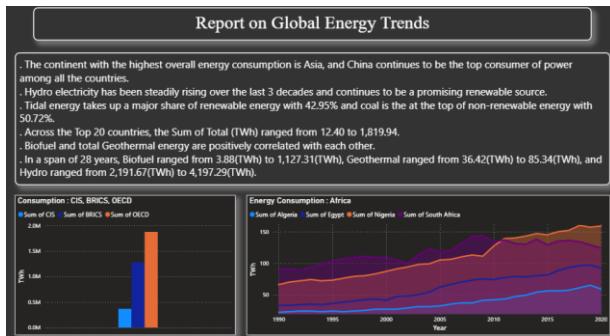
11. *Visualization:* Area chart shows the energy consumption of African continents by the countries such as Egypt, Nigeria, south Africa and Algeria



5. Dashboard

5.1. Dashboard Design File





Here are potential outcomes from the dashboard image provided:

Overall Growth Trend Global energy consumption has steadily increased from 1990 to 2020, reflecting rising industrialization and population growth.

Country-Level Consumption Patterns China and the United States show the highest energy consumption growth compared to other countries.

Stability in Developed Nations Energy consumption in countries such as Germany, France, and Japan shows relatively stable or slower growth trends.

Steady Growth in Renewable Energy Renewable power generation has increased consistently from 1997 to 2017.

Non-renewable Energy Dominance Non-renewable sources still contribute the largest share of total energy generation.

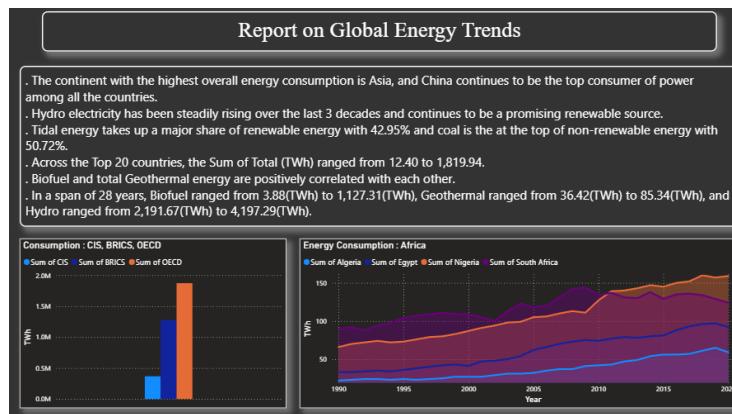
Coal as Major Contributor Coal remains the highest contributor among non-renewable energy sources.

Hydro Power Leadership Hydro power is the largest contributor among renewable energy sources.

China as the Leading Producer China has the highest overall power generation among the top 20 countries.

6. Report

6.1. Story Design File



Observations drawn from reports in Power BI can provide valuable insights into business performance and trends.

- **China is the top energy consumer globally.**
- **Hydropower generation shows a steady upward trend over the last 30 years.**
- **Coal contributes the largest share among non-renewable energy sources**
- **OECD countries consume more energy compared to CIS and BRICS regions.**
- **Hydropower's steady growth highlights its reliability and long-term sustainability.**
- **Biofuel energy rises from 3.88 TWh to over 1,127 TWh in 28 years.**
- **Top 20 countries range from 12.40 TWh to 1,819.94 TWh, indicating large disparities.**
- **Geothermal energy increases steadily from 36.42 TWh to 85.34 TWh.**

7. Performance Testing

7.1 Utilization of Data filters

Created Top N filters while creating visualizations

7.2 No of Calculation Field

A total of 8 calculated fields/measures were created to compute values such as total consumption, average consumption, median, variance, standard deviation, and energy source contributions.

7.3 No of Visualization

The project includes 18 visualizations, such as line charts, bar charts, pie charts, donut charts, cards, and map visuals, to clearly present global energy trends.

8. Conclusion/Observation

This project concludes that global energy consumption has increased steadily over the years, with **Asia emerging as the highest energy-consuming continent** and **China as the leading consumer worldwide**. Non-renewable sources, especially **coal**, still dominate global energy production, but **renewable energy sources such as hydropower, solar, and bioenergy show consistent growth**. The dashboards clearly highlight regional differences in energy usage and emphasize the need for a gradual shift toward sustainable energy sources to meet future global demand.

9. Future Scope

The project can be extended by incorporating real-time and more recent energy data to improve accuracy and relevance. Future enhancements may include predictive analysis and forecasting to estimate future energy demand and renewable adoption. Additional parameters such as carbon emissions, energy efficiency, and cost analysis can be included to support sustainability studies. The dashboard can also be expanded to provide country-specific policy insights and advanced interactivity for better decision-making.

10. Appendix

10.1. Source Code



Global Energy
Trends.pbix

10.2. GitHub & Project Demo Link

Demo link-

<https://drive.google.com/file/d/1Od8WL4UqgopV3j4cfKsqPcGmhF5S2NN9/view?usp=sharing>