Customer Problem Statement Template

I am	I'm trying to	But	Because	Which makes me feel
A Government official	Understand the current global energy trends and identify key regions and generation modes	The data comes from various sources and lacks a comprehensive, easily, interpretable format	The information is fragmented and difficult to visualize efficiently	Frustrated because , I need to make informed decisions and policies on energy sustainability
Energy Researcher	Study global energy trends and the impact of different generation modes across regions	I struggle with accessing consolidated and actionable data	The data sources are diverse and require heavy manual effort to compile	In efficient and unable to provide insights quickly to stakeholders
Business Development Manager	Identify new energy business opportunities	I lack access to comprehensive energy market data	Limited visibility into global energy trends and market analysis	Missed opportunity uncertainty

GOAL

WHO are we empathizing with?

1.GOVRNMENT
2.CUSTOMER
3.BUSINESSES
4.ENVIRONMENTAL ORGANIZATION

THINK and FEEL?
GOVRNMENT:-
Think:-prioritize renewable energy policies and carbon reduction goals
FEEL:-
pressure to balance economic growth with environmental responsibility.
CUSTOMERS:-
Think:-seek affordable and energy options.
Feel:-Expect transparency and reliability from energy providers.
BUSSINESSES:-
THINK:-focus on cost effective energy efficient solutions for competiveness.
FEEL;-
need to innovate while meeting regulatory and environmental standards.

What do they need to DO?

GLOBAL ENERGY TRANDS:-A Comprehensive analysis of key regions and generation modes using power Bi

What do they HEAR?

GOVERNMENT:-
.Need for policies supporting renewable energy adoption.
CUSTOMER:-
.Rising interest in cost-effective sustainable energy.
BUSINESS;-
Data-driven decisions can optimize energy efficiency.
ENVIRONMENTAL ORGANISATIONS:-
Urgency in reducing global carbon emissions.

PAINS

1.Lock of data-driven insights to inform energy policy decisions.
2.insufficient data to support energy infrastructure planning and development.
3.limited access to energy consuption data to inform energy management decisions.
4.limited access to data on energy related greenhouse gas emissions and environmental impact.
5.inability to identify areas for improvement in energy efficiency and sustainability.

GAINS

1.Data -driven insights to inform energy policy decisions.
2.Enhanced energy infrastructure planning and development.
3.Access to energy consumption data to inform enery management decisions.
4.identifying of new business opportunities in the energy sector.
5.Tracking of progress towards renewable energy t[illegible]nd reduced carbon foc[illegible]

What do they SEE?

GOVERNMENT:-
1.Focus on sustainability and achieving carbon neutrality.
CUSTOMER:-
1.Demand for cleaner, more affordable, and reliable energy option.
BUSSINESS:-
1.Interest in renewable energy to align with sustainability goals.
ENVIRONMENTAL ORGANIZATIONS:-
1.Advocating for aggressive carbon reduction and renewable energy adoption.

What other thoughts and feelings might influence their behavior?
ENERGY ACCESSIBILITY:-Ensuring equal access to energy for all regions and communities.
Renewable energy integration:Managing the integration of renewable energy sources into existing energy systems.
FEELINGS:-
1.OPTIMISM ABOUT ENERGY TRANSITION:
hope and enthusiasm for a transition to a more sustainable energy future.
FRUSTRATION W[illegible]W PROGRESS:
frustration with t[illegible] of energy transition and the continued reliance [illegible]sil fuels.

What do they SAY?

GOVERNMENT:-
Push for renewable energy policies and carbon neutrality goals.
CUSTOMER:-
Demand for affardable and reliable energy.
BUSINESS:-
Exploring new revenue streams in renewable and storage.
ENVIRONMENTAL ORGANIZATION:-
Monitaring emissions ,and biodiversity impact.
2.pressure on corparations and governments for utimate action.

What do they DO?

GOVERNMENT:-
Implements renewable energy policies and incentives.
CUSTOMERS:-
choose cost-effective and reliable energy-options.
BUSINESSES:-
Invest in renewable energy projects and technologies.
ENVIRONMENTAL ORGANISATION:-
Raise awarness about

Template

Brainstorm & idea prioritization

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

- **10 minutes** to prepare
- **1 hour** to collaborate
- **2-8 people** recommended

Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

10 minutes

A Team gathering
Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.

B Set the goal
Think about the problem you'll be focusing on solving in the brainstorming session.

C Learn how to use the facilitation tools
Use the Facilitation Superpowers to run a happy and productive session.

Open article

1 Define your problem statement

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

5 minutes

PROBLEM

Understand the current global energy trends and identify key regions and generation modes

Key rules of brainstorming

To run an smooth and productive session

- Stay in topic.
- Encourage wild ideas.
- Defer judgment.
- Listen to others.
- Go for volume.
- If possible, be visual.

2 Brainstorm

Write down any ideas that come to mind that address your problem statement.

10 minutes

TIP
You can select a sticky note and hit the pencil [switch to sketch] icon to start drawing!

Person 1

- Build a unified database for global energy metrics
- Integrate APIS from major energy agencies for real time data
- Standardize diverse datasets from different generations modes

Person 2

- Utilize cloud storage for scalable data consoridation
- Apply GIS mapping to visualize regional energy trends
- Leverage machine learning for pattern detection

Person 3

- Collaborate with international energy research networks
- Incorporate satellite and remote sensing data for renewables
- Develop interactive dashboards for actionable insights

Person 4

- Merge policy, economic, and technical data sets
- Automate data cleaning and normalization processes
- Validate findings with cross - regional case studies

3 Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups.

20 minutes

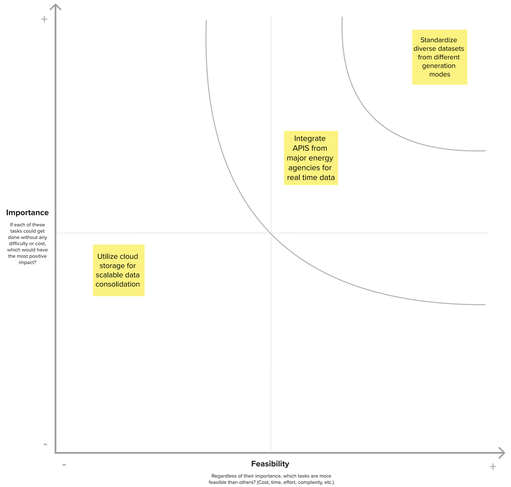
TIP
Add customizable tags to sticky notes to make it easier to find, browse, organize, and categorize important ideas as themes within your mural.

4 Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

20 minutes

TIP
Participants can use their cursors to point at where sticky notes should go on the grid. The facilitator can confirm the spot by using the laser pointer holding the **H key** on the keyboard.



After you collaborate

You can export the mural as an image or pdf to share with members of your company who might find it helpful.

Quick add-ons

A Share the mural
Share a view link to the mural with stakeholders to keep them in the loop about the outcomes of the session.

B Export the mural
Export a copy of the mural as a PNG or PDF to attach to emails, include in slides, or save in your drive.

Keep moving forward

Strategy blueprint
Define the components of a new idea or strategy.
Open the template

Customer experience journey map
Understand customer needs, motivations, and obstacles for an experience.
Open the template

Strengths, weaknesses, opportunities & threats
Identify strengths, weaknesses, opportunities, and threats (SWOT) to develop a plan.
Open the template

Need some inspiration?
See a finished version of this template to kickstart your work.
Open example

Scenario: [Existing experience through a product or service]	Entice How does someone become aware of this service?	Enter What do people experience as they begin the process?	Engage In the core moments in the process, what happens?	Exit What do people typically experience as the process finishes?	Extend What happens after the experience is over?
Experience steps What does the person (or people) at the center of this scenario typically experience in each step?	Run targeted ads on linked in twitter and facebook to reach energy professionals collabarate with energy industry influncers to promote the report.	Design dedicated landing page with a clear and concise overview of report provide a brief summary of the reports key findings and insights	Provide on interactive power BI dashboard for customers to explore global energy trends.	Allow customers to download the report in a convenient format (e.g PDF).	Premium services such as customized reports or ongaing energy trands
Interactions What interactions do they have at each step along the way? - **People:** Who do they see or talk to? - **Places:** Where are they? - **Things:** What digital touchpoints or physical objects do they use?	User click on a targeted social media ad. User opens a targeted email campaign user clicks on an influncer partnersship link	User views the dedicated landing page. User reads the report view user clicks on the CTA.	User explores the interactive power BI dash board. user schedules a webinar or consultation.	User downloads the report follow-up email user opens the follow up email .user submit feedback or survey responses	user inquires about premium services.
Goals & motivations At each step, what is a person's primary goal or motivation? ("Help me..." or "Help me avoid...")	Raise awareness of global energy trends and their impact on business.	Provide a clear and concise overview of the report and its benefits.	Provide an interactive and immersive experience for users to explore global energy trends.	Provide a seamless and convenient experience for users to access the report.	Build long term relationships with energy professional and establish through leadership.
Positive moments What steps does a typical person find enjoyable, productive, fun, motivating, delightful, or exciting?	Introduce the concept of global energy trands analysis using power BI through social ,media ,blogs ,and industry events	Offer a free trial or demo of the power BI analysis to prospective customers	Deliver regular insights and updates on global energy trends to keep customers engaged.	Send remainders and notifications to customers about upcoming renewal dates.	Offer additional features and services and services to premium content to customer.
Negative moments What steps does a typical person find frustrating, confusing, angering, costly, or time-consuming?	Customer is unclear about the benefits of using power BI for energy trend analysis	Customer finds it challenging to set up and use the power BI dashboard.	Customer finds the insights and analysis provided by the power BI dashboard to be irrelevant or unactionable.	Customer does not see the value in continuing to use the power BI dashboard.	customer finds that the power BI dashboard is not keeping pace with their evalving needs and requirements
Areas of opportunity How might we make each step better? What ideas do we have? What have others suggested?	Awareness and interest social media advertising linked twitter influencer partnerships energy industry throught leaders	Free trial or demo of power BI. webinars and online tutorials.	Regular email newsletters energy trends power BI updates. user community and forum energy analysts ,power BI users	Notification of expiration or cancellation power BI subscription. offer to renew or upgrade power BI .	Offer additional services custom energy data analysis, consulting, promote related products.

Product School Created in partnership with Product School
See an example

Project Design Phase-II
Data Flow Diagram & User Stories

Date	31 January 2025
Team ID	LTVIP2025TMID2134
Project Name	Global Energy Trends
Maximum Marks	4 Marks

Data Flow Diagrams:
A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.

Data collection
⇩
Data cleaning
⇩
Data modelling
⇩
Data visualization
⇩
Smart data insight
⇩
Data Report

User Stories
Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Policy maker	data collection	USN-1	As a policy maker I can access energy	energy production	High	Sprint-1

			consumption and generation trends by region.	and consumption data available per country.		
Energy Researcher	Data cleaning	USN-2	As a energy researcher I can clean and standardize data to insure consistency.	Data is for matted uniformly with missing values handled.	High	Sprint-2
Energy Researcher	Data modelling	USN-3	As a energy researcher, can create a data model in power Bi.	Data relationships are defined for efficient analysis.	High	Sprint-1
Data Analyst	Data visualization	USN-4	As an analyst I can create interactive dashboards to explore energy trends.	Dashboards display energy generation trends by region and mode.	Medium	Sprint-1
Sustainability consultant	Smart data insights	USN-5	As a sustainability consultant I can track the progress of NetZero commitment s	Trends in decarbonisation on efforts globally are available.	High	Sprint-2
Government official	data report	USN-6	As a government official I can generate reports for policy planning.	Reports summarise national energy challenge improvement are us	Medium	Sprint-2

Project Design Phase-II
Solution Requirements (Functional & Non-functional)

Date	31 January 2025
Team ID	LTVIP2025TMID21340
Project Name	Global Energy Trends :A Comprehensive Analysis of key regions And Generation modes Using power BI.
Maximum Marks	4 Marks

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	**DATA COLLECTION**	Gather real –time and historical energy data from various sources (smart grids, manufacturing plants ,rural electrification projects.
FR-2	**DATA PROCESSING**	Perform real-time monitoring of energy consumption and generation.
FR-3	**DATA VISUALIZATION**	Create interactive Power BI dashboards to track key energy metrics.
FR-4	**USER INTERACTION**	Allow energy stakeholders(government, corporations ,communities) to interact with data.
FR-5	**OPTIMIZATION&DECISION SUPPORT**	Recommend strategies for improving energy efficiency(e.g., load shifting demand-side management
FR-6	**INDUSRIAL ENERGY MANAGEMENT**	Analyze energy consumption in manufacturing ,identify inefficiencies ,and suggest optimization strategies.

Non-functional Requirements:

Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Provide an intuitive ,user-friendly dashboard for diverse stakeholders.
NFR-2	**Security**	Protect sensitive data and restrict unauthorized access.
NFR-3	**Accuracy**	Maintain high data integrity with reliable data sources and verification processes.
NFR-4	**Performance**	Ensure Power BI processes and visualizes large datasets efficiently.
NFR-5	**Availability**	Ensure 24/7 access to dashboards and reports.
NFR-6	**Scalability**	Allow expansion to include future energy data and trends.

Project Design Phase-II
Technology Stack (Architecture & Stack)

Date	31 January 2025
Team ID	LTVIP2025TMID21340
Project Name	Global Energy Trends :A Comprehensive Analysis of key regions And Generation modes Using power BI.
Maximum Marks	4 Marks

Technical Architecture:

The Deliverable shall include the architectural diagram as below and the information as per the table1 & table 2

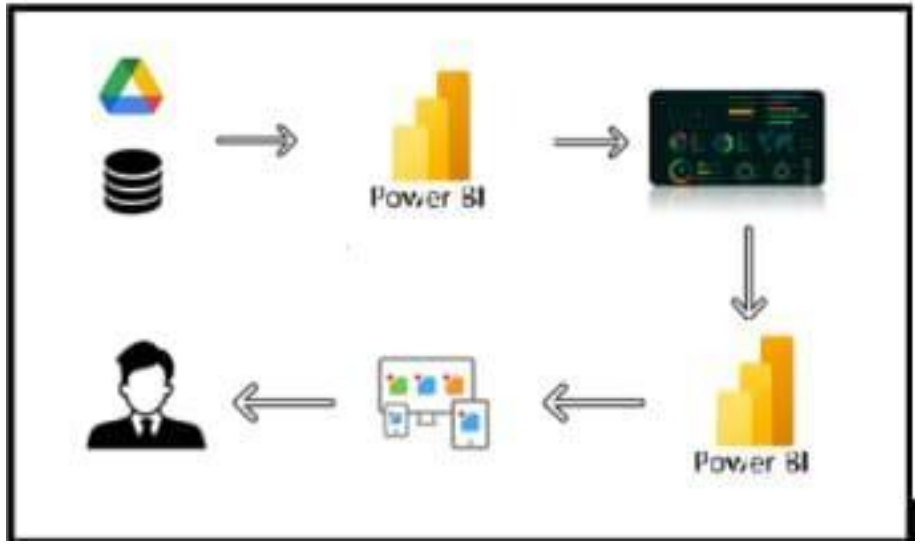


Table-1 : Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	Dashboard, Web UI	Power BI,React HTML/CSS
2.	Application Logic-1	Data processing cleaning	SQL/ Python
3.	Application Logic-2	Energy consumption analysis	Machine learning (Tensor Flow, S cikit-learn)
4.	Application Logic-3	Logic for a process in the application	IBM Watson Assistant
5.	Database	Energy data storage	My SQL, No SQL, Azure data lake
6.	Cloud Database	Cloud based storage	Azure SQL,AWS RDS
7.	File Storage	Data file storage	AWS S3 Google cloud storage
8.	External API-1	Weather Data	Open weather API
9.	External API-2	Government energy data	IEA API,EIA API
10.	Machine Learning Model	Demand Forecasting	LSTM Prophet model
11.	Infrastructure (Server / Cloud)	Applicationhosting	AWS EC2, Azure kubernetes

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	Tools for data analysis	Pandas,Numpy,Tensor Flow
2.	Security Implementations	Data&user security	e.g. SHA-256 OAUth,IAM policies
3.	Scalable Architecture	Handing large scale data	Microservices, kubernetes
4.	Availability	High availability traffic management	Load Balancers,Distributed servers
5.	Performance	Fast data processing	Redis cache,CDN

Problem-Solution fit canvas 2.0

Purpose / Vision

Define CS, fit into

1. CUSTOMER SEGMENT(S) — CS

Agricultural policymakers (governments, ministries of agriculture).

Agribusiness companies (food producers, suppliers, exporters).

Farmers & cooperatives (seeking data-driven decisions).

Researchers & analysts (academics, NGOs).

Investors & financial institutions (analysing market trends).

6. CUSTOMER CONSTRAINTS — CC

Limited access to real-time data.

Technical knowledge gap in using advanced analytics tools.

Budget constraints for adopting expensive BI solutions.

Dependence on outdated methods for decision-making.

5. AVAILABLE SOLUTIONS — AS

Traditional reports & statistics (FAO, World Bank, USDA).
Pros: Reliable data.
Cons: Static, lacks visualization, difficult to interpret.
Basic Excel analytics.
Pros: Easily accessible.
Cons: Limited insights, not scalable for large data.
Third-party market reports.
Pros: Industry-specific insights
Cons: Expensive, not customizable
Custom-built BI solutions.
Pros: Highly tailored, real-time insights.
Cons: High implementation costs.

Explore AS,

Focus on J&P, tap into BE, understand

2. JOBS-TO-BE-DONE / PROBLEMS — J&P

Data-driven decision-making in agriculture and food security.

Understanding production trends to forecast demand and supply.

Identifying major contributors to global food production.

Optimizing supply chains based on regional strengths.

Mitigating risks associated with climate change and trade policies

9. PROBLEM ROOT CAUSE — RC

Fragmented data sources make it hard to consolidate insights.

Lack of visual analytics hinders effective communication of trends Slow adoption of technology in traditional agricultural sectors.

7. BEHAVIOUR — BE

Directly related: Searching for agricultural trends, reading reports, attending policy meetings.

Indirectly related: Engaging in discussions on food security, collaborating with international agencies.

Focus on J&P, tap into BE, understand

Identify strong TR & EM

3. TRIGGERS — TR

Food security concerns due to climate change and population growth.

Government policies requiring better agricultural data.

Business expansion into emerging agricultural markets.

Sustainability initiatives in food production Fluctuations in global commodity prices.

4. EMOTIONS: BEFORE / AFTER — EM

. Emotions (Before & After)
Before: Uncertainty, lack of clarity, guesswork in planning
After: Confidence, data-backed strategies, informed decision-making.

10. YOUR SOLUTION — SL

A Power BI dashboard that provides:
Interactive visualizations for food production trends.
Comparative analysis of major commodities over time.
Regional insights on agricultural output
Forecasting capabilities to predict future trends.

8. CHANNELS of BEHAVIOUR — CH

Channels of Behaviour
Online: Government & agribusiness websites, data portals, webinars, LinkedIn groups.

8.2 OFFLINE

Offline: Conferences, trade shows, policy summits, research collaborations.

Extract online & offline CH of BE

AMALTAMA

Project Design Phase
Proposed Solution Template

Date	15 February 2025
Team ID	LTVIP2025TMID21340
Project Name	Global Energy Trends : A Comprehensive Analysis of key regions AND Generation modes using power BI.
Maximum Marks	2 Marks

Proposed Solution Template:

Project team shall fill the following information in the proposed solution template.

S.No.	Parameter	Description
1	Problem Statement (Problem to be solved)	The global energy sector faces challenges in sustainability, efficiency, and reliability. There is a need to integrate renewable sources, optimize consumption, and reduce CO2 emissions.
2	Idea / Solution description	Utilize power bi to analyze energy trends across key regions and generation modes, focusing on smart grids, industrial energy management, and rural electrification to enhance sustainability.
3	Novelty / Uniqueness	The project combines real- time data analytics with energy transition strategies, providing deep insights into renewable integration, efficiency improvements and sustainable development.
4	Social Impact / Customer Satisfaction	Improved energy efficiency and increase renewable adoption lead to lower emissions, cost savings, and better access to electricity, enhancing overall quality of life and industrial productivity.
5	Business Model (Revenue Model)	ABC company can provide data-drive insights, power bi dashboards, and consultancy services to governments, energy providers, and industrial sectors to support informed decision- making.

6	Scalability of the Solution	The model is adoptable across different energy sectors and regions , with potential for continues improvement as new data sources and technologies emerge.

Problem Design Phase
Solution Architecture

Date	15 February 2025
Team ID	LTVIP2025TMID21340
Project	Global Energy Trends: A comprehensive analysis of key regions and generation modes using power BI.
Maximum Marks	4 Marks

Solution Architecture:
Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. Its goals are to:

- Find the best tech solution to solve existing business problems.
- Describe the structure, characteristics, behavior , and other aspects of the software to project stakeholders.
- Define features, development phases, and solution requirements
.
- Provide specifications according to which the solution is defined, managed, and delivered.

Example - Solution Architecture Diagram:

ProjectPlanningPhase

Project Planning Template (Product Backlog, Sprint Planning, Stories, Story points)

Date	15February2025
Team ID	LTVIP2025TMID25291
Project Name	Global Energy Trends : A Comprehensive Analysis of key regions AND Generation modes using power BI.
MaximumMarks	5 Marks

ProductBacklog,SprintSchedule,andEstimation(4Marks)

Usethebelowtemplatetocreateproductbacklogandsprintschedule

Sprint	Functional Requirement(Epic)	UserStory Number	UserStory/Task	StoryPoints	Priority	Team Members
Sprint-1	Data collection	USN-1	As a policy maker I can access energy consumption and generation trends by region.	2	High	K.Sowmya
Sprint-1	DataCleaning	USN-2	As a energy researcher I can clean and standardize data to insure consistency.	1	High	K.Sowmya
Sprint-1	Data Modeling	USN-3	As a energy researcher, can create a data model in power Bi.	2	High	K.Deepika
Sprint-2	Data Visualization	USN-4	As an analyst I can create interactive dashboards to explore energy trends.	5	medium	K.Tejaswari
Sprint-2	Trends analysis	USN-5	Analyze the global energy historical pattern	3	High	K.Vineeta
Sprint-2	Data Report	USN-6	As a government official I can generate reports for policy planning.	2	Medium	K.Vineeta

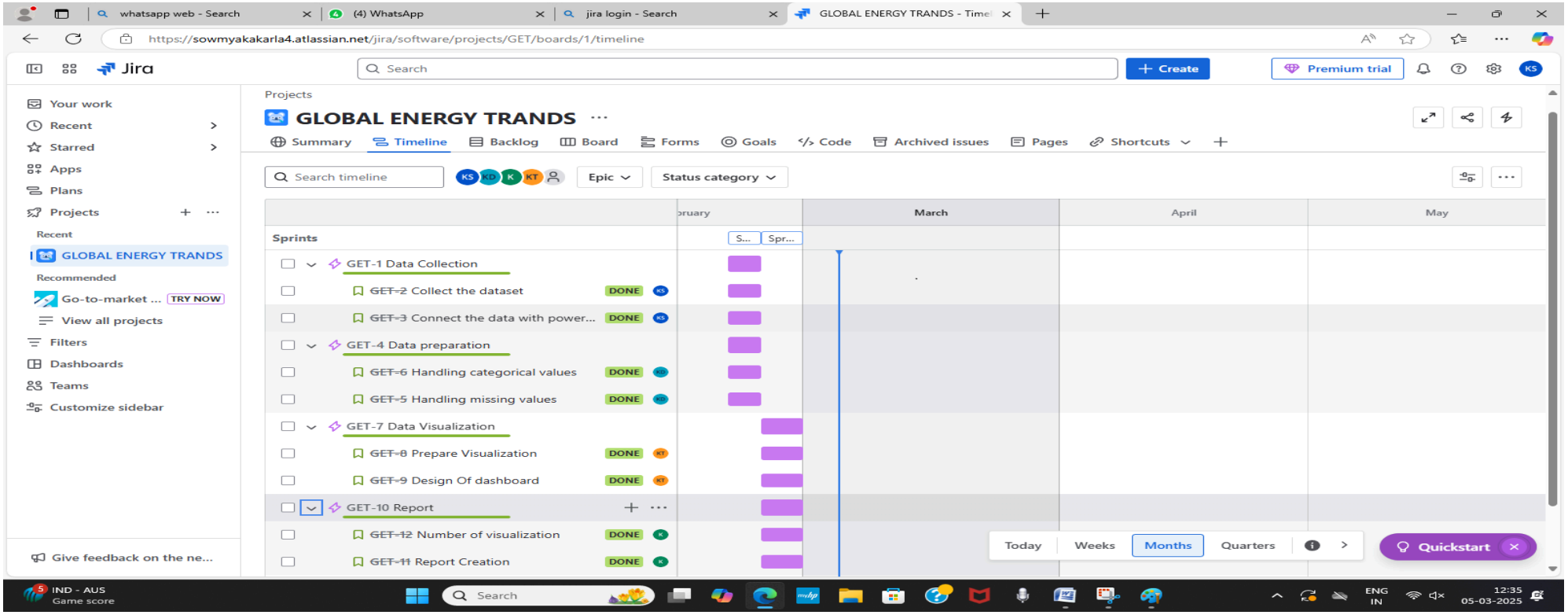
ProjectTracker,Velocity&BurndownChart:(4Marks)

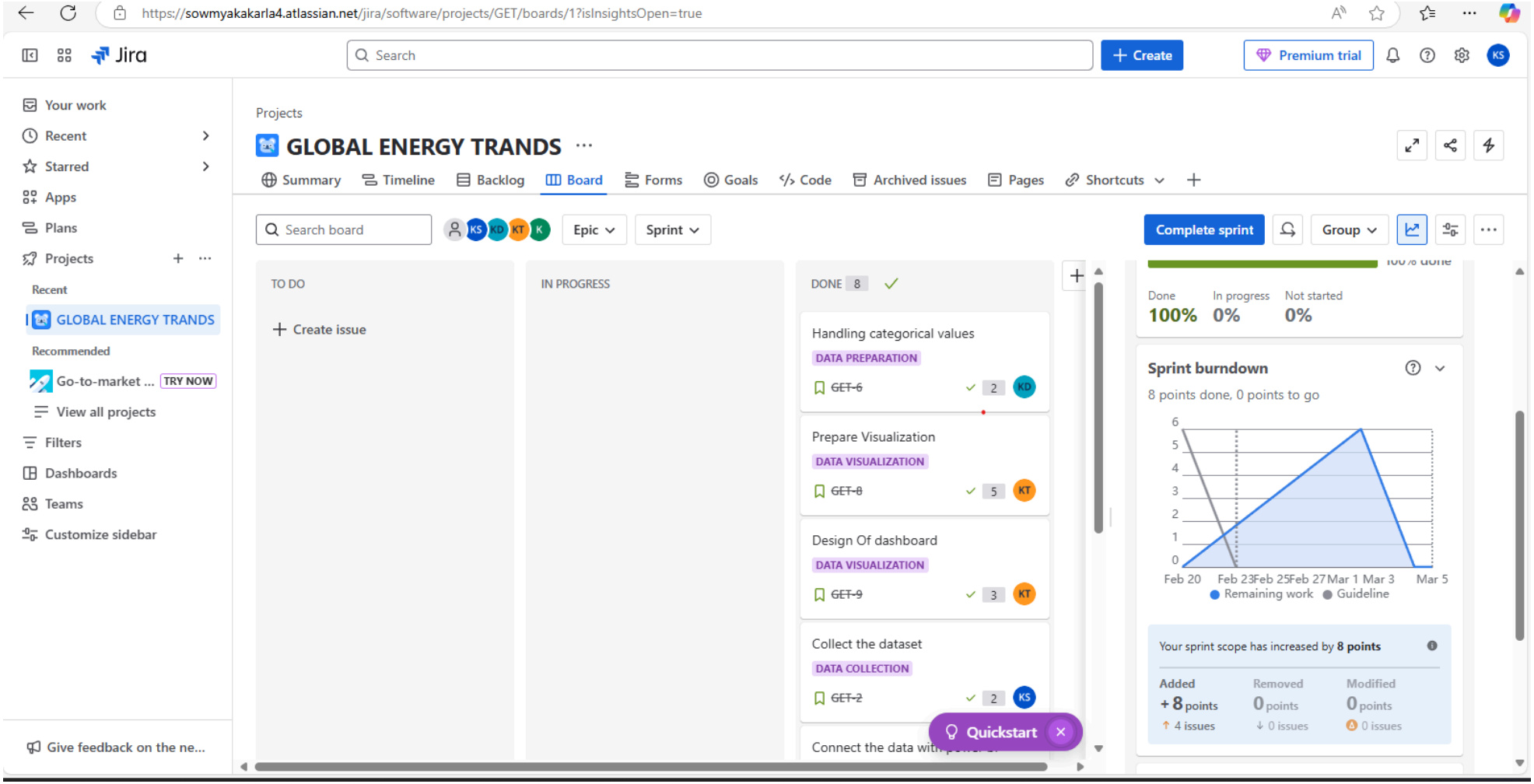
Sprint	TotalStory Points	Duration	SprintStartDate	SprintEndDate (Planned)	Story Points Completed(ason PlannedEndDate)	SprintReleaseDate (Actual)
Sprint-1	24	2Days	20FEB 2025	21FEB2025	24	21FEB 2025
Sprint-2	24	2Days	22FEB 2025	23FEB 2025	24	23FEB 2025
Sprint-3	24	2Days	24FEB 2025	26FEB 2025	24	26FEB 2025
Sprint-4	24	2Days	27FEB 2025	28FEB 2025	24	28FEB 2025

Velocity:

Imaginewehavea10- day sprint duration and the velocity of the team is 20 (points per sprint). Let'scalculatetheteam'saveragevelocity(AV)per iteration unit (story points per day)

$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

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Jira
Search
Create
Premium trial
Your work
Recent
Starred
Apps
Plans
Projects
Recent
GLOBAL ENERGY TRANDS
Recommended
Go-to-market ... TRY NOW
View all projects
Filters
Dashboards
Teams
Customize sidebar
Give feedback on the ne...
Projects
GLOBAL ENERGY TRANDS
Summary
Timeline
Backlog
Board
Forms
Goals
Code
Archived issues
Pages
Shortcuts
Search board
Epic
Sprint
Complete sprint
Group
TO DO
Create issue
IN PROGRESS
DONE 8
Handling categorical values
DATA PREPARATION
GET-6
2
Prepare Visualization
DATA VISUALIZATION
GET-8
5
Design Of dashboard
DATA VISUALIZATION
GET-9
3
Collect the dataset
DATA COLLECTION
GET-2
2
Quickstart
Done
100%
In progress
0%
Not started
0%
Sprint burndown
8 points done, 0 points to go
6
5
4
3
2
1
0
Feb 20
Feb 23
Feb 25
Feb 27
Mar 1
Mar 3
Mar 5
Remaining work
Guideline
Your sprint scope has increased by 8 points
Added
+ 8 points
4 issues
Removed
0 points
0 issues
Modified
0 points
0 issues

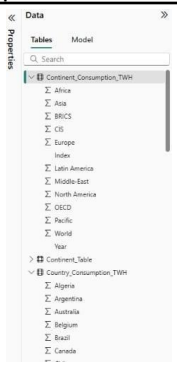
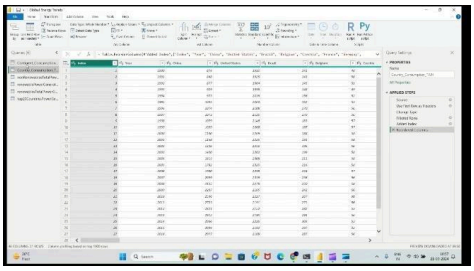
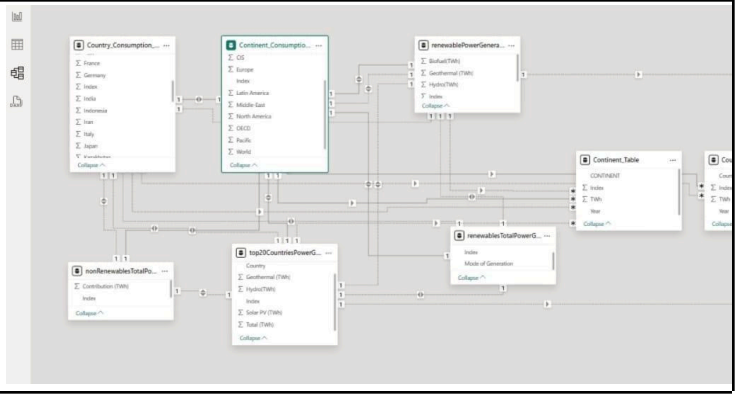
Project Development Phase
Model Performance Test

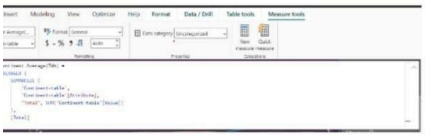
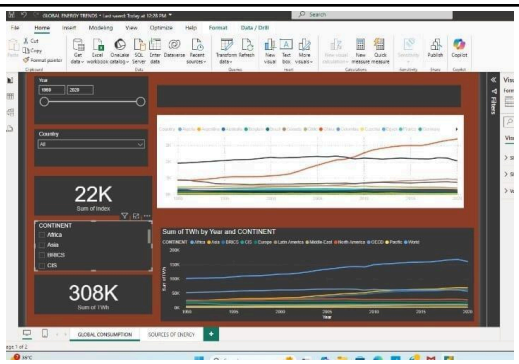
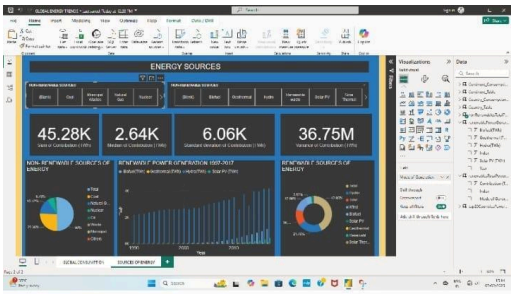
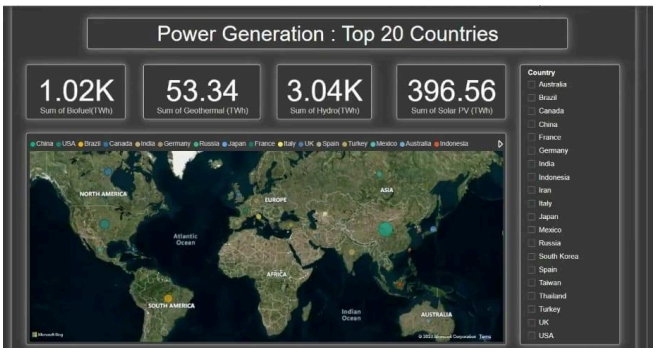
Date	10 February 2025
Team ID	LTVIP2025TMID21340
Project Name	Global Energy Trends :A Comprehensive Analysis of key regions And Generation modes Using power BI.
Maximum Marks	

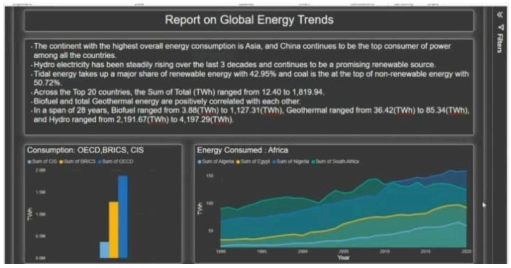
Model Performance Testing:

Project team shall fill the following information in model performance testing template.

S.No.	**Parameter**Please	**Screenshot / Values**
1.	Data Rendered	Downloading the dataset Please use the link to download the dataset in reference: Global Energy Consumption & Renewable Generation | Kaggle.. Global Energy Consumption (1990-2020) & Renewable Energy Generation (1997-2017).. https://www.kaggle.com/datasets/jamesvandenberg/renewable-power-generation. Global Energy Consumption & Renewable Generation About Dataset Content 4 of these datasets outline the quantity of terawatt hours (TWh) produced through various sources of energy, comparing both renewable and non-renewable sources, while highlighting the renewable use of the top 20 countries. The Renewables Power Generation dataset includes a 1997-2017 timeline that outlines the progress of the main renewable energy sectors : Hydro, Wind, Biofuel, Solar PV, and Geothermal. Additionally, the Top 20 Countries Power Generation dataset includes the national data for each of the renewable categories as outlined above. The last 2 datasets include the global TWh generated from renewable and non-renewable sources. In the latest version, I added two datasets which contain the global consumption figures on national and continental/international group levels, which help provide context about the quantity of energy required, how that is changing over time, and how we are doing in terms of transitioning from non-renewable to renewable energy use.

		Source Renewable Energy: Reddy, Vamsi., Kalananda, Aala., Komanapalli, Narayana. "Nature Inspired Optimization Algorithms for Renewable Energy Generation, Distribution and Management - A Comprehensive Review. 2021. Consumption: https://yearbook.enerdata.net/total-energy/world-consumption-statistics.html (data converted from mTOE to TWh)
2.	Data Preprocessing	 
3.	Utilization of Data Filters	

4.	DAX Queries Used	 
5.	Dashboard design	  

6	Report Design	

Global Energy Trends: A
Comprehensive Analysis Of Key Regions And Generation Modes Using Power BI

Introduction:-

Energy plays a vital role in various aspects of modern life, and its importance is expected to increase further as electric vehicles and heat pumps become more prevalent for transportation and heating. Although power generation currently accounts for a significant portion of global CO_2 emissions, it is also leading the way in transitioning to net-zero emissions by rapidly adopting renewable energy sources like solar and wind power.

The energy landscape is undergoing a substantial transformation with a strong focus on sustainability and effectiveness. In this context, incorporating renewable energy sources and optimizing energy usage are crucial. Enhancing energy efficiency and integrating renewable generation are key elements in moving towards a more sustainable energy future. Utilizing data analysis techniques within the energy sector holds considerable promise for achieving these goals.

Scenario 1:Smart Grid Implementation in Urban Areas:

In a bustling urban city, the local government has embarked on a project to upgrade its energy infrastructure to meet the increasing demands sustainably. They have implemented a smart grid system that integrates renewable energy sources like solar and wind power into the existing grid. This system allows for more efficient distribution of electricity, minimizing energy loss during transmission. Moreover, smart meters installed in households provide real-time data on energy consumption, enabling residents to monitor and adjust their usage patterns. As a result, the city experiences reduced reliance on fossil fuels, lower CO_2 emissions, and increased resilience to power outages.

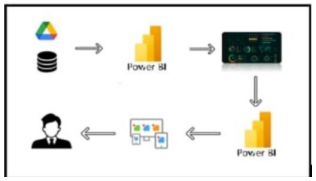
Scenario 2:Industrial Energy Management in Manufacturing Plants: A large manufacturing plant recognizes the importance of optimizing energy usage to enhance its sustainability and cost-effectiveness. Leveraging data analysis techniques, the plant implements an advanced energy management system that monitors energy consumption across various processes in real-time. Through predictive analytics, the system identifies areas of inefficiency and suggests optimization strategies, such as scheduling production during off-peak hours or upgrading equipment to more energy-efficient models. Additionally, the plant integrates renewable energy sources like rooftop solar panels to offset its reliance on grid electricity further. This initiative not only reduces the plant's carbon footprint but also leads to substantial cost savings over time.

scenario 3:Rural Electrification Project in Developing Countries

In a remote rural community in a developing country, access to reliable electricity has been a longstanding challenge. To address this issue sustainably, a non-profit organization initiated a rural electrification project focused on utilizing renewable energy sources. They install solar microgrids to power homes, schools, and community centers, providing access to clean and affordable electricity for the first time. Data analytics are employed to optimize the operation of these microgrids, ensuring efficient energy distribution and minimal wastage. As a result, the community experiences significant improvements in living standards, with enhanced educational

opportunities, better healthcare facilities, and economic empowerment through small-scale enterprises powered by electricity. This project serves as a model for sustainable development in similar rural areas worldwide, demonstrating the transformative potential of renewable energy and data-driven solutions.

Technical Architecture:



Project Flow

The activities listed below must be completed:

1. Data Collection
    - Collect the dataset
    - Connect Data to Tableau
2. Data Preparation
    - Prepare the Data for Visualization
3. Data Visualizations
    - Number of Unique Visualizations
4. Dashboard
    - Response and Design of Dashboard
5. Report
    - Report Creation
6. Performance Testing
    - Utilization of Data Filters
    - Number of Calculated Columns/Measures
    - Number of Visualizations/Graphs
7. Project Demonstration & Documentation
    - Record explanation Video for project end-to-end solution
    - Project Documentation - Step by step project development procedure

<u>Data Collection & Extraction from Database</u>

Data collection is the process of gathering and measuring information on variables of interest,in an established systematic fashion that enables one to answer stated research questions, test hypotheses, evaluate outcomes and generate insights from the data.

Downloading the dataset

Please use the link to download the dataset in reference
Global Energy Consumption & Renewable Generation | Kaggle..
Global Energy Consumption (1990-2020) & Renewable Energy Generation (1997-2017)..

https://www.kaggle.com/datasets/jamesvandenberg/renewable-power-generation

Understand the data

Data contains all the meta information regarding the columns described in the Excel files.
Description of the Dataset:
There are six data files that collectively form our dataset. The list of files is as follows:

1.Continent Consumption TWH
1.Year
2.World
3.OECD
4.BRICS
5.Europe
6.North America
7.Latin America
8.Asia
9.Pacific
10.Africa
11.Middle East
12.CIS

2.Country Consumption TWH
Columns in the dataset:
1.Year
2.China
3.United States
4.Brazil
5.Belgium
6.Czechia
7.France
8.Germany
9.Italy
10.Netherlands
11.Poland
12.Portugal
13.Romania
14.Spain
15.Sweden
16.United Kingdom
17.Norway
18 Turkey
19.Kazakhstan
2o.Russia
21.Ukraine

22.Uzbekistan
23.Argentina
24.Canada
25.Chile
26.Colombia
27.Mexico
28.Venezuela
29.Indonesia
30. Japan
31.Malaysia
32.South Korea
33.Taiwan
34.Thailand
35.India
36.Australia
37.New Zealand
38.Algeria
39.Egypt
40.Nigeria
41.South Africa
42.Iran
43.Kuwait
44.Saudi Arabia
45.United Arab Emirates

3.Non-Renewable – Total Power Generation
Columns in the dataset:
1.Mode of Generation
2.Contribution (TWH)

4.Renewable – Total Power Generation
Columns in the dataset:
1.Mode of Generation
2.Contribution (TWH)

5.Renewable Power Generation 1997-2017
Columns in the dataset:

1.Year
2.Solar (TWH)
3.Biofuel (TWH)
4.Hydro (TWH)
5.Geothermal (TWH)

6. Top 20 Countries Power Generation

Columns in the dataset:

1.Country
2.Solar PV (TWH)
3.Biofuel (TWH)
4.Hydro (TWH)
5.Geothermal (TWH)
6.Total (TWH)

Data Preparation

Preparing the data for visualization involves cleaning the data to remove irrelevant or missing data, transforming the data into a format that can be easily visualized, exploring the data to identify patterns and trends, filtering the data to focus on specific subsets of data, preparing the data for visualization software, and ensuring that the data is accurate and complete.

Prepare the Data for Visualization

This process helps to make data easily understandable and ready for creating visualizations to gain insights.
Explanation video link:-
https://drive.google.com/file/d/1CTfVj6wwTQia2zNPc_prRfSVP2EaCXq4/view?usp=drivesdk

Data Transformation

Explanation video link:-
https://drive.google.com/file/d/1COAMgcnmVpqaNLjiR8EQVc3V6VY5VqIA/view?usp=drivesdk

Data Visualization

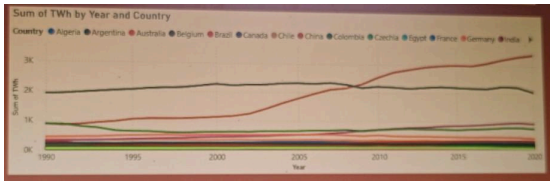
Data visualization is the process of creating graphical representations of data to help people understand information. The goal of data visualization is to make complex data sets more accessible, intuitive, and easier to interpret. By using visual elements such as charts, graphs, and maps, data visualization can help people identify patterns, trends, and outliers quickly in the data.

Number of unique visualizations

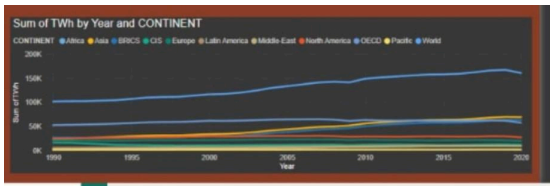
The number of unique visualizations that can be created with a given dataset. Some common types of visualizations that can be used to analyze include bar charts, line charts, heat maps, scatter plots, pie charts, maps, etc. These visualizations can be used to compare, and track

changes over time, show distribution, relationships between variables, breakdown of one category, and much more.
NOTE: Explanations (video) for the charts are in the Dashboard Section.

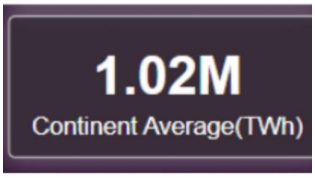
Country wise consumption



Continent Consumption

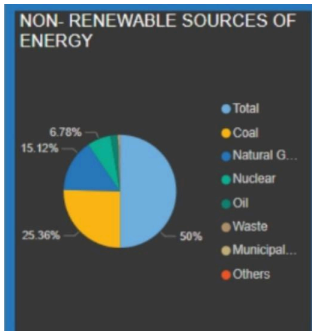


Continent Average

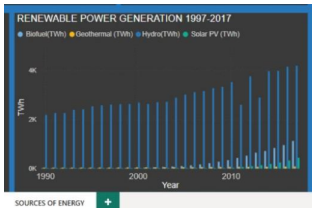


Country Average

Non-Renewable Sources

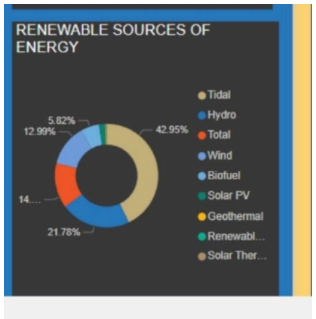


Renewable Generation 1997-2017

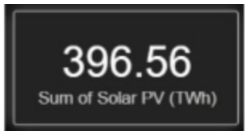


Cards- Sum, Median, Standard Deviation and Variance of Contribution

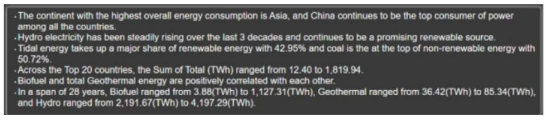
Renewable Sources



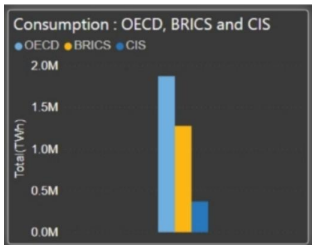
Cards - Geothermal, Biofuel, Hydro and Solar PV



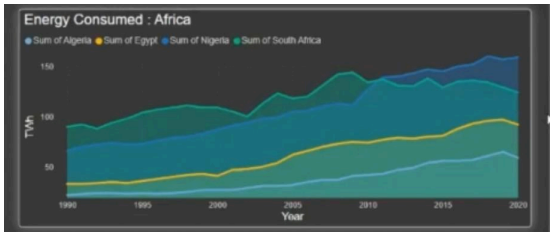
Report Narrative



BRICS, OECD and CIS



Energy Consumption in Africa



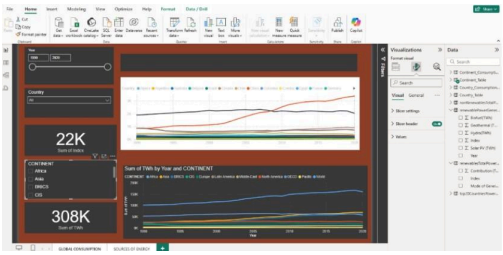
Explanation video link:-
https://drive.google.com/file/d/1CeMB1p__ooRS4RzWLAgIbBzX9_ixhD0l/view?usp=drivesdk

Dashboard

A dashboard is a graphical user interface (GUI) that displays information and data in an organized and easy-to-read format.Dashboards are often used to provide real-time monitoring and analysis of data. They are typically designed for a specific purpose or use case. Dashboards can be used in a variety of settings, such as business,finance,manufacturing, healthcare, and many other industries. They can be used to track key performance indicators (KPIs), monitor performance metrics, and display data in the form of charts, graphs, and tables.

Responsive and Design of Dashboard

Dashboard:1



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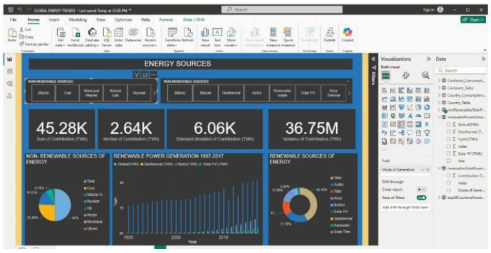
Dashboard:-2



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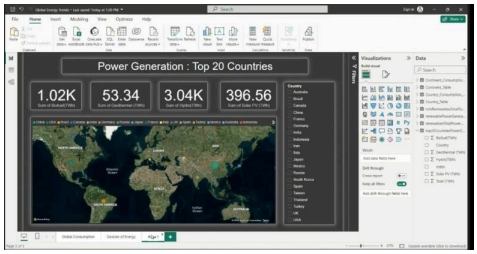
Dashboard:-3



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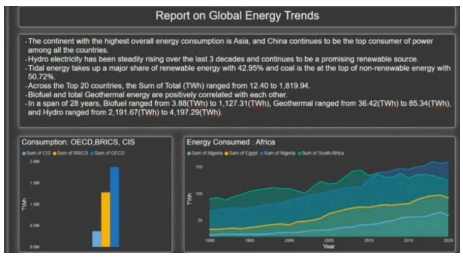
Report

A report is a way of presenting data and analysis in a narrative format, with the goal of making information more engaging and easier to understand. It typically includes a clear introduction that sets the stage and explains the context for the data, a body that presents the data and analysis in a logical and systematic way, and a conclusion that summarizes the key findings and highlights their implications. Data stories can be told using a variety of media, such as reports, presentations, interactive visualizations, and videos.

Report:-



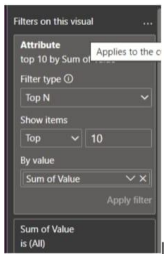
https://drive.google.com/file/d/1TMZ06sReP_Y990WbOX7FvW3nhUTLm1er/view?usp=drivesdk

Performance Testing

Performance Testing
For the aforementioned energy project focusing on incorporating renewable energy sources and optimizing energy usage, performance testing plays a critical role in ensuring the effectiveness and reliability of the implemented systems. Performance testing involves assessing various aspects, including the efficiency of energy generation from renewable sources, the effectiveness of energy distribution through smart grids or microgrids, and the accuracy of data analytics algorithms in identifying optimization opportunities.

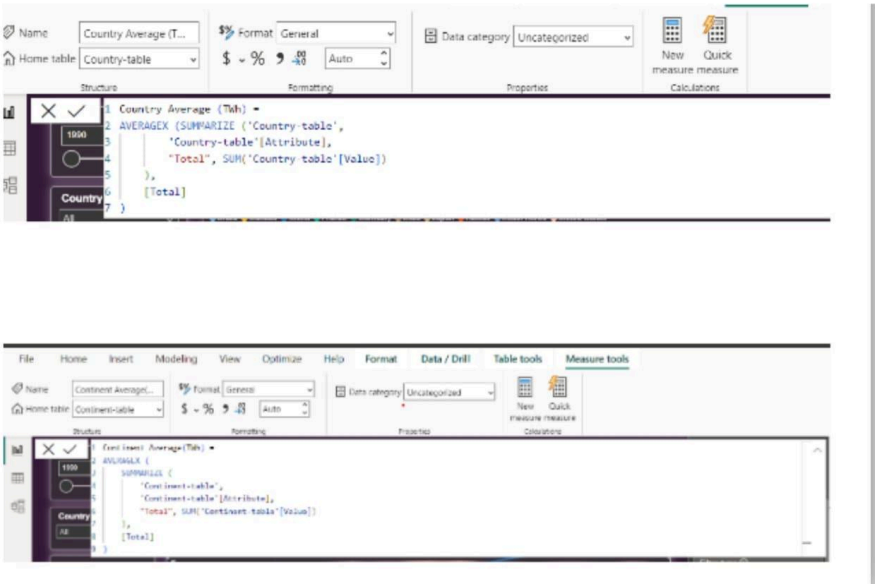
Application of Data Filters

Selections within the data allow users to filter data based on individual fields or dimensions. Users can choose specific values within a field to include or exclude from analysis. Complex filters based on predefined conditions and logic can also be created.



Use of Measures/Calculated Columns

Power BI allows the creation of reusable filter objects like Measures, and Calculated Columns which can simplify the process of applying consistent filters across multiple visualizations and dashboards.



Number of Graphs/ Visualizations

1.Country-wise energy consumption
2.Continent Energy Consumption
3.Continent Average(TWh)
4.Country Average(TWh)
5.Non-renewable sources of Energy
6.Renewable Generation 1997-2017 (TWh)
7.Cards - Sum, Median, Standard Deviation and Variance 8.of Contribution(TWh)
9.Renewable Sources of Energy
10.Cards - Geothermal, Biofuel, Hydro and Solar PV
11.BRICS, OECD, and CIS Comparison
12.Report Narrative
13 Energy Consumption in African countries

Project Demonstration & Documentation
Below mentioned deliverables to be submitted along with other deliverables
Activity 1:- Record explanation Video for project end to end solution
Activity 2:- Project Documentation-Step by step project development procedure
Create document as per the template provided