High Level Design Document

Introduction

This High Level Design (HLD) document outlines the architecture and core components for the **EcoPulse - Energy Consumption Trends** project. The purpose of this project is to deliver a Power BI dashboard that visualizes energy consumption trends over time across different regions or facilities, supporting research and business analysis through interactive line and area charts.

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1. System Architecture Overview

Architecture Description:
EcoPulse is a data analytics solution leveraging Power BI for visualization. The system ingests energy consumption data, processes it for analysis, and presents interactive dashboards to end users.

Component	Role/Responsibility
Data Source	Stores raw energy consumption data (CSV, SQL, or API)
Data Ingestion Layer	Imports and refreshes data into Power BI
Data Model	Structures and transforms data for analysis
Visualization Layer	Power BI dashboards with line/area charts
User Interface	Power BI Service or Desktop for end-user interaction

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2. Component Interactions

Sequence Step	Interaction Description
1	Data Source provides raw energy data to Data Ingestion Layer
2	Data Ingestion Layer loads and refreshes data into Power BI
3	Data Model transforms and aggregates data for trend analysis
4	Visualization Layer renders interactive charts based on the Data Model
5	Users access dashboards via Power BI UI (web or desktop)

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3. Data Flow Overview

Source Component	Target Component	Data/Action Description
Data Source	Data Ingestion Layer	Raw energy consumption data
Data Ingestion Layer	Data Model	Imported and refreshed dataset
Data Model	Visualization Layer	Aggregated and structured data for charts

Visualization Layer	User Interface	Interactive dashboards and reports

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4. Technology Stack

Layer/Function	Technology/Tool
Data Storage	CSV, SQL Database, or API Endpoint
Data Ingestion/ETL	Power BI Dataflows, Power Query
Data Modeling	Power BI Data Model (DAX, Power Query)
Visualization	Power BI (Line/Area Charts, Filters)
User Access	Power BI Service or Power BI Desktop

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5. Scalability & Reliability

- **Scalability:** Power BI supports scheduled data refresh and can connect to scalable data sources (e.g., cloud databases). For larger datasets, DirectQuery or incremental refresh can be used.
- **Reliability:** Power BI Service ensures high availability and secure access. Data refresh schedules and access controls maintain data integrity and security.
- **Security:** Role-based access and data source authentication are enforced via Power BI and underlying data storage.

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