MEASURE ENERGY CONSUMPTION
Phase1: problem definition and design thinking

Electricity use over time is measured in Watthours.The amount of electricity that a power plant generates or an electric utility customer uses is typically measured in kilowatthours (kWh). One kWh is one kilowatt generated or consumed for one hour.

OBJECTIVES:
determine their energy needs, automatically redistribute energy resources around the network and determine when excess energy should be stored or when it should be sold back to the grid

TOOLS TO MEASURE:

1. *Energy Meter*: Start by using an energy meter or wattmeter. These devices plug into an electrical outlet and measure the energy consumption of the devices or appliances you connect to them.

2. *Reading Utility Bills*: If you want to measure the energy consumption of your entire home or facility, you can review your utility bills. They usually provide information on your energy usage in kilowatt-hours (kWh).

3. *Smart Meters*: Many homes and businesses have smart meters installed by utility companies. These meters provide real-time information on energy usage and can often be accessed online.

4. *Energy Monitoring Systems*: Consider installing an energy monitoring system. These

systems can provide detailed insights into energy usage …

5. *Data Loggers*: For a more in-depth analysis, you can use data loggers to track energy usage over time. They record energy consumption data at regular intervals, which you can analyze later.

6. *Energy Audits*: Consider conducting an energy audit. Professionals can assess your home or facility's energy usage and recommend energy-saving measures.

DESIGN APPROACH:

1. Data Source Selection:
   - Identify and acquire an appropriate dataset containing energy consumption measurements. Ensure the dataset is reliable, up-to-date, and covers the necessary parameters.

2. Data Preprocessing:
   - Clean the dataset to remove inconsistencies, missing values, and outliers.
   - Transform and format the data into a suitable structure for analysis.

3. Feature Extraction:
   - Identify key features and metrics within the energy consumption data that are relevant for analysis and decision-making.

4. Model Development:
   - Utilize statistical analysis techniques to uncover trends, patterns, and anomalies in the energy consumption data.
   - Implement machine learning algorithms, if applicable, for predictive analysis.

5. Visualization:
   - Create informative and user-friendly visualizations such as graphs and charts to present energy consumption trends and insights.
   - Use visualization tools like matplotlib, seaborn, or Tableau for this purpose.

6. Automation:
   - Develop a script or software application that automates the entire process, including data collection, preprocessing, feature extraction, model development, and visualization.

- Ensure that the automation is scheduled or triggered at regular intervals to keep the information up-to-date.

7. User Interface:
   - Design a user-friendly interface that allows users to interact with the system, view visualizations, and access relevant insights easily.

8. Decision Support:
   - Implement features for decision support, such as alerts for unusual energy consumption spikes or recommendations for energy optimization.

9. Scalability and Security:
   - Ensure that the system can scale to handle data from various sectors and is secured to protect sensitive energy consumption data.

10. Testing and Validation:
   - Rigorously test the system to validate its accuracy, reliability, and usability.
   - Gather feedback from users and stakeholders for continuous improvement.

11. Deployment:

- Deploy the automated energy consumption measurement and analysis system in the target environment, ensuring it operates smoothly and efficiently.

12. Maintenance:
- Regularly update and maintain the system to adapt to changing data sources, technologies, and user requirements.

CONCLUSION:
Conservation of energy is an action made to decrease energy consumption by any means. This can be done by using less energy. It is important for saving our natural resources