PROJECT TITLE: **MEASURE ENERGY CONSUMPTION**

INTRODUCTION:

In this phase, we will detail the steps to transform the design for calculating energy consumption into an innovative solution. This phase builds upon the foundation laid in Phase 1, where we defined the problem and designed a solution using the datasets available to us.

STEP 1: DATA PREPARATION

Before innovation can begin, ensure that your datasets (aep_hourly, comed_hourly, dom_hourly, fe, ni, pjm, pjm_load, pjme_hourly) are clean, well-organized, and properly formatted. This may involve:

- Cleaning and handling missing data.
- Normalizing or standardizing data for consistency.
- Merging and aligning datasets as required.

STEP 2: FEATURE ENGINEERING

Enhance the datasets by creating relevant features that can improve energy consumption prediction accuracy. Feature engineering may include:

- Extracting temporal features like time of day, day of the week, or seasonality.
- Incorporating weather data if available to account for external factors.
- Calculating historical usage trends to identify patterns.

STEP 3: MODEL SELECTION

Select appropriate machine learning or statistical models for energy consumption prediction. Consider models like:

- Linear Regression for basic consumption estimation.
- Time Series Forecasting methods (ARIMA, Prophet) for capturing temporal patterns.
- Advanced models such as Gradient Boosting or Neural Networks for improved accuracy.

STEP 4: MODEL TRAINING

Split your dataset into training and validation sets. Train your chosen models on the training data and validate their performance on the validation set. Fine-tune hyperparameters for better results.

STEP 5: EVALUATION

Assess the models' performance using relevant metrics like Mean Absolute Error (MAE), Mean Squared Error (MSE), or Root Mean Squared Error (RMSE). Choose the model that performs best on the validation set.

STEP 6: MODEL DEPLOYMENT

Once you've chosen the best-performing model, deploy it in a production environment. Ensure it can handle real-time data and perform predictions efficiently.

STEP 7: MONITORING AND MAINTENANCE

Implement a monitoring system to keep track of model performance. Regularly update the model as new data becomes available to maintain accuracy.

CONCLUSION:

In this phase, we have outlined the steps to take your energy consumption calculation design and transform it into an innovative solution. By following these steps, you can create a robust and accurate system for predicting energy consumption using the provided datasets.