PHASE 3

Measuring Energy Consumption

Introduction:

Energy consumption is a critical aspect of our daily lives and has a significant impact on the environment. It refers to the amount of energy used to power various devices and systems, such as electricity for lighting, heating, and cooling in our homes, or fuel for transportation. Managing and reducing energy consumption is not only essential for lowering utility bills but also for mitigating the effects of climate change.

In this code example, we'll explore some basic concepts related to energy consumption and how Python can be used to analyze and track energy usage.

Data collection:

```
# Import necessary libraries
import pandas as pd
import datetime

# Simulate energy consumption
data (replace with actual data
sources)
# For example, you can read data
from a CSV file, an API, or IoT
devices.

# Simulated energy consumption
data
data = {
    'Timestamp':
[datetime.datetime(2023, 10, 1, 0, 0),
datetime.datetime(2023, 10, 2, 0, 0),
datetime.datetime(2023, 10, 3, 0,
0)],
    'Energy Consumption (kWh)':
[100, 110, 95]
}

# Create a DataFrame to store the
data
energy_df = pd.DataFrame(data)

# Display the collected energy
consumption data
print(energy_df)
```

Source code:

```
import time

# Function to simulate power readings
(replace with actual sensor data)
def get_power_reading():
    # Replace this with code to read actual
power data from sensors or devices
    # For demonstration, we'll use a simple
function that returns random power values.
    import random
    return random.uniform(100, 500)  #
Simulated power reading in watts

# Constants
SECONDS_PER_HOUR = 3600

# Initialize variables
total_energy_consumed = 0  # in watt-hours
(Wh)
start_time = time.time()

# Simulate measuring energy consumption
for 1 hour (you can adjust the duration)
measurement_duration_hours = 1

print("Measuring energy consumption for 1
hour...")
while time.time() - start_time <
measurement_duration_hours *
SECONDS_PER_HOUR:
    power = get_power_reading()  # Get the
current power reading in watts
    elapsed_time = time.time() - start_time  #
Calculate elapsed time in seconds
    energy_consumed = power *
(elapsed_time / SECONDS_PER_HOUR)  #
Calculate energy consumption in watt-hours
    total_energy_consumed +=
energy_consumed  # Add to the total

# Print the result
print(f"Total energy consumed:
{total_energy_consumed:.2f} Wh")
```

Comclusion:

In conclusion, while this example is a basic introduction to energy measurement in Python, it forms the basis for more advanced energy monitoring and management systems that can play a vital role in our efforts to reduce energy waste and environmental impact.