

IBM NaanMuthalvan – Artificial Intelligence Group 4

College name : SSM Institute Of Engineering And
Technology.

College code : 9221

Team Members :

J.Margrate Sneka (922121106045)

S.Nagapriya (922121106056)

M.Pooja (922121106064)

C.M.Priyadharshini (922121106069)

Phase 1:

MEASURE ENERGY CONSUMPTION

Problem Definition:

The problem at hand is the need for a comprehensive and user-friendly system to accurately measure and monitor energy consumption in residential and commercial settings. Current methods are often cumbersome, lack real-time data, or fail to engage users in energy conservation.

Design Thinking:

Designing an energy consumption system involves several components and consideration.

Hardware and Sensors:

Select appropriate sensors for measuring energy consumption

Data Acquisition System:

Set up a data acquisition system to collect data from sensors.

Use microcontrollers, data loggers, or dedicated hardware to interface with sensors.

Communication:

Choose a communication protocol for transmitting data from sensors to a central processing unit.

Central Processing Unit:

Select a microcontroller or single-board computer to receive, process, and store the incoming data.

Implement necessary algorithms for data processing and analysis.

Data Storage:

Decide on a suitable database or storage solution for storing historical energy consumption data.

User Interface:

Develop a user interface for interacting with the system (e.g., web application, mobile app, dashboard).

Include features for viewing real-time and historical energy consumption data.

Data Analysis and Reporting:

Implement algorithms to analyze the data and generate reports or visualizations.

Include features for identifying trends, anomalies, and potential areas for optimization.

Alerts and Notifications:

Set up a system for generating alerts based on predefined thresholds or anomalies in energy consumption.

Power Management:

Implement power-saving measures for the system itself to minimize energy consumption.

Security:

Implement security measures to protect sensitive data and ensure the system's integrity.

Testing and Calibration:

Thoroughly test the system to ensure accurate data collection and processing.

Calibrate sensors periodically to maintain accuracy.

Maintenance and Updates:

Establish a maintenance schedule for sensor calibration, software updates, and hardware checks.

Phase of development:

Measuring energy consumption involves tracking and recording the amount of energy used by devices. It helps understand usage patterns and identify opportunities for energy efficiency and conservation. Tools like smart meters and energy monitoring systems can assist in this process. Smart meters and energy monitoring system help track and record how much energy using.

Code:

```
import struct
```

```

import binascii
import time

from pymodbus.constants import Endian
from pymodbus.payload import BinaryPayloadDecoder
from pymodbus.payload import BinaryPayloadBuilder

from struct import *
from pymodbus.client.sync import ModbusTcpClient

import logging
logging.basicConfig()
log = logging.getLogger()
#log.setLevel(logging.DEBUG)

host = '192.168.1.204'
port = 502

client = ModbusTcpClient(host, port)
client.connect()

for x in range(0, 300):

rr = client.read_input_registers(0x0000,2,unit=1)

assert(rr.function_code < 0x80) # test that we are not an error

print "-----"
print rr
print rr.registers
print "-----"
print format(rr.registers[0], '02x')
print format(rr.registers[1], '02x')
print "-----"
# PYTHON FLOAT IEEE 754
decoder = BinaryPayloadDecoder.fromRegisters(rr.registers, endian=Endian.Big)
print ("Voltage is ", decoder.decode_32bit_float(), "V")
print "-----"
time.sleep(1)

```

Evaluation steps

Step 1

Engage Management

Step 2

Plan for energy management

Step 3

Implement energy management

Step 4

Measure results.

Evaluation metrics:

Energy Consumption:

Measure the total energy consumed over a specific period.

Energy Efficiency:

Assess how effectively energy is being utilized in a system or building.

Power Quality:

Evaluate the stability, consistency, and cleanliness of the power supply.

Peak Demand:

Analyze the highest power usage during a specific timeframe, which can impact pricing and infrastructure needs.

Energy Cost:

Calculate the financial expenditure on energy consumption.

Carbon Footprint:

Determine the environmental impact of energy usage, often measured in terms of carbon dioxide emissions.

Monitoring Accuracy:

Ensure that the monitoring system accurately records and reports energy usage data.

Response Time:

Measure how quickly the system detects and responds to changes in energy usage or anomalies.

Data Granularity:

Assess the level of detail provided by the monitoring system in terms of time intervals and specific energy sources.

User-Friendliness:

Evaluate the ease of use and accessibility of the monitoring system for users, including the availability of visualizations and reports.