

Software Engineering Assignment

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1. List various requirements(scope) for the above program initiative that can be used for

developing a suitable technology oriented digital solution.

- a) Integration of renewable energy data into a single platform for easy monitoring and management.
- b) Real-time monitoring and analysis of energy data for efficient decision-making and planning.
- c) Automation of energy generation, transmission, and distribution processes for increased efficiency and cost savings.
- d) Implementation of predictive maintenance systems to reduce downtime and maintenance costs.
- e) Integration of artificial intelligence and machine learning algorithms to optimize energy production and consumption.
- f) Development of digital twins to model, forecast and test energy systems for optimal performance.
- g) Secure and scalable data storage and processing capabilities to accommodate large amounts of energy data.
- h) Robust communication networks to connect energy systems and devices for real-time data exchange
- i) Implementation of cybersecurity measures to protect against cyber threats and ensure data privacy.
- j) Seamless integration with existing energy systems and devices.

2. Identify various technologies, tools and systems available in the market to support these

needs.

List of tools, technologies, and systems to support such needs:

- a) IoT sensors and devices for real-time energy monitoring and data collection.
- b) Cloud computing platforms for scalable data storage and processing.
- c) Machine learning and artificial intelligence algorithms for energy optimization and forecasting.
- d) Predictive maintenance systems for efficient maintenance planning.
- e) Digital twin technology for modeling, testing and forecasting energy systems.
- f) Blockchain technology for secure and transparent data storage and management.
- g) Communication protocols such as MQTT and OPC UA for data exchange between devices and systems.
- h) SCADA systems for real-time monitoring and control of energy systems.
- i) Advanced analytics tools for data analysis and visualization.
- j) Cybersecurity tools and measures to protect against cyber threats.

3. Generate one API and suitable data analysis Code base to access the energy related data set and perform data analysis

```
import requests
import json
import pandas as pd

# Define API Endpoint
url = "https://api.example.com/energydata"

# Set Headers and Parameters
headers = {"Authorization": "Bearer your_access_token"}
params = {"start_date": "2022-01-01", "end_date": "2022-01-31"}
```

```
# Send GET Request
response = requests.get(url, headers=headers, params=params)

# Parse Response JSON
data = json.loads(response.text)

# Convert Data to DataFrame
df = pd.DataFrame(data)

# Filter Data
df_filtered = df[df["energy_type"] == "solar"]

# Group Data by Date
df_grouped =
df_filtered.groupby("date")["energy_value"].sum()

# Plot Data
df_grouped.plot(kind="bar", title="Solar Energy Production")
```