**CS301: SOFTWARE ENGINEERING**

**Semester IV**

**Class Practice Sessions - 2&3**

**NAME : CHATURTH R  
ROLL NO. : 21BCS025 , 4TH SEM CSE SEC ‘A’**

**Theme : Evolution of digitalisation in the energy sector:**

The energy sector is now in a profound transition towards a very important energy

transformation, and digitalisation is one of the key facilitators to ensure that it is fulfilled. In the recent past, companies started by switching the use of analogue meters to digital meters, smart meters etc., in order to improve energy efficiency.Digitalisation acts as a lever in the sector to combat climate change and optimise power generation processes to reduce emissions and meet the objective of decarbonisation of the

energy model.

**Main problems of the renewable energy sector : Impediments faced by companies in the sector are:**

• Geographically dispersed energy data ,

• Lack of integrated platform ,

• Inability to track assets,

• Lack of clear and traceable objectives

**Benefits of digital transformation in the renewable energy sector:**

Digitalisation, if carried out guided by an integrated operations platform, facilitates the

integration of renewable energies, energy policies and transparency in the management of these. In addition, it allows to have the user much more connected, offering the following benefits:

• Digitalisation tools and platforms help build renewable energy plants with automated

processes, for informed decision making. In addition, the interconnections they propose

are the basis for a more decentralized generation, thus avoiding isolated ‘energy

islands’.

• These platforms reduce downtime by offering alerts based on predictive maintenance,

anticipating asset maintenance. The modernisation of production plants is necessary to

make them more competitive and efficient.

• They allow a more accurate forecast of the weather and market conditions, which

helps to maximize renewable production, by offering a deep analysis of all information

received in real time, to be able to make decisions and offer stability in demand.

• The use of artificial intelligence and machine learning to optimize the engineering and

construction of new renewable sources and plants reduces time to market,

anticipating the benefits of free C02 generation and increasing production.

**Objective: To develop Digital-based future energies**

New power plants are born digital by their design, guaranteeing the efficiency and high

availability of their services. In addition, they are backed by digital twins that help with

modelling, forecasting, and testing for optimal performance, from power generation to its link with the customers.But for most existing plants, the basic need is in installing sensors and counters throughout the system to create Smart Grids. All these new systems must be connected to existing ones in order to achieve digitalisation in the sector.

**Digitalisation** : To achieve this, energy companies must rely on management software

capable of interconnecting all assets and centralising their management in order to transition to renewable energy generation and reduce the carbon footprint in their operations

**Target audiences :**

**• Private and Public Organisations, Homes, etc**

**Assignment scope :**

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

**developing a suitable technology oriented digital solution.**

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

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

**Note: Use ChatGPT/BERD/Bing or any other AI platform wherever possible or needed**

**Deliverables :**

**1. List of requirements**

**2. List of tools, technologies and systems to support such needs.**

**3. Working API code**

**RESULTS :**

**1. List various requirements(scope) for the above program initiative that can be used for developing a suitable technology oriented digital solution.**

**Requirements for the digitalisation program initiative in the renewable energy sector:**

* Integration of all energy data sources onto a single platform for centralized management.
* Real-time monitoring and reporting of energy generation, consumption, and distribution.
* Integration of smart sensors and meters to monitor the performance of renewable energy assets. d. Implementation of predictive maintenance to avoid equipment downtime and maximize efficiency.
* Integration of weather forecasting and market conditions analysis to optimize renewable energy production.
* Deployment of artificial intelligence and machine learning tools for efficient engineering and construction of new renewable energy sources.
* Implementation of digital twins for modeling, forecasting, and testing of renewable energy systems.
* Integration of existing systems with new digital solutions to achieve complete digitalisation of the energy sector.

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

**Technologies, tools and systems available in the market to support these needs:**

* IoT (Internet of Things) sensors and devices for real-time monitoring of energy generation, consumption, and distribution.
* Cloud computing platforms for centralized management of energy data.
* Predictive maintenance software for equipment monitoring and maintenance.
* Big data analytics tools for weather forecasting and market conditions analysis.
* Artificial intelligence and machine learning platforms for efficient engineering and construction of new renewable energy sources.
* Digital twin platforms for modeling, forecasting, and testing of renewable energy systems.
* APIs for integration of existing systems with new digital solutions.

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

# Import required libraries

import requests

import pandas as pd

# Define API endpoint and parameters

url = "https://api.energydata.com"

params = {

"api\_key": "YOUR\_API\_KEY",

"start\_date": "2022-01-01",

"end\_date": "2022-01-31",

"location": "New York"

}

# Send request to API endpoint

response = requests.get(url, params=params)

# Convert response to pandas dataframe

data = pd.DataFrame(response.json())

# Perform data analysis

total\_energy\_consumption = data["energy\_consumption"].sum()

average\_temperature = data["temperature"].mean()

# Print results

print(f"Total energy consumption: {total\_energy\_consumption}")

print(f"Average temperature: {average\_temperature}")

import requests

import pandas as pd

api\_key = 'YOUR\_API\_KEY\_HERE'

series\_id = 'ELEC.GEN.ALL-US-99.A'

url = f'https://api.eia.gov/series/?api\_key={api\_key}&series\_id={series\_id}'

response = requests.get(url)

data = response.json()

print(data)

import requests

import pandas as pd

api\_key = 'YOUR\_API\_KEY\_HERE'

series\_id = 'ELEC.GEN.ALL-US-99.A'

url = f'https://api.eia.gov/series/?api\_key={api\_key}&series\_id={series\_id}'

response = requests.get(url)

data = response.json()

df = pd.DataFrame(data['series'][0]['data'], columns=['Year', 'Generation'])

df['Year'] = pd.to\_datetime(df['Year'], format='%Y')

df.set\_index('Year', inplace=True)

print(df.head())

**THANK YOU MADAM!**

**NAME : CHATURTH R**

**ROLL NO. : 21BCS025**

**4TH SEM CSE SEC ‘A’**