YOUR ENERGY OUR SOLUTION

18CSC206J - SEPM LAB REPORT

Submitted by

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Under the Guidance of

Dr. Savaridassan P

Assistant Professor, Department of Networking and Communications

In partial satisfaction of the requirements for the degree of

BACHELOR OF TECHNOLOGY

in

COMPUTER SCIENCE AND ENGINEERING

with specialization in Internet of Things

SCHOOL OF COMPUTING

COLLEGE OF ENGINEERING AND TECHNOLOGY

SRM INSTITUTE OF SCIENCE AND

TECHNOLOGY KATTANKULATHUR - 603203

MAY 2023

COLLEGE OF ENGINEERING & TECHNOLOGY

SRM INSTITUTE OF SCIENCE & TECHNOLOGY

S.R.M. NAGAR, KATTANKULATHUR – 603 203

Chengalpattu District

BONAFIDECERTIFICATE

Register No. RA2111028010060 Certified to be the bonafide work done by KUMARI HARSHITA of II Year/IV Sem B.Tech Degree Course in the **Practical Course – 18CSC206J Software Engineering and Project Management** in **SRM INSTITUTE OF SCIENCE AND TECHNOLOGY,** Kattankulathur during the academic year 2022 – 2023.

SIGNATURE

FACULTY IN-CHARGE
Dr. Savaridassan P
Assistant Professor
Department of Networking and Communications
SRM Institute of Science and Technology

SIGNATURE

HEAD OF THE DEPARTMENT
Dr. Annapurani Panaiyappan. K
Professor and Head,
Department of Networking and Communications
SRM Institute of Science and Technology

ABSTRACT

"Your Energy Our Solution" is an innovative project that focuses on monitoring and optimizing renewable energy sources, with a specific emphasis on wind energy. By leveraging a combination of smart electrical meters, AWS IoT Core, AWS DynamoDB, and an advanced AI prediction model, the project provides a comprehensive solution for efficient energy management.

Smart electrical meters are strategically deployed at wind farms and key locations to gather real-time data on crucial parameters such as wind speed, wind direction, temperature, and power output. This data is securely transmitted using MQTT to AWS IoT Core, which acts as a reliable message broker and IoT gateway.

AWS IoT Core's Rules Engine ensures seamless data ingestion and storage by routing the received data messages to AWS DynamoDB, a robust NoSQL database. This arrangement guarantees data integrity and facilitates subsequent processing and analysis.

The backend processing component consists of a sophisticated backend application that utilizes cutting-edge AI techniques to extract valuable insights from the stored wind energy data. By leveraging machine learning algorithms and predictive models, the system can identify patterns, trends, and potential anomalies, allowing for proactive decision-making and optimal energy management.

To provide a user-friendly interface for stakeholders, a feature-rich frontend application is developed. This application seamlessly integrates with the backend, retrieving and visualizing the analysed data. The frontend empowers users to explore intuitive charts, graphs, maps, and dashboards, enabling them to gain actionable insights into wind energy patterns and performance.

"Your Energy Our Solution" aims to revolutionize the renewable energy sector by offering a holistic solution for real-time monitoring, intelligent analysis, and data-driven decision-making. By leveraging advanced technologies and AI capabilities, the project empowers stakeholders to optimize their renewable energy operations, leading to increased efficiency, cost savings, and a greener future.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF ABBREVIATIONS

NO	WORD	ABBREVIATION
1	TSV	TREE STRUCTURE VIEW
2	WBS	WORK BREAKDOWN STRUCTURE
3	ER	ENTITY RELATION
4	DFD	DATA FLOW DIAGRAM
5	UI	USER INTERFACE
6	SWOT	STRENGTHS, WEAKNESSES, OPPORTUNITIES AND THREATS
7	RMMM	RISK MITIGATION, MONITORING AND MANAGEMENT

School of Computing

SRM IST, Kattankulathur – 603 203

Course Code: 18CSC206J

Course Name: Software Engineering and Project Management

Experiment No	1
Title of Experiment	To identify the Software Project, Create Business Case, Arrive at a Problem Statement
Name of the candidate	KUMARI HARSHITA
Team Members	Bhanu Prakash , Kumari Harshita,Mahesh Reddy, Nandavardhan R
Register Number	RA2111028010060
Date of Experiment	30-1-2023

Mark Split Up

S.No	Description	Maximum Mark	Mark Obtained
1	Exercise	5	
2	Viva	5	
	Total	**10**	

Staff Signature with date

Aim

To Frame a project team, analyze and identify a Software project. To create a business case and Arrive at a Problem Statement for the <title of the project>

Team Members:

S. No	Register No	Name	Role
1	RA2111028010043	NANDAVARDHAN R	Lead/Rep
2	RA2111028010041	BHANU PRAKASH	Member
3	RA2111028010056	MAHESH REDDY	Member
4	RA2111028010060	HARSHITA	Member

Project Title: Your energy Our solution

Project Description

We aim to solve SDG goals 7(Affordable and Clean Energy), 9(Industry, Innovation and Infrastructure), 11(Sustainable cities and Communities) by means of providing a dashboard and necessary infrastructure for monitoring and predicting renewable energy output.

Business Case

<Incorporate the Business Case template>

Result

Thus, the project team formed, the project is described, the business case was prepared and the problem statement was arrived.

ONE PAGE BUSINESS CASE TEMPLATE

DATE	30/01/2023
SUBMITTED BY	Kumari Harshita
TITLE / ROLE	Member

LOG

THE PROJECT

In bullet points, describe the problem this project aims to solve or the opportunity it aims to develop.

Our project "Your energy Our solution" is a solution to monitor and predict renewable energy output, which will help plan for future energy demands which will also ease the strain on the power grid.

THE HISTORY

In bullet points, describe the current situation.

- Renewable energy has been rapidly growing in recent years and is increasingly seen as a key solution to global energy and environmental challenges.
- such as wind, solar, hydro and bioenergy provide over 70% of the world's electricity generation.
- At present renewable energy is monitored using legacy software which is difficult to understand and requires special training to use.
- Also every wind farm or solar farm uses their own proprietary software which inhibits collaboration.

LIMITATIONS

List what could prevent the success of the project, such as the need for expensive equipment, bad weather, lack of special training, etc.

- performance issues with new technologies.
- implementing the hardware to measure the output can prove challenging.
- Also storing the vast amount of data produced will be difficult.

APPROACH

List what is needed to complete the project.

- Use a cloud service for database
- implement necessary schemas for the DB
- Procure smart electrical meters to measure output of a windmill or a solar panel
- store the data from the smart electrical meter in the DB
- Design necessary UI/UX
- Implement a prediction model to predict future output
- Integrate predictions with UI/UX

BENEFITS

In bullet points, list the benefits that this project will bring to the organization

.

- Ease of access of data
- Ability to optimize energy usage
- Ability to plan ahead
- Can use heuristic approach to predict when breakdowns can happen

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SRM IST, Kattankulathur – 603 203

Course Code: 18CSC206J

Course Name: Software Engineering and Project Management

Experiment No	2
Title of Experiment	Identification of Process Methodology and StakeholderDescription
Name of the candidate	**KUMARI HARSHITA**
Team Members	**BHANU PRAKASH,NANDAVARDHAN,HARSHITA**
Register Number	**RA2111028010060**
Date of Experiment	**6-2-2023**

Mark Split Up

S.No	Description	Maximum Mark	Mark Obtained
1	Exercise	5	
2	Viva	5	
	Total	**10**	

Staff Signature with date

Aim

To identify the appropriate Process Model for the project and prepare Stakeholder and User Description.

Team Members:

Sl No	Register No	Name	Role
1	RA2111028010043	NANDAVARDHAN R	Rep/Member
2	RA2111028010056	MAHESH REDDY	Member
3	RA2111028010060	KUMARI HARSHITA	Member
4	RA2111028010041	BHANU PRAKASH	Member

Project Title: YOUR ENERGY OUR SOLUTION

Selection of Methodology:

Scrum model is a lightweight model which in contrast to heavyweight models such as waterfall model, focuses on rapid development and an emphasis on customer satisfaction. It also needs daily team meeting, where the scrum master asks every team member 3 questions

- **What have we completed since the last meeting**
- **What do we need to do now**
- **What obstacles impede our progress**

It Also has a backlog of features which need to features, these are implemented in a cycle of either 30 days or 15 days

Usage of Scrum in this scenario is beneficial for our project since it allows us to modify and

complete the project incrementally which allows us to take advice and necessary changes according to the advisor.

Software used for scrum: Asana **https://asana.com/**

Incorporate information to below table regarding stakeholders of the project [Make use of below examples]

Stakeholder Name	Activity/ Area/Phase	Interest	Influence	Priority (High/Medium/ Low)
Users	Provides feedback and also uses the software	Medium	Medium	High
Investors	Provides necessary funding for the project, in this case is the wind/solar farm owners	High	High	Medium
Developers	Develops the necessary software and deploys it	Medium	High	High
Supplier	Supplies the necessary infrastructure of the project	Low	Medium	Low
Advisor	Provides necessary insight for the project	High	Medium	Medium

/ *

For Example

Stakeholder Name	Activity / Area / Phase	Interest	Influence	Priority (High / Medium/Low)
Regional Head of Sales & Marketing	Subscription using mobile App	High	High	1
Finance Account Receivable consultant	Multiple Currency Payment	High	Low	3

Interest and Influence matrix

Interest	Influence
High	High
Low	Low
Low	High
High	Low

Stakeholder	Interests	Estimated Project Impact	Estimated Priority
Owner	Achieve targets, Increase sales margin	High	1
Sponsor	Provides new market to expand ventures Negotiate funding for project Reviews changes to project environments.	Med	3
Team members	Demand incentives Retain and upgrade skills New product excitement	High	2
Project Manager	Lead the team in every aspect. Accountable for entire project scope, team, success & failure	High	2
Investors	Promoter of the investment, Provides necessary financial resources	Low	5
Resource Manager	Resource planning and allocation. Ensuring adequate resource according to project needs and budget.	Med	4
Suppliers	Ensuring feasible and realistic in every aspect Managing divergence from budgeted cost.	Med	6
End Users	Provides feedback	Low	7

*/

Result

Thus the Project Methodology was identified and the stakeholders were described.

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SRM IST, Kattankulathur – 603 203

Course Code: 18CSC206J

Course Name: Software Engineering and Project Management

Experiment No	3
Title of Experiment	System, Functional and Non-Functional Requirements of theProject
Name of the candidate	**KUMARI HARSHITA**
Team Members	**MAHESH REDDY , NANDAVARDHAN, HARSHITA, BHANU**
Register Number	**RA2111028010060**
Date of Experiment	**13-02-2023**

Mark Split Up

S.No	Description	Maximum Mark	Mark Obtained
1	Exercise	5	
2	Viva	5	
	Total	**10**	

Staff Signature with date

Aim

To identify the system, functional and non-functional requirements for the project.

Team Members:

Sl No	Register No	Name	Role
1	RA2111028010043	NANDAVARDHAN R	Rep/Member
2	RA2111028010056	MAHESH REDDY	Member
3	RA2111028010060	KUMARI HARSHITA	Member
4	RA2111028010041	BHANU PRAKASH	Member

Project Title: Your Energy Our Solution

System Requirements :

Server : Fast internet connection greater than 50mbps, with at least 50 gb storage

Client :

- At least 3G or equivalent Wifi Connectivity
- 1 GHz or faster CPU
- At least 2 gb of RAM

Functional Requirements :

- **Data Collection :** Ability to collect real time data from multiple data sources, such wind turbines, solar panels, energy storage solutions etc.
- **Data Visualization :** Capability to visualize and plot all data points in a user friendly manner.
- **Predictive Analytics** : The software should be able to predict the future output of renewable energy systems based on historical data and current conditions.
- **Energy Management** : The software should allow users to monitor the energy consumption and production of individual renewable energy systems and provide recommendations for optimizing their performance.
- **Alarm and Alerts** : The software should have an alarm and alert system to notify users in case of any discrepancies or failures in the renewable energy systems.
- **User Management** : The software should have a user management system to manage access to the data and features based on user roles and permissions.

Non-Functional Requirements

- **Performance :** The system should be able to cope with real time data, and analyze large amounts of data with minimal latency and high accuracy.
- **Reliability :** The software should be reliable and have high availability, with built-in mechanisms for detecting and alerting about failures.

- **Usability :** The software should be easy to use and have a user-friendly interface, with clear and concise navigation, and understandable visualizations.
- **Security :** The software should be secure, with encryption for data storage and transmission, and multiple levels of access control.
- **Scalability :** The software should be scalable, with the ability to handle increasing amounts of data and users as the renewable energy systems grow.

Result:

Thus the requirements were identified and accordingly described.

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SRM IST, Kattankulathur – 603 203

Course Code: 18CSC206J

Course Name: Software Engineering and Project Management

Experiment No	4
Title of Experiment	Prepare Project Plan based on scope, Calculate Project effort based on resources and Job roles and responsibilities
Name of the candidate	Kumari Harshita
Team Members	NANDAVARDHAN ,BHANU PRAKASH, HARSHITHA, MAHESH REDDY
Register Number	RA2111028010060
Date of Experiment	20-02-2023

Mark Split Up

S.No	Description	Maximum Mark	Mark Obtained
1	Exercise	5	
2	Viva	5	
	Total	**10**	

Staff Signature with date

Aim

To Prepare Project Plan based on scope, Calculate Project effort based on resources, Find Job roles and responsibilities

Team Members:

Sl No	Register No	Name	Role
1	RA2111028010043	NANDAVARDHAN	**Lead**
2	RA2111028010056	MAHESH REDDY	**Member**
3	RA2111028010060	HARSHITHA	**Member**
4	RA2111028010041	BHANU PRAKASH	**Member**

Requirements

<Incorporate the Project plan template>

Result:

Thus, the Project Plan was documented successfully.

1. Project Management Plan

Describe the key issues driving the project. **[Min 3 Focus Areas]**

Focus Area	Details
Integration Management	Governance Framework Project Team Structure Roles & Responsibilities of Team Change Management (Change Control, Issue Management) Project Closure
Scope Management	Scope Statement Requirement Management (Gathering, Control, Assumption, Constraint Stakeholder) Define Deliverable Requirement Change Control Activities and Sub-Tasks
Schedule Management	Define Milestones Schedule Control
Cost Management	Estimate Effort Assign Team Budget Control
Quality Management	Quality Assurance: Quality assurance will be managed including governance, roles and responsibilities, tools and techniques and reporting Quality Control: Specify the mechanisms to be used to measure and control the quality of the work products
Resource Management	Estimate and Manage the need People: People & Skills Required Finance: Budget Required Physical: Facilities, IT Infrastructure
Stakeholder	Identifying, Analysing, Engaging Stakeholders
Communication Management	Determine communication requirements, roles and responsibilities, tools and techniques. [Type of Communication, Schedule, Mechanism Recipient]
Risk Management	Identifying, analysing, and prioritising project risks
Procurement Management	Adhering to organisation procurement process

2. Estimation

2.1. Effort and Cost Estimation

Activity Description	Sub-Task	Sub-Task Description	Effort (in hours)	Cost in INR
Design the user screen	E1R1A1T1 (Effort-Requirement-Activity-Task)	Confirm the user requirements (acceptance criteria)	3	1500
	E1R1A1T2	Distribution of design work to team	2	1000
	E1R1A1T3	Designing the User interface	8	4000
Identify Data Source for displaying units of Energy Consumption		Go through Interface contract (Application Data Exchange) documents	8	4000
		Documentation	4	2000

Effort (hr)	Cost (INR)
1	500

2.2. Infrastructure/Resource Cost [CapEx]

< OneTime Infra requirements >

Infrastructure Requirement	Qty	Cost per qty	Cost per item
Smart electric metres	number of electric sources	1500*number of electric sources	1500

2.3 Maintenance and Support Cost [OpEx]

Category	Details	Qty	Cost per qty per annum	Cost per item
People	Network, System, Middleware and DB admin Developer , Support Consultant	3	2,000,000	6,000,000
License	Operating System Database Middleware IDE	10	10000	100,000
Infrastructures	Server, Storage and Network	20	20000	400,000

3. Project Team Formation

3.1. Identification Team members

Name	Role	Responsibilities
XYZ Company	Key Business User (Product Owner)	Provide clear business and user requirements
Nandavardhan R	Project Manager	Manage the project
Bhanu Puli	Business Analyst	Discuss and Document Requirements
Nandavardhan R	Technical Lead	Design the end-to-end architecture
Mahesh Reddy	UX Designer	Design the user experience
Mahesh Reddy	Frontend Developer	Develop user interface
Nandavardhan R	Backend Developer	Design, Develop and Unit Test Services/API/DB
Harshita	Cloud Architect	Design the cost effective, highly available and scalable architecture
Harshita	Cloud Operations	Provision required Services
Bhanu Puli	Tester	Define Test Cases and Perform Testing

3.2. Responsibility Assignment Matrix

RACI Matrix	Team Members			
Activity	**Bhanu (BA)**	**Harshita, Mahesh Reddy (Developer)**	**Nandavardhan R (Project Manager)**	**Key Business User**
User Requirement Documentation	A	C/I	I	R
Development	C	A	C/I	C

A	Accountable
R	Responsible
C	Consult
I	Inform

Reference

1. https://www.pmi.org/
2. https://www.projectmanagement.com/
3. https://www.tpsgc-pwgsc.gc.ca/biens-property/sngp-npms/ti-it/ervcpgpm-dsfvpmpt-eng.html

School of Computing

SRM IST, Kattankulathur – 603 203

Code: 18CSC206J

Course Name: Software Engineering and Project Management

Experiment No	5
Title of Experiment	Prepare Work breakdown structure, Timeline chart, Risk identification table
Name of the candidate	**Kumari Harshita**
Team Members	**BHANUPRAKASH,KUMARIHARSHITA, NANDAVARDHAN R, MAHESH REDDY**
Register Number	**RA2111028010060**
Date of Experiment	**28-02-2023**

Mark Split Up

S.No	Description	Maximum Mark	Mark Obtained
1	Exercise	5	
2	Viva	5	
	Total	**10**	

Staff Signature with date

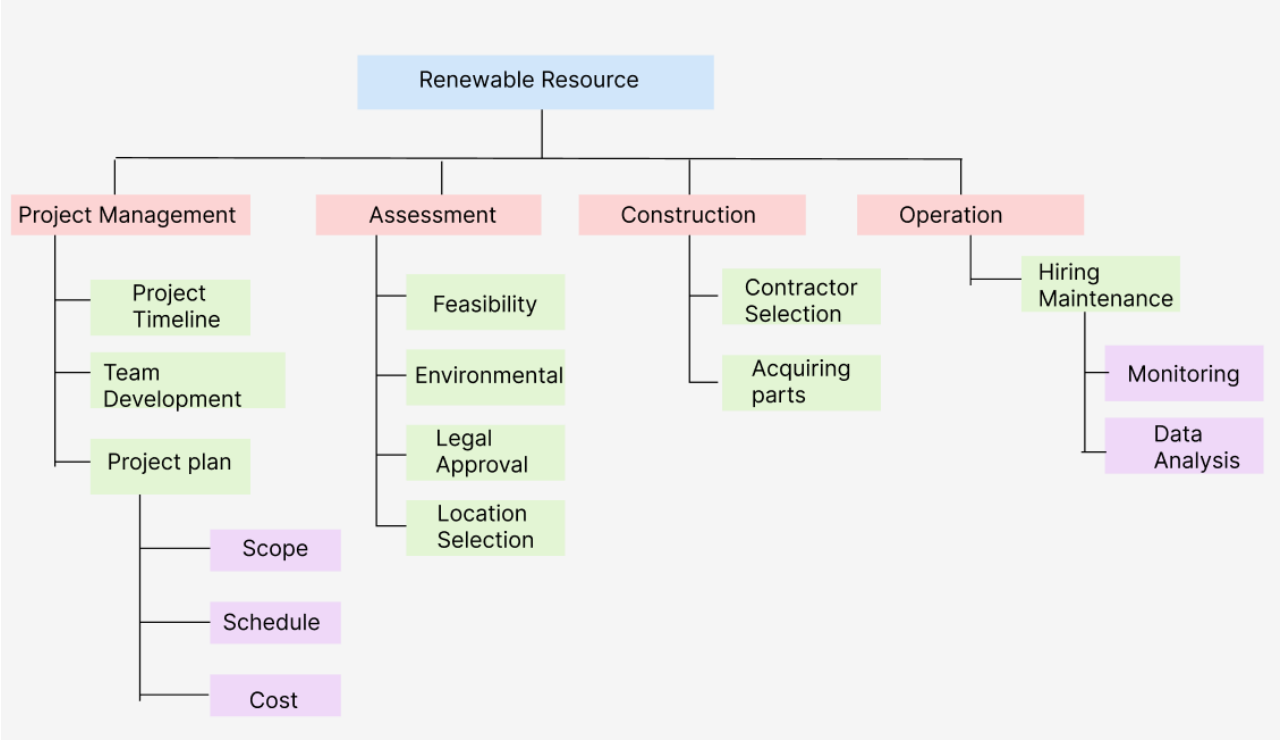
Aim

To Prepare Work breakdown structure, Timeline chart and Risk identification table

Team Members:

Sl No	Register No	Name	Role
1	RA2111028010043	NANDAVARDHAN R	Rep
2	RA2111028010056	MAHESH REDDY	Member
3	RA2111028010060	KUMARI HARSHITA	Member
4	RA2111028010041	BHANU PRAKASH	Member

Work Breakdown Structure(WBC)



1. Project Management
   1.1 project Timeline
   1.2 Team Development
   1.3 Project Plan
      1.3.1 Scope
      1.3.2 Schedule
      1.3.3 Cost
2. Assessment
   2.1 Feasibility

2.2 Environmental
2.3 Legal Approval
2.4 Location Selection

3. Construction
   3.1 Constructor
   3.2 Acquiring Parts

4. Operation
   4.1 Hiring Maintenance
      4.1.1 Monitoring
      4.1.2 Data Analysis

RISK ANALYSIS

Strengths

- Low maintenance requirements
- No additional costs for fuel nor delivery logistics
- Environmental impact low compared with conventional energy sources
- Mature,well developed, technology in developed countries

Weaknesses

- Requires a suitable site
- High capital/initial investment costs can impede development
- Potential market needs to be large enough to support expertise/equipment required for implementation
- Transport access problems for installation of large system in remote areas

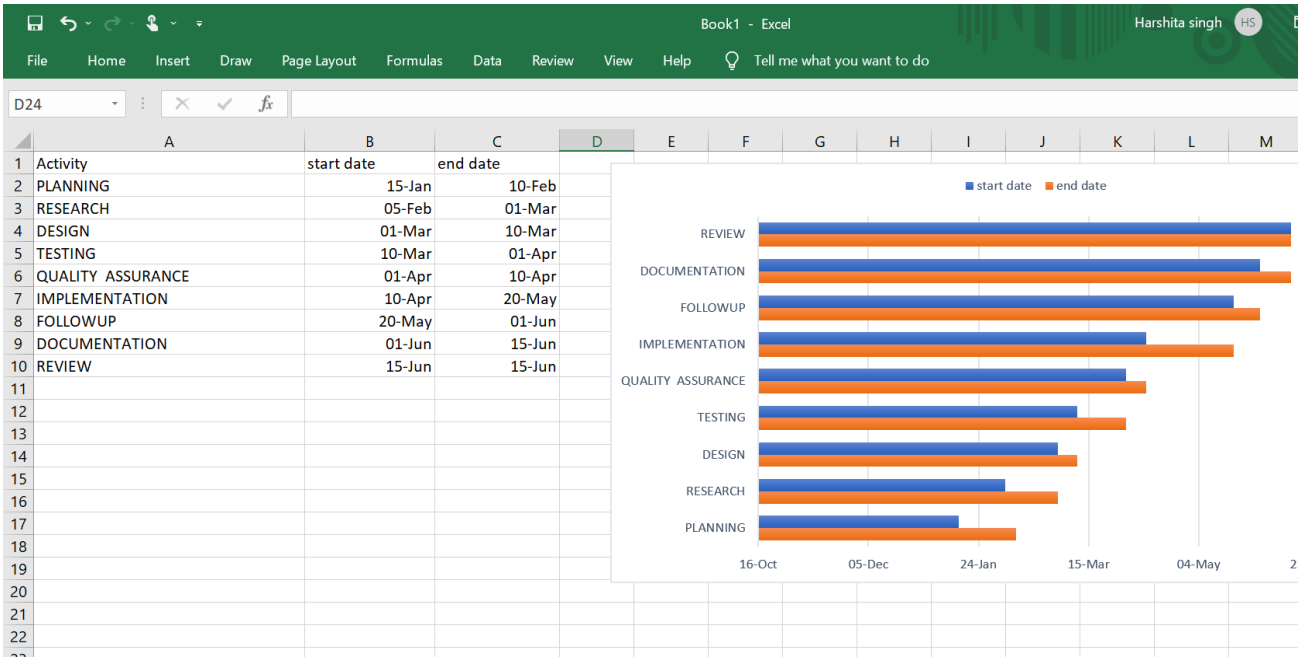
Opportunities

- Regional cooperation of stakeholder
- Increased energy efficiency
- Use of new technologies
- Higher prestige

Threats

- Lack of domestic policy organization
- Increased urbanization
- Not efficient of export/import of goods
- Lack of government synchronization

TIMELINE-GANTT CHART



Activity	start date	end date
PLANNING	15-Jan	10-Feb
RESEARCH	05-Feb	01-Mar
DESIGN	01-Mar	10-Mar
TESTING	10-Mar	01-Apr
QUALITY ASSURANCE	01-Apr	10-Apr
IMPLEMENTATION	10-Apr	20-May
FOLLOWUP	20-May	01-Jun
DOCUMENTATION	01-Jun	15-Jun
REVIEW	15-Jun	15-Jun

RISK MANAGEMENT FRAMEWORK-RISKS AND MITIGATION

Response	Strategy	Example
Avoid	Avoiding the risk by eliminating or avoiding the cause of the risk	If the risk is related to a particular component of the renewable energy system, the component can be replaced or redesigned to avoid the risk.
Transfer	Transferring the risk to another party, such as an insurance company or a third-party contractor.	Insurance can be purchased to cover potential losses from natural disasters or equipment failures.
Mitigation	Mitigating the risk by reducing the severity of the potential impact. This may involve implementing contingency plans to minimize the impact of potential disruptions or failures.	If a renewable energy system is being constructed in an area known for high winds, measure can be taken to increase the stability of the wind turbines, and reduce the risk of them toppling over

Accept	Accepting the risk and preparing for the consequences. This may involve developing a plan to manage the risk and mitigate, while acknowledging that this cannot be completely eliminated.	If there is a risk of damage to renewable energy system from a natural disaster, the system owner may accept the risk and allocate resources to repair the system it necessary

RMMM PLAN

Risk	Monitoring	Mitigation
Unpredictable weather patterns	The renewable energy system should be equipped with weather monitoring sensor to track the weather condition	By utilizing multiple renewable energy sources, such as wind turbines and solar panels, the impact of unpredictable weather patterns on energy generation can be minimized.
Technical failure and breakdown	Regular inspections and maintenance of the renewable energy system should be conducted to identify the potential technical issues early on.	Using remote monitoring systems and data analytics to monitor the performance of the renewable energy system in real time, allowing for the promotion of identification and resolution of any technical issues.
Wildlife interference	Implementing wildlife monitoring system to track the activity of wildlife near the renewable energy system	Developing the strategies to reduce the impact of the renewable energy system on the local wildlife, such as modifying the design of the system or adjusting the location of the system.
Cost overruns	Regular tracking of expenses related to the construction and operation of the system	Conducting a thorough cost-benefit analysis before the project begins, establishing a budget, and tracking expenses closely throughout the project to identify the potential cost overruns early on.

Result:

Thus, the work breakdown structure with timeline chart and risk table were formulated successfully.

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SRM IST, Kattankulathur – 603 203

Course Code: 18CSC206J

Course Name: Software Engineering and Project Management

Experiment No	6
Title of Experiment	Design a System Architecture, Use Case and Class Diagram
Name of the candidate	**KUMARI HARSHITA**
Team Members	**MAHESH REDDY, NANDAVARDHAN,HARSHITA, BHANU PRAKASH**
Register Number	**RA2111028010060**
Date of Experiment	06-03-2023

Mark Split Up

S.No	Description	Maximum Mark	Mark Obtained
1	Exercise	5	
2	Viva	5	
	Total	**10**	

Staff Signature with date

Aim

To Design a System Architecture, Use case and Class Diagram

Team Members:

Sl No	Register No	Name	Role
1	RA2111028010043	NANDAVARDHAN R	Rep
2	RA2111028010056	MAHESH REDDY	Member
3	RA2111028010060	KUMARI HARSHITA	Member
4	RA2111028010041	BHANU PRAKASH PULI	Member

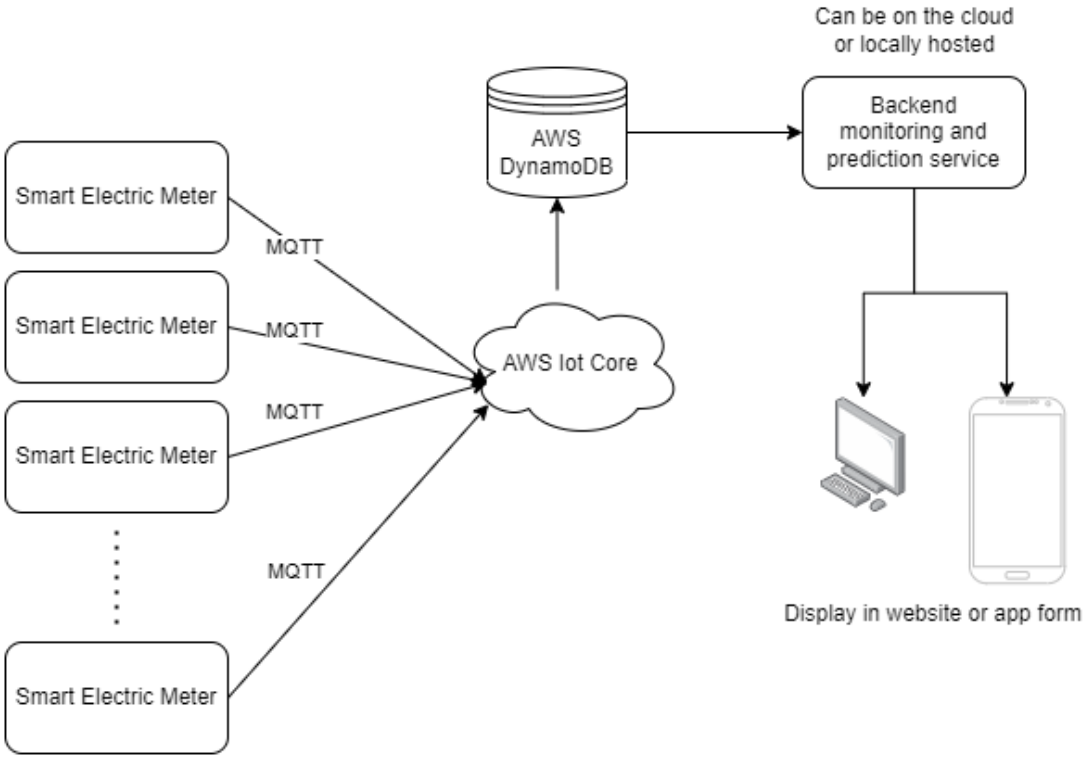
Requirements:

Enclosed below

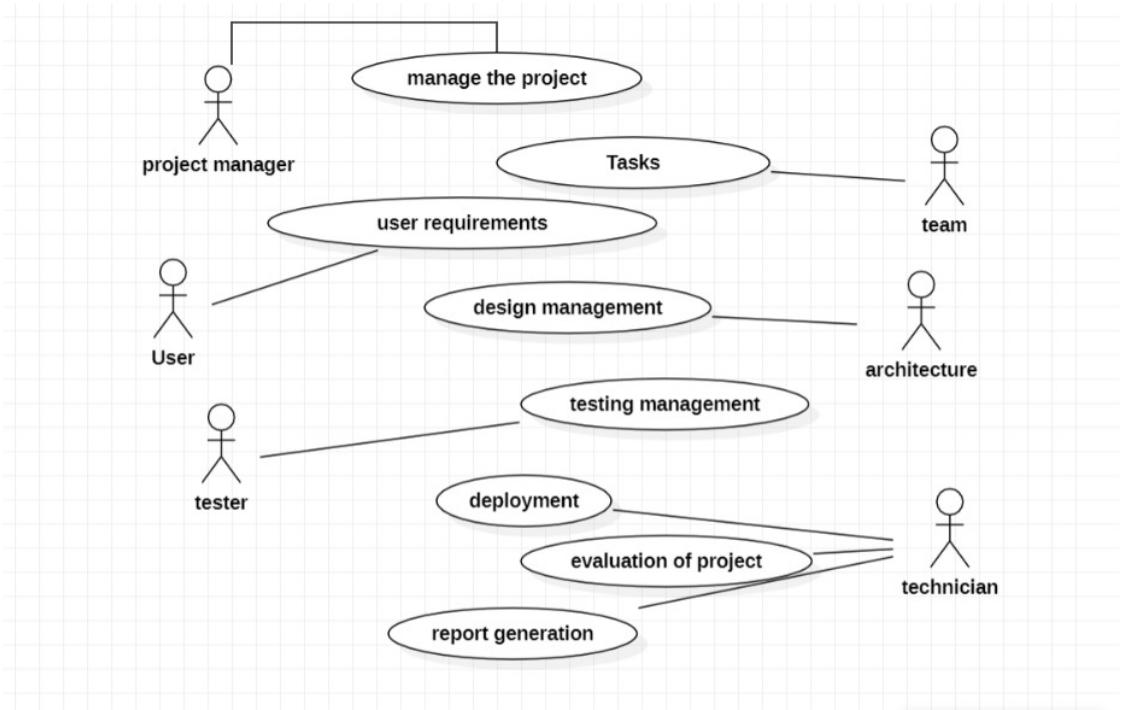
Result:

Thus, the system architecture, use case and class diagram created successfully.

SYSTEM ARCHITECTURE



USE CASE DIAGRAM



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SRM IST, Kattankulathur – 603 203

Course Code: 18CSC206J

Course Name: Software Engineering and Project Management

Experiment No	7
Title of Experiment	Design a Entity relationship diagram
Name of the candidate	**KUMARI HARSHITA**
Team Members	**NANDAVARDHAN,MAHESH REDDY, BHANU PRAKASH HARSHITA**
Register Number	**RA2111028010060**
Date of Experiment	**11-03-2023**

Mark Split Up

S. No	Description	Maximum Mark	Mark Obtained
1	Exercise	5	
2	Viva	5	
	Total	**10**	

Staff Signature with date

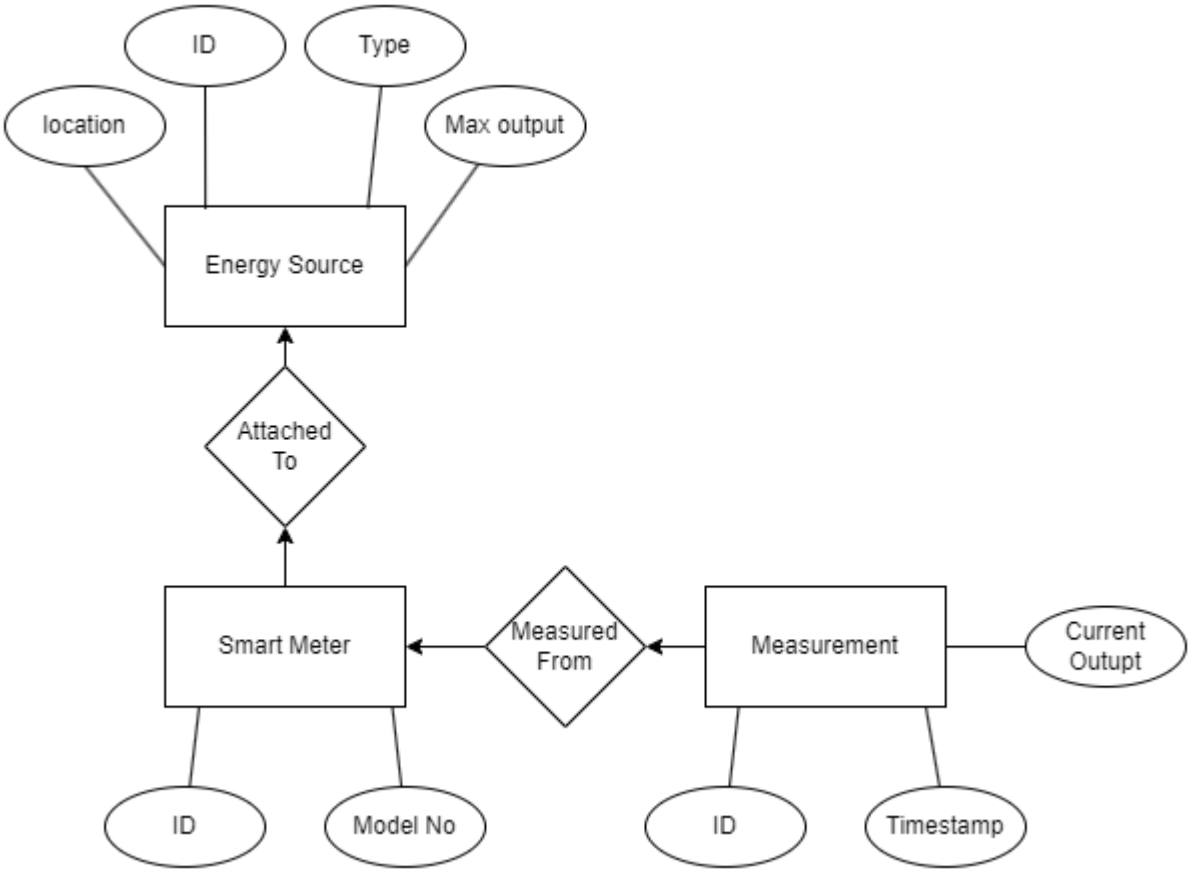
Aim :

To create the Entity Relationship Diagram

Team Members:

S No	Register No	Name	Role
1	RA2111028010044	NANDAVARDHAN R	Rep
2	RA2111028010060	KUMARI HARSHITA	Member
3	RA2111028010056	MAHESH REDDY SYAMALA	Member
4	RA2111028010041	BHANU PRAKASH	Member

ER DIAGRAM



Result:

Thus, the entity relationship diagram was created successfully.

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SRM IST, Kattankulathur – 603 203

Course Code: 18CSC206J

Course Name: Software Engineering and Project Management

Experiment No	8
Title of Experiment	Develop a Data Flow Diagram (Process-Up to Level 1)
Name of the candidate	**Kumari Harshita**
Team Members	**NANDAVARDHAN R, MAHESH REDDY, KUMARI HARSHITA, BHANU PRAKASH**
Register Number	**RA2111028010060**
Date of Experiment	**21-03-21**

Mark Split Up

S. No	Description	Maximum Mark	Mark Obtained
1	Exercise	5	
2	Viva	5	
	Total	**10**	

Staff Signature with date

Aim

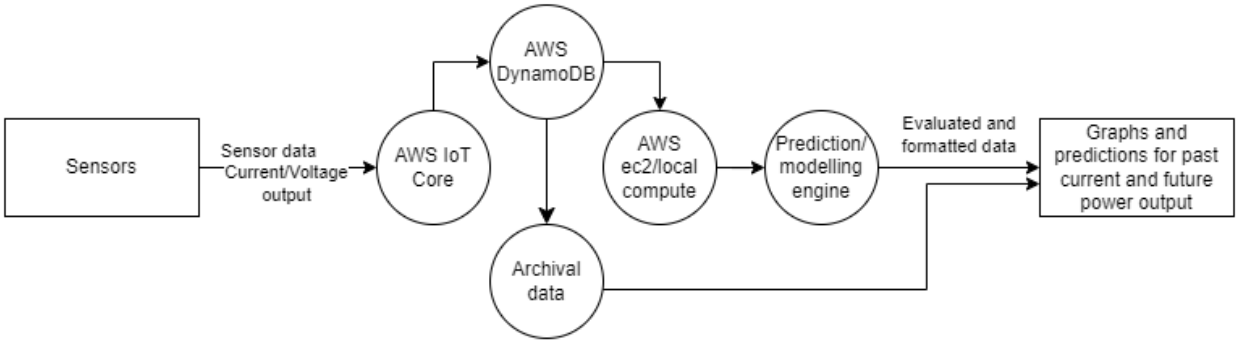
To develop the data flow diagram up to level 1 for the <project name>

Team Members:

Sl No	Register No	Name	Role
1	RA2111028010043	NANDAVARDHAN R	Rep
2	RA2111028010056	MAHESH REDDY	Member
3	RA2111028010060	KUMARI HARSHITA	Member
4	RA2111028010041	BHANU PRAKASH	Member

DFD Level 0

DFD Level 1



Result:

Thus, the data flow diagrams have been created for the Your Energy Our Solution

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SRM IST, Kattankulathur – 603 203

Course Code: 18CSC206J

Course Name: Software Engineering and Project Management

Experiment No	9
Title of Experiment	Design a Sequence and Collaboration Diagram
Name of the candidate	**Kumari Harshita**
Team Members	**NANDAVARDHAN R, MAHESH REDDY, HARSHITA, BHANU PRAKASH**
Register Number	**RA2111028010060**
Date of Experiment	**29/03/23**

Mark Split Up

S. No	Description	Maximum Mark	Mark Obtained
1	Exercise	5	
2	Viva	5	
	Total	**10**	

Staff Signature with date

\

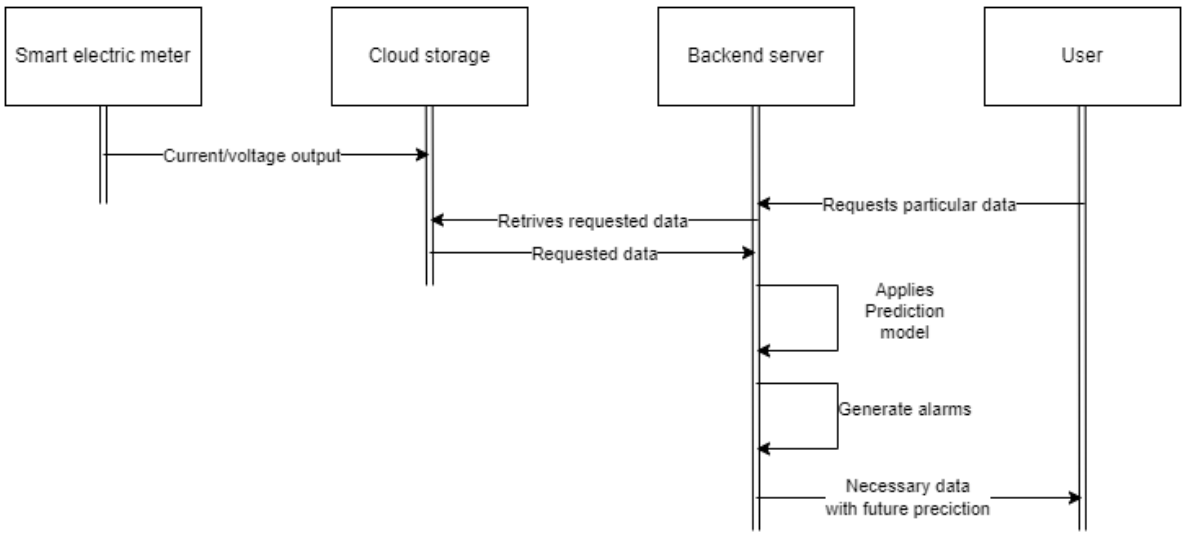
Aim

To create the sequence and collaboration diagram for the <project name>

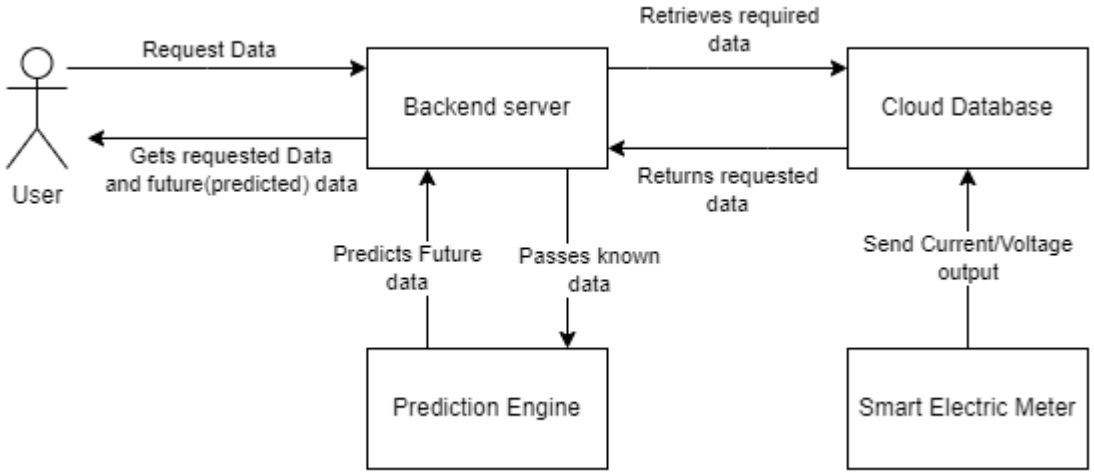
Team Members:

S No	Register No	Name	Role
1	RA2111028010043	NANDAVARDHAN R	Rep/Member
2	RA2111028010056	MAHESH REDDY	Member
3	RA2111028010060	HARSHITA	Member
4	RA2111028010041	BHANU PRAKASH	Member

Sequence Diagram



Collaboration Diagram



Result:

Thus, the sequence and collaboration diagrams were created for Your Energy Our Solution.

School of Computing

SRM IST, Kattankulathur – 603 203

Course Code: 18CSC206J

Course Name: Software Engineering and Project Management

Experiment No	10
Title of Experiment	Develop a Testing Framework/User Interface
Name of the candidate	**KUMARI HARSHITA**
Team Members	**NANDAVARDHAN R, MAHESH REDDY, KUMARI HARSHITA, BHANU PRAKASH**
Register Number	**RA21110280100**
Date of Experiment	

Mark Split Up

S. No	Description	Maximum Mark	Mark Obtained
1	Exercise	5	
2	Viva	5	
	Total	**10**	

Staff Signature with date

Aim

To develop the testing framework and/or user interface framework for the “Your energy our solution”

Team Members:

S No	Register No	Name	Role
1	RA2111028010043	Nandavardhan	Rep
2	RA2111028010060	Harshita	Member
3	RA2111028010041	Bhanu Prakash	Member
4	RA2111028010056	Mahesh Reddy	Member

Executive Summary

Scope: The scope of testing for “Your energy Our solution”, is both functional and nonfunctional testing. This covers all modules of the project

Objective: The objective of testing is to ensure that the “Your energy Our solution” meets the required quality standards, performs as expected, and is reliable, efficient, and secure. The testing will also ensure that the system meets the needs of the end users and is user-friendly.

Approach: The approach to testing will be a combination of manual and automated testing methodologies. For functional testing, manual testing will be used to evaluate the user interface, test scenarios that require human interaction, and test cases that cannot be automated. Automated testing will be used to execute repetitive and critical path test cases. For non-functional testing, testing tools will be used to test the system's performance, security, and scalability. Test cases will be documented and managed using test management tools.

Overall, the testing process will follow a comprehensive test plan and ensure that it is reliable, efficient, and secure.

Test Plan

Scope of Testing

Functional Testing: The "Your energy Our solution" application should be tested for sensitivity and specificity, which is the ability of the algorithm to correct and identify power fluctuations and predict to some accuracy future power output. Also, user testing should be conducted with different types of energy sources and multiple weathers to evaluate the usability and effectiveness of the application. The application should be monitored for accuracy and improved upon based on user feedback and updates to the AI model.

Non-Functional Testing: Performance testing should be conducted to assess the application's ability to handle a large volume of user requests and analyze data in a timely manner. This can be done by running simulated power sources to simulate high-traffic scenarios and measuring response time, and resource utilization.

Security testing should be conducted to identify vulnerabilities in the application's security controls and ensure it is compliant with relevant security standards and regulations

Types of Testing, Methodology, Tools

Category	Methodology	Tools Required
Functional Requirements	Manual Testing	Word Template
Non-Functional Requirements	Automated Testing	Testing Frameworks, Security Testing Tools, Test Management Tools

Result:

Thus, the testing framework has been created for "Your energy our solution"

School of Computing

SRM IST, Kattankulathur – 603 203

Course Code: 18CSC206J

Course Name: Software Engineering and Project Management

Experiment No	11
Title of Experiment	Test Cases
Name of the candidate	**KUMARI HARSHITA**
Team Members	**NANDAVARDHAN R, MAHESH REDDY, KUMARI HARSHITA, BHANU PRAKASH**
Register Number	**RA21110280100**
Date of Experiment	

Mark Split Up

S. No	Description	Maximum Mark	Mark Obtained
1	Exercise	5	
2	Viva	5	
	Total	**10**	

Staff Signature with date

Aim

To develop the test cases manual for the “your energy our solution”

Team Members:

S No	Register No	Name	Role
1	RA2111028010043	Nandavardhan	Rep
2	RA2111028010060	Harshita	Member
3	RA2111028010041	Bhanu Prakash	Member
4	RA2111028010056	Mahesh Reddy	Member

<Utilize the templates below and incorporate the project’s test cases - Manual Test case to be written for at least one module >

Functional Test Cases

Test ID (#)	Test Scenario	Test Case	Execution Steps	Expected Outcome	Actual Outcome	Status	Remarks
1	Data validation	Check data validation	Open the application and navigate to the data input page	Valid input is accepted and processed without errors	Valid input is accepted and processed without errors	Pass	success

2	Verify that the all the interfaces and API are functioning correctly	Check integration	Open the application and navigate to the Graph page	Open the application and navigate to the Graph page	The correct result display on the screen	pass	success
3	Verify that the system meets the performance requirement	Check performance	Run the load testing tools and set up expected	Give the best performanc e	Give the best performance	pass	success

Non-Functional Test Cases

Test ID (#)	Test Scenario	Test Case	Execution Steps	Expected Outcome	Actual Outcome	Status	Remarks
1	Performa nce testing	Verify the system performance under the different load condition	Simulate the different load conditions	Handle the load condition without system failure	Response time is measured and recorded	pass/fail based on the response time	success
2	Security testing	Verify the system's security features	Test for unauthorized access to the system/ pen testing	To protect the data from the unauthorized access	Security vulnerability	pass/fail based on the number of the security vulnerability found	success
3	Usability testing	Verify the system usability	Test for the user friendly intuitive design	System should be easy to use and	Usability issues, if any, identified and reported	pass/fail based on the ease of use and accessibility for	success

				navigate		all the users	

Result:

Thus, the test case manual has been created for the “your energy our solution”

School of Computing

SRM IST, Kattankulathur – 603 203 Course

Code: 18CSC206J

Course Name: Software Engineering and Project Management

Experiment No	12
Title of Experiment	Manual Test Case Reporting
Name of the candidate	**KUMARI HARSHITA**
Team Members	Nandavardhan, Harshita, Mahesh, Bhanu
Register Number	RA21110280100
Date of Experiment	

Mark Split Up

S. No	Description	Maximum Mark	Mark Obtained
1	Exercise	5	
2	Viva	5	
	Total	**10**	

Staff Signature with date

Aim

To prepare the manual test case report for the <project name>

Team Members:

S No	Register No	Name	Role
1	RA2111028010043	Nandavardhan R	Rep/Member
2	RA2111028010060	Kumari Harshita	Member
3	RA2111028010056	Mahesh Reddy	Member
4	RA2111028010041	Bhanu Prakash	Member

<Manual Test Case Report to be incorporated >

<< Summarize the current status of the Testing>

<< present obstacles to proceed further >>

<< Seek help from stakeholders to remove obstacles/constraints>>

Category	Progress Against Plan	Status
Functional Testing	green	In-Progress
Non-Functional Testing	amber	In-Progress

Functional	Test Case Coverage (%)	Status
AI model	68%	Not started
Front End	84%	In-Progress
API integration	93%	In-Progress

Obstacles faced while implementation:

1. **AI Model:** Lack of varied data, since power output and other factors depend on multiple factors, like the weather condition, condition of power generation equipment. The cost of equipment and varied geographical locations proves to be the biggest challenge
2. **Front End:** Simultaneous UI design for naïve user and advanced user proves to be difficult, too much data and the UI look daunting and clutter for users, too little data and advanced users can't use the software properly

Measures mitigate the obstacles:

1. **AI Model:** data from stakeholders such as power plant (Renewable) from varied geographical location, prevents overfitting of the AI model and provides better prediction results.
2. **Front End:** Intensive back and forth with stakeholders such as power plant (Renewable) employees both advanced users and naïve users, with enough constructive feedback and iterative development, the UI can be made according to the stakeholders needs.

Result:

Thus, the test case report has been created for the “Your energy Our solution”

School of Computing

SRM IST, Kattankulathur – 603 203

Course Code: 18CSC206J

Course Name: Software Engineering and Project Management

Experiment No	13
Title of Experiment	Provide the details of Architecture Design/Framework/Implementation
Name of the candidate	**Kumari Harshita**
Team Members	**BHANU PRAKASH, NANDAVARDHAN, MAHESH REDDY KUMARI HARSHITA**
Register Numbers	**RA2111028010060**
Date of Experiment	

Mark Split Up

S. No	Description	Maximum Mark	Mark Obtained
1	Exercise	5	
2	Viva	5	
	Total	**10**	

Staff Signature with date

Aim

To provide the details of architectural design/framework/implementation

Team Members:

S No	Register No	Name	Role
1	RA2111028010043	NANDAVARDHAN R	Rep/Member
2	RA2111028010060	HARSHITA	Member
3	RA2111028010041	BHANU PRAKASH	Member
4	RA2111028010056	MAHESH REDDY	Member

< Provide the details of architectural design/framework/implementation with screenshots - Minimum three modules to be completed (excluding login page) use of software on their choice to implement>

Architectural design:

- Smart Electrical Meters: These meters are deployed at wind farms and locations of interest. They collect real-time data on wind energy parameters and publish data messages using MQTT.
- AWS IoT Core: It acts as a message broker and IoT gateway. The smart meters connect to AWS IoT Core and publish their data messages to an MQTT topic.
- Data Ingestion: AWS IoT Core Rules Engine is used to route the data messages to storage. The messages are stored in AWS DynamoDB, a NoSQL database service.
- Backend Processing: A backend application, hosted locally or in the cloud, consumes the data from DynamoDB. It includes an AI prediction model to analyse the wind energy data and make predictions.
- Frontend Application: A user interface is developed to visualize the analysed data and predictions. The frontend application retrieves data from the backend or DynamoDB for display.

HOME ABOUT SERVICES CONTACTS LOGIN SINGUP

WIND ENERGY

The wind energy industry has grown rapidly in recent years, as the cost of generating electricity from wind has decreased.
Wind energy is now one of the cheapest sources of electricity in many parts of the world, and it is also one of the cleanest, producing no greenhouse gas emissions or other air pollutants.

WFM

- Dashboard
- Production
- Finances
- Statistics

Wind farm management

Turbine 1	45%
Turbine 2	20%
Turbine 3	25%
others	10%

Weather Parameters

Wind speed 5.6m/s	Wind direction NE	Humidity 48%
cloud cover 78%	Pressure 1024 hpa	Temperature 12deg C

Production vs demand

Production Demand

SMART WIND FARM

```
<div class="frame-1 screen">
  <div class="overlap-group">
    <div class="rectangle-12"></div>
    <div class="rectangle-13"></div>
    <div class="turbine-1 turbine inter-normal-black-40px">
      <span class="inter-normal-black-40px">Turbine</span><span class="inter-normal-black-80px"> 
</span
      ><span class="inter-normal-black-40px">1</span>
    </div>
    <div class="percent inter-normal-black-40px">45%</div>
    <div class="percent-1 percent-6 inter-normal-black-40px">20%</div>
    <div class="percent-2 percent-6 inter-normal-black-40px">25%</div>
    <div class="percent-3 percent-6 inter-normal-black-40px">10%</div>
    <div class="turbine-2 turbine inter-normal-black-40px">
      <span class="inter-normal-black-40px">Turbine</span><span class="inter-normal-black-80px"> 
</span
      ><span class="inter-normal-black-40px">2</span>
    </div>
    <div class="turbine-3 turbine inter-normal-black-40px">
      <span class="inter-normal-black-40px">Turbine</span><span class="inter-normal-black-80px"> 
</span
      ><span class="inter-normal-black-40px">3</span>
    </div>
    <div class="others inter-normal-black-40px">others</div>
    <div class="ellipse-2"></div>
    <div class="ellipse-3"></div>
    <div class="ellipse-4"></div>
    <div class="ellipse-5"></div>
    <img
      class="image-5"
      src="https://anima-
uploads.s3.amazonaws.com/projects/645b674f1c3980762121e09e/releases/645b688e2b627b51fa792e73/img/image-
502x.png"
      alt="image 5"
    />
    <h1 class="title">Wind farm management</h1>
    <img
      class="image-6"
      src="https://anima-
uploads.s3.amazonaws.com/projects/645b674f1c3980762121e09e/releases/645b688e2b627b51fa792e73/img/image-
602x.png"
      alt="image 6"
    /><img
      class="image-7"
      src="https://anima-
uploads.s3.amazonaws.com/projects/645b674f1c3980762121e09e/releases/645b688e2b627b51fa792e73/img/image-
7.png"
      alt="image 7"
    />
    <div class="production-vs-demand">Production vs demand</div>
    <div class="rectangle-14"></div>
    <div class="rectangle-15"></div>
    <div class="production inter-normal-black-50px">Production</div>
    <div class="demand inter-normal-black-50px">Demand</div>
    <img
      class="image-8"
      src="https://anima-
uploads.s3.amazonaws.com/projects/645b674f1c3980762121e09e/releases/645b688e2b627b51fa792e73/img/image-
8.png"
      alt="image 8"
    />
    <div class="rectangle-16"></div>
    <div class="rectangle-17"></div>
    <div class="rectangle-18"></div>
    <div class="rectangle-19"></div>
    <div class="rectangle-20"></div>
    <div class="rectangle-21"></div>
    <div class="wind-speed wind inter-normal-black-40px">Wind speed</div>
    <div class="cloud-cover inter-normal-black-40px">cloud cover</div>
    <div class="pressure inter-normal-black-40px">Pressure</div>
    <div class="temperature inter-normal-black-40px">Temperature</div>
    <div class="wind-direction wind inter-normal-black-40px">Wind direction</div>
    <div class="humidity inter-normal-black-40px">Humidity</div>
    <div class="x56ms inter-normal-black-40px">5.6m/s</div>
```

```
    <img
      class="image-11"
      src="https://anima-
uploads.s3.amazonaws.com/projects/645b674f1c3980762121e09e/releases/645b688e2b627b51fa792e73/img/image-
11@2x.png"
      alt="image 11"
    /><img
      class="image-12"
      src="https://anima-
uploads.s3.amazonaws.com/projects/645b674f1c3980762121e09e/releases/645b688e2b627b51fa792e73/img/image-
12@2x.png"
      alt="image 12"
    /><img
      class="image-13"
      src="https://anima-
uploads.s3.amazonaws.com/projects/645b674f1c3980762121e09e/releases/645b688e2b627b51fa792e73/img/image-
13@2x.png"
      alt="image 13"
    /><img
      class="image-14"
      src="https://anima-
uploads.s3.amazonaws.com/projects/645b674f1c3980762121e09e/releases/645b688e2b627b51fa792e73/img/image-
14@2x.png"
      alt="image 14"
    /><img
      class="image-15"
      src="https://anima-
uploads.s3.amazonaws.com/projects/645b674f1c3980762121e09e/releases/645b688e2b627b51fa792e73/img/image-
15@2x.png"
      alt="image 15"
    />
    <div class="ne inter-normal-black-40px">NE</div>
    <div class="percent-4 percent-6 inter-normal-black-40px">48%</div>
    <div class="x12deg-c inter-normal-black-40px">12deg C</div>
    <div class="address inter-normal-black-40px">1024 hpa</div>
    <div class="percent-5 percent-6 inter-normal-black-40px">78%</div>
    <div class="weather-parameters">Weather Parameters</div>
    <div class="dashboard inter-normal-cultured-pearl-40px">Dashboard</div>
    <div class="production-1 inter-normal-cultured-pearl-40px">Production</div>
    <div class="finances inter-normal-cultured-pearl-40px">Finances</div>
    <div class="statistics inter-normal-cultured-pearl-40px">Statistics</div>
    <div class="ellipse-6"></div>
    <div class="ellipse-7"></div>
    <div class="ellipse-8"></div>
    <div class="ellipse-9"></div>
    <img class="star-1" src="star-1.svg" alt="Star 1" /><img
      class="image-9"
      src="image-9.png"
      alt="image 9"
    />
  </div>
</div>
```

Result:

Thus, the details of architectural design/framework/implementation along with the screenshots were provided.

CONCLUSION

Throughout the course of this project, I have been involved in the development of the "Your Energy Our Solution" application, which aims to monitor and optimize renewable energy sources, with a focus on wind energy. This project has been an exciting journey, filled with challenges, learnings, and moments of inspiration.

"Your Energy Our Solution" goes beyond technological advancements; it carries a profound societal impact. By harnessing the power of renewable energy, particularly wind energy, the project addresses critical environmental challenges and promotes a more sustainable future. By leveraging smart electrical meters, advanced analytics, and AI prediction models, we enable stakeholders to make informed decisions, optimize energy operations, and reduce reliance on non-renewable sources.

One significant societal impact of the project is the promotion of clean energy practices. By monitoring wind energy sources, we can better understand their potential and decrease dependence on fossil fuels, ultimately reducing greenhouse gas emissions and mitigating the effects of climate change. This transition to renewable energy not only benefits the environment but also improves air quality and reduces pollution, enhancing the overall well-being of communities.

Furthermore, "Your Energy Our Solution" empowers stakeholders with valuable insights into wind energy patterns and performance. By optimizing energy operations, organizations can enhance their financial sustainability, reduce costs, and increase energy efficiency. This, in turn, contributes to economic growth and long-term stability.

The project also drives innovation, collaboration, and knowledge sharing within the renewable energy industry. By embracing advanced technologies and analytics, we inspire industry stakeholders to adopt sustainable practices, invest in renewable energy infrastructure, and explore novel approaches to address the challenges of the evolving energy landscape.

Through my involvement in "Your Energy Our Solution," I have witnessed the transformative power of renewable energy and its positive societal impact. Contributing to this project has allowed me to be part of a team dedicated to creating a cleaner, greener, and more sustainable world.

In conclusion, "Your Energy Our Solution" is a project that not only monitors and optimizes renewable energy sources but also catalyzes environmental, economic, and technological advancements. By promoting clean energy practices, driving economic growth, and inspiring innovation, this project lays the foundation for a more sustainable future. As a proud team member, I am grateful for the opportunity to contribute to this transformative initiative and be part of a collective effort towards a better world for generations to come.

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