Hyderabad Institute of technology and management Science

PROJECT PROPOSAL

Project Title: Electricity Billing System with Bill Slip Feature

Course: Data Structures

Hyderabad Institute for Technology and Management Sciences

Submitted By:

- Mubashra (Roll no)24BSSW005
- Minha (Roll no)24BSSW077

Submitted To: Engr. Rashida Sohail

Date: 30-NOV-2025

---

1. Introduction

Electricity billing and record management are essential processes for utility companies. Manual billing methods are time-consuming, prone to errors, and inefficient for tracking multiple customers. By using **data structures**, we can design an automated system to handle customer data, generate bills, manage payments, and maintain historical records efficiently. Data structures like **hash maps**, **queues**, and **lists** are crucial for fast data retrieval, sequential billing, and maintaining bill histories.

---

2. Problem Statement

The manual and inefficient management of electricity billing creates challenges for both customers and administrators. This project aims to implement a **digital electricity billing system** that automates bill generation, payment tracking, and record keeping using suitable data structures.

---

3. Objectives

Primary Objective:

- Develop a user-friendly, automated electricity billing system that generates, manages, and tracks bills efficiently.

Secondary Objectives:

- Implement Admin and Customer login functionality.
- Generate bill slips for confirmation and record keeping.
- Maintain sequential billing for multiple customers.
- Provide autosave and data backup features to prevent data loss.
- Securely store customer passwords using SHA-256 encryption.
- Enable viewing of historical bills and payment status.

---

4. Relevant Data Structures

- **HashMap:**
  - Stores customer records with Customer ID as the key for **fast retrieval and updates**.
- **ArrayList:**
  - Stores all bills for each customer, allowing **dynamic resizing** and **easy iteration**.
- **Queue (LinkedList):**
  - Supports **sequential billing mode**, processing bills in the order of generation.
- **Serializable Objects:**
  - Customer and Bill classes implement **Serializable** to allow **persistent storage** of data in files.

Justification:

- **HashMap** provides O(1) average access to customer data.
- **ArrayList** allows sorting and searching of bills.
- **Queue** ensures sequential processing of customer bills.
- Together, these data structures ensure **efficient, reliable, and scalable billing management**.

---

5. Project Features / Functionalities

- Admin login and management of all customers.
- Customer login to view personal bills and history.

- Add, delete, and search for customers.
- Generate electricity bills based on units consumed.
- Automatic bill calculation with fixed charges and tiered rates.
- Pay bills and update status to PAID.
- Sequential billing mode for processing multiple customers efficiently.
- Bill slip generation with detailed bill information.
- View bill history with search functionality.
- Data autosave every 60 seconds and backup functionality.
- SHA-256 hashed passwords for security.

---

6. Tools & Technologies

- **Programming Language:** Java (JDK 8+)
- **GUI Library:** Swing
- **IDE:** Eclipse / IntelliJ IDEA / NetBeans
- **Data Structures:** HashMap, ArrayList, Queue (LinkedList), Serializable Objects
- **Utilities:** SHA-256 encryption for passwords, File I/O for persistent storage
- **Optional:** Date/Time API (java.time) for bill dates