POWER PLANTS PERFORMANCE MONITORING SYSTEM IN PT PLN (PERSERO) UP3 PAMEKASAN

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POWER PLANTS PERFORMANCE MONITORING SYSTEM IN PT PLN (PERSERO) UP3 PAMEKASAN

THORQULHAQ JIBRIL AL QUDSY

A thesis submitted in fulfilment of the
requirements for the award of the degree of
Bachelor of Computer Science (Software Engineering)

School of Computing
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DEDICATION

This thesis is dedicated to all those involved in its work, especially my family who have given their best in the form of support, time and opportunity so far. So I want to give the best for them through the existence of this thesis.

ACKNOWLEDGEMENT

First of all, thanks to the presence of God Almighty. By His grace and guidance, I was able to finish my thesis entitled Power Plants Performance Monitoring System In PT PLN (Persero) UP3 Pamekasan on time. This paper is prepared to fulfil the task of Final Year Project 1. In addition, this paper aims to add insight about software development for readers and also for me.

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Lastly, I realize that this thesis is still far from perfect. Therefore, suggestions and constructive criticism are expected for the perfection of this thesis.

ABSTRACT

Electricity has a big role in human life, this can be seen from the developments experienced by humans before and after the use of electrical energy. In fact, we can see that electricity cannot be separated from industrial activities, commercial activities and in everyday household life. Therefore, a facility that can convert mechanical energy into electrical energy such as a power plant is very important as an effort to provide electrical resources. PT PLN (Persero) plays an important role in the distribution of electricity throughout Indonesia. Therefore, PT PLN (Persero) needs to provide good services in the distribution and management of electricity resources. One of the efforts is by conducting periodic monitoring and maintenance of the power plant so that the performance of the power plants can be optimal and maintained in generating electricity. But over time, the number of power plants continues to grow especially in the area of Madura Island and its surroundings which is under the control of PT PLN (Persero) UP3 Pamekasan . So that creates a new problem with the power plants performance monitoring system which causes maintenance not to be optimal. On the other hand, the efficiency of the system is also reduced because it still uses manual methods and data management that is not centralized. To overcome these problems, one of the objectives of this system development project is to design and develop a proposed web-based application named Power Plants Performance Monitoring System In PT PLN (Persero) UP3 Pamekasan to replace the current existing system which is still using manual methods. The project only focuses on power plants in PT PLN (Persero) UP3 Pamekasan, which are located in Pamekasan Regency, East Java, Indonesia. In this project, the system development methodology used is Agile with six sequential phases. Besides, this proposed system will be developed with Laravel as the framework. Meanwhile, MySQL will be used for the database management system, and some network security technology such as authentication will be applied to enhance and secure the proposed system. At the end of this project, the proposed system is able to replace the manual operation of existing systems and thus provide an optimal, efficient and systematic way to monitor the performance of power plants in Madura Island and its surroundings.

ABSTRAK

Tenaga elektrik mempunyai peranan yang besar dalam kehidupan manusia, ini dapat dilihat daripada perkembangan yang dialami oleh manusia sebelum dan selepas penggunaan tenaga elektrik. Malah, kita dapat melihat bahawa tenaga elektrik tidak dapat dipisahkan daripada aktiviti perindustrian, aktiviti komersial dan dalam kehidupan rumah tangga seharian. Oleh itu, kemudahan yang boleh menukar tenaga mekanikal kepada tenaga elektrik seperti loji janakuasa adalah sangat penting sebagai usaha untuk menyediakan sumber elektrik. PT PLN (Persero) memainkan peranan penting dalam pengagihan tenaga elektrik di seluruh Indonesia. Oleh itu, PT PLN (Persero) perlu memberikan perkhidmatan yang baik dalam pengagihan dan pengurusan sumber elektrik. Salah satu usaha adalah dengan melakukan pemantauan dan penyelenggaraan secara berkala ke atas loji janakuasa tersebut agar prestasi loji janakuasa tersebut dapat dioptimumkan dan dikekalkan dalam menjana tenaga elektrik. Namun seiring berjalannya waktu, jumlah janakuasa tersebut terus bertambah terutama di kawasan Pulau Madura dan sekitarnya yang berada di bawah kendali PT PLN (Persero) UP3 Pamekasan. Sehingga menimbulkan masalah baru dengan sistem pemantauan prestasi loji janakuasa yang menyebabkan penyelenggaraan tidak optimum. Sebaliknya, kecekapan sistem juga berkurangan kerana masih menggunakan kaedah manual dan pengurusan data yang tidak berpusat. Bagi mengatasi masalah tersebut, salah satu objektif projek pembangunan sistem ini adalah untuk mereka bentuk dan membangunkan satu cadangan aplikasi berasaskan web yang diberi nama Sistem Pemantauan Prestasi Power Plants Di PT PLN (Persero) UP3 Pamekasan bagi menggantikan sistem sedia ada yang masih menggunakan manual. kaedah. Projek tersebut hanya tertumpu kepada janakuasa di PT PLN (Persero) UP3 Pamekasan yang terletak di Kabupaten Pamekasan, Jawa Timur, Indonesia. Dalam projek ini, metodologi pembangunan sistem yang digunakan ialah Agile dengan enam fasa berurutan. Selain itu, sistem yang dicadangkan ini akan dibangunkan dengan Laravel sebagai rangka kerja. Sementara itu, MySQL akan digunakan untuk sistem pengurusan pangkalan data, dan beberapa teknologi keselamatan rangkaian seperti pengesahan akan digunakan untuk meningkatkan dan menjamin sistem yang dicadangkan. Di akhir projek ini, sistem yang dicadangkan mampu menggantikan operasi manual sistem sedia ada dan sekali gus menyediakan cara yang optimum, cekap dan sistematik untuk memantau prestasi loji janakuasa di Pulau Madura dan sekitarnya.

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LIST OF ABBREVIATIONS

UTM	-	Universiti Teknologi Malaysia
PIC	-	Person In Charge
P3MS	-	Power Plants Performance Monitoring System

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Since the Industrial revolution 2.0, electricity has become a very important basic need for human life until now. Even without electricity, it is very difficult for industrial activities to run. This is inseparable from the role of an Indonesian government-owned corporation, namely PT PLN (Persero). However, even though we know that we have now entered Industry 4.0, the distribution of electricity access is still not comprehensive throughout Indonesia, especially in remote areas. So that PT PLN (Persero) plans to expand access to electricity by increasing the number of power plants in areas that are not yet covered by electricity.

Apart from increasing the number of power plants, there are other things that need to be considered, namely the maintenance of the power plant itself. Thus as the number of generators increases it will require a lot of effort needed to carry out maintenance. The maintenance itself is based on reports from the results of monitoring the power plant which is carried out every day.

Not only for maintenance, monitoring of plant performance can also help predict something in the future as well as anticipate things that are not desirable. So, we can say that periodic monitoring of power plant performance plays an important role in the sustainability of power plants.

1.2 Problem Background

PT PLN (Persero) UP3 Pamekasan is a branch of PT PLN (Persero) located on Madura Island, precisely in Pamekasan Regency, East Java which is responsible for distributing electricity access in the Madura Island area including small islands nearby. Due to the fact that there are still many areas that do not have access to electricity on Madura Island and the surrounding area, they plan to increase the number of power plants in order to spread electricity access to areas that do not yet have access to electricity. But unfortunately the process of monitoring the performance of power plants has not used a computerized system in its implementation, which is now still using a manual system. So that, innovation is needed immediately to anticipate some problems caused by the increase in the number of power plants.

To confirm some things about the existing system, we conducted some interviews with Ms. Habibah Zahra Faluqi (Supervisor at PT PLN (Persero)) for more details. After a few interview sessions, some of problems have been identified starting from data collection which still uses WhatsApp Groups with various formats that cause confusion, data checking or validating process that cause ambiguity because the status of the data whether approved or rejected has not been recorded properly, data classification for each power plant that is carried out one by one, processing raw data still using excel sheets to organized data for analysis, everything is done gradually from person to person. This is where some various problems arise due to the absence of a centralized and real-time system to monitor this, starting from redundant data, possibility of human error, time-consuming and inefficient because data needs to go through many stages and cannot be done synchronously. Last but not least, they cannot see the progress of the data they input directly in real-time.

1.3 Project Aim

This project aims to develop an automated monitoring system of power plant performance in PT PLN (Persero) UP3 Pamekasan in a web-based approach that is able to speed up the process of data gathering, data checking and verification, data classification until data processing so that the monitoring process of power plant performance in PT PLN (Persero) UP3 Pamekasan will be more efficient and manageable.

1.4 Project Objectives

The objectives of the project are:

(a) To identify the requirement of the power plants performance monitoring system.

(b) To design and develop the power plants performance monitoring system based on user requirements.

(c) To test the functionalities of the power plants performance monitoring system as per user requirements.

1.5 Project Scope

The scopes of the project are:

(a) The project scope only focuses on power plants in PT PLN (Persero) UP3 Pamekasan.

(b) Organized data will be presented as a bar chart, list data & downloadable excel document.

(c) The system can only be accessed by three different levels of users which are operator staff for every power plant, PIC staff for every power plant and system administrator with different authorized access.

1.6 Project Importance

This project will transform the monitoring process of the power plants performance in PT PLN (Persero) UP3 Pamekasan to be automatic where previously the process was done manually. It will significantly increase the monitoring process efficiency while still providing convenience in its implementation. Also, with the additional features for different authorized access and enhancement in data management by implementing the use of a centralized database, it can help better in managing, tracking and securing the data. Therefore, in this proposed system, every role starting from Operator Staff, PIC Staff & Supervisor can work in a focused manner only through the system where everything needed is centralized.

1.7 Report Organization

This section will briefly explain the chapter organization of this report which consists of five chapters including Introduction, Literature Review, System Development Methodology, Requirement Analysis and Design, Implementation and Testing, and Conclusion. Starting from this first chapter which is Introduction, it consists of the overview of the project including the problem background until the proposed solution. In this case, Power Plants Performance Monitoring System In PT PLN (Persero) UP3 Pamekasan is our proposed solution. Next, in chapter two, it consists of a literature review which discusses the method to solve the existing system problem including the organization structure and explanation related with how the existing system works. Then, in chapter three, it discusses more detail about the methodology that was used for the system development including some justification related with the chosen methodology, technology used also system requirement analysis will be included here. Then, in chapter four, it discusses more detail about the requirement analysis and also some design such as project design, database design, interface design and chapter design. Then, in chapter five it explains the implementation and testing of the system including the code and also the interface of the system main function. Last but not least, in chapter six, it consists of the conclusion related with this report of the system development including the achievement of the project objective and suggestions for future improvement.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter provides a brief description related to literature review that is relevant to the proposed project which is Power Plants Performance Monitoring System In PT PLN (Persero) UP3 Pamekasan. It provides sufficient background information based on relevant literature reviews from some equivalent systems in the current market. By comparing the related existing systems with the proposed system, we can use it as a reference in making improvements for our proposed system in the future.

2.2 Case Study

This project is studying about the monitoring activity of the power plants performance in PT PLN (Persero) UP3 Pamekasan. But, due to PT PLN (Persero) UP3 Pamekasan plans to increase the number of power plants. A system that can handle the monitoring process with a larger number of power plants is needed since some issues were discovered on the current system such as inefficient and inconvenient ways to monitor the power plant performance in PT PLN (Persero) UP3 Pamekasan.

2.2.1 Company Organization Structure

PT PLN (Persero) is an Indonesian government-owned corporation that was established on January 1st, 1965 which has a monopoly on electricity distribution in Indonesia and generates the majority of the country's electrical power. Since its establishment, PT PLN (Persero) has spread to every region in Indonesia. We can see the branch offices everywhere when we stop in an area located in Indonesia. Since it is the only electricity company and the largest in Indonesia, its role is very important in the survival of each region. One of its branches is PT PLN (Persero) UP3 Pamekasan which is located in Pamekasan Regency, Madura. PT PLN (Persero) UP3 Pamekasan itself is responsible for the Madura Island area and its surroundings.

As for the purposes of monitoring the performance of power plants, it includes 4 parts. Starting from the bottom, namely the operator staff whose activities are to collect data about all things about power plants in the field. Regarding the absence of operator staff in the company's organizational chart because the operator staff themselves have the status of outsourced workers. Then there is the PIC staff who will verify whether the data collected by the operator staff is appropriate and also document it to an excel sheet document. Unlike the operator staff, the PIC staff themselves have the status of permanent employees. Then after everything has been documented, the Supervisor will retrieve all the documented data from all power plants under his responsibility. After everything is collected, all data will be reported to the center by the supervisor, precisely Network Section Manager (Manajer Bagian Jaringan). The organizational structure of the company is as Figure 2.1.

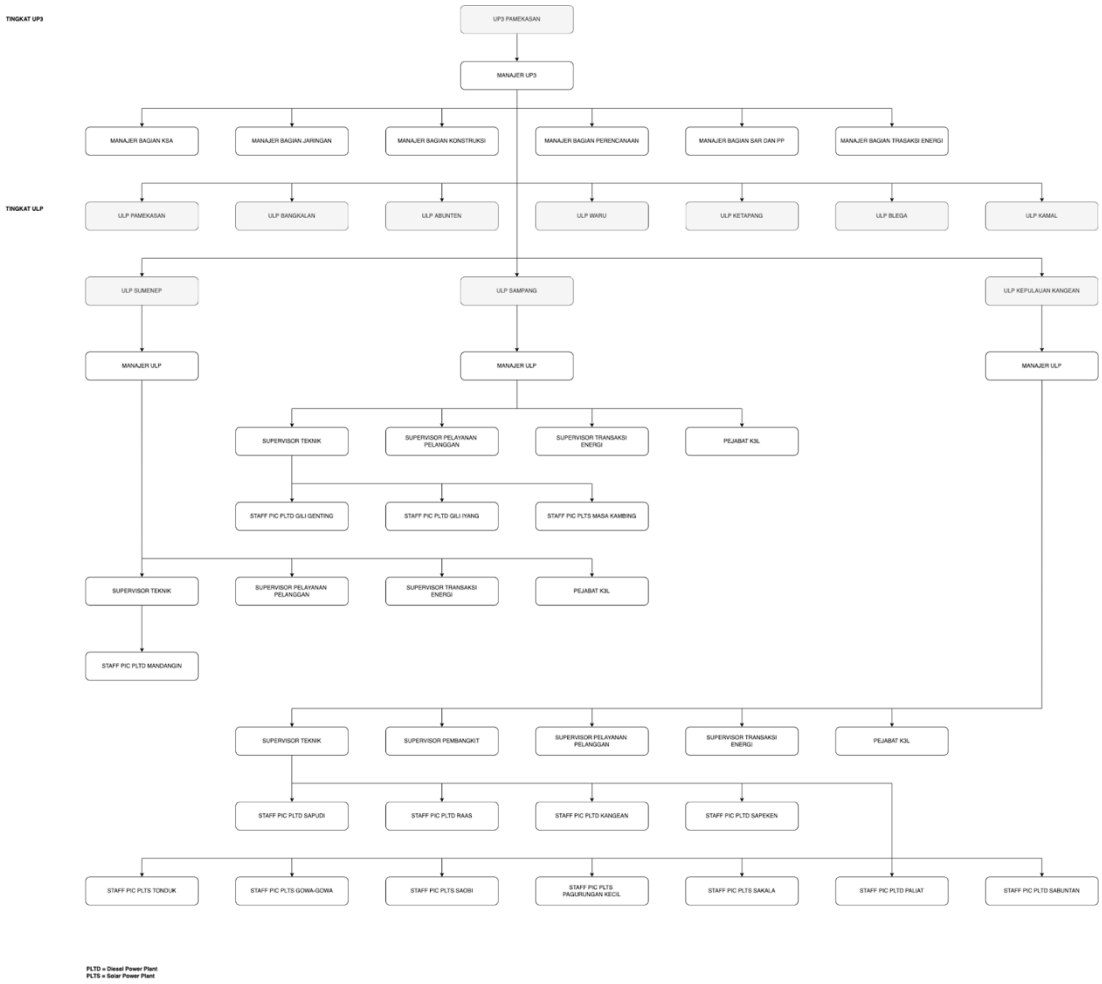

Figure 2.1 Organizational Chart for PT PLN (Persero) UP3 Pamekasan

2.2.2 Manual Operation

For the process of monitoring power plants performance, it starts with the data gathering which still uses manual methods by using a platform namely WhatsApp. For this step, every staff operator from each power plant will report data that has been recapitulated in the field, every day. But, unfortunately the format of the data that has been reported by the operator staff is still using various formats. After all the data from every power plant was gathered, there will be a data checking or validation from the PIC staff. This activity is also done by using WhatsApp. So, after the PIC staff reviewing the data, they will inform the status of the data whether it is approved or not by replying to a message through WhatsApp. If the data was rejected, operator staff need to resend the data that has already been revised. But if data was approved, we can continue to the next step which is data classification. Unlike the previous step, this step was done without any tools or platform. So the data will be classified manually based on the report type by moving the data from the WhatsApp to the specific excel document template which has been provided previously with certain formulas. If the placement of the data in excel is deemed appropriate, then we can proceed to the next step which is data processing. In this last step, the data will be calculated by the excel based on the formula that was already set before. After the calculation process is done, it will produce something we call organized data. This data will be used as a reference for various purposes, including maintenance of the power plants itself.

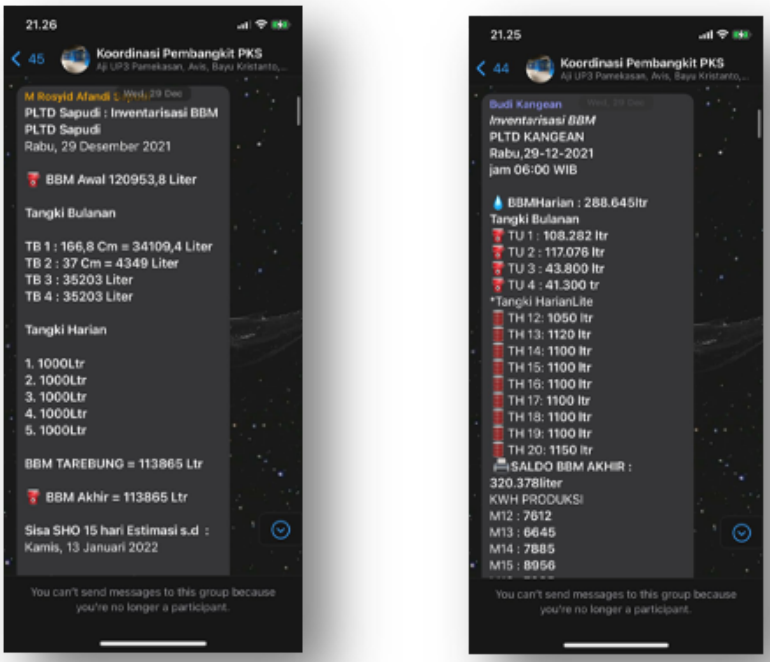

Figure 2.2 Data Reporting message of monitoring power plants performance in WhatsApp group

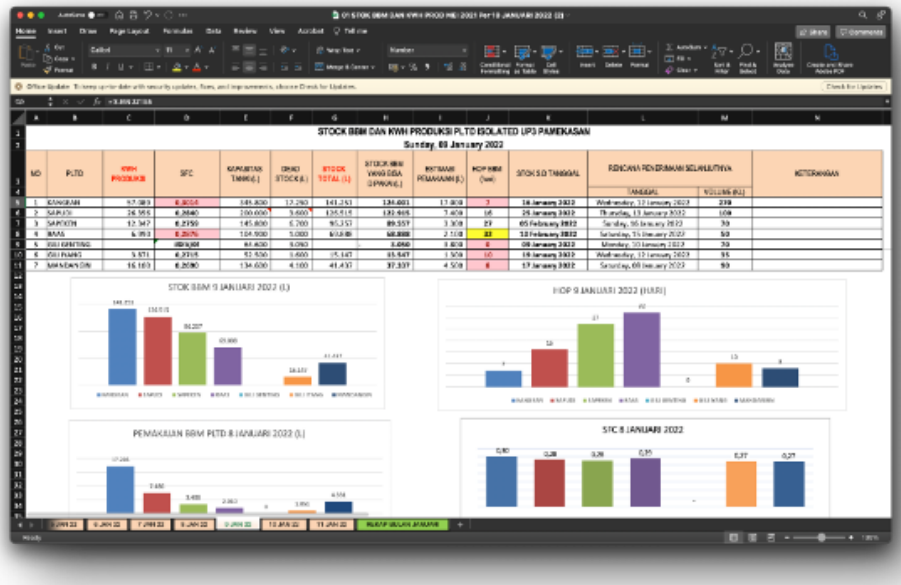

Figure 2.3 Organized data of monitoring power plants performance in Excel Sheet

2.3 Current System Analysis

The current system used by PT PLN (Persero) UP3 Pamekasan for monitoring power plants performance uses a manual method for storing their power plants performance information which still did not use a centralized system. This system itself involves several software products in its application. Some of them such as WhatsApp as a means for collecting data from the operator staff in the field and also as verification whether the data is approved or not from the PIC staff. Then, there is also Microsoft Excel as a tool for collecting data on report results that have been received from the operator staff in the field if it has been approved and also a tool for data processing such as calculations so that it can produce the desired output according to a predetermined formula. The figure 2.4 will explain in more detail about the current system workflow.

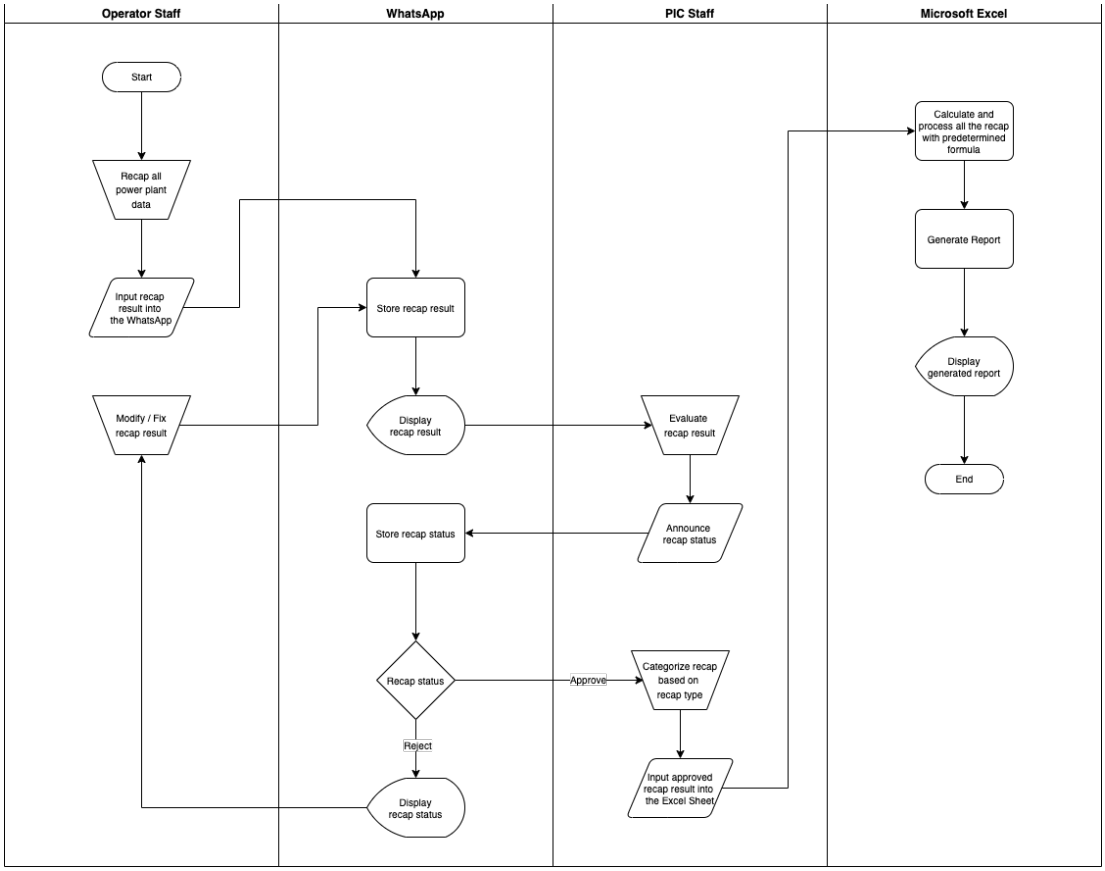

Figure 2.4 Current System Workflow

2.4 Comparison between existing systems

There are a few existing applications in the current market. In this case study, the analysis of the existing applications that provide similar system functions and features are conducted to examine their characteristics, strengths, and weaknesses. It is to obtain ideas on the characteristics and functionality to be adapted to the proposed application. From our analysis, there are several systems which we can refer to such as Avnet's Smart Diesel Generator Monitoring Solution System, Technoton's Diesel Generator Monitoring System and Sekawan Media's Logistics Delivery Monitoring System.

2.4.1 Avnet's Smart Diesel Generator Monitoring Solution System

Avnet's Smart Diesel Generator Monitoring Solution System is a mobile application that provides a remote access feature to monitor a diesel generator (Smart Diesel Generator Monitoring. Avnet, n.d.). Figure X.X shows the user interfaces of Avnet's Smart Diesel Generator Monitoring Solution System.

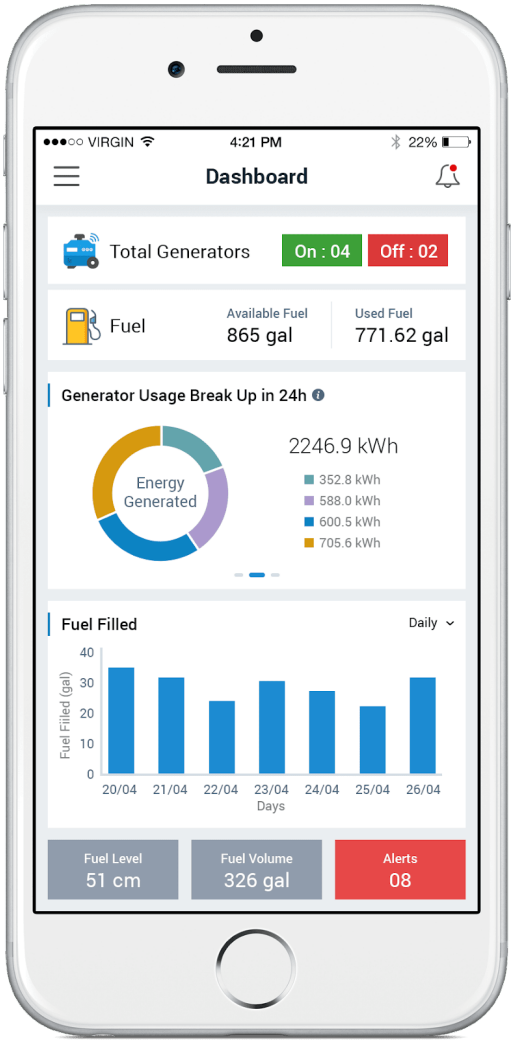

Figure 2.5 Dashboard UI for Avnet's Smart Diesel Generator Monitoring Solution System

2.4.2 Technoton's Diesel Generator Monitoring System

Technoton's Diesel Generator Monitoring System is a web application that provides a solution that allows for fuel monitoring, monitoring of diesel generator operation parameters and engine diagnostics, obtaining electrical data from the alternator, and remote genset control (Diesel Generator Monitoring. Technoton, 2022). Figure X.X shows the user interfaces of Technoton's Diesel Generator Monitoring System.

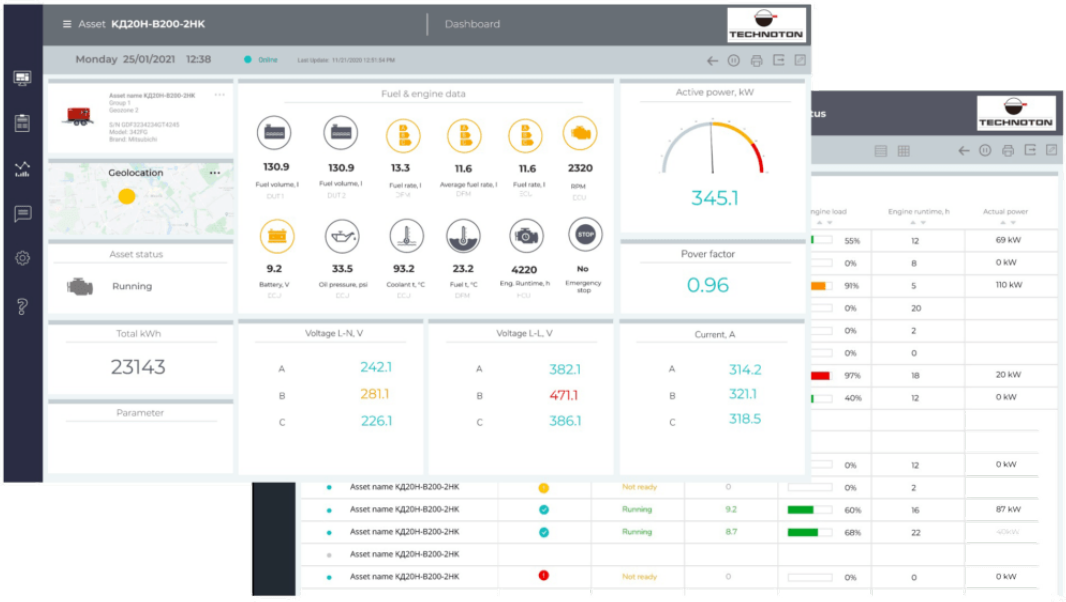

Figure 2.6 Dashboard UI for Technoton's Diesel Generator Monitoring System

2.4.3 Sekawan Media's Logistics Delivery Monitoring System

Sekawan Media's Logistics Delivery Monitoring System is a web application that is designed to manage and monitor activities related to logistics fleets, including trucks, box cars, containers, and other vehicles (Fleet Management System: Solusi Monitoring Armada Logistik, 2022). Figure X.X shows the user interfaces of Sekawan Media's Logistics Delivery Monitoring System.

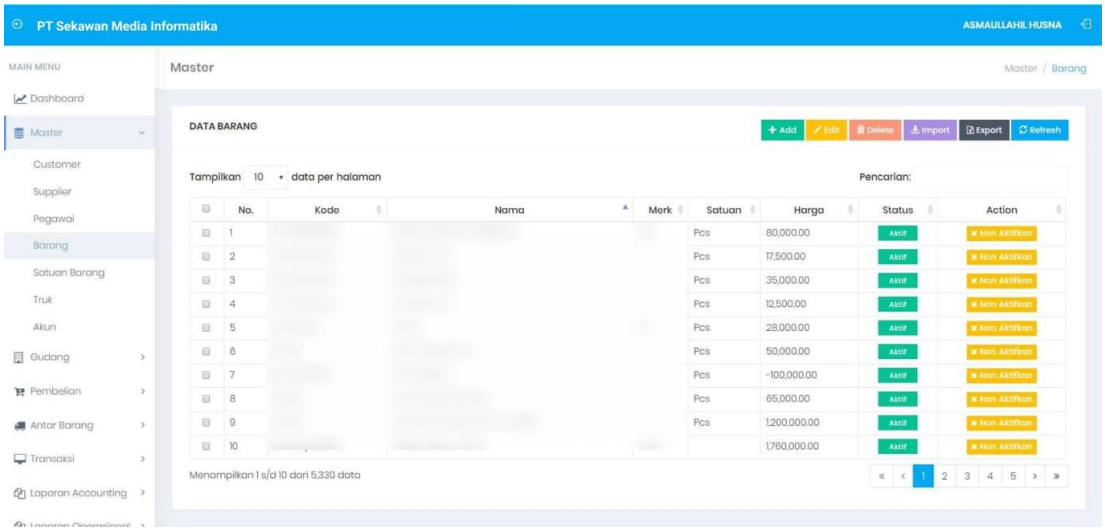

Figure 2.7 Dashboard UI for Sekawan Media's Logistics Delivery Monitoring System

Table 2.1 Comparison Between Existing System and Proposed System

No	System Feature	S1	S2	S3	S4
1	Cross-Platform Availability	No	Yes	Yes	Yes
2	Multiple User Role Type Access	No	No	Yes	Yes
3	Downloadable excel-based report	No	No	Yes	Yes
4	Displaying data in a chart form.	Yes	Yes	Yes	Yes
5	Centralized Database	Yes	Yes	Yes	Yes
6	User Data Management	No	No	No	Yes
7	Master Data Management	No	No	Yes	Yes
8	User Authentication	Yes	No	Yes	Yes
9	Admin Console	No	No	Yes	Yes
10	Data Verification / Approval	No	No	Yes	Yes

Note :

S1 - Avnet's Smart Diesel Generator Monitoring Solution System

S2 - Technoton's Diesel Generator Monitoring System

S3 - Sekawan Media's Logistics Delivery Monitoring System

S4 - Power Plants Performance Monitoring System

2.5 Literature Review of Technology Used

This section will discuss the tools and technology used for the development of the proposed project which is Power Plants Performance Monitoring System In PT PLN (Persero) UP3 Pamekasan.

2.5.1 Laravel

Laravel is an open-source PHP framework that provides support for our project development of Power Plants Performance Monitoring System In PT PLN (Persero) UP3 Pamekasan. Beside, Laravel also implements the MVC (Model-View-Controller) concept so that the website development process can be done more quickly and efficiently. Also, by using Laravel, we can implement the use of reusable components so that later we can speed up the coding process and also make it easier to trace bugs when there is a problem with the code. Last but not least, Laravel also provides complete, clear and easy-to-understand documentation for both beginners and experts.

2.5.2 Tailwind CSS

Tailwind CSS is one of the most widely used CSS frameworks. In terms of documentation, it's even better. Especially if it is implemented with Laravel and applies reusable components because Tailwind itself is basically a low-level CSS framework.

2.5.3 Vue JS

Vue is a JavaScript framework for developing UI or we could say the front-end side. Compared to other frameworks, Vue JS is very light and has a fairly complete library for us to use later. This is where we will apply the reusable component later.

2.5.4 Inertia JS

Inertia JS is a new approach to create a SPA-based web application or Single Page Application using a framework such as Vue JS without the need to create a Rest API or in other terms The Modern Monolith. This allows us to create single page applications (SPAs) that render completely on the client side, without much of the hassle that is common when developing SPAs in general.

2.5.5 MySQL

MySQL is a type of database management system that is open source and is included in the RDBMS (Relational Database Management System). Some of the advantages are that it supports integration with other programming languages, a flexible table structure and also from a security perspective.

2.5.6 DataGrip

DataGrip is a multi-engine database environment by JetBrains that is designed to query, create, and manage databases. It supports MySQL, PostgreSQL, Microsoft SQL Server, Oracle, and more. Also it allows us to run databases locally, on a server, or in the cloud.

2.5.7 Visual Studio Code

Visual Studio Code is a fairly lightweight source-code editing software made by Microsoft. Visual Studio Code provides features such as syntax highlighting, code completion, code snipping, code refactoring, defaulting, and Git. In addition, there are many other extensions provided by Visual Studio Code that can be used to simplify our development process.

2.5.8 Amazon Elastic Compute Cloud (Amazon EC2)

Amazon EC2 is one of the AWS products that allows us to host our dynamic website. Some of the advantages of using AWS products alone are broad platform support, worldwide data centres and flexible pricing models. For the Amazon EC2 itself, it has the advantage of configuring the size of the server that we use.

2.5.9 Draw.io

Draw.io is a full lifecycle UML based modelling tool used to help us in the planning, design and construction of software systems and business processes.

2.5.10 Figma

Figma is a UI and UX design application and prototyping tool with web-based and additional offline features that we can use to create smaller websites, apps, or user interface components that can be integrated into other projects. Some of the advantages are, cross-platform is available, lightweight, complete documentation and many extensions both from the community and official that we can use to simplify the design process.

2.6 Chapter Summary

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CHAPTER 3

SYSTEM DEVELOPMENT METHODOLOGY

3.1 Introduction

The methodology used to develop Power Plants Performance Monitoring System In PT PLN (Persero) UP3 Pamekasan will be briefly discussed in this chapter. Justification of the selected methodology and explanation of how the methodology is being applied throughout the development will be discussed. The technology used will also be briefly described here. Last but not least, the system requirements analysis for both hardware and software will be listed.

3.2 Methodology Choice and Justification

The methodology of systems development is a standardized process to perform all the necessary steps to analyze, design, implement and maintain a system efficiently. There are so many various kinds of system floating methods that can be used, this can also be adjusted to the needs or requirements. According to the system requirements, Agile methodology is the suitable software development approach we use to develop Power Plants Performance Monitoring System In PT PLN (Persero) UP3 Pamekasan.

Basically, Agile works by breaking the project down into small pieces of user functionality, prioritizing them, and then delivering them in 2 to 4-week cycles known as iterations or sprints. Before each cycle begins, the team defines work goals. By default, the highest priority items will be defined based on the Product Owner's analysis of the customer's priorities. In this way, the product can be continuously improved and the development process also improved (Project Management Academy, n.d.).

With Agile Methodology, we can quickly implement any feedback from consumers in the next iteration. Whether it's about adding features or bug fixes. As a result, the quality of the software will improve and increase because it is more in line with consumer desires. In addition, if there is a lot of feedback, we can be flexible in choosing whether to make changes in each iteration. So, we don't have to follow a plan from start to finish. This is an added point for the developers themselves. Finally, each Agile methodology has regular iterations that focus on incremental development. So, our software development will be more predictable and we can also know the various expenses well. As a result, business risk will be reduced.

3.3 Phases of the Chosen Methodology

The phases of chosen methodology which is Agile software development life cycle will be discussed in this section. The phases include Requirement Analysis, Design, Development, Testing, Deployment and Review. The flow phases of the Agile software development life cycle model are depicted in Figure 3.1.

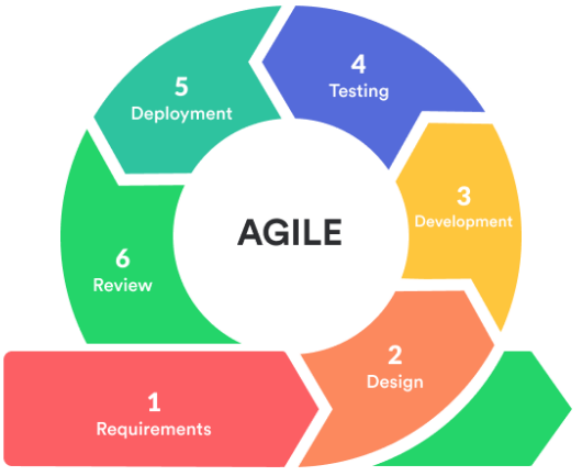

Figure 3.1 Software Development Life Cycle Model of Agile

3.3.1 Requirements

Requirement is a stage where the development team and also clients or stakeholders design what is needed in a software to be made. More specifically, the client or stakeholder will determine the backlog as well as user stories. While the development team will turn off whether the feature can be developed.

3.3.2 Design

Design is the stage where all the analysis results of system that have been carried out previously and the discussion of system specifications is applied to a system's design or blueprint.. The blueprint itself can be interpreted in more detail as a system design that is ready to be developed, beginning with implementation, system analysis, and system support personnel. Features and operations of the system are also described in detail. Making a prototype is also part of the design stage. The prototype will demonstrate the basic idea of how the application should look and work.

3.3.3 Development

Development is the stage where the software development process begins. The development team will begin building the entire system by writing code with the programming language that has already been chosen. The software development process is usually divided into several units or modules for large projects and then assigned to several development teams. For example, the database admin will create the necessary data in the database, the front-end developer is in charge of creating a GUI to interact with services or logic that has been developed by the back-end. The software development process will be carried out based on predetermined requirements and procedures.

3.3.4 Testing

Testing is a stage in which the software that has been developed is tested or checked, which is the responsibility of the quality control department, so that any bugs that are still discovered can be fixed immediately and the software's quality is maintained.

3.3.5 Deployment

Deployment is a stage that must be completed in order to ensure the quality of the developed software by testing the system's quality. If the produced system meets the requirements, the software will be ready for development.

3.3.6 Review

Review is the stage where we get user feedback. Whether it's about bugs that weren't found during testing or feedback about adding features if needed. From here it could be a new software development life cycle to fix bugs, define an iterative development plan, or add features in future releases.

3.4 Technology Used Description

This section will briefly explain the required tools and technology used for the development of the proposed system which is Power Plants Performance Monitoring System In PT PLN (Persero) UP3 Pamekasan will be briefly discussed in this section.

Table 3.1 Technology Used For Proposed System Development

Technology	Description
Operating System	
macOS Monterey	Operating System
Documentation	
Google Drive	Cloud Storage
Design	
Draw.io	UML Diagram Editor
Figma	UI and UX Design
Software Development	
Visual Studio Code	Code Editor
DataGrip	Database Management
Stack	
Laravel	PHP Framework
Vue JS	JavaScript Framework
Tailwind CSS	CSS Framework
Inertia JS	JavaScript Library
MySQL	Database
Network	
Amazon Elastic Compute Cloud (Amazon EC2)	Cloud Hosting

3.5 System Requirement Analysis

This section will briefly discuss the system requirement analysis for both hardware and software that required to develop the Plants Performance Monitoring System In PT PLN (Persero) UP3 Pamekasan. The integration of hardware and software is critical to the overall system development process.

3.5.1 Hardware Requirements

(a) Intel Pentium 4 or later for Intel Processor, AMD Athlon or later for AMD Processor and Apple M1 or later for Apple Processor

(b) Minimum 2 GB RAM memory.

(c) Internet connection required

3.5.2 Software Requirements

(a) Windows 8 or later for Windows Operating System, macOS Sierra 10.12 or later for Mac Operating System and Ubuntu 14.04+ 64-bit for Linux Operating System.

(b) Google Chrome 54 or later, Microsoft Internet Explorer 11 or later, Mozilla Firefox version 48 or later and Apple Safari 15.4 or later

3.6 Chapter Summary

This chapter describes the software development methodology that will be carried out to solve the existing problems. Planning for software development is carried out as well as possible and systematically to ensure that the development process runs smoothly. Not only is it important in the development process, it is also important to ensure users get satisfaction when using the product. Also, the specifications of both hardware and software are explained clearly and in detail to ensure that the project will be developed accordingly.

CHAPTER 4

REQUIREMENT ANALYSIS AND DESIGN

4.1 Introduction

This chapter describes the Power Plants Performance Monitoring System (P3MS) requirements and design for PT PLN (Persero) UP3 Pamekasan. Analyses of essential functional and non-functional requirements gathered during the design process are being incorporated into this chapter. These requirements comprise essential design elements. Various diagrams, such as use case diagrams, sequence diagrams, and activity diagrams, are drawn to represent each use case in greater detail in order to visualize the functional requirements. In addition to that, the design of the system architecture, the design of the database, and the design of the interface will each be briefly described in this chapter.

4.2 Requirement Analysis

The functional and non-functional requirements of the Power Plants Performance Monitoring System (P3MS) for PT PLN (Persero) UP3 Pamekasan are discussed in this section. These requirements were gathered from the stakeholders of the system.

4.2.1 Functional Requirement

The functional requirements for the proposed system, which is the Power Plants Performance Monitoring System (P3MS) for PT PLN (Persero) UP3 Pamekasan, describe the features that the system ought to have and the manner in which those features ought to be carried out. It is essential to have a good understanding of the functional requirements in order to identify the primary features and functionalities of the system.

4.2.1.1 Use Case Diagram

In a use case diagram, the key features and functions of the proposed system are represented graphically. The use case model of the Power Plants Performance Monitoring System (P3MS) for PT PLN (Persero) UP3 Pamekasan illustrates and describes the relationship between the system and the actors that make up the system. The use case Figure 4.1 presents a diagram of the Power Plants Performance Monitoring System (P3MS) for PT PLN (Persero) UP3 Pamekasan.

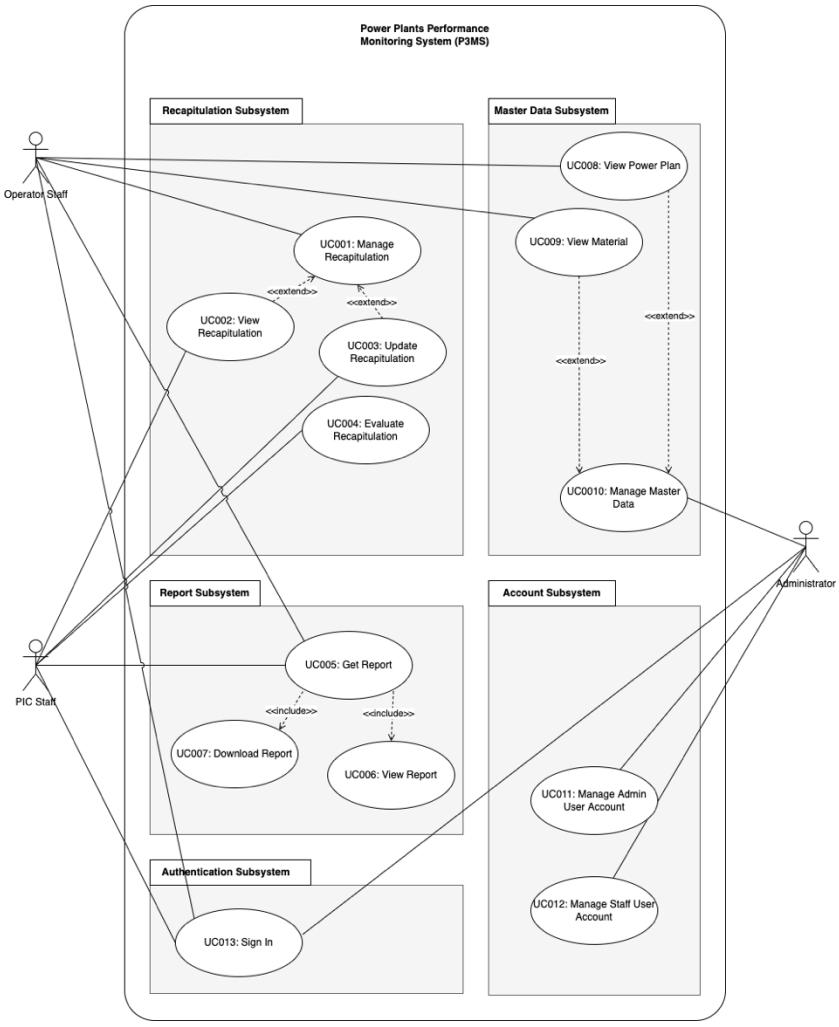

Figure 4.1 Use Case Diagram of P3MS

4.2.1.2 Actor Description

There are three actors involved in the Power Plants Performance Monitoring System (P3MS) which are Operator Staff, PIC Staff and Administrator. The following table will provide a detailed description of each actor.

Table 4.1 Actor Description

No	Actor Name	Description
1	Operator Staff	This user helps the company to manage user accounts, including staff and the administrator itself. Also, manage master data, including managing units, managing power plants, and managing the material.
2	PIC Staff	This user has access to recap and submit all the power plants. performance statistic data to the system. Besides creating a recapitulation, they can view, update, and delete it. In the end, they can get the generated report either downloaded to an excel file or viewed directly from the website.
3	Administrator	This user has access to evaluate all the recapitulations that were already submitted by operator staff, either rejected or approved. Besides evaluating a recapitulation, they can view and update the recapitulation directly if it is felt that there is no need for more revisions from the operator staff. In the end, they can get the generated report either downloaded to an excel file or viewed directly from the website.

4.2.1.3 Use Case Description

For each of the use cases depicted in Figure 4.1 above, a brief description of how the user can interact with the system's functionalities is provided in this section. Following is a description of each of the use cases.

Table 4.2 Use Case Description

Use Case ID	Use Case Name	Description
UC001	Manage Recapitulation	Allow the operator staff to create a new recapitulation or view, update, and delete an existing recapitulation.
UC002	View Recapitulation	Allow the PIC staff to view a list of requested recapitulations.
UC003	Update Recapitulation	Allow the PIC staff to update the requested recapitulations.
UC004	Evaluate Recapitulation	Allow the PIC staff to evaluate the requested recapitulations, whether they are approved or rejected.
UC005	Get Report	Allow operator staff and PIC staff to get the generated report results.
UC006	View Report	Allow operator staff and PIC staff to view the generated report results.
UC007	Download Report	Allow operator staff and PIC staff to download the generated report results.
UC008	View Power Plan	Allow the administrator to add a new power plant or view, update, and to delete an existing power

		plant.
UC009	View Material	Allow the administrator to add new material or view, update, and delete existing material.
UC010	Manage Master Data	Allow the administrator to add a new chosen master data or view, update, and delete an existing chosen master data.
UC011	Manage Admin User Account	Allow the administrator to add a new admin user account or view, update, and delete an existing admin user account.
UC012	Manage Staff User Account	Allow the administrator to add a new staff user account or view, update, and delete an existing admin staff account.
UC013	Sign In	Allow all users to authenticate their account credentials before being able to access the main system features.

4.2.1.4 Use Case Specification

In order to understand better how the user interacts with the system, a use case specification provides a detailed description of each use case. For each use case, a unique ID, use case name, description, related actors involved in the use case, normal flow and alternative flow to show the steps to perform a task, pre-condition, post-condition, and related requirements are included. The use case specification for UC001: Manage Recapitulation is presented in Table 4.3. Appendix A provides more information about the use case specification.

Table 4.3 Use Case Specification of UC001: Manage Recapitulation

Use Case ID	UC001
Use Case Name	Manage Recapitulation
Description	This use case allows the operator staff to create, view, update, and delete the recapitulation.
Actor(s)	Operator Staff
Pre-conditions	User must be logged in to the system as an operator staff with a valid login credential.
Normal Flow	1. The operator staff redirects to the staff dashboard page after successfully logging in. 2. The operator staff clicks on the “Input Recapitulation” button. 3. The system will redirect the operator staff to the input recapitulation page. 4. The operator staff chooses the power plant type. 5. The operator staff chooses the power plant name. 6. The operator staff chooses the date input. 7. The operator staff chooses the recapitulation type. 8. The system will display a recapitulation form based on the chosen recapitulation type. 9. The operator staff input all required fields on the recapitulation form. 10. The operator staff clicks on the “Submit” button. If the operator staff clicks on the “Cancel” button, AF1 will be performed. If the operator staff clicks on the “Save” button, AF2 will be performed. If the form is not fully full-filled or the required fields are blank, EF 1 will be performed. 11. The system saves all the information inputted by the operator staff to the database. 12. The system will redirect the operator staff to the recapitulation history page and display new recapitulation information. 13. If the operator staff clicks on the “Edit” button, AF3 will be performed. 14. If the operator staff clicks on the “Delete” button, AF4 will be performed.
Alternative Flow	1. Cancel recapitulation’s input 1.1. The system will redirect the operator staff to the staff dashboard page.

	2. Save recapitulation's input 2.1. The system will redirect the operator staff to the recapitulation history page. 3. Update Recapitulation 3.1. The system will display a recapitulation edit form. 3.2. The operator staff updates the specific field that needed to be updated. 3.3. The operator staff clicks on the "Update" button. If the form is not fully full-filled or the required fields are blank, EF 1 will be performed. 3.4. The system saves all the information inputted by the operator staff to the database. 3.5. The system will redirect the operator staff to the recapitulation history page and display new recapitulation information. 4. Delete Recapitulation 4.1. The system displays a confirmation dialogue. 4.2. The operator staff continues by clicking the "Yes" button. 4.3. The system deleted selected recapitulation data from the database. 4.4. The system will reload the recapitulation history page.
Exception Flow	1. Required fields in the recapitulation form are empty or the form is blank. 1.1. The system displays an error message. 1.2. Continue NF9 / AF3.2 .
Post Conditions	1. The operator staff has successfully created a new recapitulation. 2. The operator staff has successfully viewed the existing recapitulation. 3. The operator staff has successfully updated the existing recapitulation. 4. The operator staff has successfully deleted the existing recapitulation.
Related Requirement	-

4.2.1.5 Sequence Diagram

A sequence diagram depicts the relationships between the various components of a system. It shows the sequence of messages exchanged when a task is completed by the user who is involved in the conversation. For more complete and details of the sequence diagram can be found in SRS Appendix A.

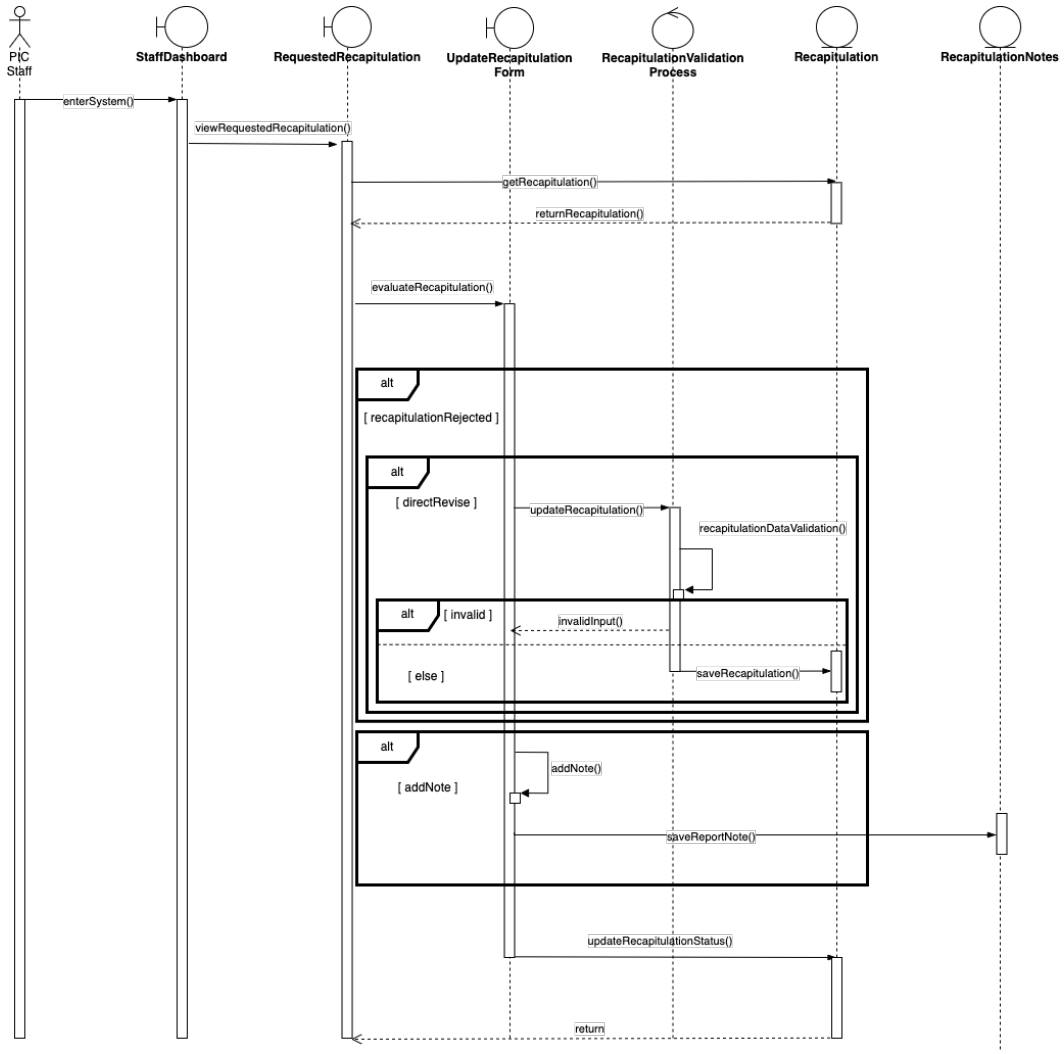

Figure 4.2 Sequence Diagram of P3MS

4.2.1.6 Activity Diagram

The activity diagram illustrates the workflow of a particular function or task by outlining the specific steps that must be taken in order to move from one activity to the next. Figure 4.3 is a representation of the activity diagram for the UC001: Manage Recapitulation procedure. For more complete and details of the activity diagram can be found in SRS Appendix A.

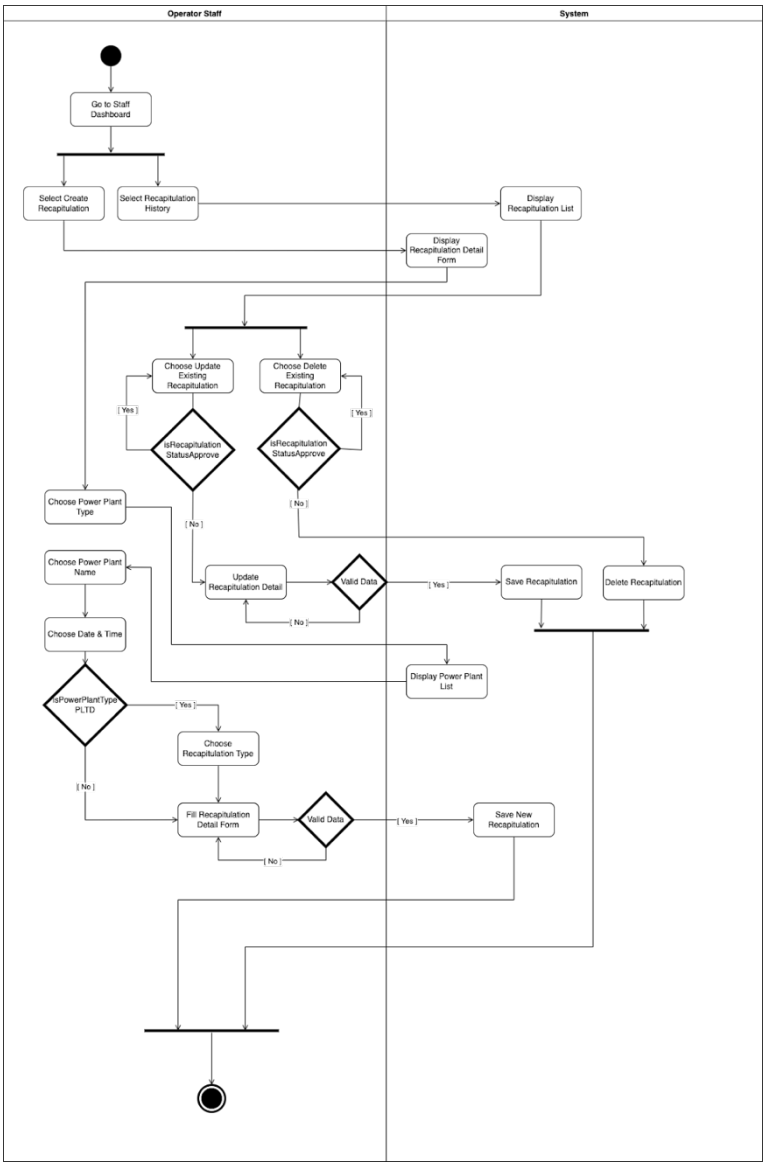

Figure 4.3 Activity Diagram of P3MS

4.2.2 Non-Functional Requirement

When describing the system's capabilities and constraints, non-functional requirements can help the system work better. Instead of providing an explanation of how the system operates, non-functional requirements describe the tasks that the system must be able to complete. The following is a list of the non-functional requirements that must be met by the Power Plants Performance Monitoring System (P3MS) for the PT PLN (Persero) UP3 Pamekasan.

I. Security - The system shall only permit specific tasks to be performed by authorized users with varying levels of access. Aside from that, the information contained within the system is kept safe and secure by limiting authorized access to the end-user of PT PLN (Persero) UP3 Pamekasan for the purpose of this project as well as any future business that makes use of this particular system.

II. Portability - Since the system is web-based, the user should be able to access it through any web browser that is currently operational and has a reliable connection to the internet. Examples of such web browsers include Google Chrome, Mozilla Firefox, Microsoft Edge, Apple Safari, and Opera.

III. Maintainability - System developers must maintain the system in order to detect potential flaws and correct them by modifying the relevant module. Regular testing of the system is required in order to ensure the system's continued high level of quality and functionality.

IV. Availability: Users should be able to access the system at any time and from any location, and the system should be accessible 24 hours a day. Users should be able to access the system during standard business hours.

4.3 Project Design

In terms of architecture, this system follows the Model-View-Controller (MVC) design pattern. Model, view, and controller are the three interconnected parts of this architecture model's conceptualization of implementation code. Data storage and retrieval from a database are handled by a component called the model that serves as a bridge between the view and controller. For the end user, views are the interfaces that serve as visual representations of the entire system. Using the user interfaces, the end-user can input data, and then the system will display the corresponding result. It is the job of the controller to call the appropriate functions in the model and then carry out the necessary tasks. Following that, the pertinent information or result is then transferred before being presented by the user interfaces in View.

In the process of developing the Power Plants Performance Monitoring System (P3MS), the MVC architecture design pattern is an extremely important component. This is especially true for the system's implementation and maintenance. As a result of breaking the code into separate models, developers can easily make changes to the code without affecting other models. MVC makes it easier for developers to understand the code for different functions and apply good practices of code arrangement and management because it clearly shows the separation of codes. Figure X.X illustrates the architecture design of the Power Plants Performance Monitoring System (P3MS).

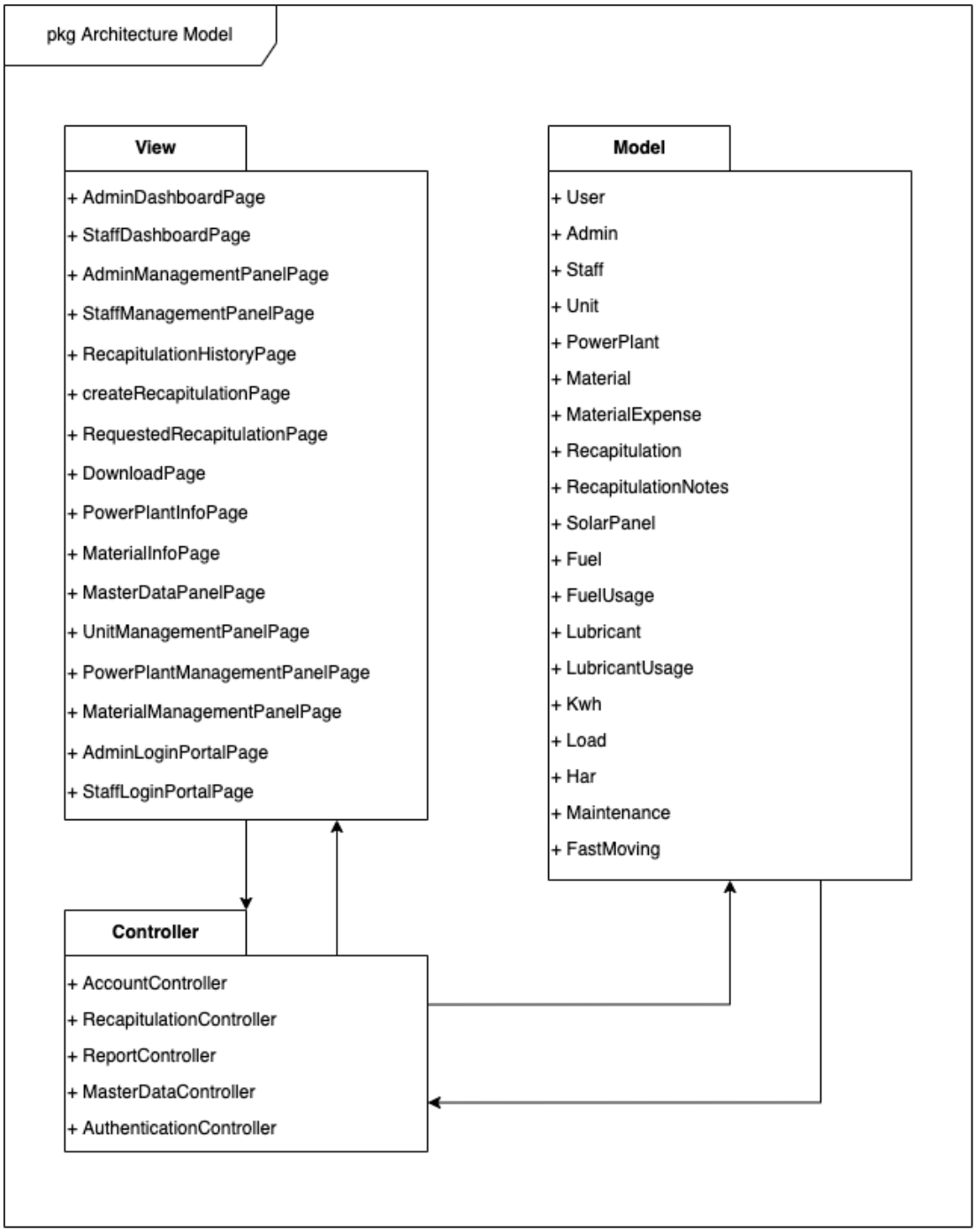

Figure 4.4 Architecture Diagram of P3MS

4.4 Database Design

This section explains how the Power Plants Performance Monitoring System (P3MS) for PT PLN (Persero) UP3 Pamekasan database was designed for the use of proposed system. In the process of developing, designing, and implementing a system, one of the most important roles played is that of database design. The data of this system can be well organized by using good database design principles.

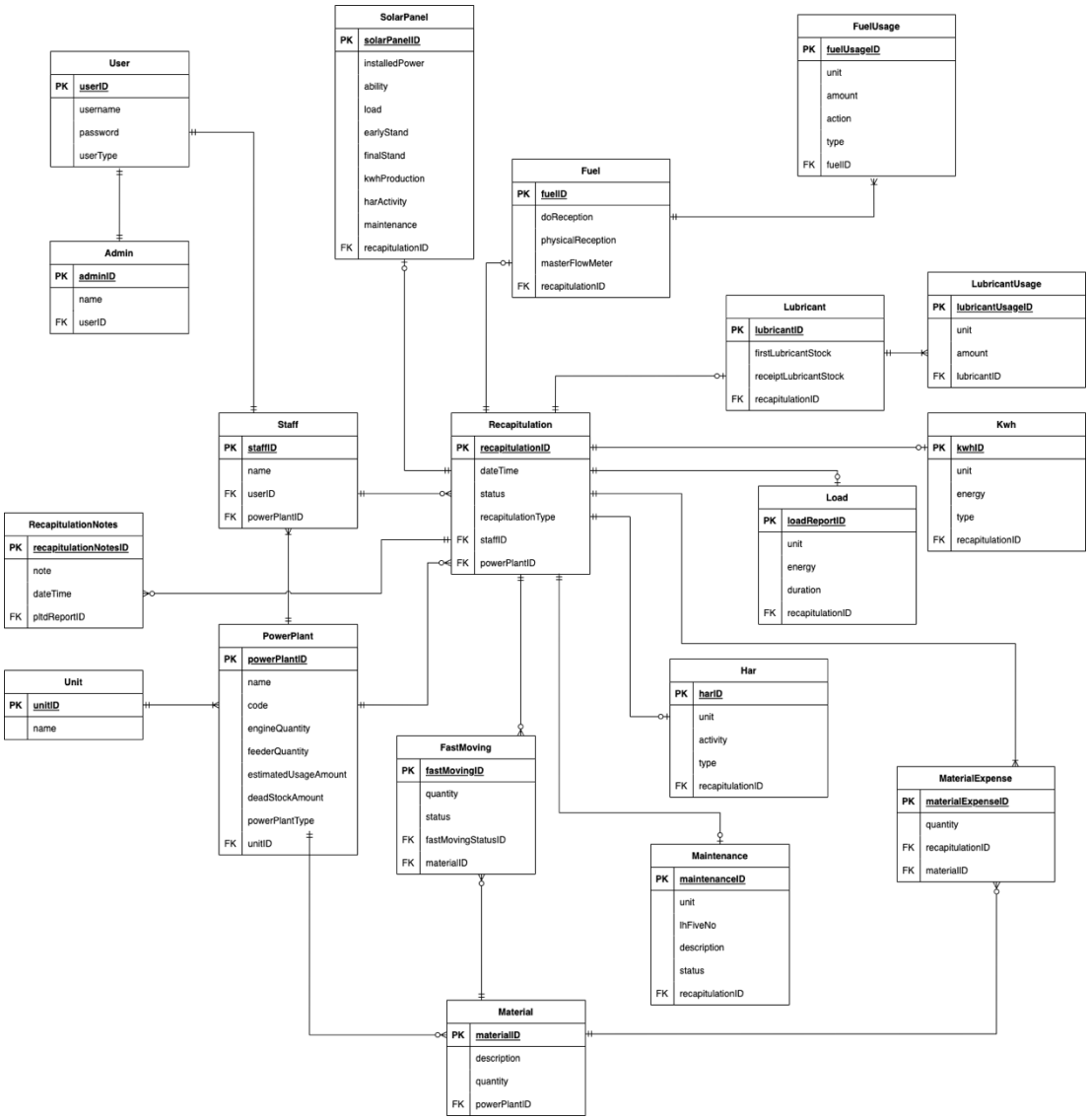

Figure 4.5 Entity Relationship Diagram (ERD) of P3MS

4.4.1 Data Dictionary

A data dictionary contains information regarding the data stored in a database. Table 4.4 displays data dictionaries for the Recapitulation table and Table 4.5 displays data dictionaries for the Power Plants table. The SDD, which can be found in Appendix B, contains the entirety of the system's data dictionary.

Table 4.4 Data Dictionary for Recapitulation Table

Field Name	Datatype	Constraint	Description
Recapitulation Table			
recapitulationID	BIGINT	Primary Key	Unique ID for Recapitulation
dateTime	TIMESTAMP	Not Null	Date and time of the report insertion
status	BIGINT	Not Null	The report status whether it is on progress, submitted, approved or rejected
recapitulationType	BIGINT	Not Null	The recapitulation type
staffID	BIGINT	Foreign Key	The ID of the staff who make this report
powerPlantID	BIGINT	Foreign Key	The ID of power plant who have this report

Table 4.5 Data Dictionary for Power Plant Table

Field Name	Datatype	Constraint	Description
PowerPlant Table			
powerPlantID	BIGINT	Primary Key	Unique ID for PowerPlant
name	VARCHAR	Not Null	Name of the power plant
code	CHAR	Not Null	The power plant code identifier
engineQuantity	INT	Not Null	The number of engine under the power plant
feederQuantity	INT	Not Null	The number of feeder under the power plant
estimatedUsageAmount	INT	Not Null	Amount of estimated usage
deadStockAmount	INT	Not Null	Amount of dead stock
powerPlantTypeID	BIGINT	Not Null	The power plant type
unitID	BIGINT	Foreign Key	The ID of unit

4.5 Interface Design

This section demonstrates the interface design that is being used by the Power Plants Performance Monitoring System (P3MS) for PT PLN (Persero) UP3 Pamekasan. This section will include the design of the page's navigation, which will demonstrate how the page is organized. In addition to that, the user interface design that is shown to the end-user will also be included.

4.5.1 Page Navigation

This There are three distinct user roles that are utilized within this system which are the administrator, the operator staff, and the PIC staff. Figures 4.6, 4.7, and 4.8, respectively, show examples of how to navigate pages according to the various user roles that can be assigned to a user account.

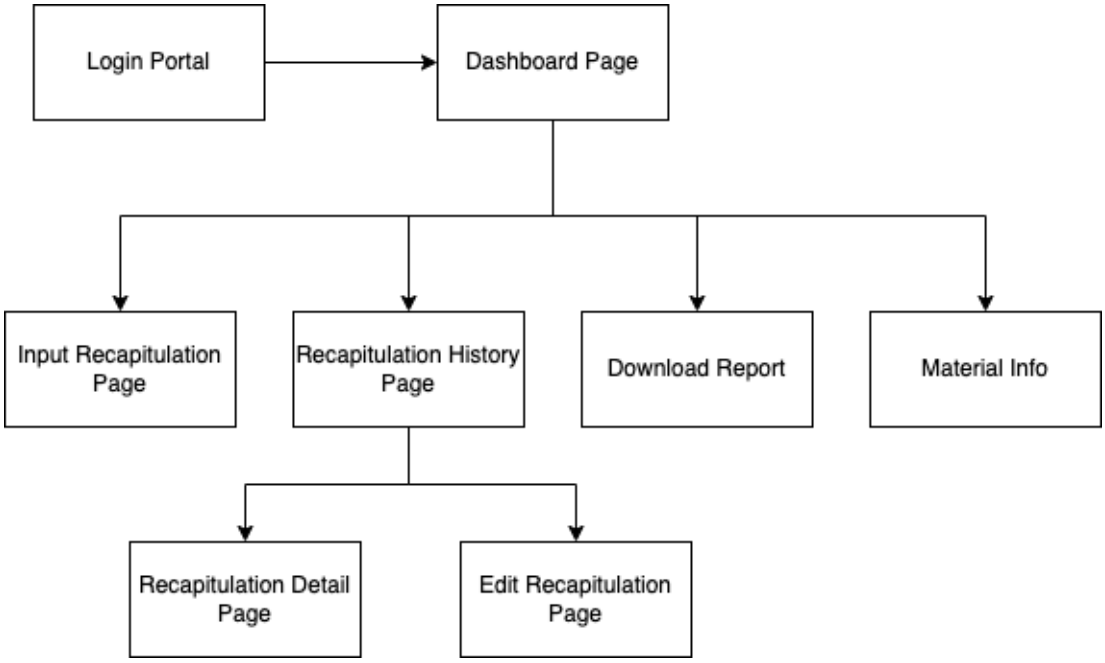

Figure 4.6 Page Navigation of Operator Staff in P3MS

The operator staff will be taken directly to the dashboard page of the system once they have successfully logged in to the system. From the dashboard page, the operator staff has the option to navigate to the pages that allow them to manage input recapitulation, view recapitulation history, download reports, and view material information.

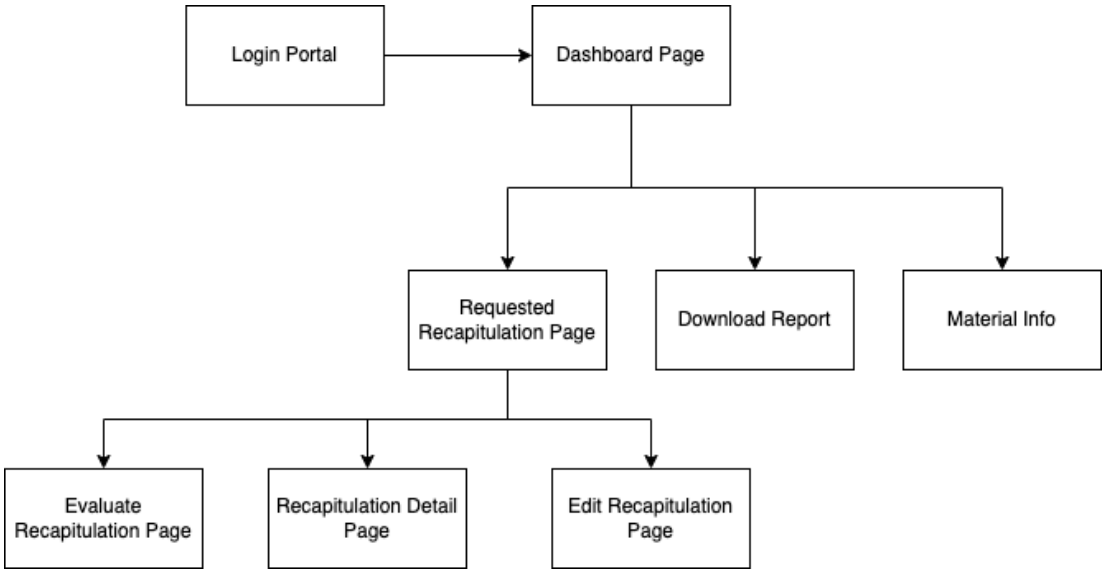

Figure 4.7 Page Navigation of PIC Staff in P3MS

The PIC staff will be taken directly to the dashboard page of the system once they have successfully logged in to the system. From the dashboard page, the PIC staff has the option to navigate to the pages that allow them to manage requested recapitulation, download reports, and view material information.

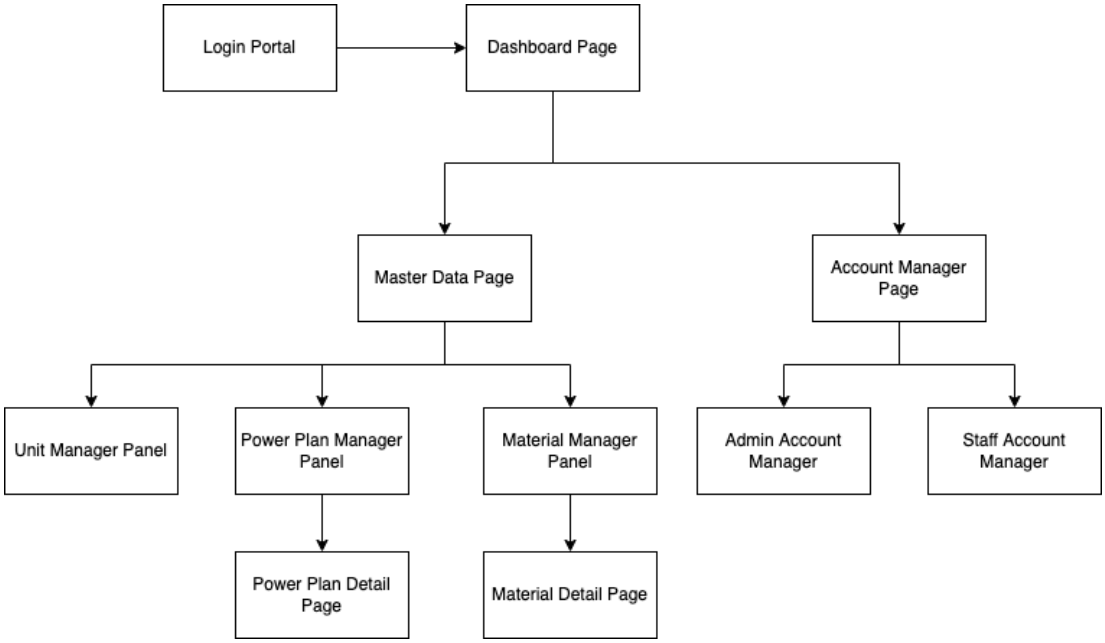

Figure 4.8 Page Navigation of Administrator in P3MS

The administrator will be taken directly to the dashboard page of the system once they have successfully logged in to the system. From the dashboard page, the admin has the option to navigate to the pages that allow them to manage master data or accounts.

4.5.2 User Interface Design

The Some examples of the user interface design of Power Plants Performance Monitoring System (P3MS) are shown in Figure 4.8, Figure 4.9, Figure 4.10, Figure 4.11, and Figure 4.12. . Refer to the System Description Document (SDD) located in Appendix B for further information regarding the user interface design of the Power Plants Performance Monitoring System (P3MS).

Figure 4.9 Staff Login Portal of P3MS

There are two types of login portals, one for staff and one for administrators. An example of a staff login can be seen in the figure above. In order to access the system's main features, users must first enter their username and password on this page.

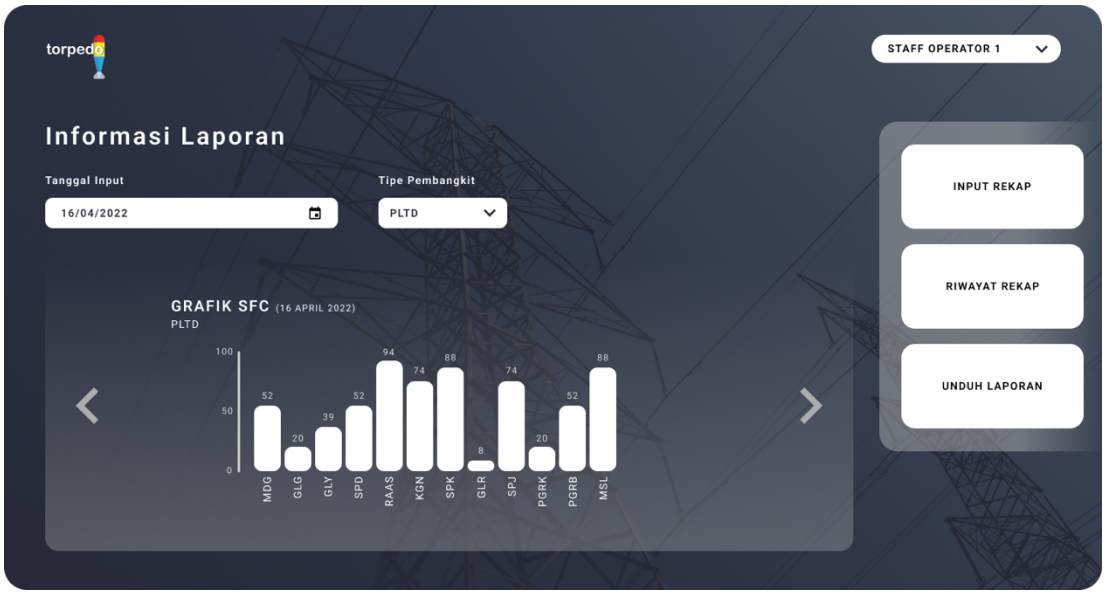

Figure 4.10 Operator Staff Dashboard Page of P3MS

After successfully logging into the system, a dashboard page shown in the figure above will appear. Users can select the activity they wish to perform using this page. In addition to that, a generated report presented in the form of a bar chart is included here. After that, they can swipe to the right or left to view the other bar chart, and they can also make some simple sorting decisions based on the date or the type of power plant.

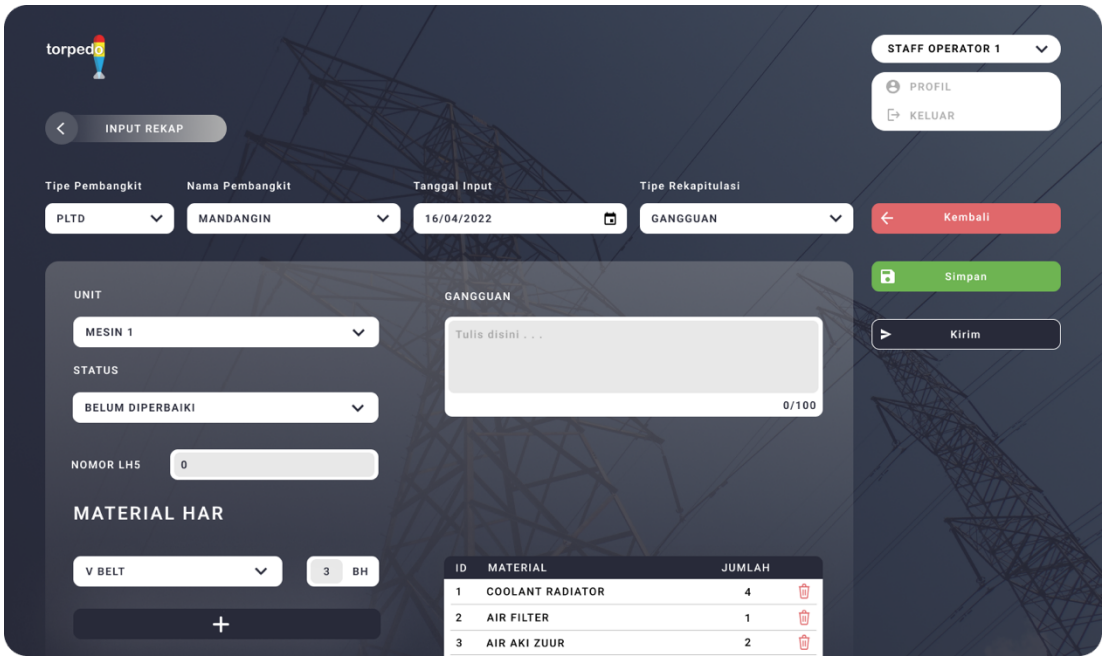

Figure 4.11 Input Recapitulation Page of P3MS

As one of its main features, input recapitulation is a necessary step before a report can be generated. This is where the staff operator will make a summary of the results of the analysis in the field.

Figure 4.12 Evaluate Recapitulation Page of P3MS

After successfully recapitulating the various types of tigers. All data will be processed. However, before being processed, the recap will be analyzed and evaluated by the PIC staff to ensure the accuracy and suitability of the input results. This is where it is as you can see in the figure above.

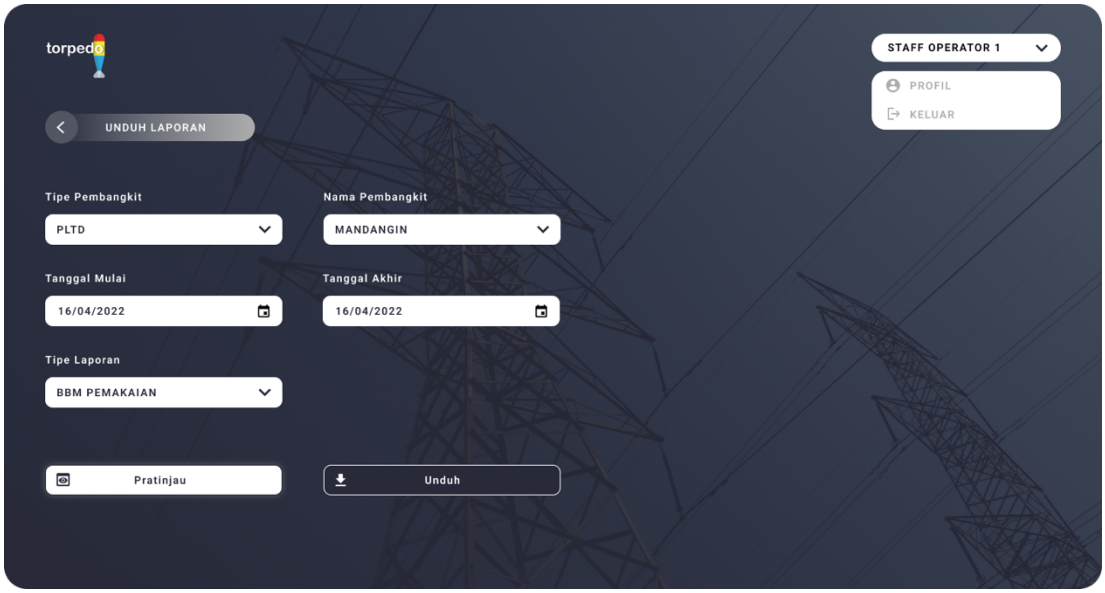

Figure 4.13 Download Page of P3MS

Then finally after all the process, the staff can download the generated report by fill-in the sort field the click download button.

4.6 Chapter Summary

This chapter provides a description of the system design and requirements of the Power Plants Performance Monitoring System (P3MS) for PT PLN (Persero) UP3 Pamekasan. These requirements include both the functional and the non-functional requirements. Use case diagrams, sequence diagrams, and activity diagrams are the three types of UML diagrams that are drawn to illustrate the functionalities of the system. Additionally, the design of the system architecture, the design of the database, and the design of the interface are all discussed in this chapter.

CHAPTER 5

CONCLUSION

5.1 Introduction

The Power Plants Performance Monitoring System is broken down and summarized in this chapter. This project's primary objective is to elicit and analyze the requirements of the project's stakeholders and to relate those requirements to the issues confronted by PT PLN (Persero) UP3 Pamekasan. The next step will involve designing and creating a suitable system to enhance the activity of keeping track of the performance of the power plant. Through the implementation of this project, the organization will be able to easily manage and organize all of the data that is associated with the power plant, such as the daily recapitulation. This will be accomplished by converting the manual system into a computerized system. As a direct consequence of this, the business productivity of the organization will gradually increase as a result. In addition to that, the achievements that have been made throughout PSM 1 will be summed up in this chapter. As a point of reference for the next PSM 2, suggestions for how to improve and implement future projects will be given.

5.2 Achievement of Project Objectives

The issues that PT PLN (Persero) UP3 Pamekasan's stakeholders have faced in regard to the power plant performance monitoring activity have been examined. After compiling a list of the requirements that should be met by stakeholders, the staff of the organization is brought into a discussion to evaluate their level of enthusiasm for using the application. A literature review of existing systems that are analogous to the proposed system is carried out, and the comparisons between the proposed system and the existing systems is detailed in Chapter 2. The methodology that was utilized in the development of the system is briefly explained and discussed as well as included in Chapter 3. Within the SRS, the system requirements are broken down into manageable chunks and thoroughly documented. SDD includes information about the overall detail of system design. STD also contains a list of the system's test cases. Later it will serve as a guide for the next PSM 2.

5.3 Suggestions for Future Improvement

The next PSM 2 will concentrate on the Agile methodology's development and testing phases. It is recommended that the implementation phase be carried out in accordance with the sprints and finished within the allotted time. In order to minimize the chance of a system failure, testing should be performed on a regular basis following each sprint. After the completion of the testing and implementation phases, the system will be put through a user acceptance test to see if it meets user requirements and is ready to be made available to end-users. The results of this test will be used to make a final determination.

In order to improve the Power Plants Performance Monitoring System in the future, it has been decided to investigate the possibility of creating a web-based application that is dedicated to the system and is responsive to all types of devices. In addition, new features like automatically generated reports and user authentication can be added to the project based on the requirements of the stakeholders to ensure that it continues to meet the evolving requirements of the business.

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Appendix A System Requirements Specification

Software Requirements Specification

Power Plants Performance Monitoring System for PT PLN (Persero) UP3 Pamekasan

Version 1.0

23 June 2022

School Of Computing

Prepared by: Thoriqulhaq Jibril Al Qudsy

REVISION PAGE

a. **Overview**

This is the first draft of the Software Requirements Specification for Power Plants Performance Monitoring System for PT PLN (Persero) UP3 Pamekasan.

b. **Target Audience**

- Ms. Habibah Zahra Faluqi, Supervisor, PT PLN (Persero)
- Stakeholder of PT PLN (Persero) UP3 Pamekasan

c. **Project Team Members**

- Thoriqulhaq Jibril Al Qudsy

d. **Version Control History**

Version	**Primary Author(s)**	**Description of Version**	**Date Completed**
Version 1.0	Thoriqulhaq Jibril Al Qudsy	SRS 1.0 of Power Plants Performance Monitoring System for PT PLN (Persero) UP3 Pamekasan	23 June 2022

Note:

This Software Requirements Specification (SRS) template is based on IEEE Std 830-1998, organized by modules according to system features (Appendix A.5 of the IEEE Std, 830-1998, Section 5) and customized to meet the need of SCSJ2203 course at Faculty of Computing, UTM. Compiled and checked by Shahida Sulaiman, PhD on 20 March 2016. Examples of models are from Satzinger (2011).

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1. INTRODUCTION

1.1 Purpose

The main purpose of System Requirement Specification (SRS) documentation is to describe the detailed description of the Power Plants Performance Monitoring System (P3MS) for PT PLN (Persero) UP3 Pamekasan based on requirements including functional and non-functional, features and functionalities. These requirements were gathered from Ms. Habibah Zahra Faluqi as our stakeholder through several interview discussions and negotiations which in the end they agreed with all the requirements. This document is intended for our stakeholders, developers of the system and also the end-user.

1.2 Scope

The proposed system is named Power Plants Performance Monitoring System (P3MS). This system will be specially designed for PT PLN (Persero) UP3 Pamekasan to transform the manual monitoring process into a computerized system, which makes them easier to report, organize and monitor the power plants in future. A web-based system that provides various functionalities such as employee profile management, leave and overtime allowance management, schedule management and attendance record management will be implemented to benefit the organization. The design of this system is user friendly, easy to use and understand so that the end-users can learn quickly and can perform tasks by using this system. There are some limitations of this system. This system will not cover the salary, payroll and performance management of the employees.

1.3 Definitions, Acronyms and Abbreviation

Acronyms	Definitions
P3MS	Power Plants Performance Monitoring System
SRS	Software Requirement Specification
PT PLN (Persero) UP3 Pamekasan	Targeted company of this system
UML	Unified Modelling Language
PIC	Person In Charge

1.4 References

1. IEEE. IEEE Std. 830-1998 IEEE Recommended Practice for Software Requirements Specifications. IEEE Computer Society, 1998.

1.5 Overview

The requirements for the Power Plants Performance Monitoring System for PT PLN (Persero) UP3 Pamekasan are fully defined in three main sections of this document. An overview of the system's features, interactions, and functionality is covered in Section 2. Additionally, Section 2 discusses the distribution of requirements, assumptions and dependencies, and system constraints. The system's specific requirements, such as those for various external interface types, system features, performance requirements, design restrictions, software system attributes, and other requirements, are introduced in Section 3.

2. OVERALL DESCRIPTION

An overview of the Power Plants Performance Monitoring System (P3MS) for the PT PLN (Persero) UP3 Pamekasan proposed system will be provided in this section. To introduce the system's features and show how the end-user can interact with it, a detailed description of the system will be given. For better understanding, a detailed explanation of each system use case's flow will be provided in this section.

In order to get a better understanding and what stakeholders want, we conducted several interviews and negotiations. It went very smoothly. Until finally we came to an agreement and we formulated it into 5 subsystems, each of which has several use cases. The five subsystems that make up the Power Plants Performance Monitoring System (P3MS) are the Recapitulation subsystem, Report subsystem, Account subsystem, Master Data subsystem, and Authentication subsystem. The Administrator, Operator Staff, and PIC Staff are the three actors in this system. Figure 2.1 presents a diagram of the overall use case that was drawn up in order to illustrate the concept of this system that is being proposed.

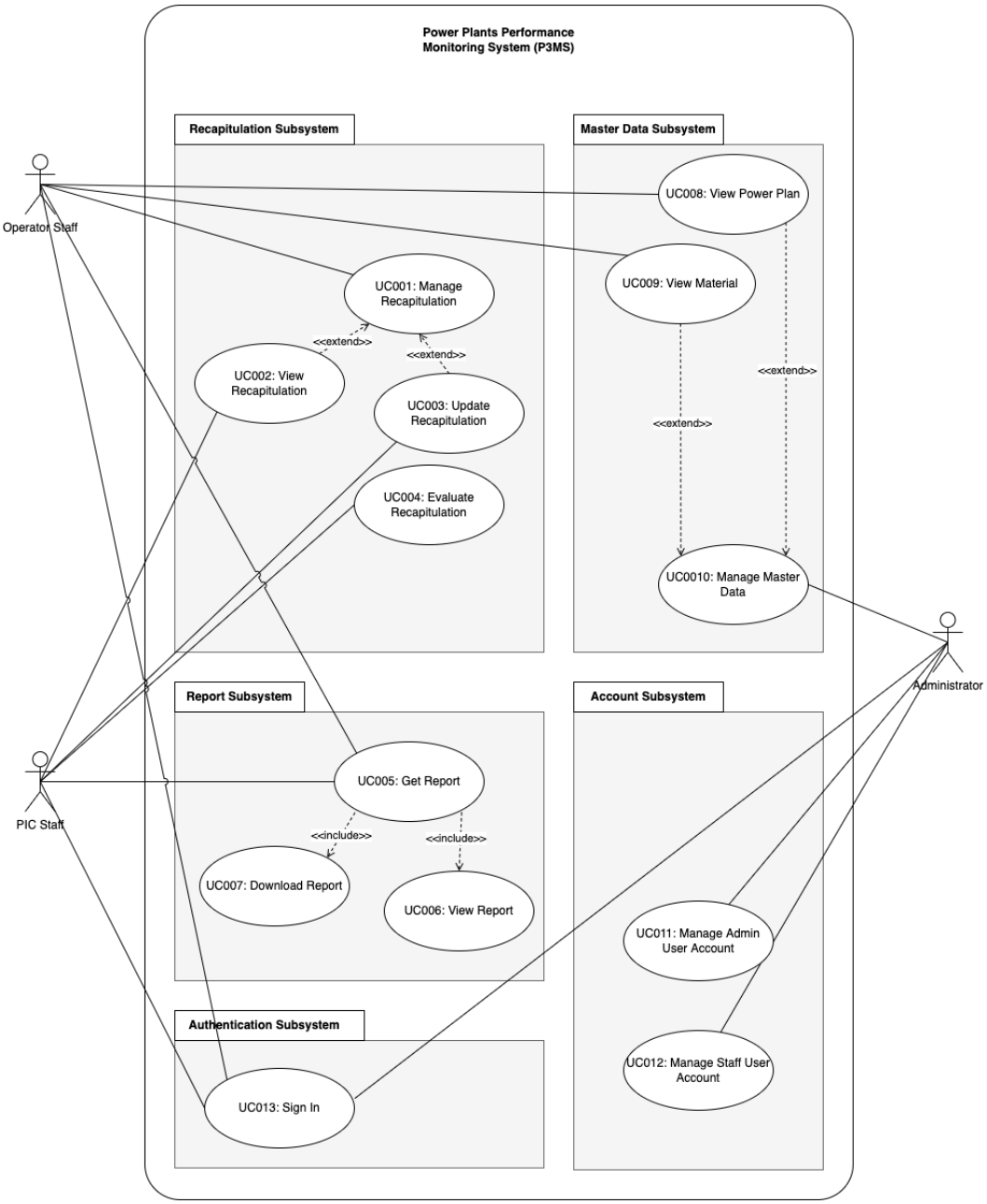

Figure 2.1: Use Case Diagram of P3MS

However, there are details that we need to ask, especially in the recapitulation input section and also in the generate report section. So we did the interview for the umpteenth time. In the end, because we felt that the requirements we got were sufficient, we finally managed to gather some information. Information regarding input recapitulation will be divided into 2 parts, namely PLTS (Solar Power Plant) and PLTD (Diesel Power Plant). For PLTS there is only one type of recapitulation which is the default. Meanwhile, the PLTD will be divided into 9 types of recapitulation, namely Fuel Consumption, Fuel Stock, Lubricants, Kwh, Loads, Planned HAR, Realized HAR, Maintenance and Fast Moving. Each type of recapitulation has a different data field which will be discussed in detail in the database design and user interface design sections for more details. As for the generate report section, it will be divided into 2, namely one that can be displayed in the user interface later and one that is downloadable. For what is contained in the user interface, only reports based on bar charts from all PLTS and PLTD. Meanwhile, the downloadable report will display statistical data from selected power plants within a predetermined timeframe. The statistical data will be taken from the daily recapitulation that has been inputted previously. For the bar chart that will be displayed in the user interface, there will be 2 graphs from PLTS and 5 graphs from PLTD. The graphs will be described in Table 2.1 along with the formula that has been determined for its calculation.

Table 2.1: Generated Graph Information

No	Type	Graph Name	Formula	Unit
1	PLTS	Load	Total Loads	kW
2		Kwh Production	Early Stand - Final Stand	kWh
3	PLTD	Fuel Stock	Total Main Tank + Total Daily Tank	Litre
4		Fuel Consumption	(Daily Physical Stock + Daily Physical Receipt) - Yesterday's Physical Stock	Litre
5		SFC	Fuel Consumption / Total Engine Module (PCC 3300)	Litre
6		HOP	(Total Physical Stock - Dead Stock) / Estimated Usage	Day
7		Kwh Production	Total Engine Module (PCC 3300)	kWh

2.1 Product Perspective

This SRS describes a system called Power Plants Performance Monitoring System (P3MS), which is our proposed solution. It is a computerized system developed for the stakeholders of PT PLN (Persero) UP3 Pamekasan, an Indonesian government-owned which has a monopoly on electricity distribution in Indonesia and generates the majority of the country's electrical power. This product will be of great benefit to the stakeholders because it assists them in developing an automated system that is more effective than the manual power plant performance activity process that they were previously using. By utilizing this system, the administrator will have an easier time managing the master data that is related to the power plan needs. The operator staff at the power plant is able to perform a recapitulation of the power plant's performance statistics in an easier and quicker manner. The PIC staff is capable of accurately evaluating the recapitulation through the use of the system. All of that will be done synchronously and centralized. Additionally, complete implementation of authorized access can be found within this system. The purpose of this system is to improve the company's ability to monitor the performance of its power plants.

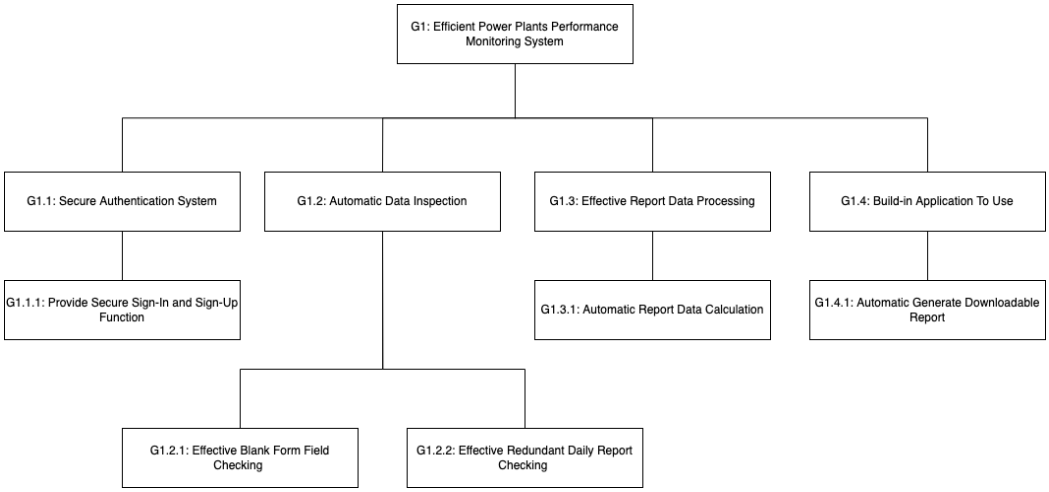

Figure 2.2: Block Diagram of P3MS

2.1.1 System Interfaces

The Power Plants Performance Monitoring System (P3MS) will be developed with a web-based approach. This web-based system will be implemented using the Laravel framework with the PHP programming language. The database used for this system is MySQL with the help of DataGrip as a DBMS.

2.1.2 User Interfaces

The Power Plants Performance Monitoring System (P3MS) will have user interfaces that are designed in a straightforward manner in order to make the system user-friendly and straightforward even for a novice to operate. The language that is utilized in this system is Indonesian, which is a language that can be comprehended by the majority of workers in Indonesia. For each user, the system has different levels of access and a variety of user interfaces. Below are brief descriptions of the user interfaces for each role.

2.1.2.1 Login Interfaces

This system's login interface allows all end users, including administrators, operator staff, and pic staff, to access specific features and perform specific tasks.

2.1.2.2 Main Interfaces for Operator Staff

The main interface is displayed after the administrator successfully log in to the system. Administrator can perform various tasks such as manage employee account, manage leave and overtime application, manage schedule and view the attendance of employee through this interface.

2.1.2.3 Login Interfaces for PIC Stuff

The main interface is displayed after the administrator successfully log in to the system. Administrator can perform various tasks such as manage employee account, manage leave and overtime application, manage schedule and view the attendance of employee through this interface.

2.1.2.4 Login Interfaces for Administrator

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2.1.3 Hardware Interfaces

This web-based system can be accessed through desktop computers as well as laptops provided that the computers have a web browser installed. It will be necessary to have a stable internet connection in order to use the system.

2.1.4 Software Interfaces

Accessing this system requires a web browser, and you must be connected to the internet in order to achieve the highest level of performance possible from the operation of the system. There are a variety of web browsers, such as Google Chrome, Mozilla Firefox, Microsoft Edge, Apple Safari, and Opera, that are all capable of accessing this system. Some of these browsers are listed above.

2.1.5 Communication Interfaces

Communication carried out over the internet makes use of dependable TCP/IP protocols like HTTP and FTP in order to ensure the highest level of compatibility and dependability possible.

2.1.6 Memory

Memory utilization is subject to the capabilities of the hardware platform that is designed to operate this system. At this time, it is not possible to provide an accurate estimate regarding the actual amount of memory that is being utilized.

2.1.7 Operations

To use this system, end-users must go to the company's website and click on a link that has been set up specifically for them. The company's administrator will be given the initial login information by the developers. As soon as they have successfully logged into the system, they have the option of changing their login information at their account management page. In order for the staff to log in to the system, they need to have an account that has been created for them by the administrator. Otherwise, new and unregistered employees will be unable to access the system. Each user's ability to use the system's features is constrained by their individual roles within the system's architecture.

2.1.8 Site Adaptation Requirements

Since it is a web-based system, it is compatible with the vast majority of platforms and can be accessed through any web browser that is compatible with that platform's operating system. As a result, this system does not necessitate any platform-specific adjustments. End users will be able to access this system in order to carry out a variety of tasks through this system once the system has been deployed and released to the server. End users will be able to access this system by browsing a specific website link that has been developed for the company.

2.2 Product Functions

Table 2.2 provides a concise explanation of how the product functions in accordance with the system modules.

Table 2.2: Product Function of P3MS

Module	**Product Function**	**Description**
Recapitulation	Manage Recapitulation	Allow the operator staff to create a new recapitulation or view, update, and delete an existing recapitulation.
	View Recapitulation	Allow the PIC staff to view a list of requested recapitulations.
	Update Recapitulation	Allow the PIC staff to update the requested recapitulations.
	Evaluate Recapitulation	Allow the PIC staff to evaluate the requested recapitulations, whether they are approved or rejected.
Report	Get Report	Allow operator staff and PIC staff to get the generated report results.
	View Report	Allow operator staff and PIC staff to view the generated report results.
	Download Report	Allow operator staff and PIC staff to download the generated report results.
Master Data	Manage Power Plant	Allow the administrator to add a new power plant or view, update, and delete an existing power plant.

	Manage Material	Allow the administrator to add new material or view, update, and delete existing material.
	Manage Master Data	Allow the administrator to add a new chosen master data or view, update, and delete an existing chosen master data.
Account	Manage Admin User Account	Allow the administrator to add a new admin user account or view, update, and delete an existing admin user account.
	Manage Staff User Account	Allow the administrator to add a new staff user account or view, update, and delete an existing admin staff account.
Authentication	Sign In	Allow all users to authenticate their account credentials before being able to access the main system features.

2.3 User Characteristics

The user characteristics based on the different user types involved in this system are briefly described in Table 2.2.

Table 2.2: User Character of P3MS

No	User	Characteristic
1	Administrator	This user helps the company to manage user accounts, including staff and the administrator itself. Also, manage master data, including managing units, managing power plants, and managing the material.
2	Operator Staff	This user has access to recap and submit all the power plants. performance statistic data to the system. Besides creating a recapitulation, they can view, update, and delete it. In the end, they can get the generated report either downloaded to an excel file or viewed directly from the website.
3	PIC Staff	This user has access to evaluate all the recapitulations that were already submitted by operator staff, either rejected or approved. Besides evaluating a recapitulation, they can view and update the recapitulation directly if it is felt that there is no need for more revisions from the operator staff. In the end, they can get the generated report either downloaded to an excel file or viewed directly from the website.

2.4 Constraints

The following are the general constraints of this system:

I. The system should be compatible with various web browsers.
II. In order for the system to work properly on the device that is supposed to run it, the device needs to have a reliable internet connection.
III. The system needs to be responsive, intuitive, and easy to use, with straightforward user interfaces that are appropriate for the functions of a power plant performance monitoring system.
IV. The language that is utilized within the system must be Indonesian to ensure that it is comprehensible to the majority of workers in Indonesia.

2.5 Assumption and Dependencies

In order to use this system, a working web browser, and an internet connection. It is possible that the system will not function properly if the devices used to access it do not have a web browser, a stable internet connection, or any of the other minimum requirements. While this is a major factor, it's also important to keep an up-to-date database for the Power Plants Performance Monitoring System, which holds all of this data. Consequently, the database is assumed to be unusable in the event of an outage, as only users with pre-assigned login details will be granted access to the Power Plants Performance Monitoring System.

New functionalities or features requested by stakeholders may be added to the software during development, which will alter the requirements' interdependencies. The time required to design and implement these new features is entirely dependent on the time needed to develop and implement the original ones. The system's requirements may be modified in response to these changes.

2.6 Apportioning of Requirements

Several requirements could be carried over to the next version of the app if this project's development is delayed. Those are some of the requirements that are going to be worked on for the second release. As a starting point for the second release, the SDD of the Power Plants Performance Monitoring System contains a detailed list of all available functions.

3. SPECIFIC REQUIREMENTS

Within this section, both the functional and non-functional requirements of the system are discussed. This section also includes the presentation of use case specifications, as well as the respective sequence diagrams and activity diagrams for each use case.

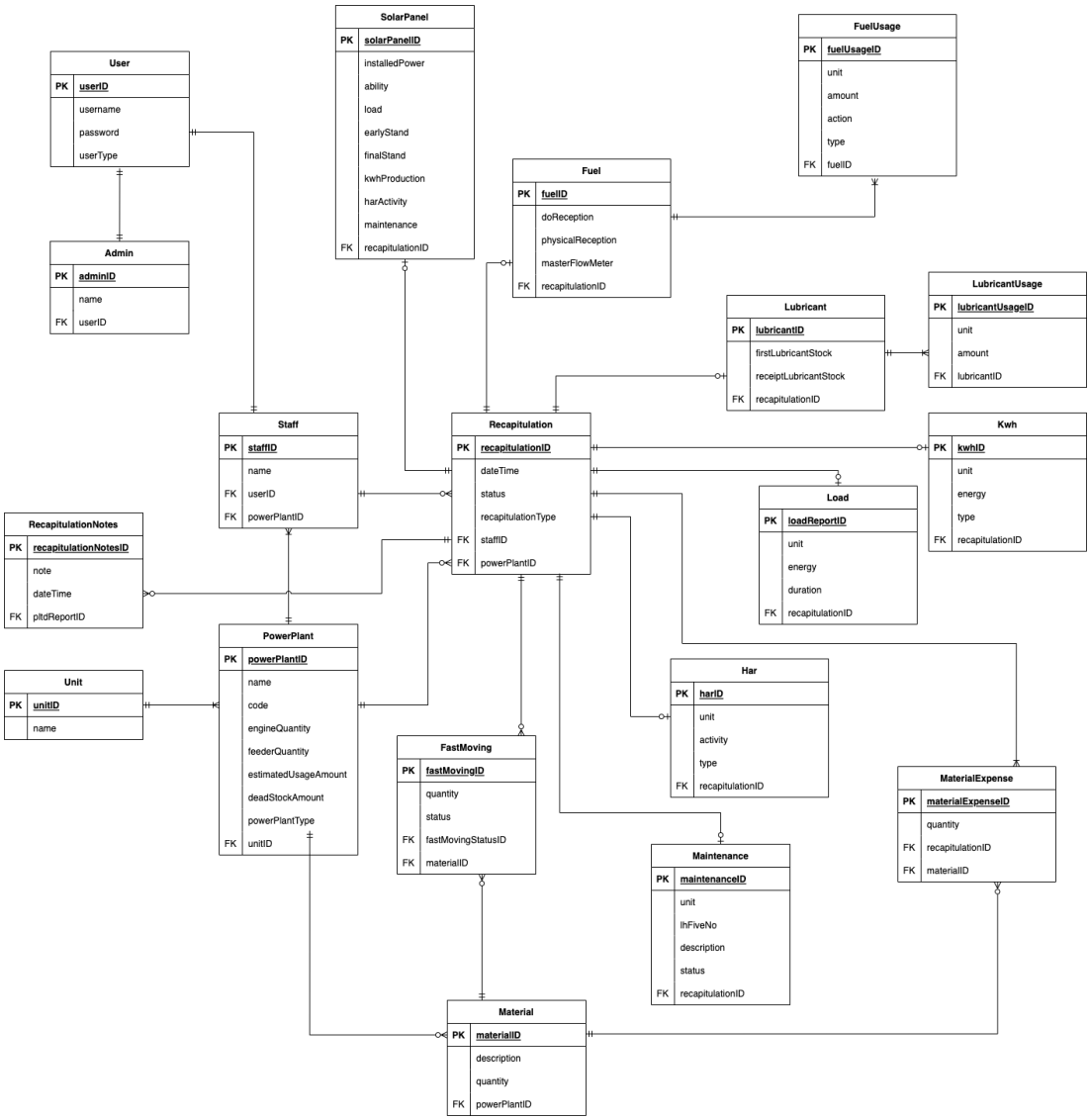


Figure 3.1: Domain Model of P3MS

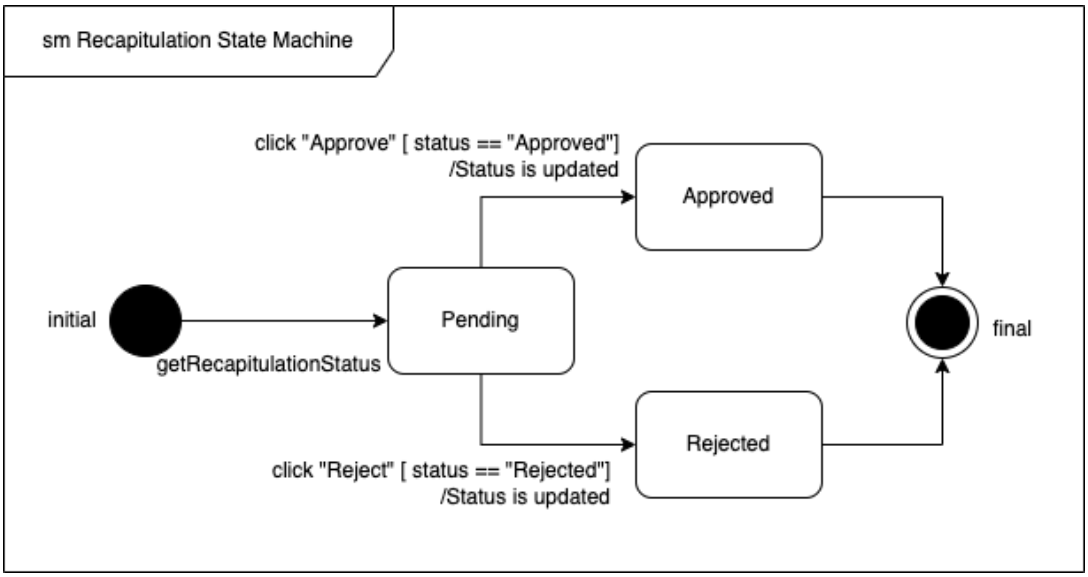


Figure 3.2: State Machine Diagram of Recapitulation

3.1 External Interface Requirements

3.1.1 User Interfaces

The user interfaces for different roles are described in detail in the following subsections.

3.1.1.1 Login Interfaces

Through the use of the system's login interface, all of the end-users, which include administrator operator staff and PIC staff, are able to log in to the system. This allows them to access the main system features or perform any particular tasks. Input fields for the username and password will be shown on this page. To access the system, a user must have a registered account and provide a username and password. The user can then log in to the system by clicking the login button after providing the username and password that were provided earlier.

3.1.1.2 Main Interfaces for Administrator

Through the use of the system's login interface, all of the end-users, which include administrator operator staff and PIC staff, are able to log in to the system. This allows them to access the main system features or perform any particular tasks. Input fields for the username and password will be shown on this page. To access the system, a user must have a registered account and provide a username and password. The user can then log in to the system by clicking the login button after providing the username and password that were provided earlier.

3.1.1.3 Main Interfaces for Operator Staff

Through the use of the system's login interface, all of the end-users, which include administrator operator staff and PIC staff, are able to log in to the system. This allows them to access the main system features or perform any particular tasks. Input fields for the username and password will be shown on this page. To access the system, a user must have a registered account and provide a username and password. The user can then log in to the system by clicking the login button after providing the username and password that were provided earlier.

3.1.1.4 Main Interfaces for PIC Staff

Through the use of the system's login interface, all of the end-users, which include administrator operator staff and PIC staff, are able to log in to the system. This allows them to access the main system features or perform any particular tasks. Input fields for the username and password will be shown on this page. To access the system, a user must have a registered account and provide a username and password. The user can then log in to the system by clicking the login button after providing the username and password that were provided earlier.

3.1.2 Hardware Interfaces

In order to use this system, you'll need a web browser on either your desktop or laptop computer. The system can only be accessed with a reliable internet connection. System failures can be caused by unstable internet connections or web browser malfunctions.

3.1.3 Software Interfaces

In order to access this system, you will need a web browser and a connection to the internet in order for the system to function properly. There are a variety of web browsers, such as Google Chrome, Mozilla Firefox, Microsoft Edge, Apple Safari, and Opera, that are all capable of accessing this system. It is essential to frequently update your web browser in order to get the most out of your computer system.

3.1.4 Communication Interfaces

In order to maintain consistent communication between its various components, this system allows users to log in using a web browser connected to a local area network (LAN). In addition, trustworthy TCP/IP protocols like HTTP and FTP are utilized for internet-based communication in order to guarantee the highest possible level of compatibility and dependability.

3.2 System Features

Detailed functional requirements for each module are outlined in this section, along with use case scenarios and their corresponding sequence diagrams and activity diagrams.

3.2.1 Module Recapitulation Subsystem

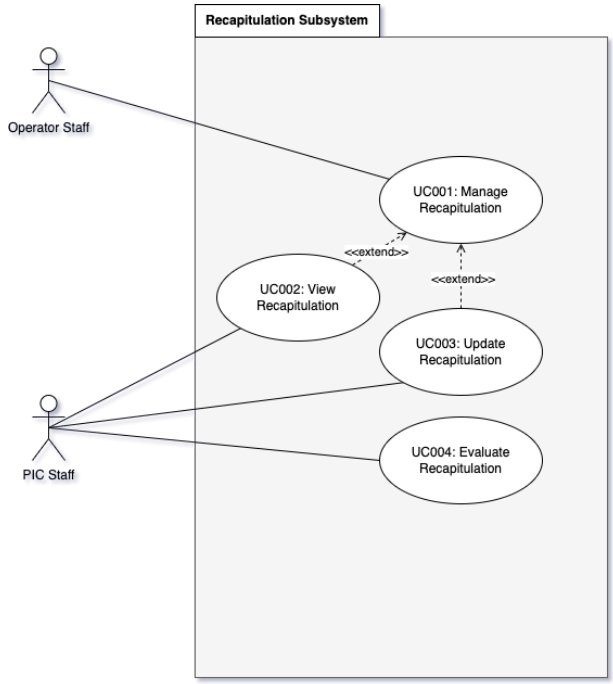


Figure 3.3: Module Recapitulation Subsystem

The functional requirements of this module are stated below.

I. FR001: Create Recapitulation - The system shall allow the operator staff to create a new recapitulation.

II. FR002: View Recapitulation - The system shall allow the operator staff and PIC staff to view the existing recapitulation.

III. FR003: Update Recapitulation - The system shall allow the operator staff and PIC staff to update the existing recapitulation.

IV. FR004: Delete Recapitulation - The system shall allow the operator staff to delete the existing recapitulation.

V. FR005: Evaluate Recapitulation - The system shall allow the PIC staff to evaluate the requested recapitulation.

3.2.1.1 UC001: Use Case Manage Recapitulation

Table 3.1: Use Case Description for Manage Recapitulation

Use Case ID	UC001
Use Case Name	Manage Recapitulation
Description	This use case allows the operator staff to create, view, update, and delete the recapitulation.
Actor(s)	Operator Staff
Pre-conditions	User must be logged in to the system as an operator staff with a valid login credential.
Normal Flow	1. The operator staff redirects to the staff dashboard page after successfully logging in. 2. The operator staff clicks on the “Input Recapitulation” button. 3. The system will redirect the operator staff to the input recapitulation page. 4. The operator staff chooses the power plant type. 5. The operator staff chooses the power plant name. 6. The operator staff chooses the date input. 7. The operator staff chooses the recapitulation type. 8. The system will display a recapitulation form based on the chosen recapitulation type. 9. The operator staff input all required fields on the recapitulation form. 10. The operator staff clicks on the “Submit” button. If the operator staff clicks on the “Cancel” button, AF1 will be performed. If the operator staff clicks on the “Save” button, AF2 will be performed. If the form is not fully full-filled or the required fields are blank, EF 1 will be performed. 11. The system saves all the information inputted by the operator staff to the database. 12. The system will redirect the operator staff to the recapitulation history page and display new

	recapitulation information. 13. If the operator staff clicks on the “Edit” button, AF3 will be performed. 14. If the operator staff clicks on the “Delete” button, AF4 will be performed.
Alternative Flow	1. Cancel recapitulation’s input 1.1. The system will redirect the operator staff to the staff dashboard page. 2. Save recapitulation’s input 2.1. The system will redirect the operator staff to the recapitulation history page. 3. Update Recapitulation 3.1. The system will display a recapitulation edit form. 3.2. The operator staff updates the specific field that needed to be updated. 3.3. The operator staff clicks on the “Update” button. If the form is not fully full-filled or the required fields are blank, EF 1 will be performed. 3.4. The system saves all the information inputted by the operator staff to the database. 3.5. The system will redirect the operator staff to the recapitulation history page and display new recapitulation information. 4. Delete Recapitulation 4.1. The system displays a confirmation dialogue. 4.2. The operator staff continues by clicking the “Yes” button. 4.3. The system deleted selected recapitulation data from the database. 4.4. The system will reload the recapitulation history page.
Exception Flow	1. Required fields in the recapitulation form are empty or the form is blank. 1.1. The system displays an error message. 1.2. Continue NF9 / AF3.2 .

Post Conditions	1. The operator staff has successfully created a new recapitulation. 2. The operator staff has successfully viewed the existing recapitulation. 3. The operator staff has successfully updated the existing recapitulation. 4. The operator staff has successfully deleted the existing recapitulation.
Related Requirement	-

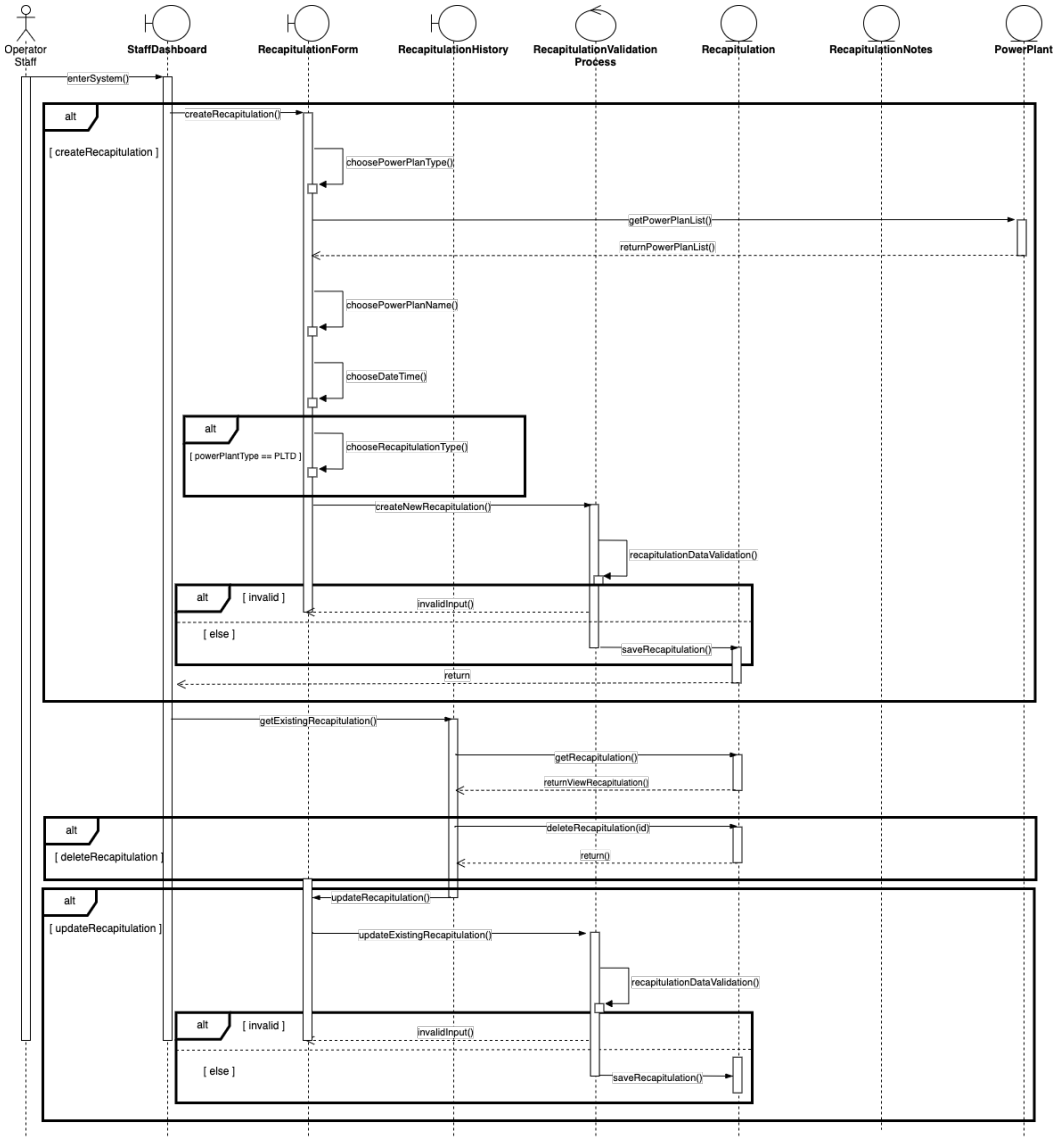


Figure 3.4: System Sequence Diagram of Manage Recapitulation

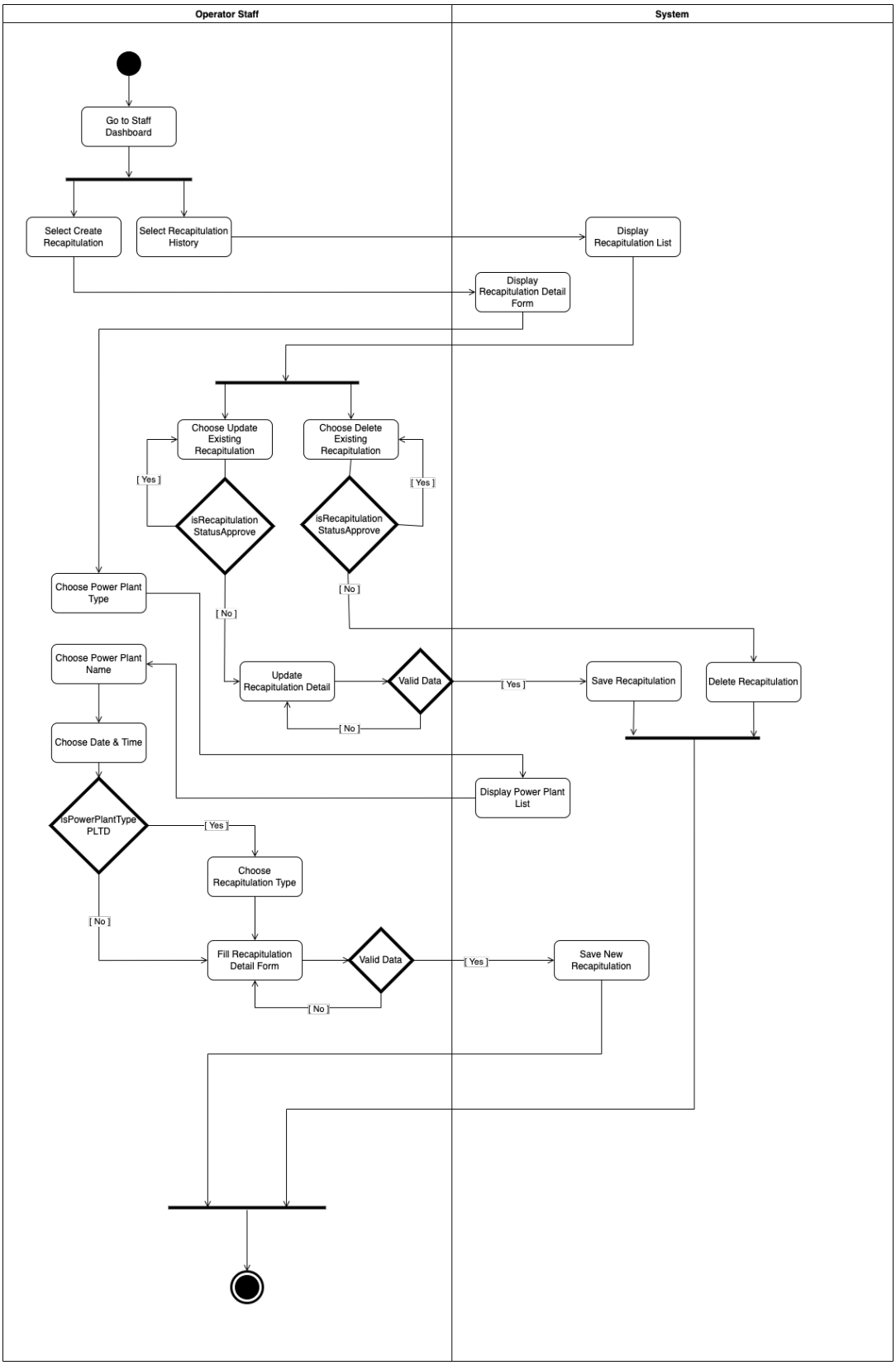


Figure 3.5: Activity Diagram of Manage Recapitulation

3.2.1.2 UC002: Use Case View Recapitulation

Table 3.2: Use Case Description for View Recapitulation

Use Case ID	UC002
Use Case Name	View Recapitulation
Description	This use case allows the PIC staff to view the list of recapitulation which has been created by the operator staff
Actor(s)	PIC Staff
Pre-conditions	User must be logged in to the system as a PIC staff with a valid login credential.
Normal Flow	1. The PIC staff redirects to the staff dashboard page after successfully logging in. 2. The PIC staff clicks on the "Requested Recapitulation" button. 3. The system will redirect the PIC staff to the requested recapitulation page and display the list of requested, approved or rejected recapitulations based on the power plant they manage. If the list of recapitulation is empty, EF 1 will be performed. 4. The PIC staff clicks on one of the recapitulations. 5. The system will display the detailed information of the recapitulation.
Alternative Flow	-
Exception Flow	1. The list of recapitulations is empty. 1.1. The system displays "Empty".
Post Conditions	1. The PIC staff has successfully viewed the list of recapitulation and the detail of recapitulation.
Related Requirement	-

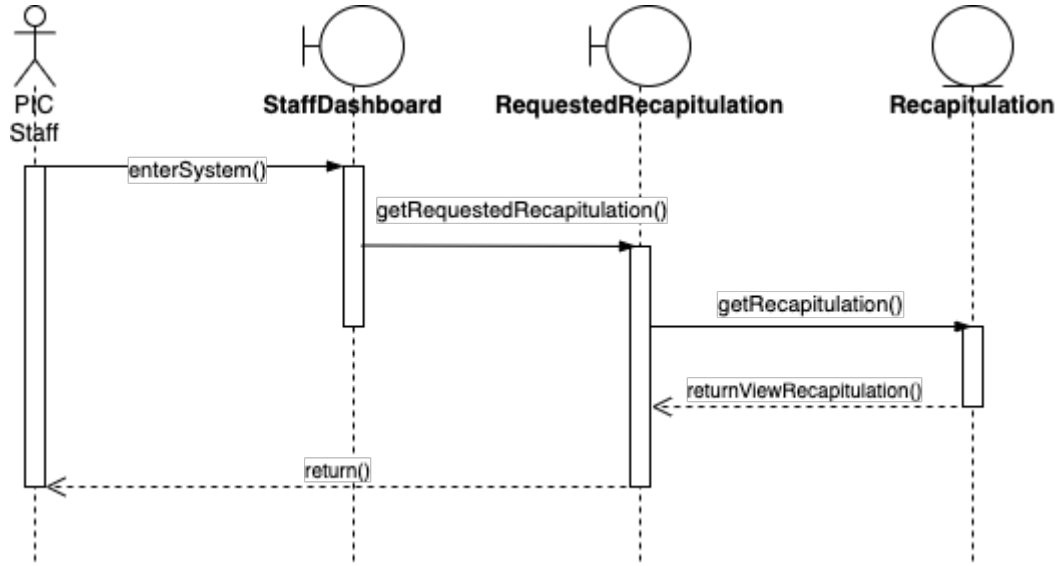


Figure 3.6: System Sequence Diagram of View Recapitulation

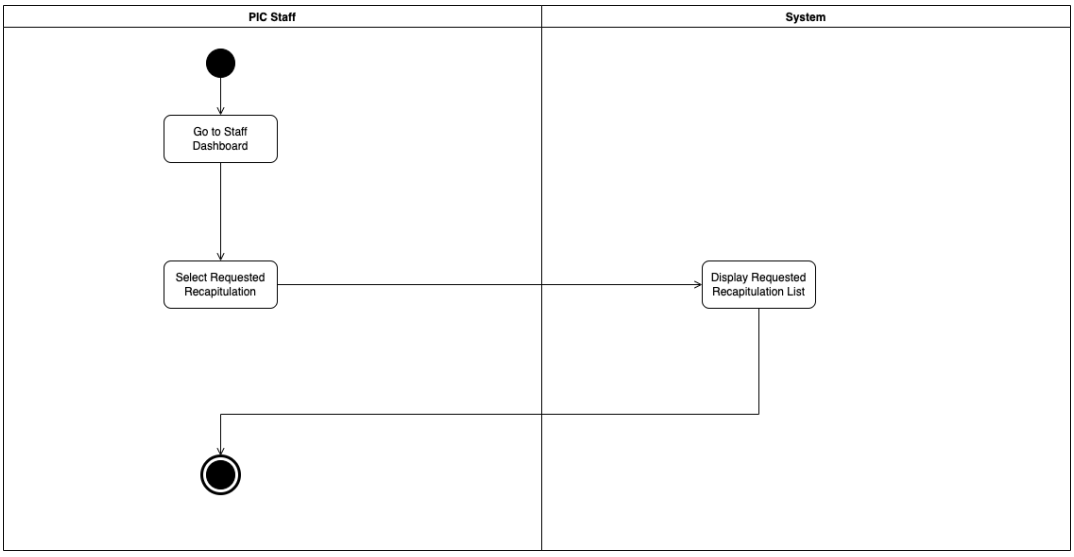


Figure 3.7: Activity Diagram of View Recapitulation

3.2.1.3 UC003: Use Case Update Recapitulation

Table 3.3: Use Case Description for Update Recapitulation

Use Case ID	UC003
Use Case Name	Update Recapitulation
Description	This use case allows the PIC staff to update the recapitulation which has been created by operator staff
Actor(s)	PIC Staff
Pre-conditions	User must be logged in to the system as a PIC staff with a valid login credential.
Normal Flow	1. The PIC staff redirects to the staff dashboard page after successfully logging in. 2. The PIC staff clicks on the "Requested Recapitulation" button. 3. The system will redirect the PIC staff to the requested recapitulation page and display the list of requested, approved or rejected recapitulations based on the power plant they manage. If the list of recapitulation is empty, EF 1 will be performed. 4. The PIC staff click the "Edit" button on one of the recapitulations. 5. The system will display a recapitulation edit form. 6. The PIC staff updates the specific field that needs to be updated 7. The PIC staff clicks on the "Update" button. If the form is not fully full-filled or the required fields are blank, EF 2 will be performed. 8. The system saves all the information inputted by the PIC staff to the database. 9. The system will redirect the PIC staff to the requested recapitulation page and display new recapitulation information.
Alternative Flow	-
Exception Flow	1. The list of recapitulations is empty.

	1.1. The system displays “Empty”. 2. Required fields in the recapitulation form are empty or the form is blank. 2.1. The system displays an error message. 2.2. Continue NF6.
Post Conditions	1. The PIC staff has successfully updated the detail of recapitulation.
Related Requirement	-

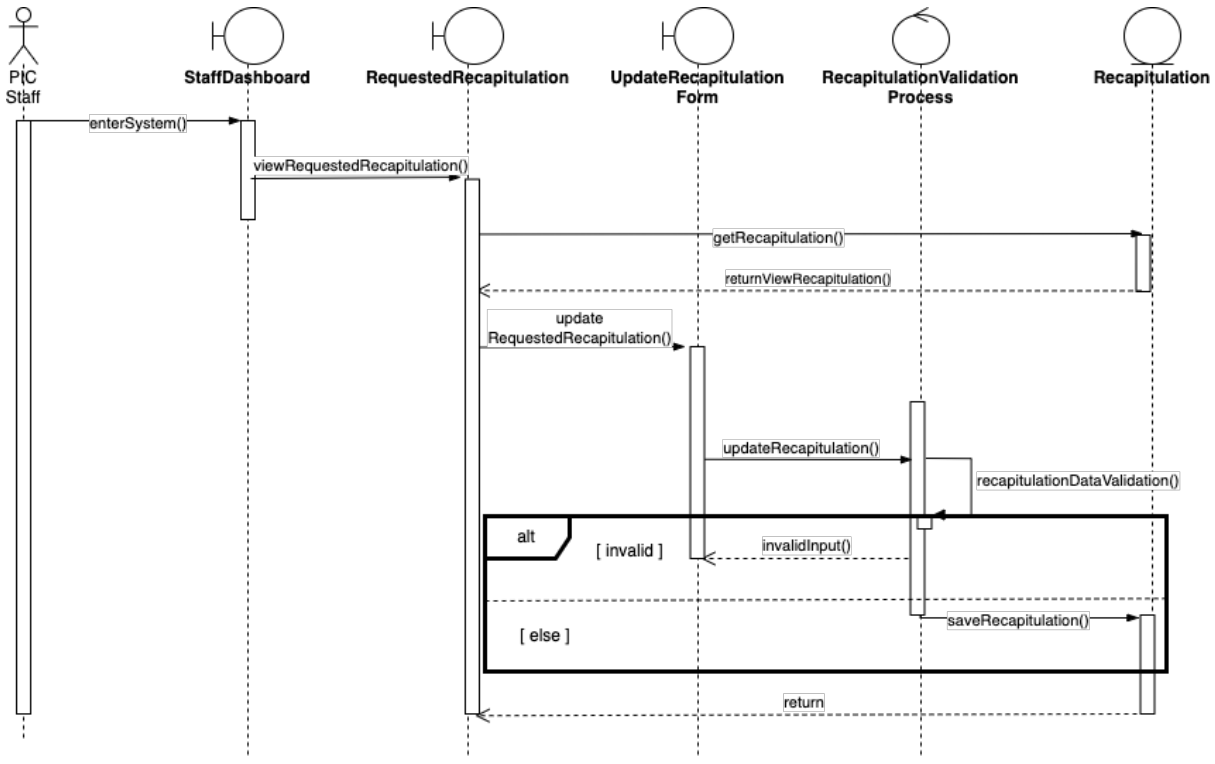


Figure 3.8: System Sequence Diagram of Update Recapitulation

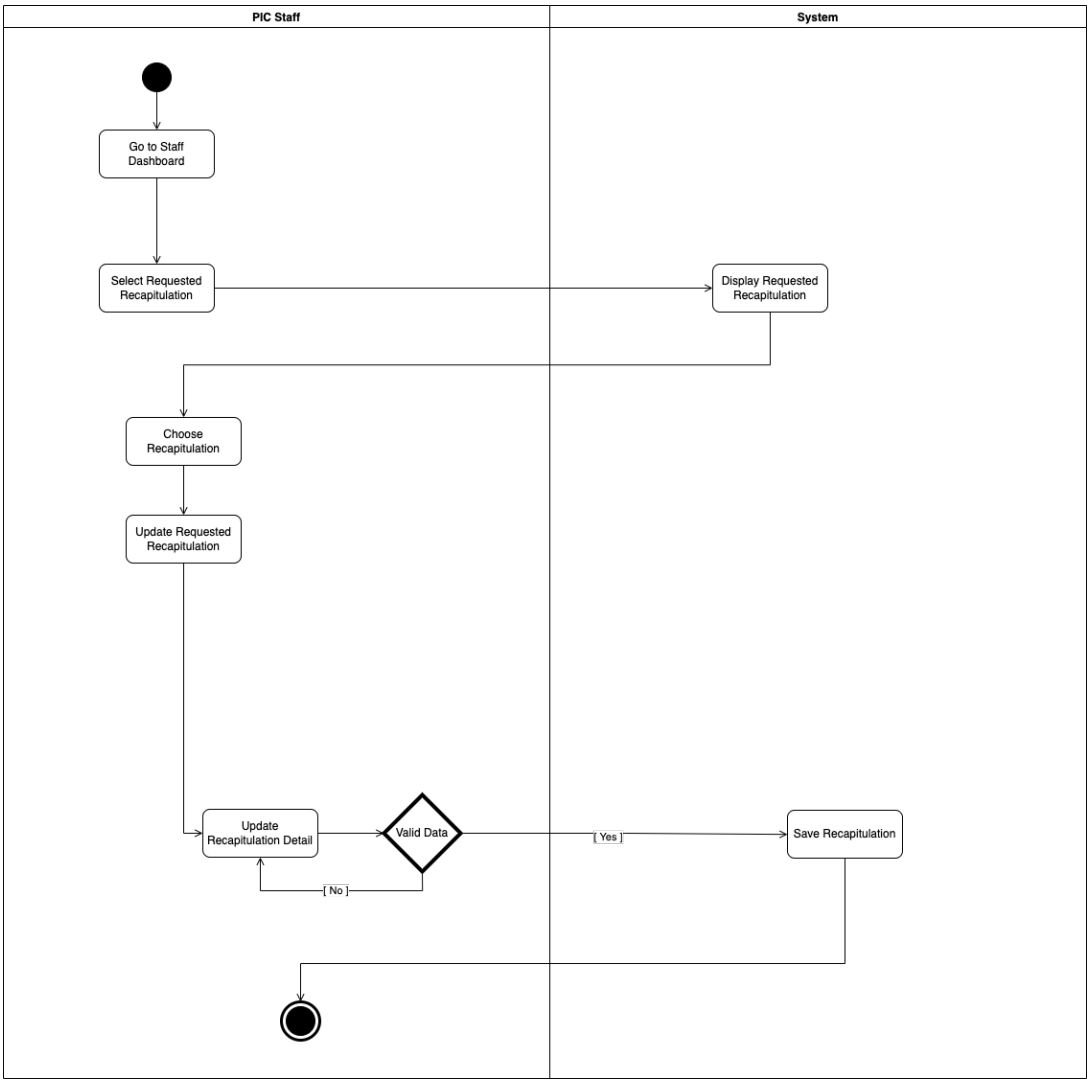


Figure 3.9: Activity Diagram of Update Recapitulation

3.2.1.4 UC004: Use Case Evaluate Recapitulation

Table 3.4: Use Case Description for Evaluate Recapitulation

Use Case ID	UC004
Use Case Name	Evaluate Recapitulation
Description	This use case allows the PIC staff to evaluate the recapitulation which has been created by the operator staff
Actor(s)	PIC Staff
Pre-conditions	User must be logged in to the system as a PIC staff with a valid login credential.
Normal Flow	1. The PIC staff redirects to the staff dashboard page after successfully logging in. 2. The PIC staff clicks on the "Requested Recapitulation" button. 3. The system will redirect the PIC staff to the requested recapitulation page and display the list of requested, approved or rejected recapitulations based on the power plant they manage. If the list of recapitulation is empty, EF 1 will be performed. 4. The PIC staff click the "Evaluate" button on one of the recapitulations. 5. The system will display a evaluate recapitulation panel. 6. The PIC staff can start evaluating the recapitulation whether approved or rejected. If the recapitulation result is rejected, AF1 will be performed. 7. If PIC staff want to add any additional notes, AF3 will be performed. 8. Update recapitulation status to "approved" by clicking the "Approved" button. 9. The system updates the status of chosen recapitulation by the PIC staff to the database. 10. The system will redirect the PIC staff to the requested recapitulation page and update the list

	of recapitulations.
Alternative Flow	1. The recapitulation result is rejected 1.1. If PIC Staff wants to make a direct revision on the recapitulation, AF2 will be performed. 1.2. The system saves all the information inputted by the PIC staff to the database. 1.3. Update recapitulation status to “rejected” by click the “Rejected” button. 1.4. The system updates the status of chosen recapitulation by the PIC staff to the database. 1.5. The system will redirect the PIC staff to the requested recapitulation page and update the list of recapitulations. 2. Direct revision by updating recapitulation 2.1. The PIC staff clicks on the “Edit” button. 2.2. The system will display a recapitulation edit form. 2.3. The PIC staff updates the specific field that needed to be updated 2.4. The PIC staff clicks on the “Update” button. If the form is not fully full-filled or the required fields are blank, EF 1 will be performed. 2.5. The system saves all the information inputted by the PIC staff to the database. 2.6. The system will redirect the PIC staff to the evaluate recapitulation panel and display new recapitulation information. 2.7. Continue NF7. 3. Make additional notes 3.1. Fill in the additional notes in the note field that was already provided. 3.2. The PIC staff clicks on the “Add Note” button.

	3.3. The system saves all the notes inputted by the PIC staff to the database. 3.4. Continue NF8 / AF1.3 .
Exception Flow	1. Required fields in the recapitulation form are empty or the form is blank. 1.1. The system displays an error message. 1.2. Continue AF2.3 .
Post Conditions	1. The PIC staff has successfully evaluated the recapitulation.
Related Requirement	-

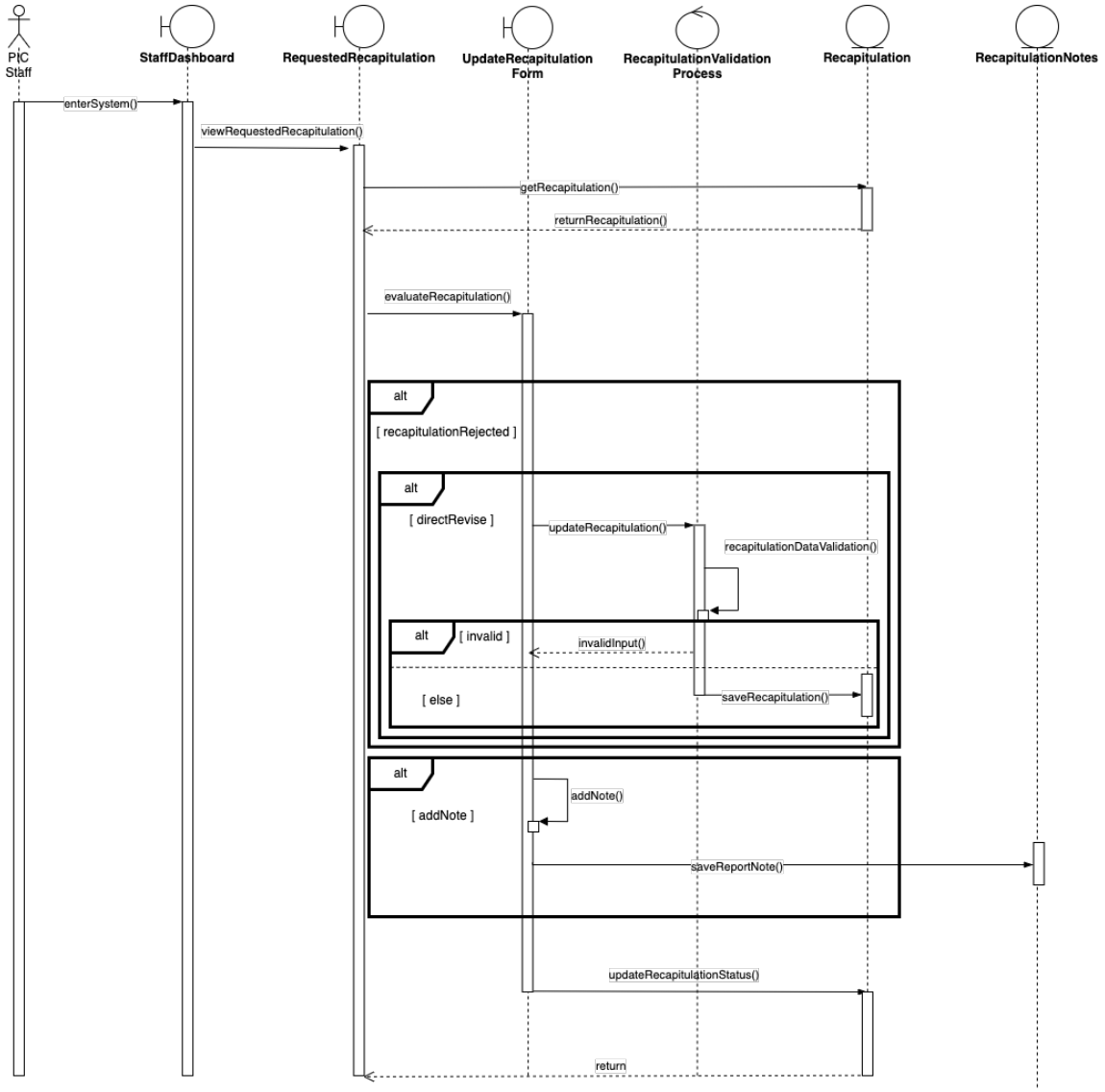


Figure 3.10: System Sequence Diagram of Evaluate Recapitulation

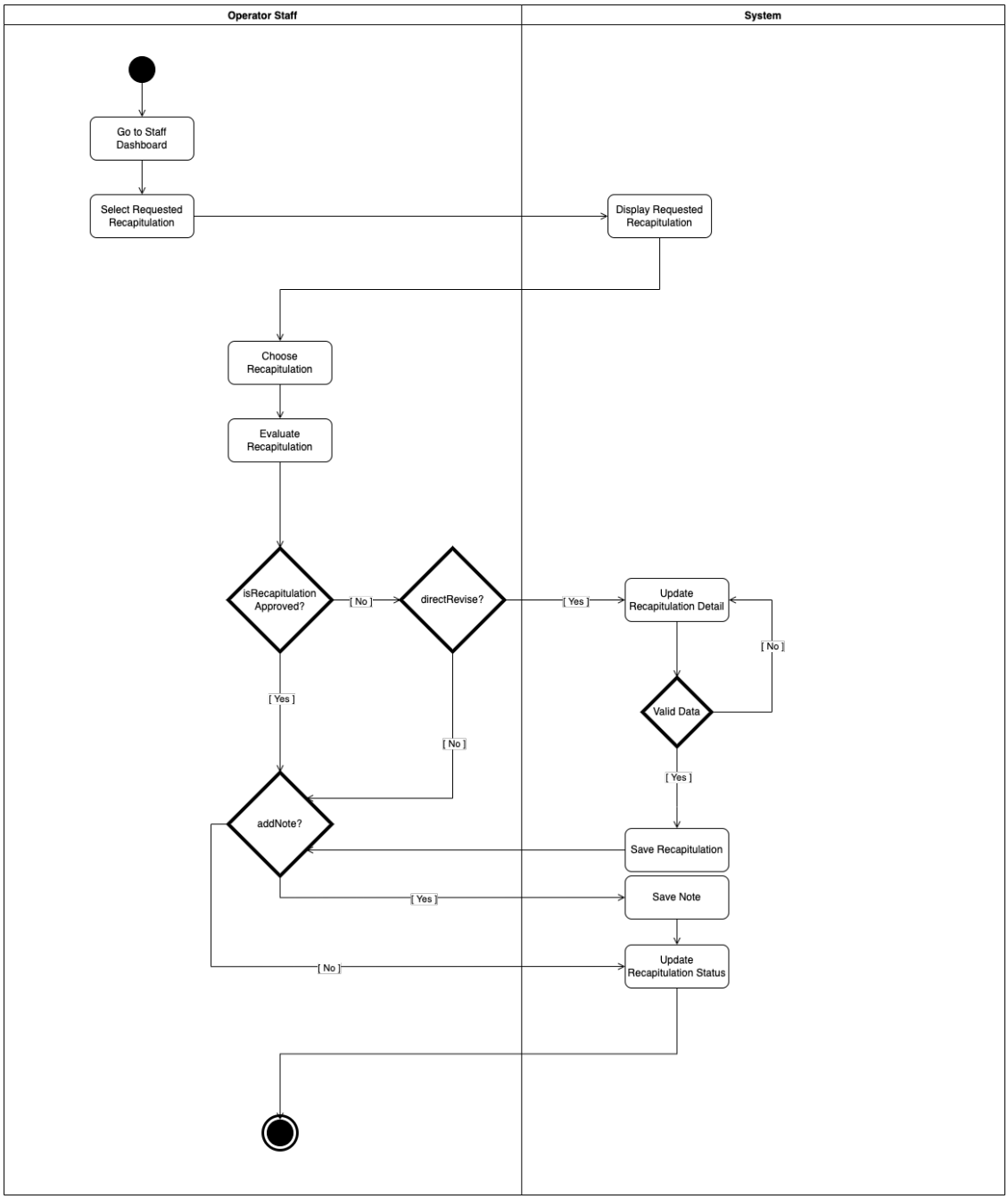


Figure 3.11: Activity Diagram of Evaluate Recapitulation

3.2.2 Module Report Subsystem

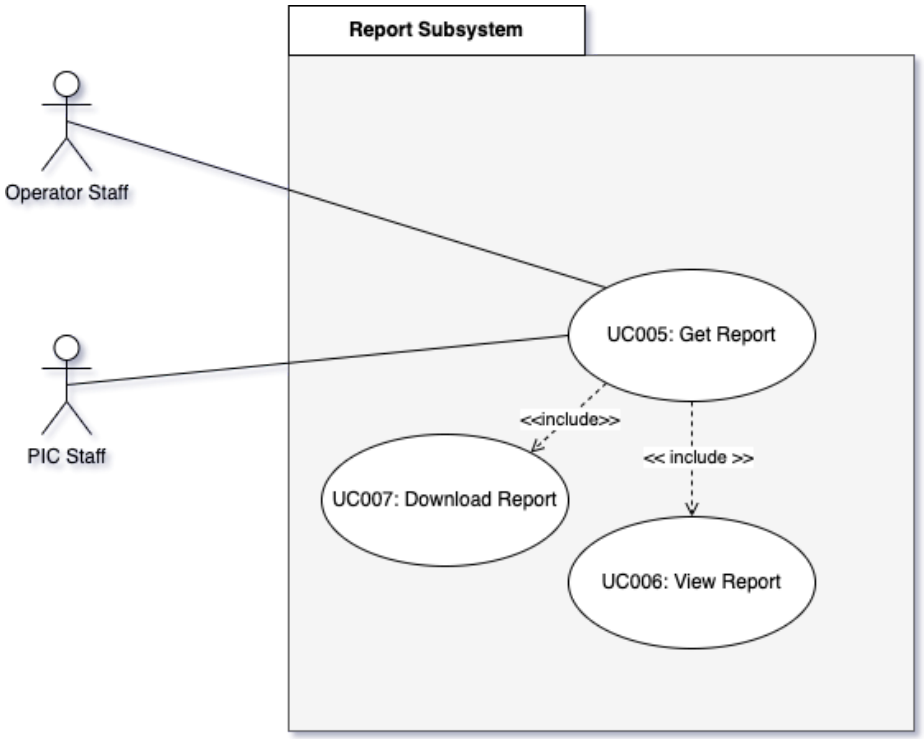


Figure 3.12: Module Report Subsystem

The functional requirements of this module are stated below.

I. FR001: View Report - The system shall allow the operator staff and PIC staff to view generated report.

II. FR002: Download Report - The system shall allow the operator staff and PIC staff to download generated report.

3.2.2.1 UC005: Use Case Get Report

Table 3.5: Use Case Description for Get Report

Use Case ID	UC005
Use Case Name	Get Report
Description	This use case allows the operator staff and PIC staff to get the generated report based on recapitulation inputted before.
Actor(s)	Operator Staff, PIC Staff
Pre-conditions	User must be logged in to the system as an operator staff or PIC staff with a valid login credential.
Normal Flow	1. The user redirects to the staff dashboard page after successfully logging in. 2. The system will display the generated report in the form of a bar chart. If the user wants to make a custom sort of a generated report, AF1 will be performed. 3. The user clicks on the “Download Report” button. 4. The system will redirect the user to the download report page and display the list of sort fields to query the generated report that the user wants to download. 5. The user input all sort fields that are required. 6. The system will generate the report based on the user query. 7. The system will display a download message. 8. The user accepts the download.
Alternative Flow	1. Custom generated report 1.1. The user input all sort fields that are required. 1.2. The system will generate the report in the form of a bar chart based on the user query.

	1.3. Continue NF3
Exception Flow	-
Post Conditions	1. The PIC staff has successfully gotten the generated report.
Related Requirement	-

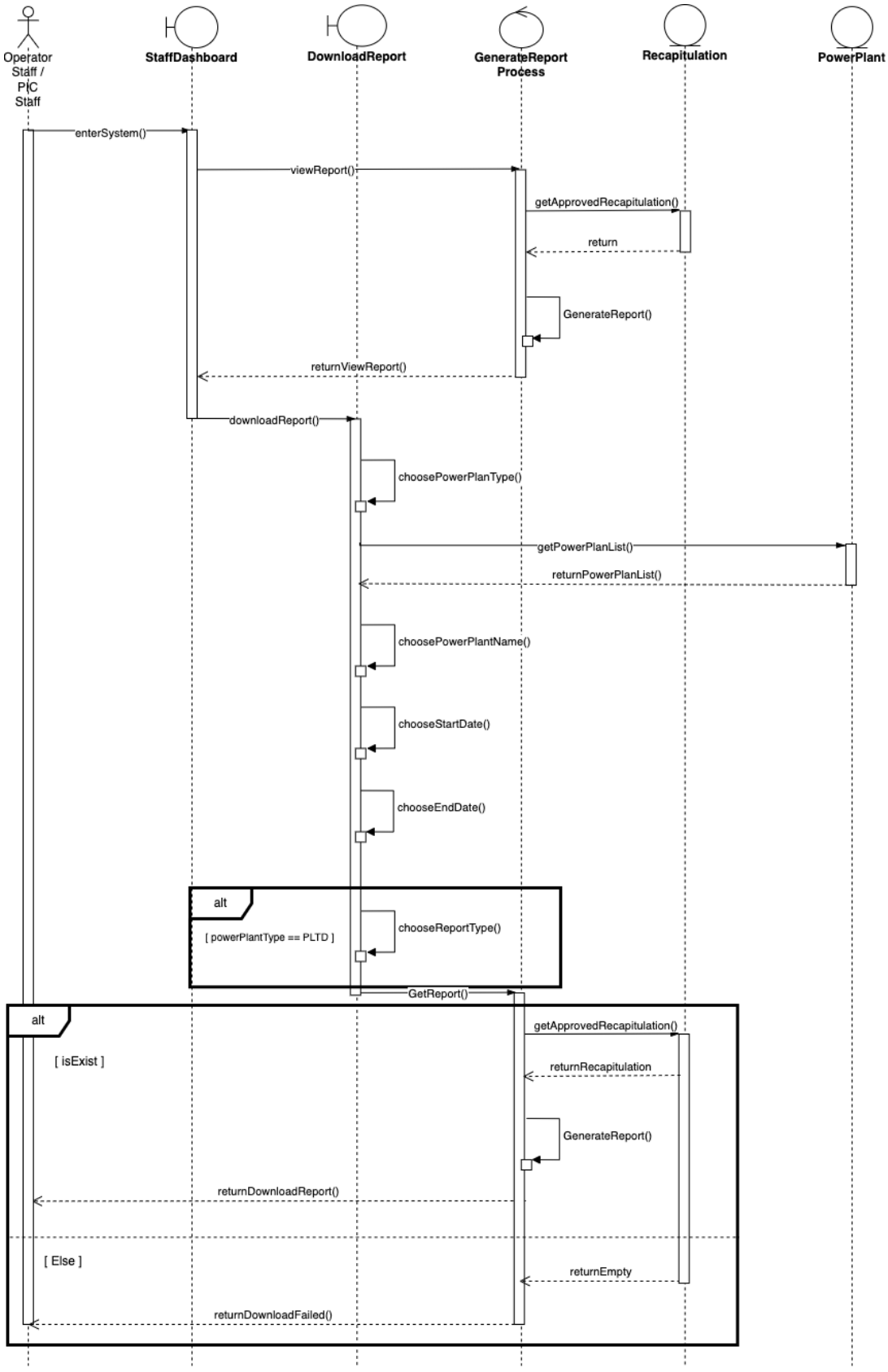


Figure 3.13: System Sequence Diagram of Get Report

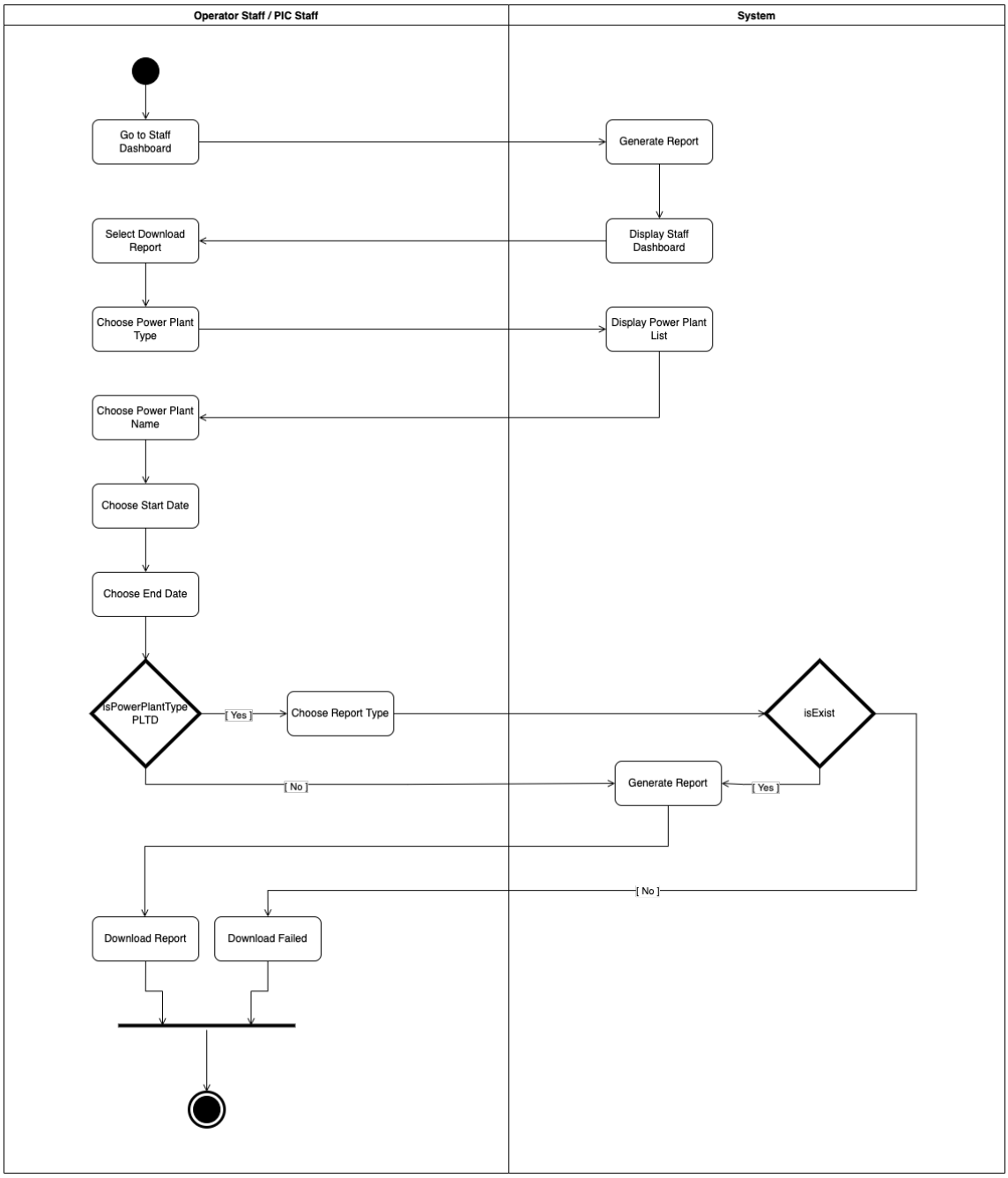


Figure 3.14: Activity Diagram of Get Report

3.2.2.2 UC006: Use Case View Report

Table 3.6: Use Case Description for View Report

Use Case ID	UC006
Use Case Name	View Report
Description	This use case allows the operator staff and PIC staff to view the generated report based on recapitulation inputted before.
Actor(s)	Operator Staff, PIC Staff
Pre-conditions	User must be logged in to the system as an operator staff or PIC staff with a valid login credential.
Normal Flow	1. The user redirects to the staff dashboard page after successfully logging in. 2. The system will display the generated report in the form of a bar chart. If the user wants to make a custom sort of a generated report, AF1 will be performed.
Alternative Flow	1. Custom generated report 1.1. The user input all sort fields that are required. 1.2. The system will generate the report in the form of a bar chart based on the user query.
Exception Flow	-
Post Conditions	1. The PIC staff has successfully viewed the generated report.
Related Requirement	-

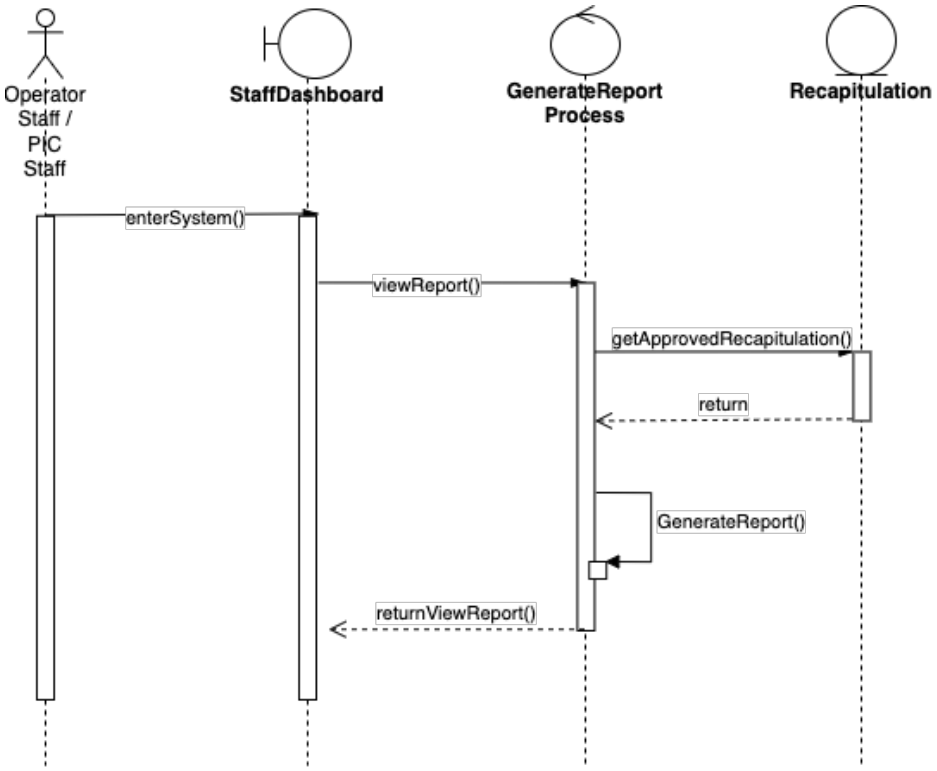


Figure 3.15: System Sequence Diagram of View Report

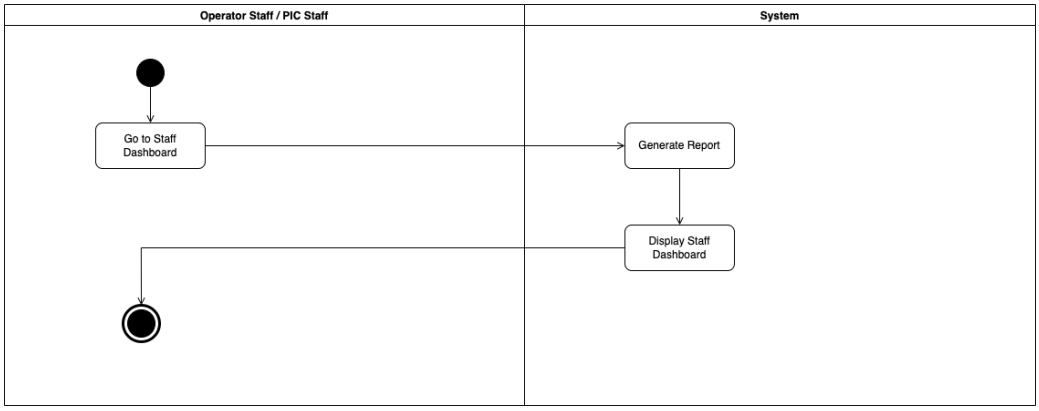


Figure 3.16: Activity Diagram of View Report

3.2.2.3 UC007: Use Case Download Report

Table 3.7: Use Case Description for Download Report

Use Case ID	UC007
Use Case Name	Download Report
Description	This use case allows the operator staff and PIC staff to download the generated report based on recapitulation inputted before.
Actor(s)	Operator Staff, PIC Staff
Pre-conditions	User must be logged in to the system as an operator staff or PIC staff with a valid login credential.
Normal Flow	1. The user redirects to the staff dashboard page after successfully logging in. 2. The user clicks on the “Download Report” button. 3. The system will redirect the user to the download report page and display the list of sort fields to query the generated report that the user wants to download. 4. The user input all sort fields that are required. 5. The system will generate the report based on the user query. 6. The system will display a download message. 7. The user accepts the download.
Alternative Flow	-
Exception Flow	-
Post Conditions	1. The PIC staff has successfully downloaded the generated report.
Related Requirement	-

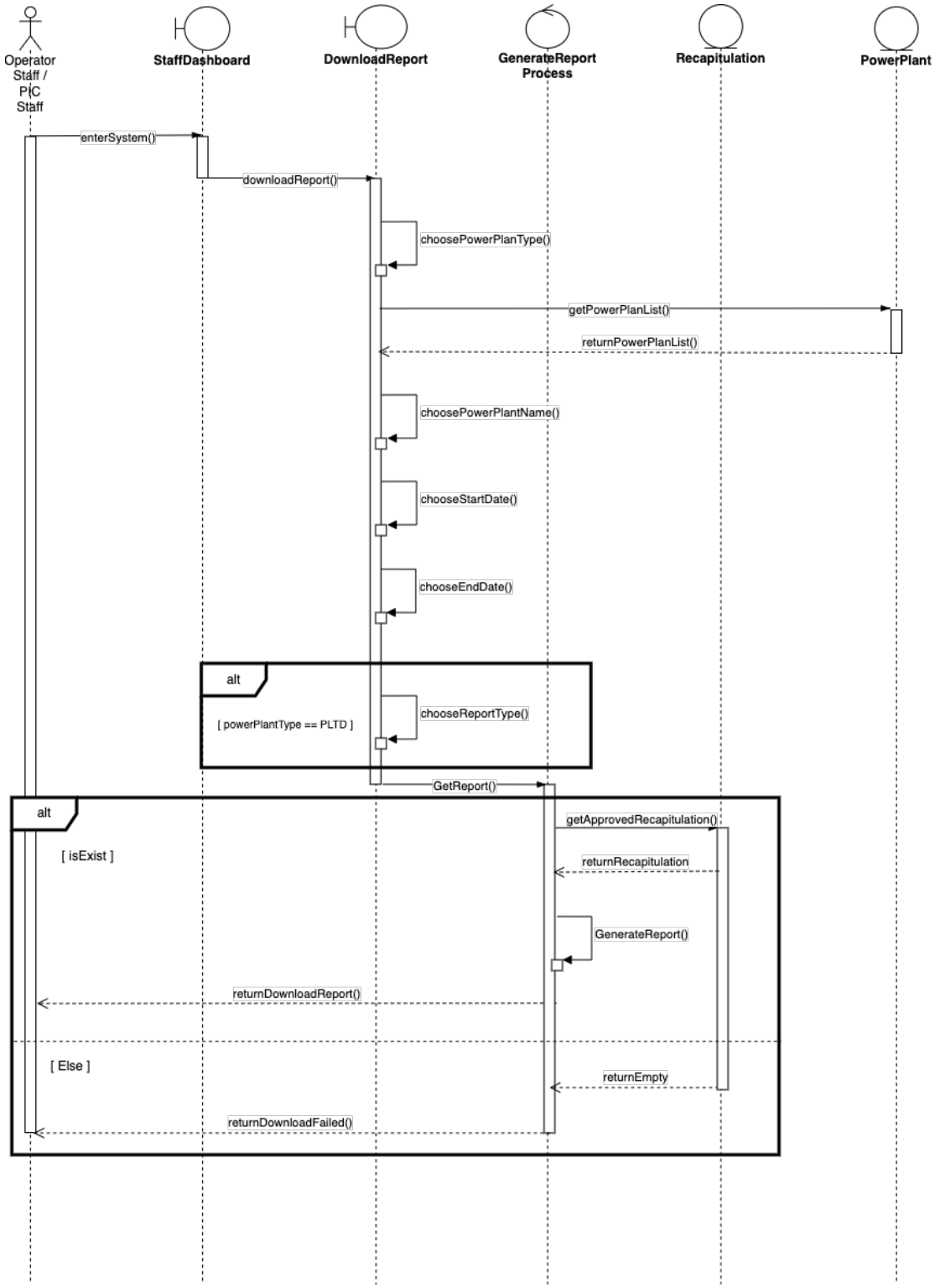


Figure 3.17: System Sequence Diagram of Download Report

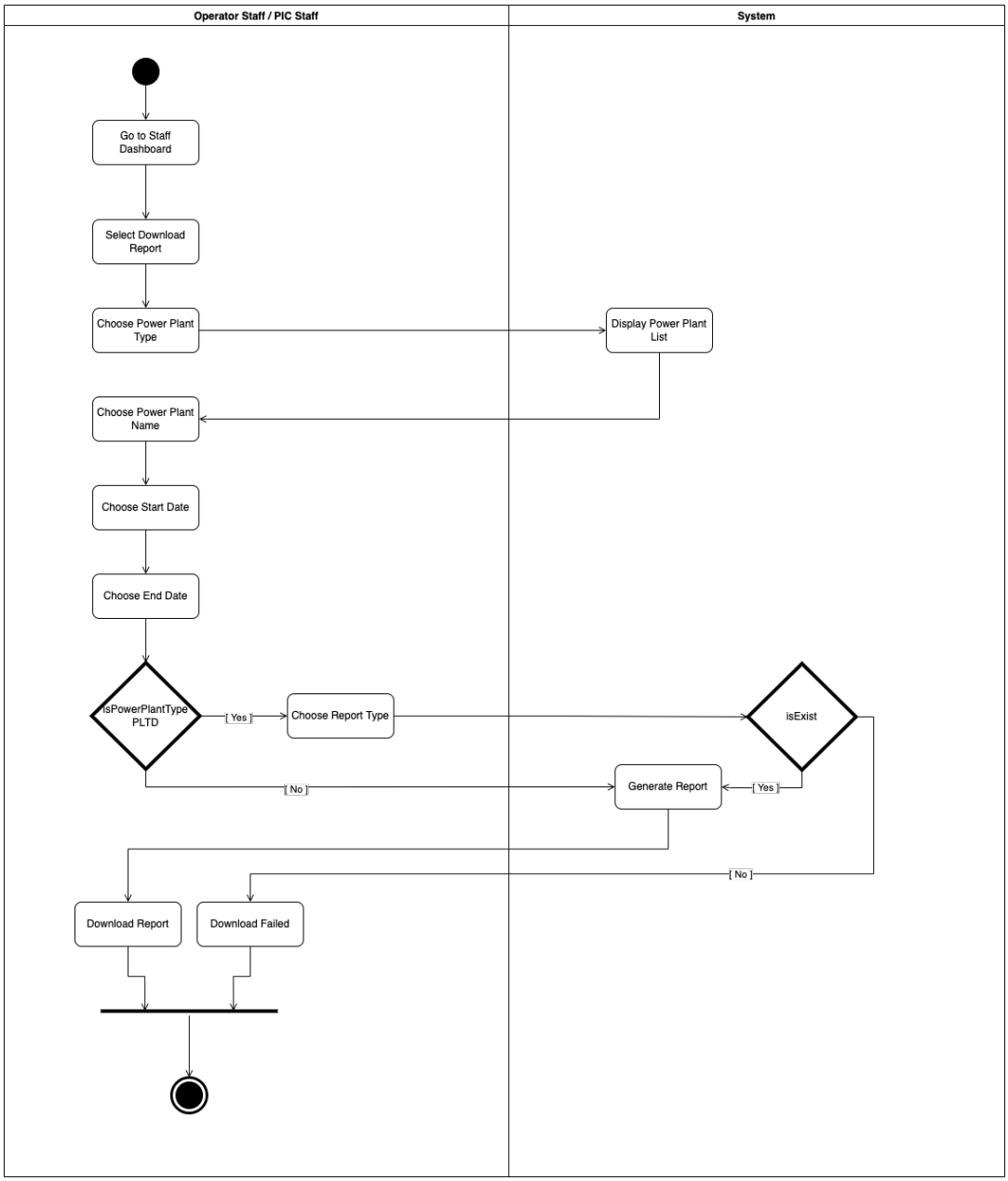


Figure 3.18: Activity Diagram of Download Report

3.2.3 Module Master Data Subsystem

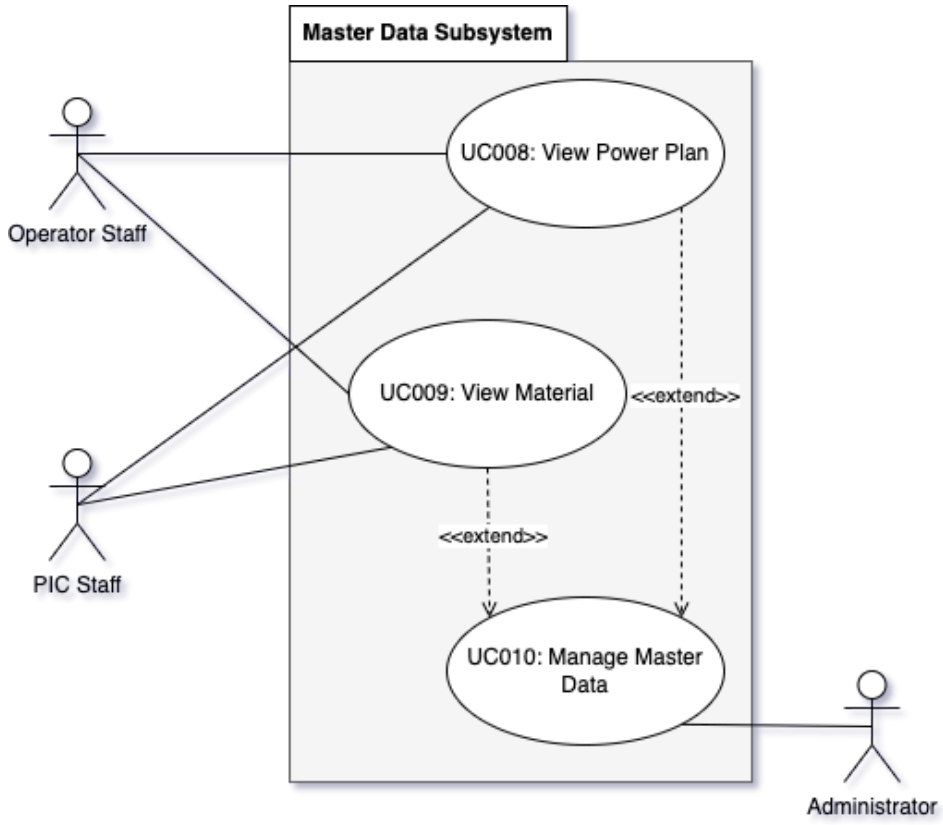


Figure 3.19: Module Master Data Subsystem

The functional requirements of this module are stated below.

I. FR001: Add Unit - The system shall allow the administrator to add a new unit.

II. FR002: View Unit - The system shall allow the administrator to view the existing unit.

III. FR003: Update Unit - The system shall allow the administrator to update the existing unit.

IV. FR004: Delete Unit - The system shall allow the administrator to delete the existing unit.

V. FR005: Add Power Plan - The system shall allow the administrator to add a new power plant.

VI. FR005: View Power Plan - The system shall allow the administrator to view the existing power plant.

VII. FR005: Update Power Plan - The system shall allow the administrator to update the existing power plan.

VIII. FR005: Delete Power Plan - The system shall allow the administrator to delete the existing power plan.

IX. FR005: Add Material - The system shall allow the administrator to add a new material.

X. FR005: View Material - The system shall allow the administrator to view the existing material.

XI. FR005: Update Material - The system shall allow the administrator to update the existing material.

XII. FR005: Delete Material - The system shall allow the administrator to delete the existing material.

3.2.3.1 UC008: Use Case View Power Plan

Table 3.8: Use Case Description for View Power Plant

Use Case ID	UC008
Use Case Name	View Power Plant
Description	This use case allows the administrator to view a list of the power plant.
Actor(s)	Administrator
Pre-conditions	User must be logged in to the system as an administrator with a valid login credential.
Normal Flow	1. The user redirects to the admin dashboard page after successfully logging in. 2. The user clicks on the “Master Data” button. 3. The system will redirect the administrator to the master data page and display some master data type options. 4. The user clicks on the “Power Plant” button. 5. The system will redirect the administrator to the power plant manager panel and display a list of active power plants.
Alternative Flow	-
Exception Flow	-
Post Conditions	1. The PIC staff has successfully viewed the power plant.
Related Requirement	-

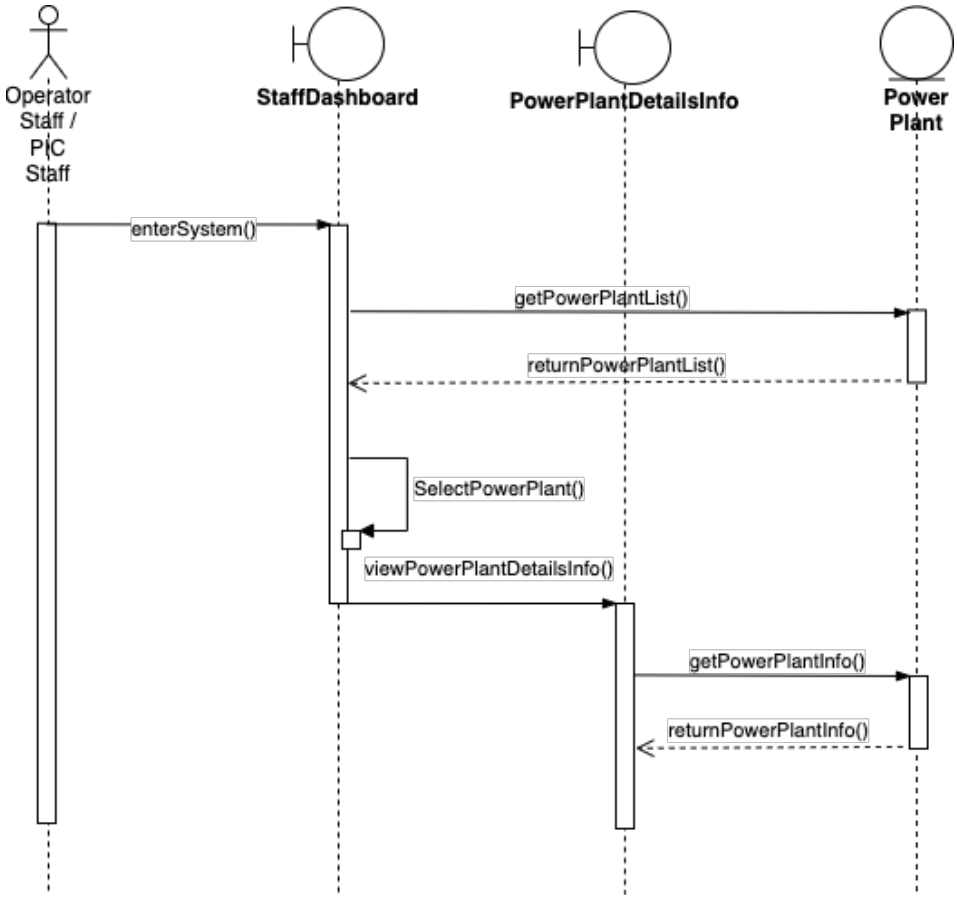


Figure 3.20: System Sequence Diagram of View Power Plant

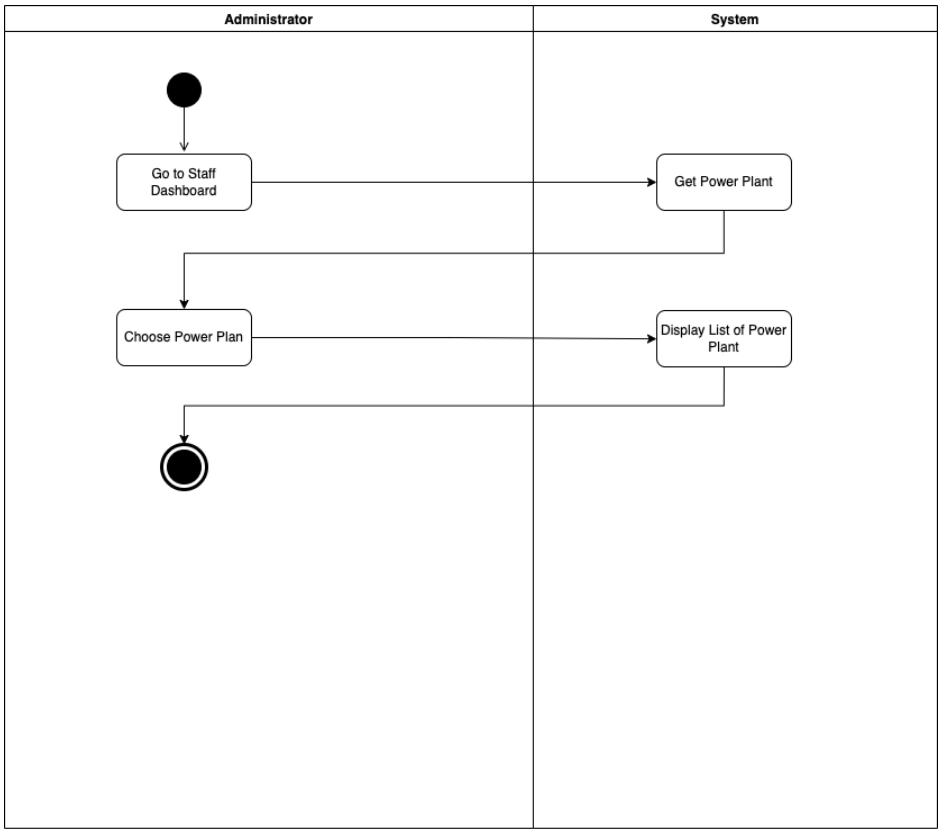


Figure 3.21: Activity Diagram of View Power Plant

3.2.3.2 UC009: Use Case View Material

Table 3.9: Use Case Description for View Material

Use Case ID	UC009
Use Case Name	View Material
Description	This use case allows the administrator to view a list of the available material.
Actor(s)	Administrator
Pre-conditions	User must be logged in to the system as an administrator with a valid login credential.
Normal Flow	1. The user redirects to the admin dashboard page after successfully logging in. 2. The user clicks on the “Master Data” button. 3. The system will redirect the administrator to the master data page and display some master data type options. 4. The user clicks on the “Material” button. 5. The system will display all active power plants. 6. The user chooses one of the active power plants. 7. The system will redirect the administrator to the material manager panel and display a list of available materials for the chosen power plant.
Alternative Flow	-
Exception Flow	-
Post Conditions	1. The PIC staff has successfully viewed the material.
Related Requirement	-

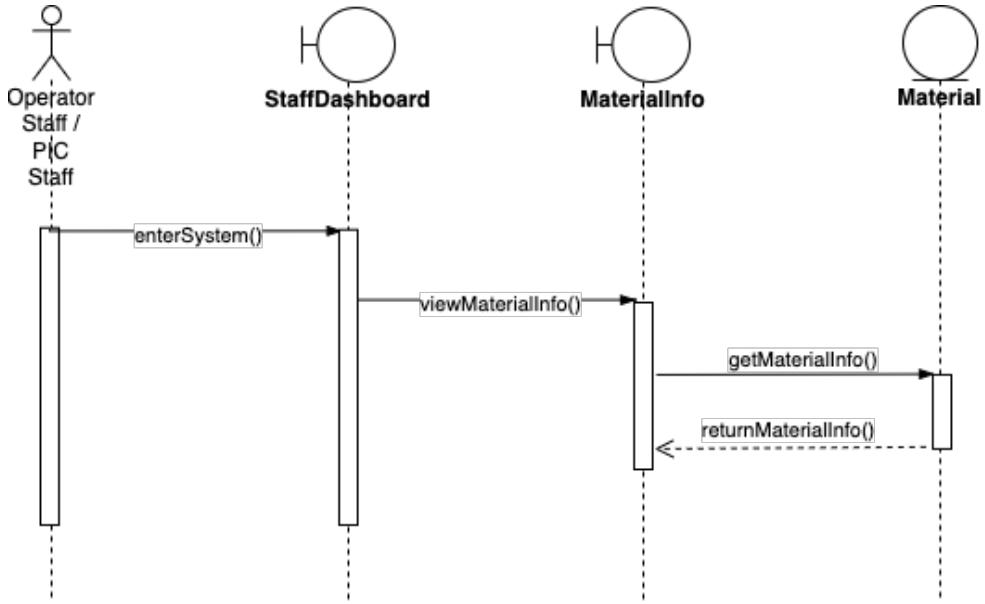


Figure 3.23: System Sequence Diagram of View Material

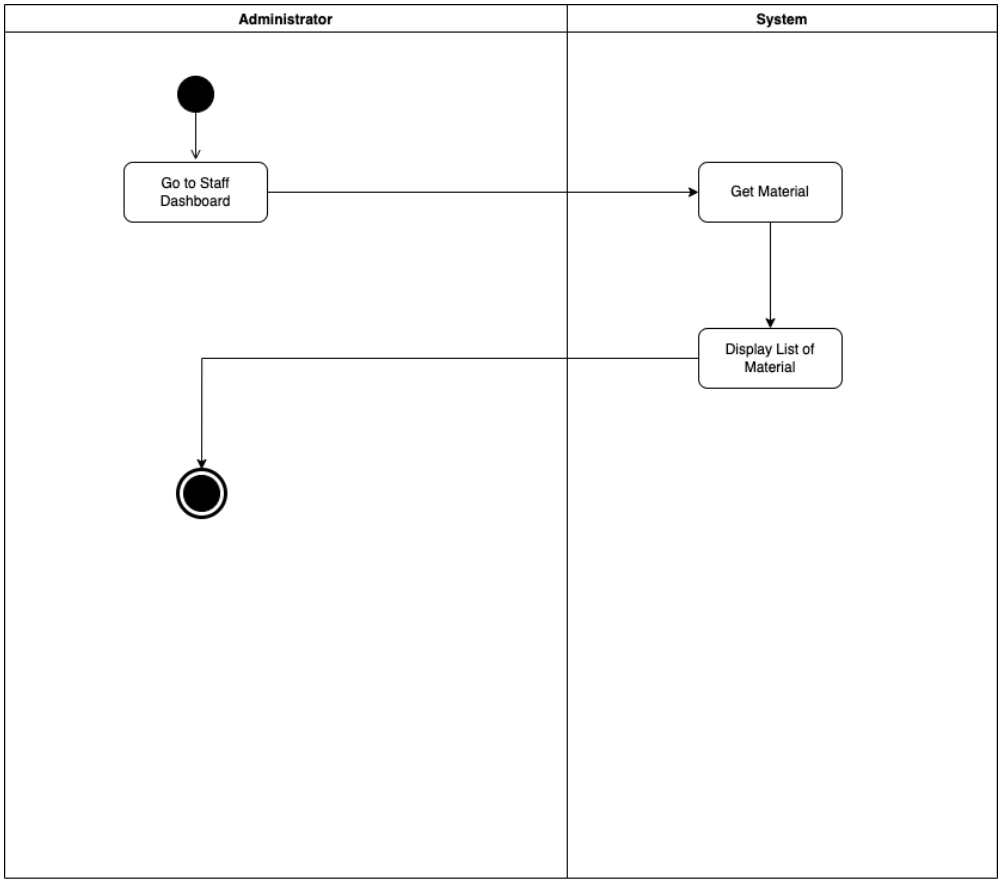


Figure 3.24: Activity Diagram of View Material

3.2.3.3 UC010: Use Case Manage Master Data

Table 3.10: Use Case Description for Manage Master Data

Use Case ID	UC010
Use Case Name	Manage Master Data
Description	This use case allows the administrator to create, view, update, and delete any data that related with master data.
Actor(s)	Administrator
Pre-conditions	User must be logged in to the system as an administrator with a valid login credential.
Normal Flow	1. The administrator redirects to the admin dashboard page after successfully logging in. 2. The administrator clicks on the “Master Data” button. 3. The system will redirect the administrator to the master data page and display some master data type options. 4. The administrator clicks on the “Unit” button. If the administrator clicks on the “Power Plant” button, AF5 will be performed. If the administrator clicks on the “Unit” button, AF6 will be performed. 5. The system will redirect the administrator to one of the master data manager panels and display a list of the master data with the chosen type. 6. The administrator clicks on the “Add” button to input a new master data with the chosen type. 7. The system will redirect the administrator to the input new master data page. 8. The system will display a master data form with the chosen type. 9. The administrator input all required fields on the master data form with the chosen type.

	10. The administrator clicks on the “Submit” button. If the administrator clicks on the “Cancel” button, AF1 will be performed. If the administrator clicks on the “Save” button, AF2 will be performed. If the form is not fully full-filled or the required fields are blank, EF 1 will be performed. 11. The system saves all the information inputted by the administrator to the database. 12. The system will redirect the administrator to the master data manager panels with the chosen type and display new data information. 13. If the administrator clicks on the “Edit” button, AF3 will be performed. 14. If the administrator clicks on the “Delete” button, AF4 will be performed.
Alternative Flow	1. Cancel master data’s input 1.1. The system will redirect the administrator to the master data manager panels with the chosen type. 2. Save master data’s input 2.1. The system will redirect the administrator to the master data manager panels with the chosen type 3. Update master data 3.1. The system will display a master data edit form. 3.2. The administrator updates the specific field that needs to be updated. 3.3. The administrator clicks on the “Update” button. If the form is not fully full-filled or the required fields are blank, EF 1 will be performed. 3.4. The system saves all the information inputted by the administrator to the database. 3.5. The system will redirect the administrator to the master data manager panels with the chosen type and display new data information. 4. Delete unit 4.1. The system displays a confirmation dialogue. 4.2. The administrator continues by clicking the “Yes” button. 4.3. The system deleted selected master data from the database.

	4.4. The system will reload the chosen master data manager panel. 5. Choose to manage the power plant 5.1. Continue NF5. 6. Choose to manage the material 6.1. The system will display all active power plants. 6.2. The administrator chooses one of the active power plants. 6.3. Continue NF5.
Exception Flow	1. Required fields in the master data form are empty or the form is blank. 1.1. The system displays an error message. 1.2. Continue NF9 / AF3.2 .
Post Conditions	1. The administrator has successfully created new data in the chosen master data. 2. The administrator has successfully viewed existing data in the chosen master data. 3. The administrator has successfully updated existing data in the chosen master data. 4. The administrator has successfully deleted existing data in the chosen master data.
Related Requirement	-

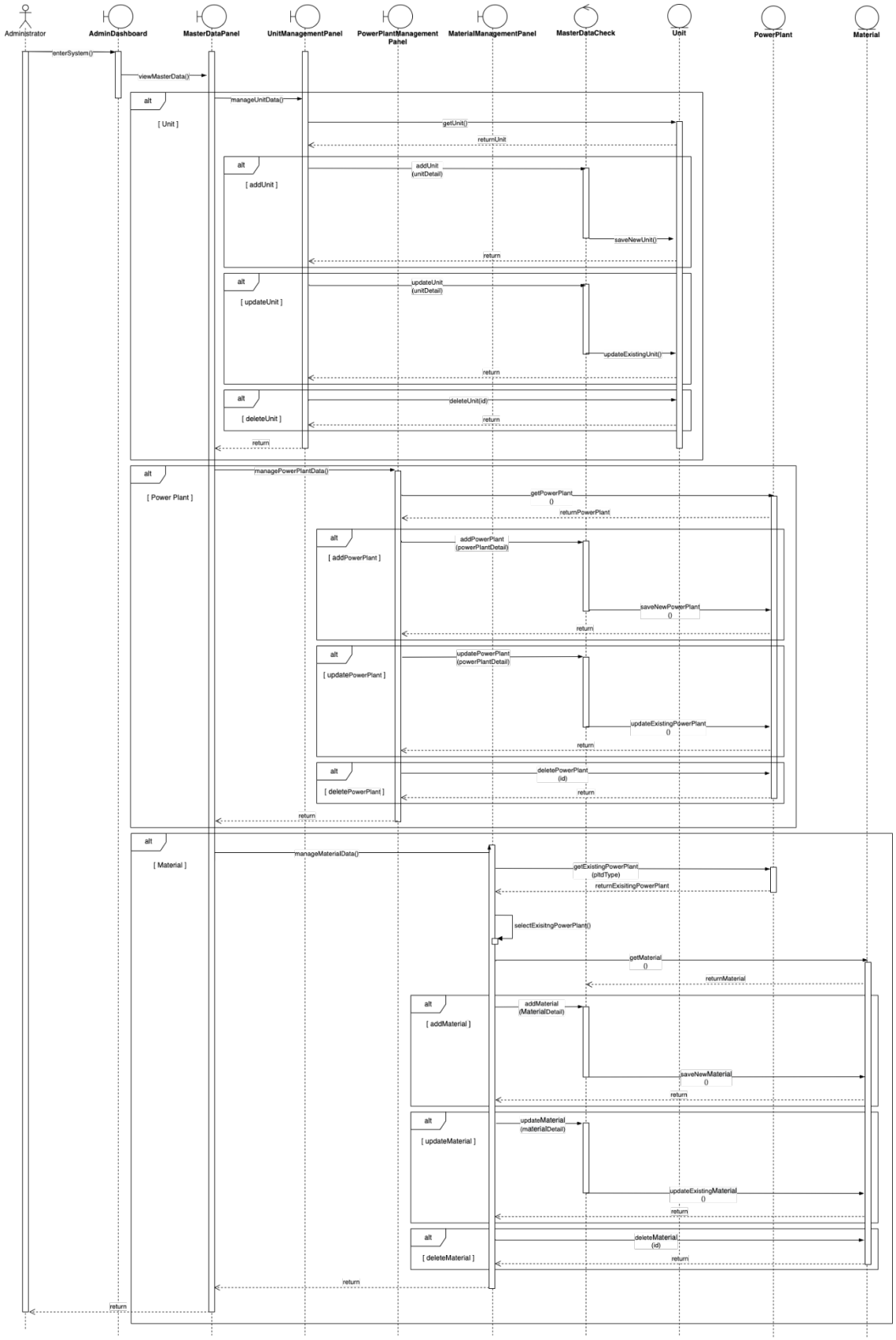


Figure 3.25: System Sequence Diagram of Manage Master Data

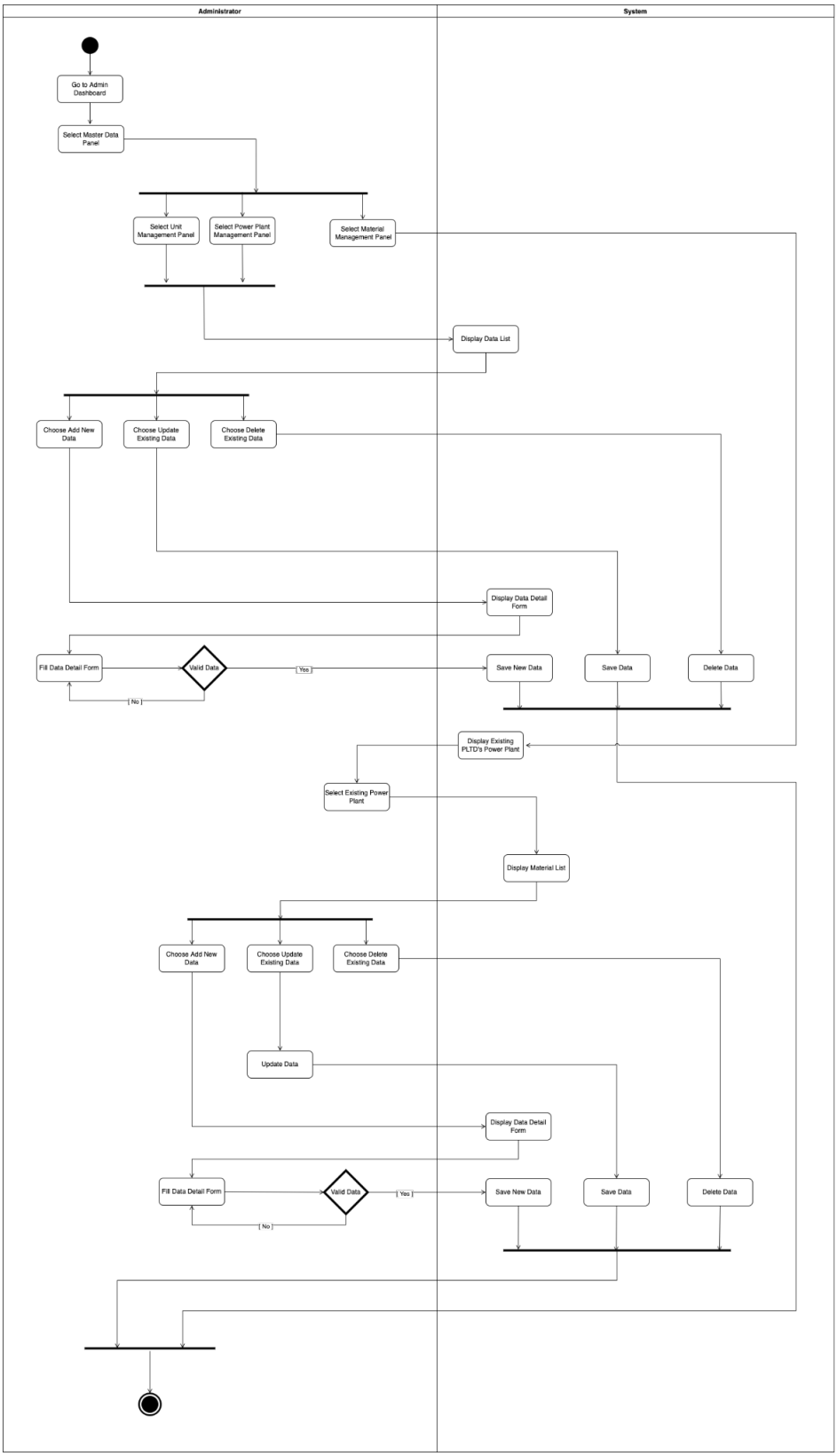


Figure 3.26: Activity Diagram of Manage Master Data

3.2.4 Module Account Subsystem

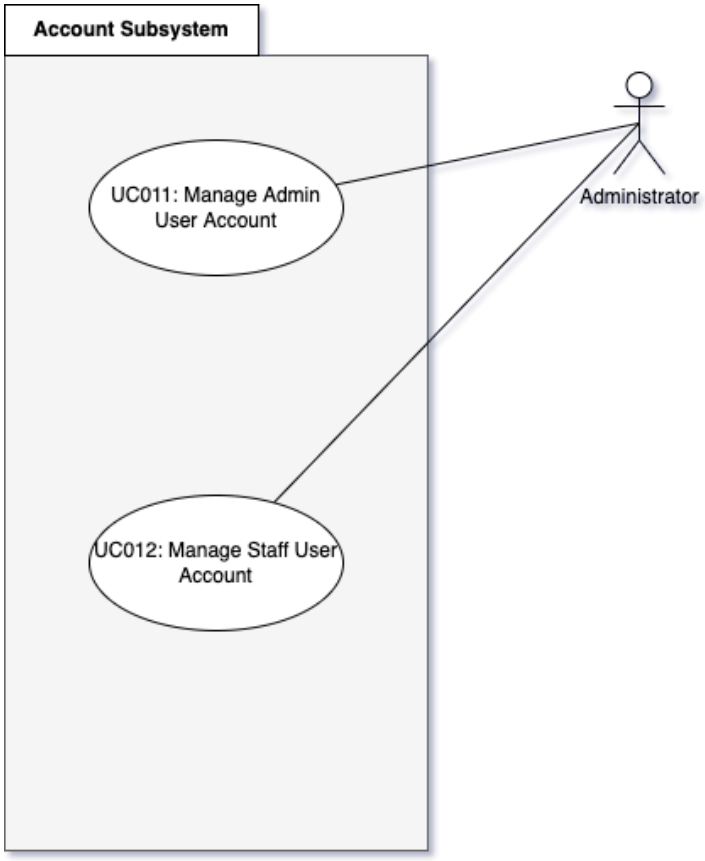


Figure 3.27: Module Account Subsystem

The functional requirements of this module are stated below.

I. FR001: Add Staff User Account - The system shall allow the administrator to add a new staff user account.

II. FR002: View Staff User Account - The system shall allow the administrator to view the existing staff user account.

III. FR003: Update Staff User Account - The system shall allow the administrator to update the existing staff user account.

IV. FR004: Delete Staff User Account - The system shall allow the administrator to delete the existing staff user account.

V. FR001: Add Admin User Account - The system shall allow the administrator to add a new admin user account.

VI. FR002: View Admin User Account - The system shall allow the administrator to view the existing admin user account.

VII. FR003: Update Admin User Account - The system shall allow the administrator to update the existing admin user account.

VIII. FR004: Delete Admin User Account - The system shall allow the administrator to delete the existing admin user account.

3.2.4.1 UC0011: Use Case Manage Admin User Account

Table 3.11: Use Case Description for Manage Admin Account

Use Case ID	UC011
Use Case Name	Manage Admin User Account
Description	This use case allows the administrator to create, view, update, and delete any data related to the admin user account.
Actor(s)	Administrator
Pre-conditions	User must be logged in to the system as an administrator with a valid login credential.
Normal Flow	1. The administrator redirects to the admin dashboard page after successfully logging in. 2. The administrator clicks on the "Account Manager" button. 3. The system will display some account-type options. 4. The administrator clicks on the "Admin" button. 5. The system will redirect the administrator to one of the account manager panels and display a list of the account with the chosen type. 6. The administrator clicks on the "Add" button to input a new account with the chosen type. 7. The system will redirect the administrator to the input new account page. 8. The system will display an account form with the chosen type. 9. The administrator input all required fields on the account form with the chosen type. 10. The administrator clicks on the "Submit" button. If the administrator clicks on the "Cancel" button, AF1 will be performed. If the administrator clicks on the "Save" button, AF2 will be performed. If the form is not fully full-filled or the required fields are blank, EF 1 will be performed. 11. The system saves all the information inputted by

	the administrator to the database. 12. The system will redirect the administrator to the account manager panels with the chosen type and display new account information. 13. If the administrator clicks on the “Edit” button, AF3 will be performed. 14. If the administrator clicks on the “Delete” button, AF4 will be performed.
Alternative Flow	1. Cancel master data’s input 1.1. The system will redirect the administrator to the account manager panels with the chosen type. 2. Save master data’s input 2.1. The system will redirect the administrator to the account manager panels with the chosen type 3. Update master data 3.1. The system will display an account edit form. 3.2. The administrator updates the specific field that needs to be updated. 3.3. The administrator clicks on the “Update” button. If the form is not fully full-filled or the required fields are blank, EF 1 will be performed. 3.4. The system saves all the information inputted by the administrator to the database. 3.5. The system will redirect the administrator to the account manager panels with the chosen type and display new account information. 4. Delete unit 4.1. The system displays a confirmation dialogue. 4.2. The administrator continues by clicking the “Yes” button.

	4.3. The system deleted the selected account from the database. 4.4. The system will reload the chosen account manager panel.
Exception Flow	1. Required fields in the account form are empty or the form is blank. 1.1. The system displays an error message. 1.2. Continue NF9 / AF3.2 .
Post Conditions	1. The administrator has successfully created a new account in the chosen account type. 2. The administrator has successfully viewed the existing account in the chosen account type. 3. The administrator has successfully updated the existing account in the chosen account type. 4. The administrator has successfully deleted the existing account in the chosen master data.
Related Requirement	-

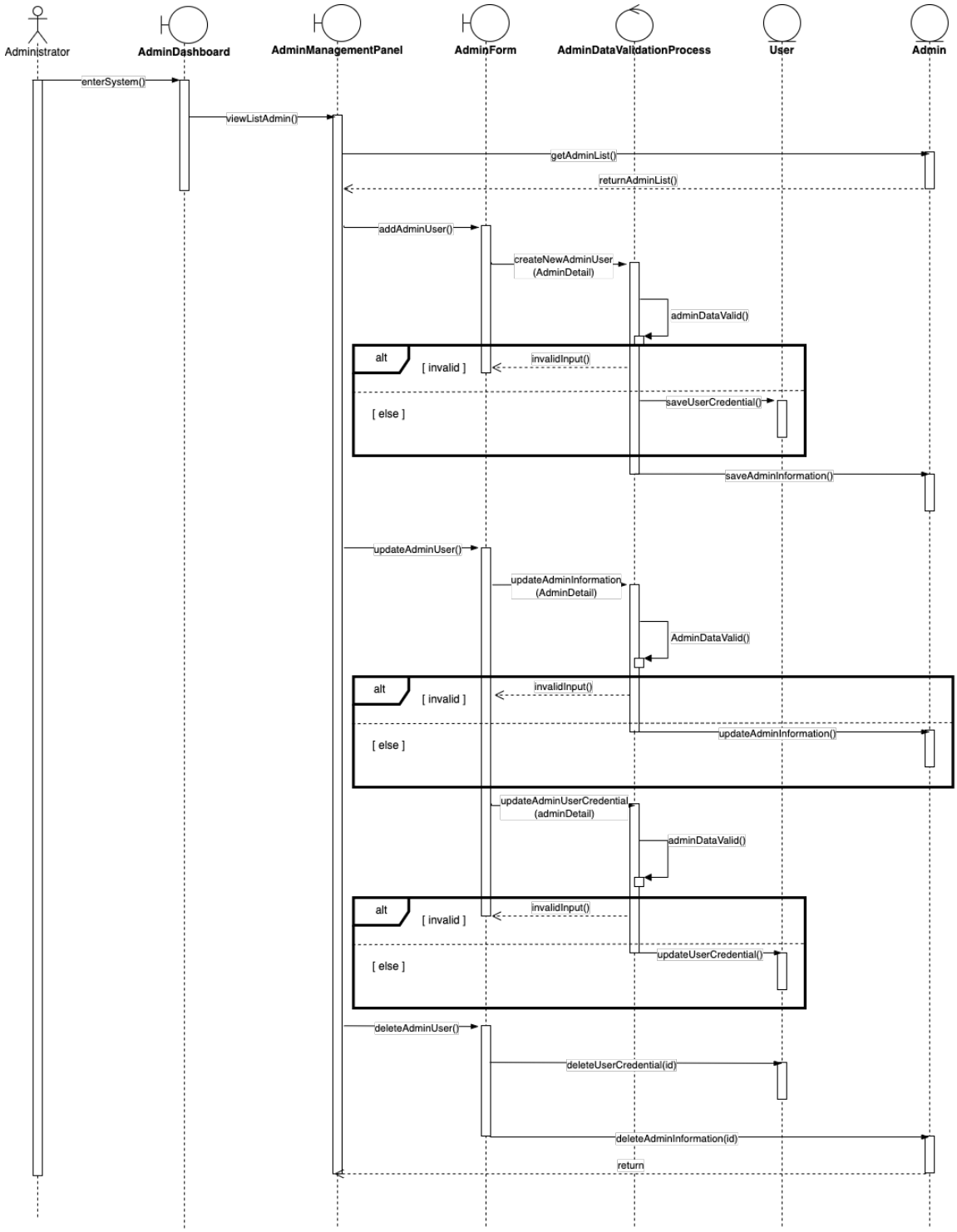


Figure 3.28: System Sequence Diagram of Manage Admin Account

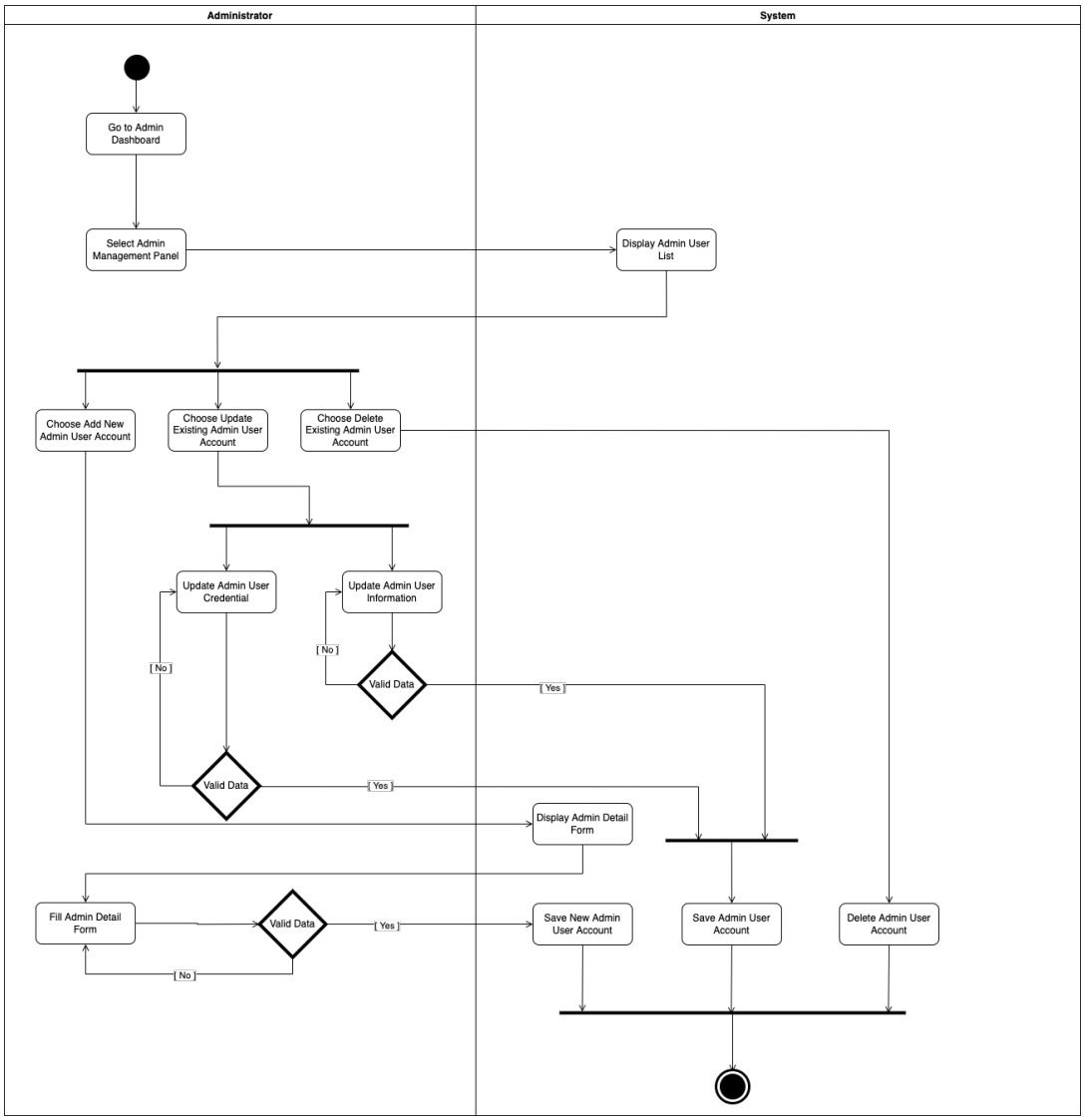


Figure 3.29: Activity Diagram of Manage Admin Account

3.2.4.2 UC0012: Use Case Manage Staff User Account

Table 3.12: Use Case Description for Manage Staff Account

Use Case ID	UC012
Use Case Name	Manage Staff User Account
Description	This use case allows the administrator to create, view, update, and delete any data related to the staff user account.
Actor(s)	Administrator
Pre-conditions	User must be logged in to the system as an administrator with a valid login credential.
Normal Flow	1. The administrator redirects to the admin dashboard page after successfully logging in. 2. The administrator clicks on the "Account Manager" button. 3. The system will display some account-type options. 4. The administrator clicks on the "Staff" button. 5. The system will redirect the administrator to one of the account manager panels and display a list of the account with the chosen type. 6. The administrator clicks on the "Add" button to input a new account with the chosen type. 7. The system will redirect the administrator to the input new account page. 8. The system will display an account form with the chosen type. 9. The administrator input all required fields on the account form with the chosen type. 10. The administrator clicks on the "Submit" button. If the administrator clicks on the "Cancel" button, AF1 will be performed. If the administrator clicks on the "Save" button, AF2 will be performed. If the form is not fully full-filled or the required fields are blank, EF 1 will

	be performed. 11. The system saves all the information inputted by the administrator to the database. 12. The system will redirect the administrator to the account manager panels with the chosen type and display new account information. 13. If the administrator clicks on the “Edit” button, AF3 will be performed. 14. If the administrator clicks on the “Delete” button, AF4 will be performed.
Alternative Flow	1. Cancel master data’s input 1.1. The system will redirect the administrator to the account manager panels with the chosen type. 2. Save master data’s input 2.1. The system will redirect the administrator to the account manager panels with the chosen type 3. Update master data 3.1. The system will display an account edit form. 3.2. The administrator updates the specific field that needs to be updated. 3.3. The administrator clicks on the “Update” button. If the form is not fully full-filled or the required fields are blank, EF 1 will be performed. 3.4. The system saves all the information inputted by the administrator to the database. 3.5. The system will redirect the administrator to the account manager panels with the chosen type and display new account information. 4. Delete unit 4.1. The system displays a confirmation dialogue. 4.2. The administrator continues by clicking the

	"Yes" button. 4.3. The system deleted the selected account from the database. 4.4. The system will reload the chosen account manager panel.
Exception Flow	1. Required fields in the account form are empty or the form is blank. 1.1. The system displays an error message. 1.2. Continue NF9 / AF3.2 .
Post Conditions	1. The administrator has successfully created a new account in the chosen account type. 2. The administrator has successfully viewed the existing account in the chosen account type. 3. The administrator has successfully updated the existing account in the chosen account type. 4. The administrator has successfully deleted the existing account in the chosen master data.
Related Requirement	-

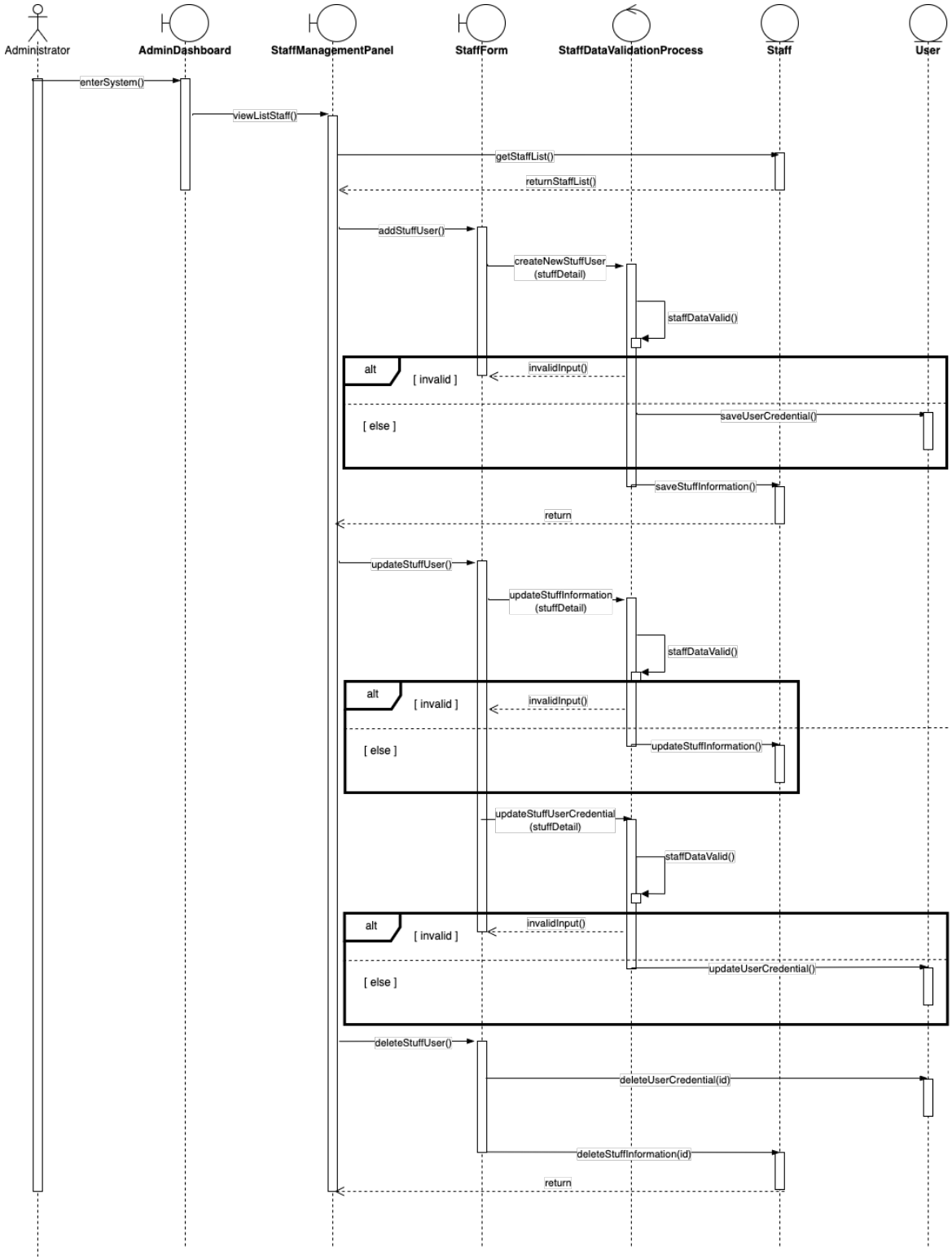


Figure 3.30: System Sequence Diagram of Manage Staff Account

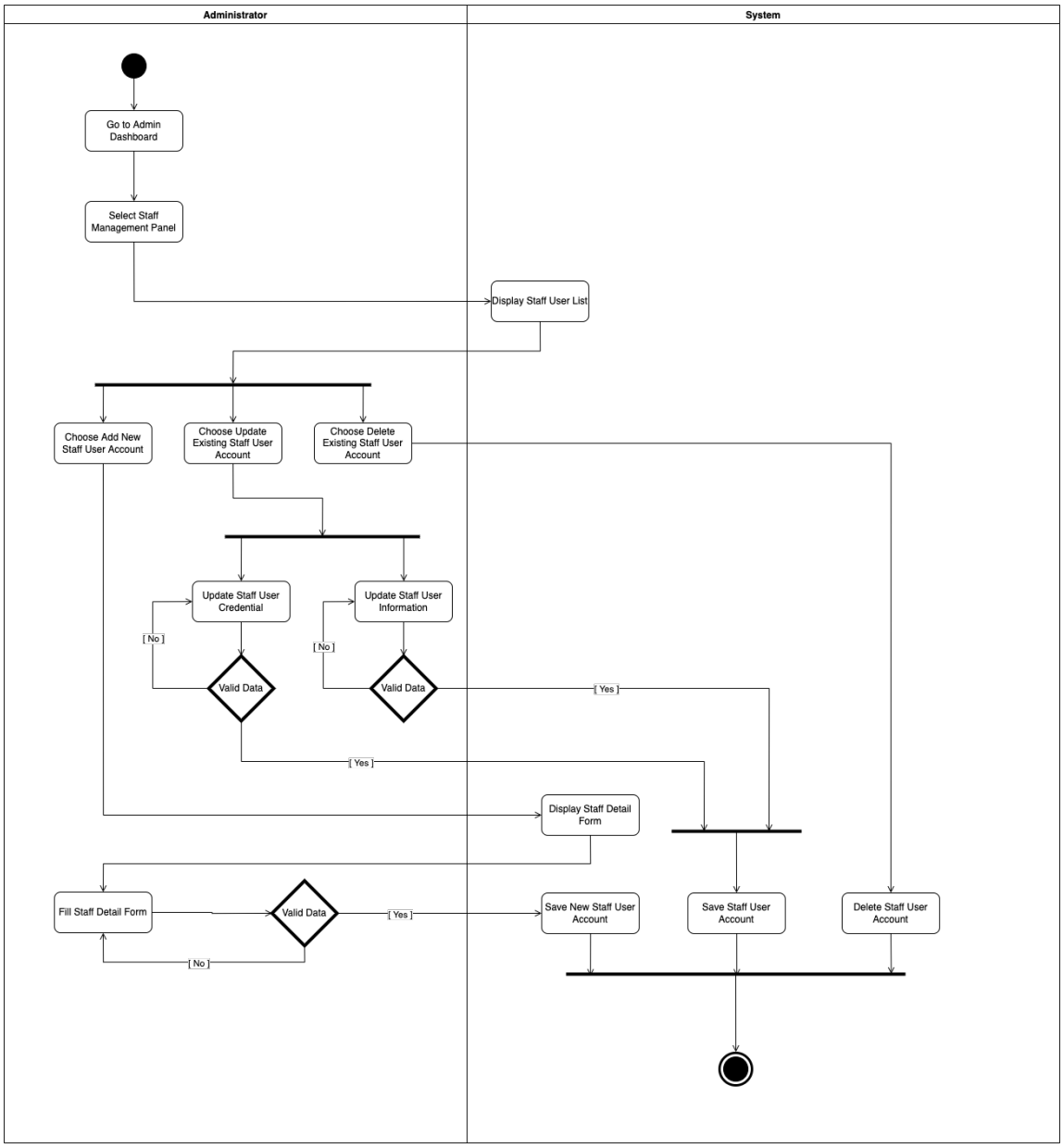


Figure 3.31: Activity Diagram of Manage Staff Account

3.2.5 Module Authentication Subsystem

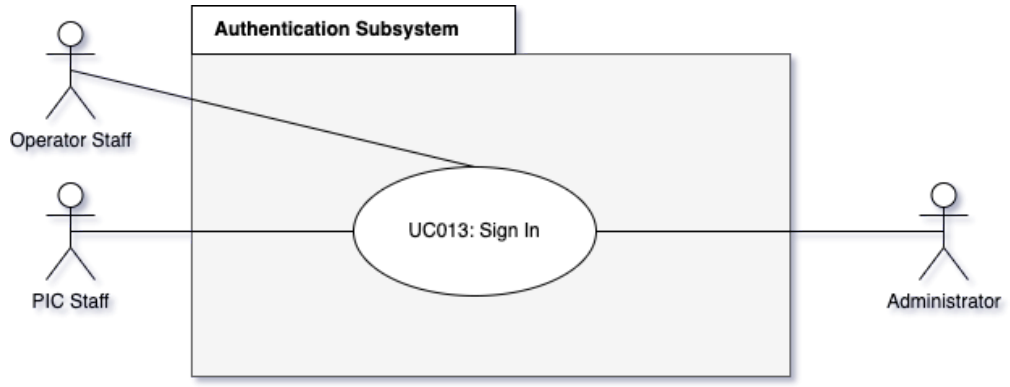


Figure 3.32: Module Authentication Subsystem

The functional requirements of this module are stated below.

I. FR002: Sign In - The system shall allow the administrator, operator staff, and PIC staff to sign in to the system.

3.2.5.1 UC0013: Use Case Sign In

Table 3.13: Use Case Description for Sign In

Use Case ID	UC013
Use Case Name	Sign In
Description	This use case allows the administrator, operator staff and PIC staff to authenticate their user credential. So they can access the main feature of the system.
Actor(s)	Administrator, Operator Staff, PIC Staff
Pre-conditions	User has an active account registered in the system and must have a connection to the internet
Normal Flow	1. The user directs to the admin login portal. If the user is staff, AF1 will be performed. 2. The user enters credential information (username and password). 3. The user clicks on the "Enter" button. If the form is not fully full-filled or the required fields are blank, EF1 will be performed. 4. The system validates the user account credential. If the account is account credential is unmatched or not found in the system, EF2 will be performed. 5. The user successfully enters and accesses to the system.
Alternative Flow	1. The user is a staff 1.1. Continue NF2.
Exception Flow	1. Required fields in the login form are empty or the form is blank. 1.1. The system displays an error message. 1.2. Continue NF2 . 2. Required valid and match account credentials. 1.1. The system displays an error message.

	1.2. Continue NF2 .
Post Conditions	1. The PIC staff has successfully signed in to the system.
Related Requirement	-

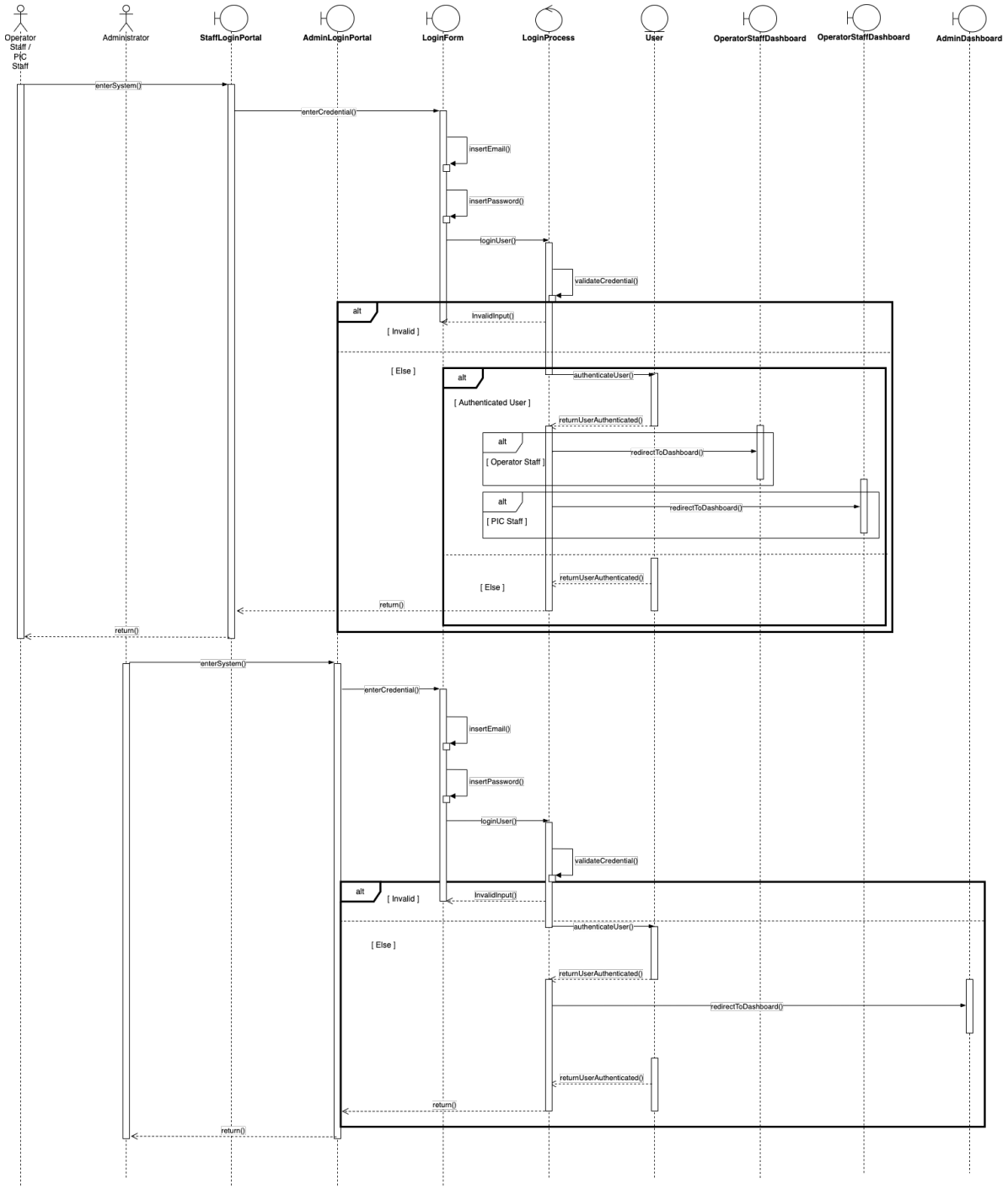


Figure 3.33: System Sequence Diagram of Sign In

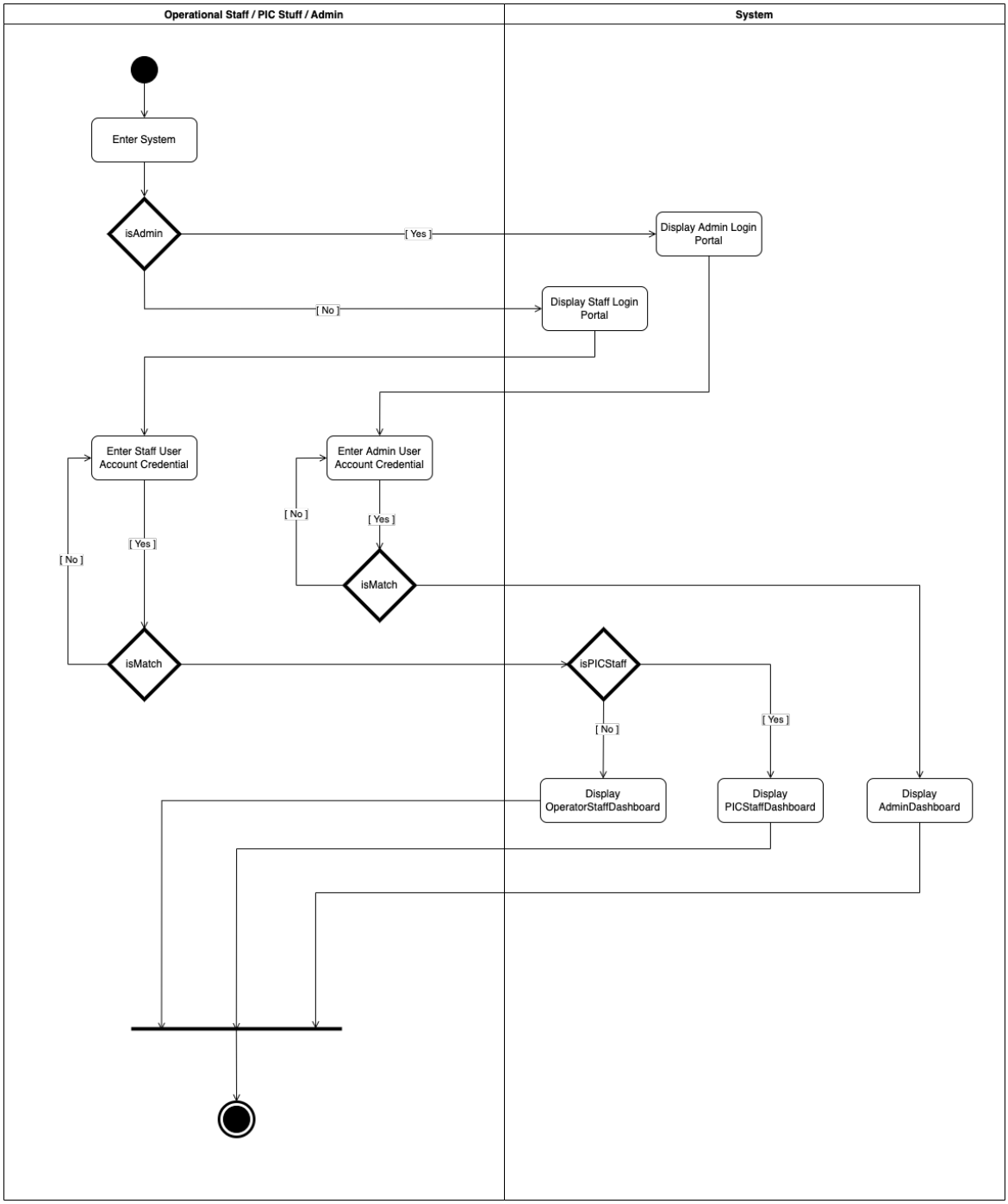


Figure 3.34: Activity Diagram of Sign In

3.3 Performance Requirements

I. Usability - In order to avoid accidental errors, the system requires prevention handlers such as pop-ups to ensure that something is incorrect before processing.

II. Safety - To ensure the integrity of data, all data and information should be transmitted to the server in a secure manner.

III. Response time - In order to successfully complete certain tasks, it is essential that the system has a quick loading time and a high processing speed. Due to this requirement's importance, it must be completed in an expeditious manner so that users can proceed to the next step in their workflow. In this particular scenario, the response time for the system to fully load into the main menu of the system after the login session is successful must be no more than five seconds.

IV. Failure contingencies - When the system fails, the user will be notified by error pages or messages that appear on the screen. To prevent data loss, all information will be frozen in order to preserve it.

3.4 Design Constraints

It is recommended that the system be developed in accordance with the standard web-based system, which can operate on any web browser provided that it has an internet connection.

3.5 Software System Attributes

I. Security - The system shall only permit specific tasks to be performed by authorized users with varying levels of access. Aside from that, the information contained within the system is kept safe and secure by limiting authorized access to the end-user of PT PLN (Persero) UP3 Pamekasan for the purpose of this project as well as any future business that makes use of this particular system.

II. Portability - Since the system is web-based, the user should be able to access it through any web browser that is currently operational and has a reliable connection to the internet. Examples of such web browsers include Google Chrome, Mozilla Firefox, Microsoft Edge, Apple Safari, and Opera.

III. Availability: Users should be able to access the system at any time and from any location, and the system should be accessible 24 hours a day. In this scenario, users should be able to access the system during standard business hours.

IV. Maintainability - System developers must maintain the system in order to detect potential flaws and correct them by modifying the relevant module. Regular testing of the system is required in order to ensure the system's continued high level of quality and functionality.

3.6 Other Requirements

There are no other requirements exist for this project.

Appendix B System Design Documentation

SCSJ3323: Software Design and Architecture

Software Design Document

Power Plants Performance Monitoring System for PT PLN (Persero) UP3 Pamekasan

Version 1.0

23 June 2022

School Of Computing

Prepared by: Thoriqulhaq Jibril Al Qudsy

REVISION PAGE

a. **Overview**

This is the first draft of the Software Design Document for Power Plants Performance Monitoring System for PT PLN (Persero) UP3 Pamekasan.

b. **Target Audience**

- Ms. Habibah Zahra Faluqi, Supervisor, PT PLN (Persero)
- Stakeholder of PT PLN (Persero) UP3 Pamekasan

c. **Project Team Members**

- Thoriqulhaq Jibril Al Qudsy

d. **Version Control History**

Version	**Primary Author(s)**	**Description of Version**	**Date Completed**
Version 1.0	Thoriqulhaq Jibril Al Qudsy	SDD 1.0 of Power Plants Performance Monitoring System for PT PLN (Persero) UP3 Pamekasan	23 June 2022

Note:

This template is an annotated outline for a software design document adapted from the IEEE Recommended Practice for Software Design Descriptions. The IEEE Recommended Practice for Software Design Descriptions have been reduced in order to simplify this assignment while still retaining the main components and providing a general idea of a project definition report. Please refer to IEEE Std 1016-1998 1 for the full IEEE Recommended Practice for Software Design Descriptions. Examples of models are from Satzinger (2011). Compiled by Shahliza Abdul Halim, PhD and checked by Shahida Sulaiman, PhD on 2 May 2016.

TABLE OF CONTENTS

1. INTRODUCTION

The scope and system overview of this SDD document are described in this section. In addition to that, the purpose of this document is broken down, and a glossary of abbreviations and definitions is offered.

1.1 Purpose

This Software Design Document (SDD) for PT PLN (Persero) UP3 Pamekasan details the general architectural design as well as the detailed design of the Power Plants Performance Monitoring System (P3MS). SDD performs an analysis and documentation of the system's database design, user interface design, and system architecture design in order to fulfill the requirements that were gathered from the stakeholders of P3MS. Stakeholders and other members of the development team can gain a deeper understanding of the system's design concept by consulting this document.

1.2 Scope

The proposed system is named Power Plants Performance Monitoring System (P3MS). This system will be specially designed for PT PLN (Persero) UP3 Pamekasan to transform the manual monitoring process into a computerized system, which makes them easier to report, organize and monitor the power plants in future. A web-based system that provides various functionalities such as employee profile management, leave and overtime allowance management, schedule management and attendance record management will be implemented to benefit the organization. The design of this system is user friendly, easy to use and understand so that the end-users can learn quickly and can perform tasks by using this system. There are some limitations of this system. This system will not cover the salary, payroll and performance management of the employees.

1.3 Definitions, Acronyms and Abbreviation

Acronyms	Definitions
P3MS	Power Plants Performance Monitoring System
SRS	Software Requirement Specification
PT PLN (Persero) UP3 Pamekasan	Targeted company of this system
UML	Unified Modelling Language
PIC	Person In Charge

1.4 Overview

This document is divided into three main sections that detail the specifications for the Power Plants Performance Monitoring System for PT PLN (Persero) UP3 Pamekasan. A thorough explanation of the system architecture design will be covered in section 2. Next, the design of the system database is mentioned in section 3. After reaching an understanding with the developers and stakeholders, the user interface design and an example of a prototype user interface will be presented in section 3.

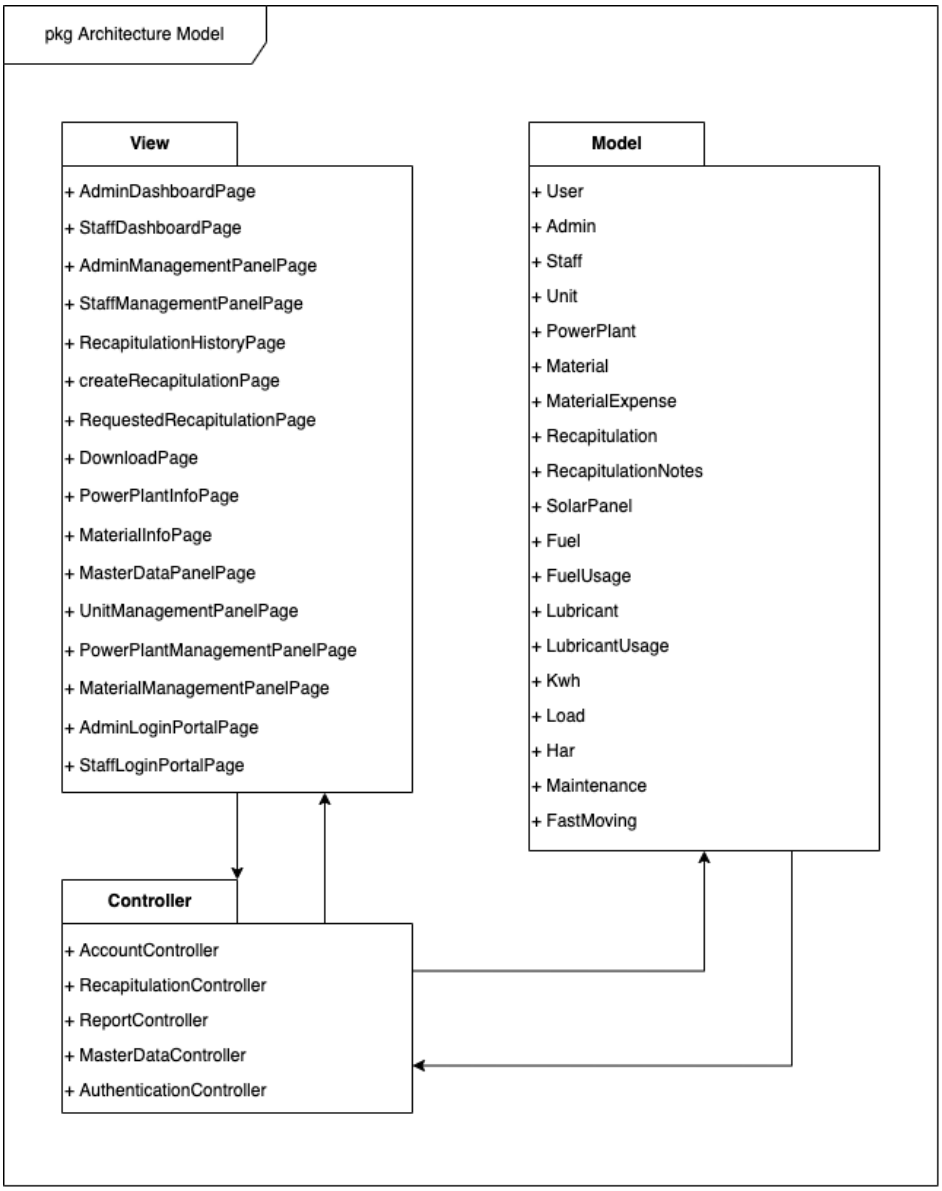
2. SYSTEM ARCHITECTURAL DESIGN

This section will provide an overview of the architecture pattern that has been selected to create the P3MS system that has been proposed. To introduce the system's architectural design and show how it can be implemented, a detailed description of the system will be given. For a more accurate illustration of the architectural style, the component model and use case diagram will be included in this section.

2.1 Architecture Style and Rationale

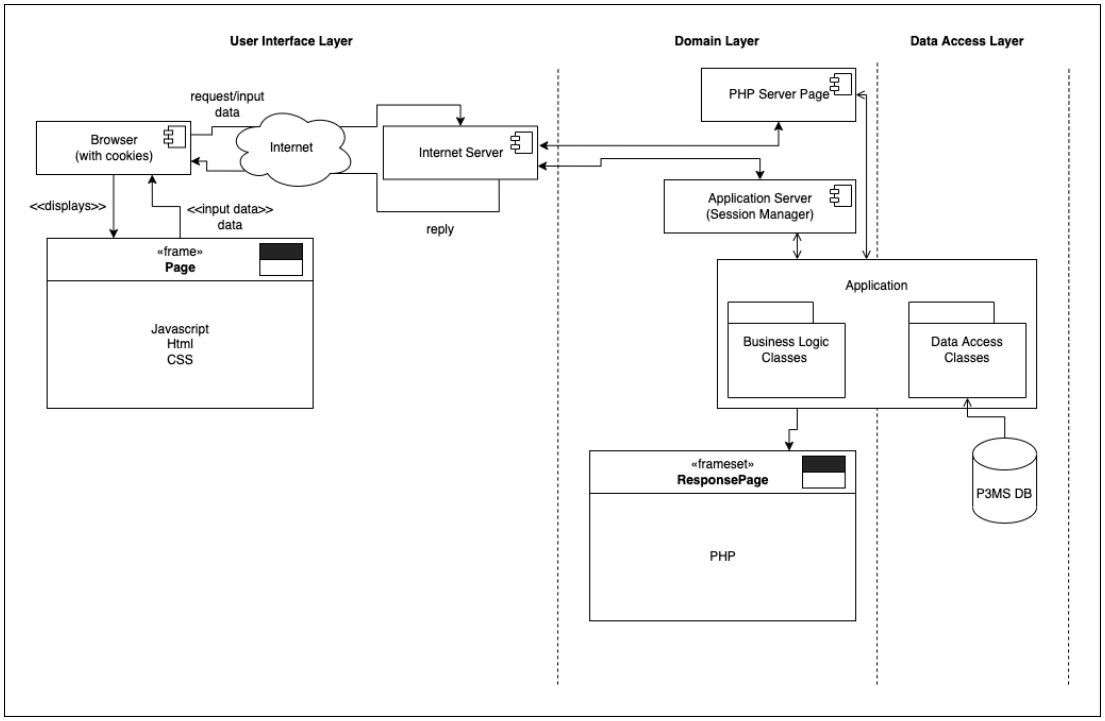
The Model-View-Controller architecture pattern, also known as MVC, is a design pattern that is most commonly used by developers when building a system. This is due to the fact that the MVC design pattern brings a great deal of benefits to the design and implementation of the system. It is much easier to manage and modify code when using this architecture pattern because the system component is divided into three main parts: model, view, and controller.

The model is what's used to handle database transactions like insertion, deletion, update, and retrieval in an architecture pattern known as MVC. These transactions take place between the controller and the system database. The view is the visual representation of the system that displays the user interfaces to the end-user and collects user input from the respective user interfaces. It also displays the system outputs to the end-user. Invoking the functions, processing the data, and sending the output to the view are all important responsibilities that fall under the purview of the controller. The following diagram is an architectural model that illustrates the MVC architecture design pattern that was utilized when developing the P3MS.



AM000 Architecture Model of P3MS

2.2 Component Model



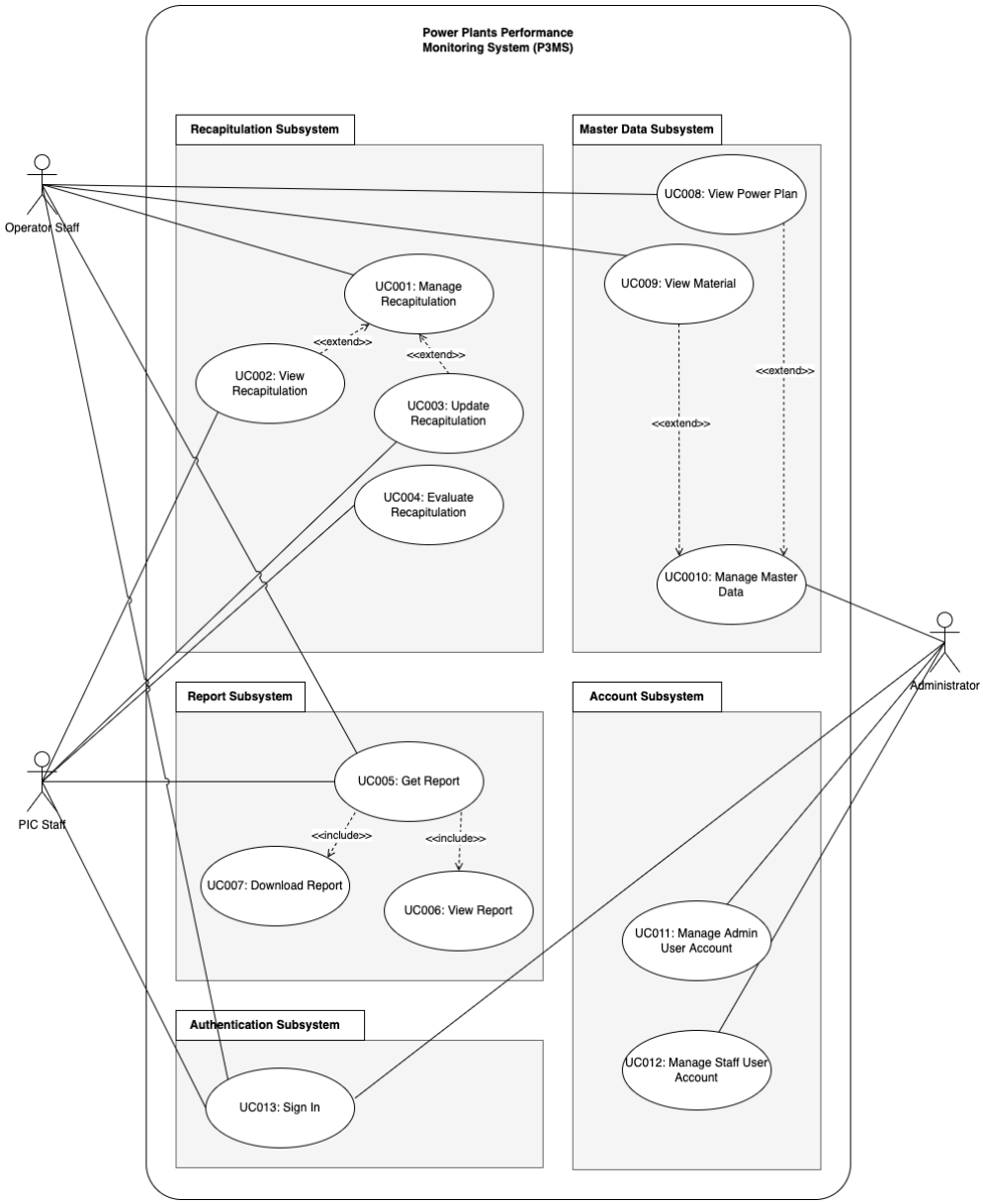
CM000 Component Model of P3MS

The component model of the Power Plants Performance Monitoring System for PT PLN (Persero) UP3 Pamekasan is depicted in the figure above. A reliable Internet connection is necessary to access the P3MS in order to ensure the system operates as efficiently as possible. JavaScript, HTML and CSS are the frameworks used at the user interface layer to display the application's user interfaces. It will also display the input form to collect user input. The domain layer will receive the user input and forward it to the internet server for later processing.

There is two-way interaction and communication between the Internet Server, PHP Server Pages, and Application Server (session manager) at the domain layer or business layer. A web user's requests are forwarded to an application program by a server page called PHP Server Pages, which then receives the data and forwarded it back to the user. Besides, a server that is specifically designed to run applications is referred to as an application server. There are both hardware and software components to a server that allow programs to run in an environment. In order to run the applications, the P3MS communicates with the Application Server. Functionalities of the application are implemented using PHP. To respond appropriately to specific user activities, the system will make use of these framesets. Its own database, the P3MS Database, is responsible for storing all of the P3MS's data at the Data Access Layer, including user and unit data as well as power plant and material information.

2.3 Use Case Diagram

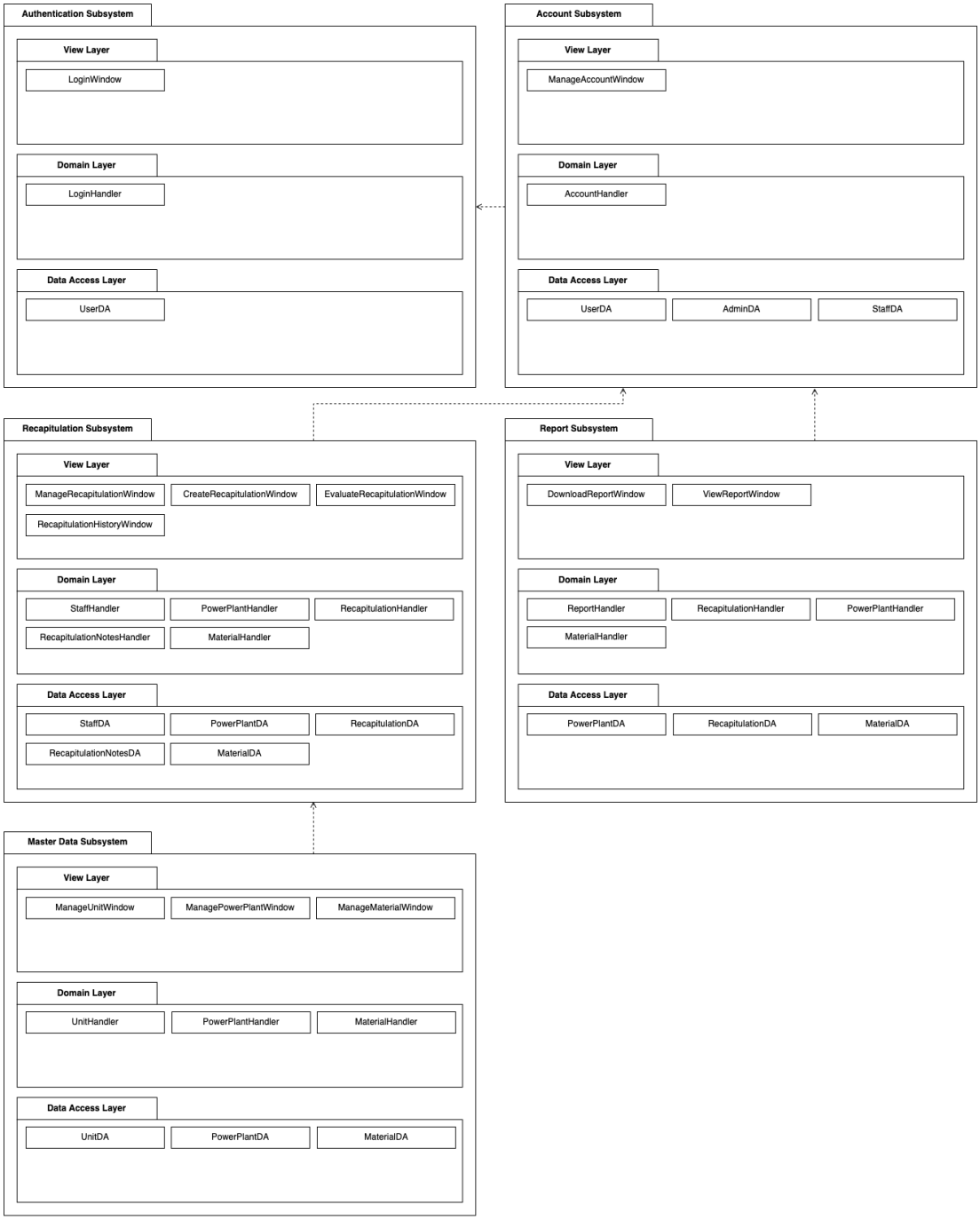
In a use case diagram, the key features and functions of the proposed system are represented graphically. The use case model of the Power Plants Performance Monitoring System (P3MS) for PT PLN (Persero) UP3 Pamekasan illustrates and describes the relationship between the system and the actors that make up the system. The use case Figure 4.1 presents a diagram of the Power Plants Performance Monitoring System (P3MS) for PT PLN (Persero) UP3 Pamekasan.



UCD000 Use Case Diagram of P3MS

3. DETAILED DESCRIPTION OF COMPONENTS

3.1 Complete Package Diagram

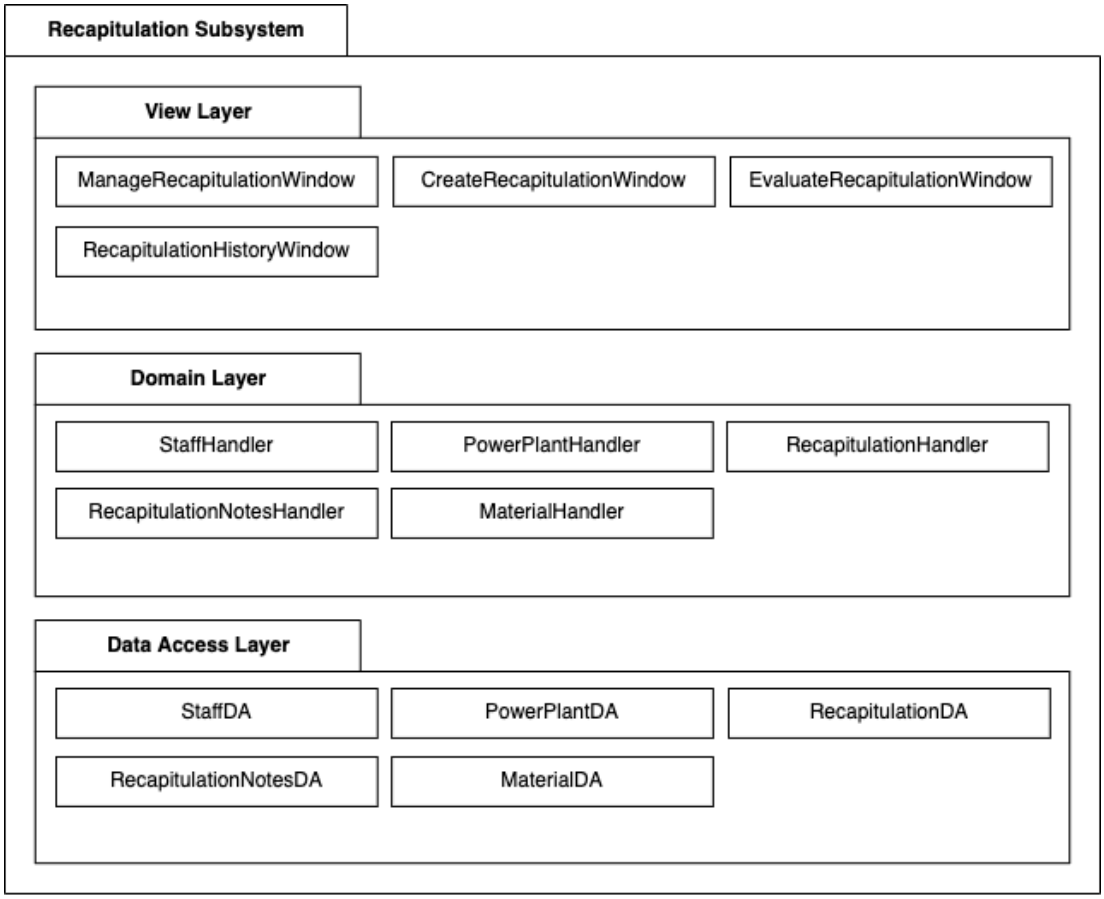


CPD000 Complete Package Diagram of P3MS

3.2 Detailed Description

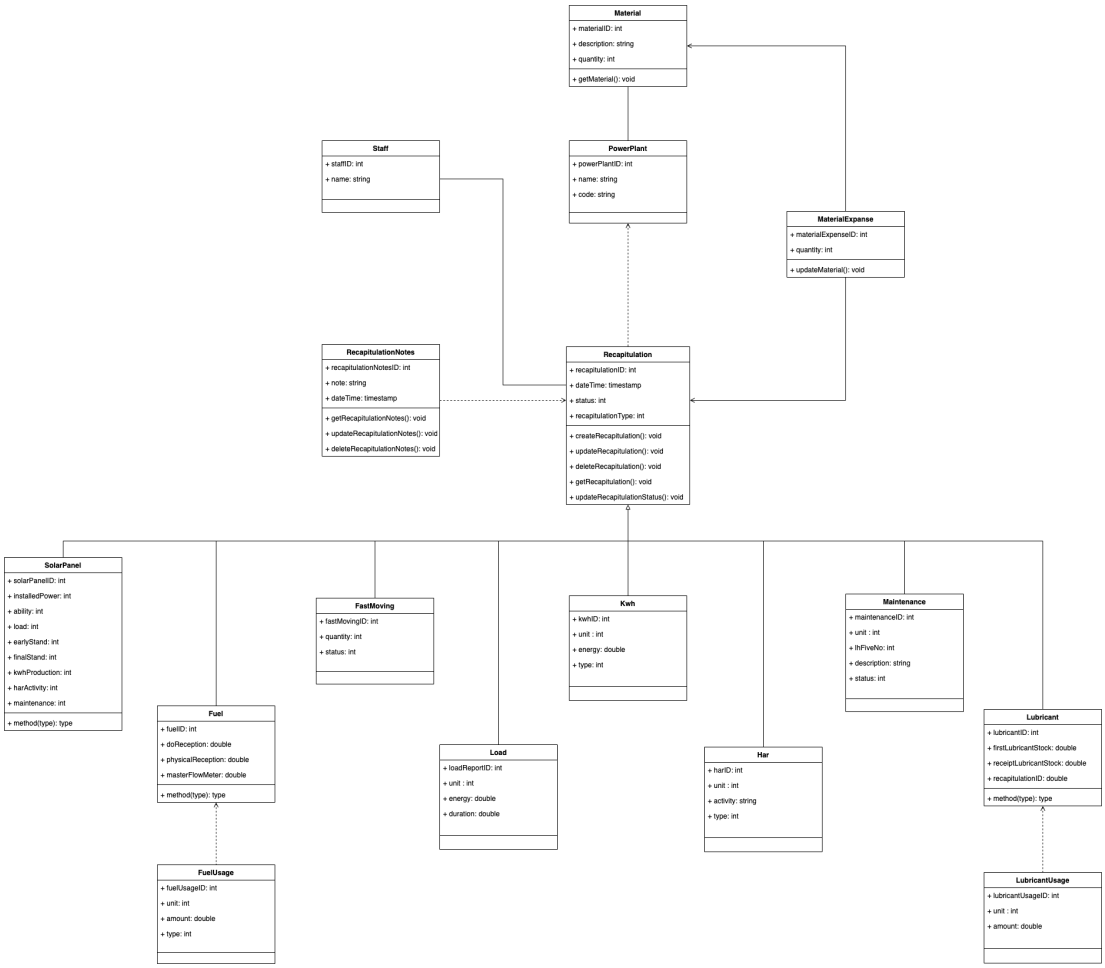
3.2.1 Subsystem Recapitulation

3.2.1.1 P001: Package Recapitulation



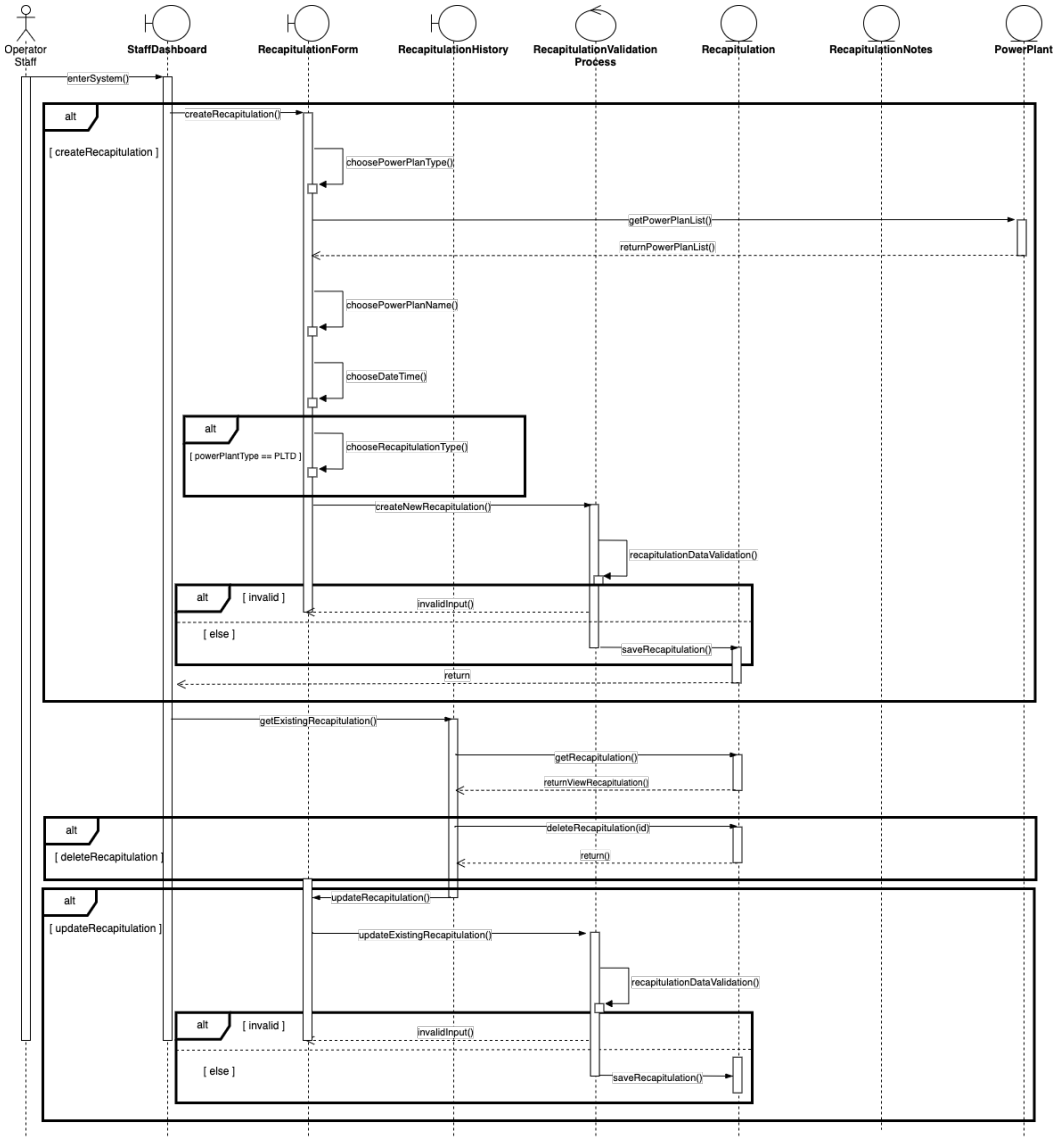
PD001 Package Diagram of Recapitulation

3.2.1.2 **Class Diagram**

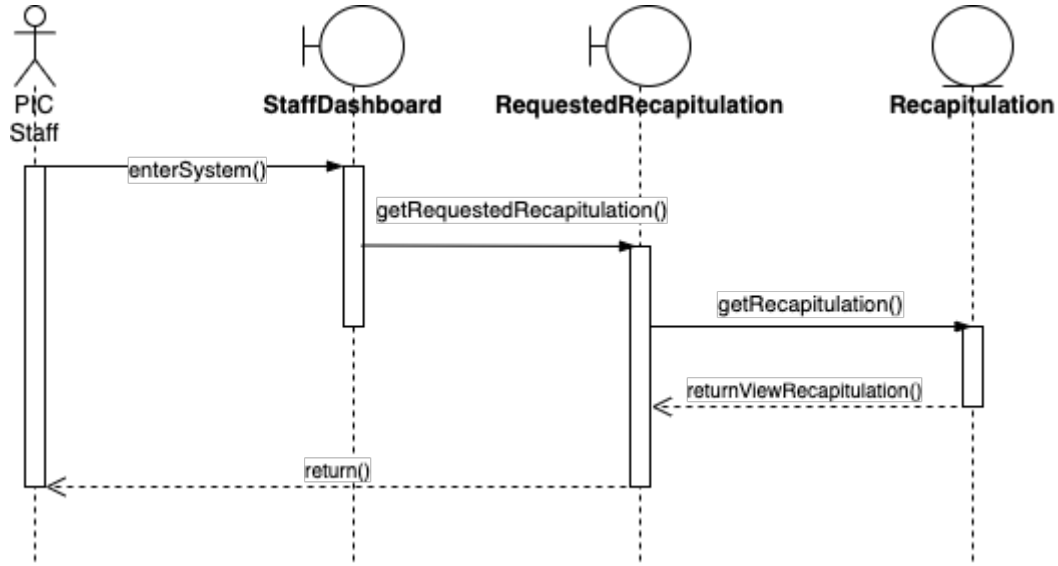


CD001 Class diagram for Recapitulation

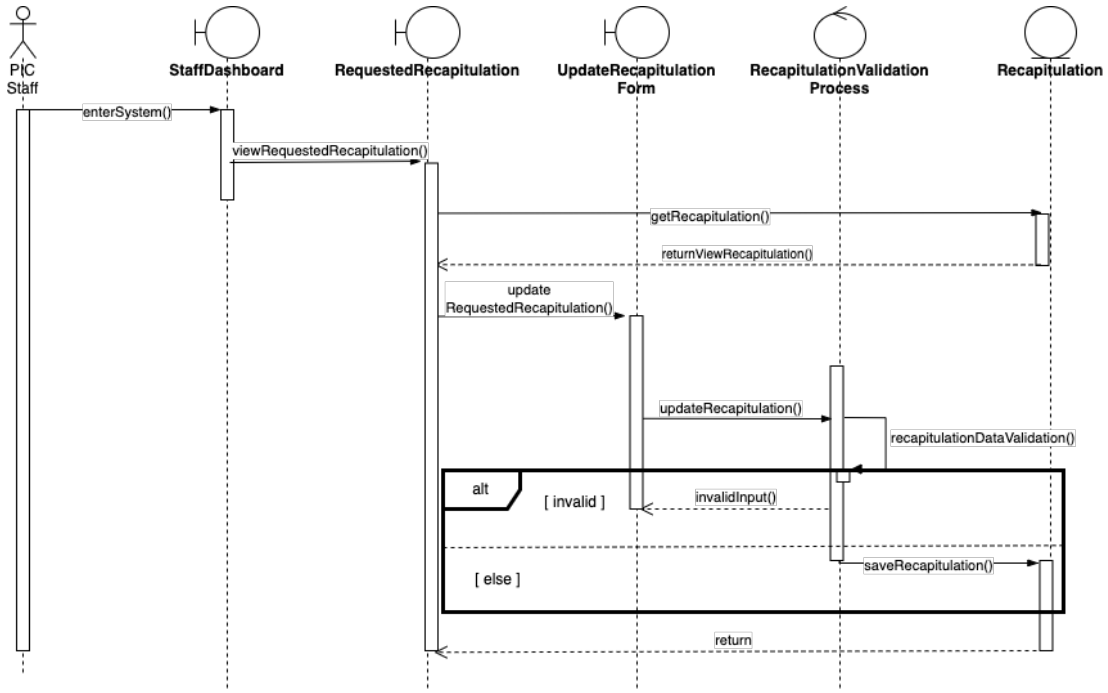
3.2.1.3 **Sequence Diagrams**



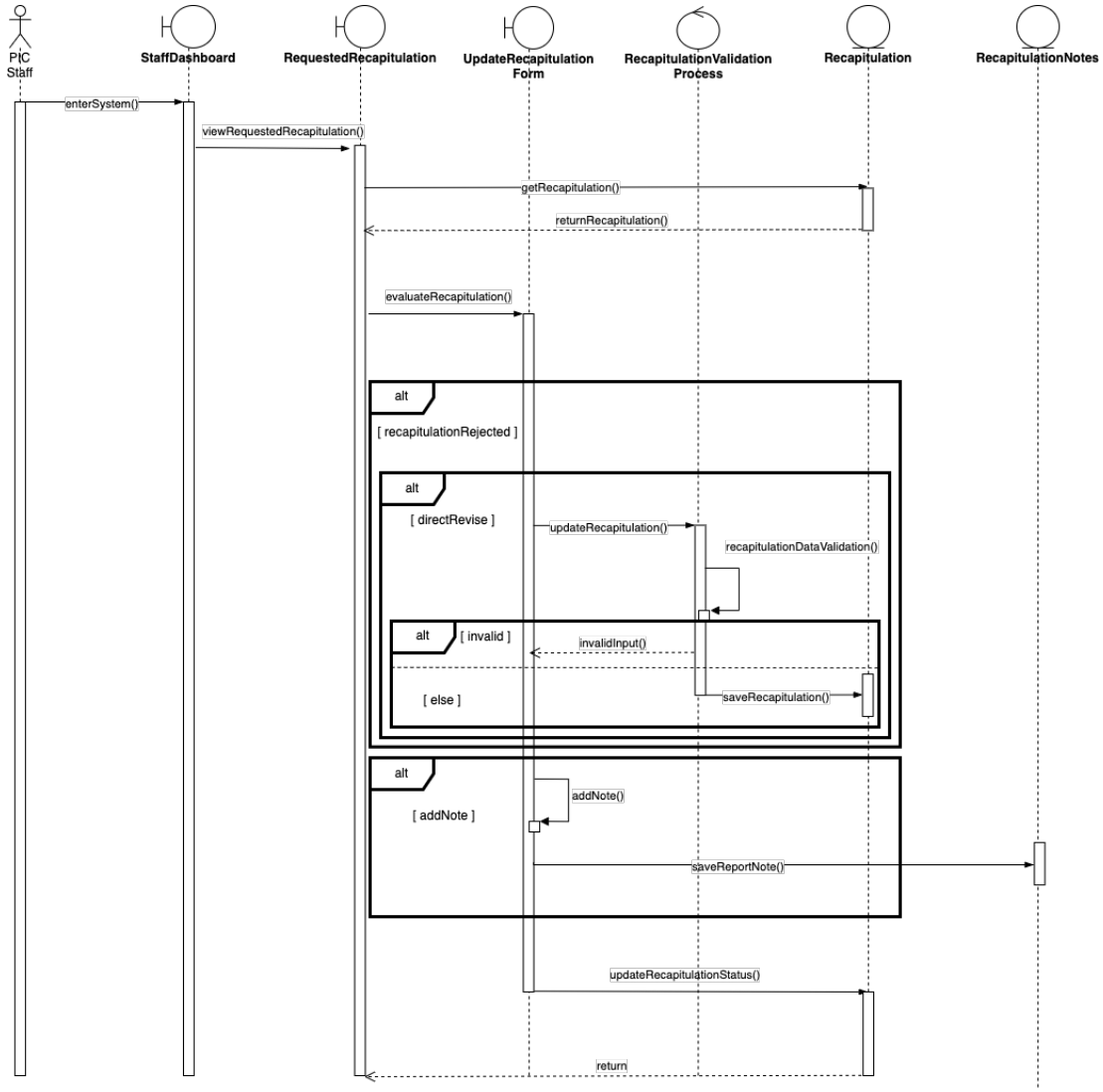
SD001 Sequence Diagram of Manage Recapitulation



SD002 Sequence Diagram of View Recapitulation



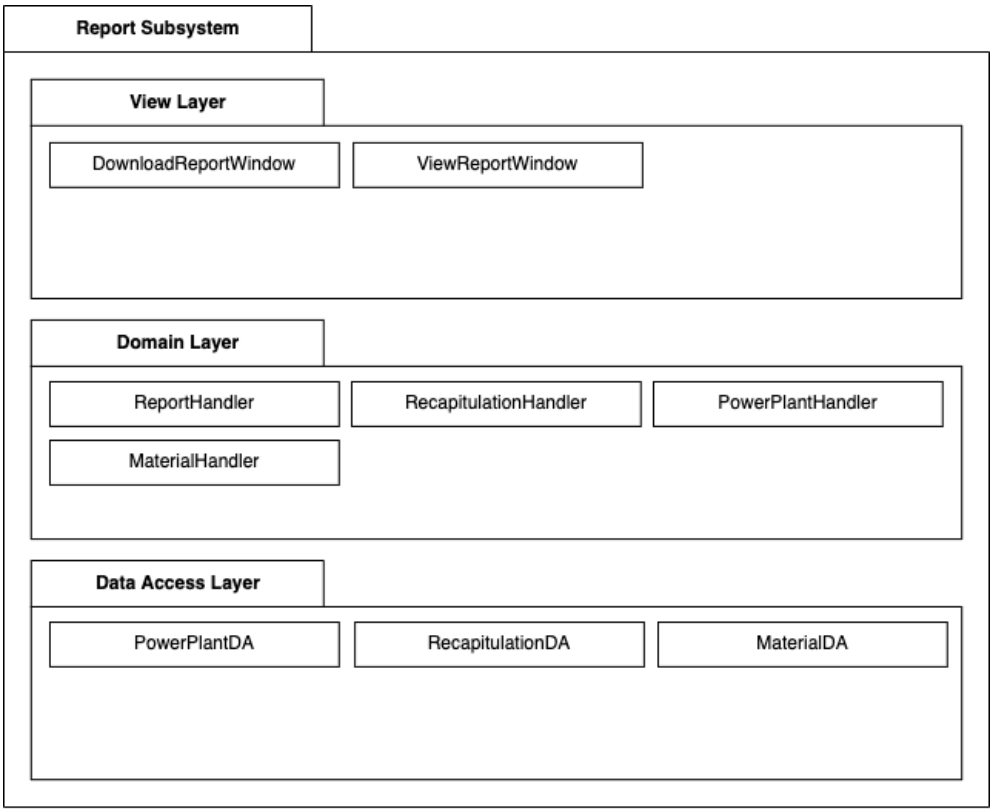
SD003 Sequence Diagram of Update Recapitulation



SD004 Sequence Diagram of Evaluate Recapitulation

3.2.2 **Subsystem Report**

3.2.2.1 **P002: Package Report**

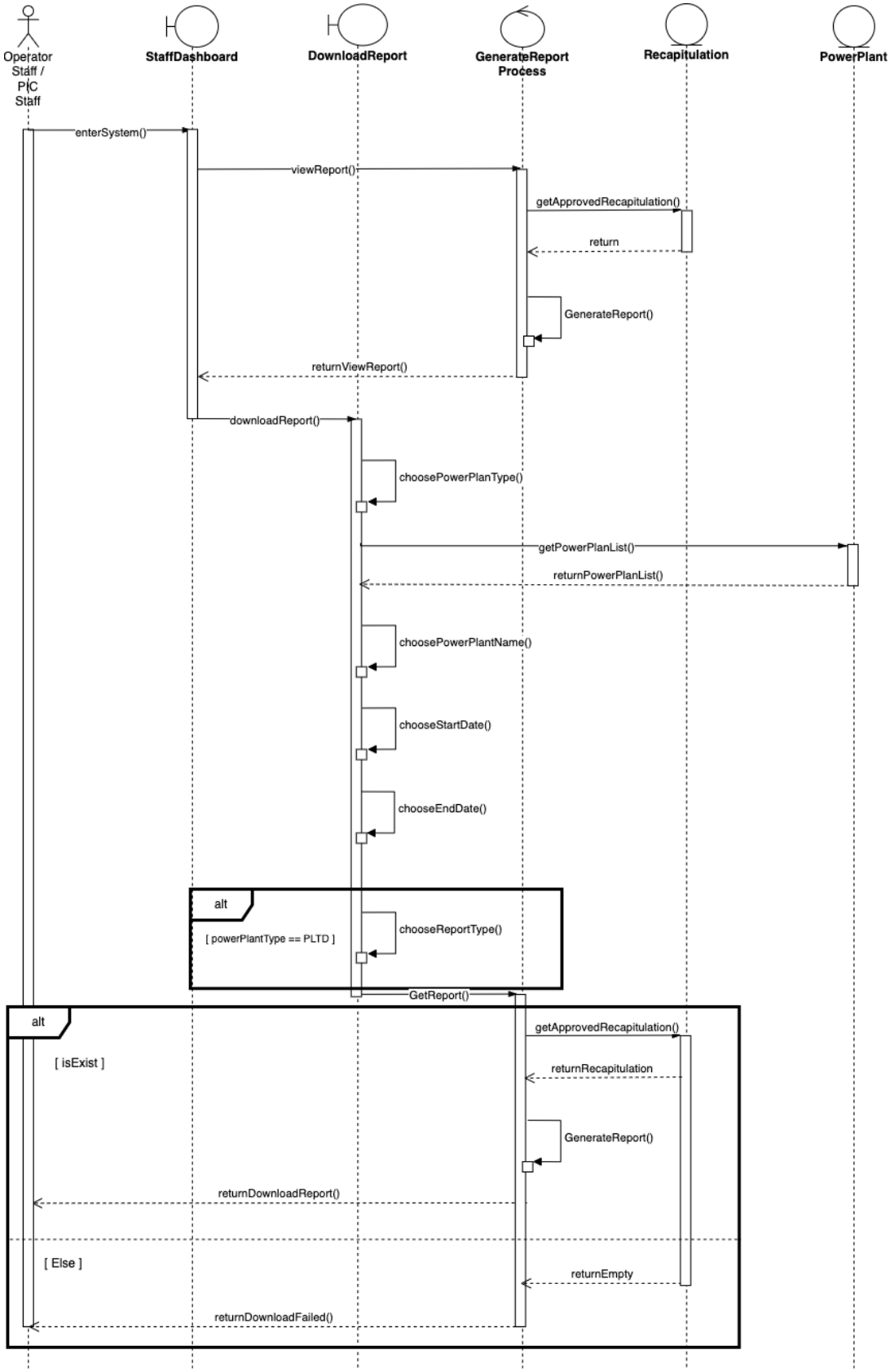


PD002 Package Diagram of Report

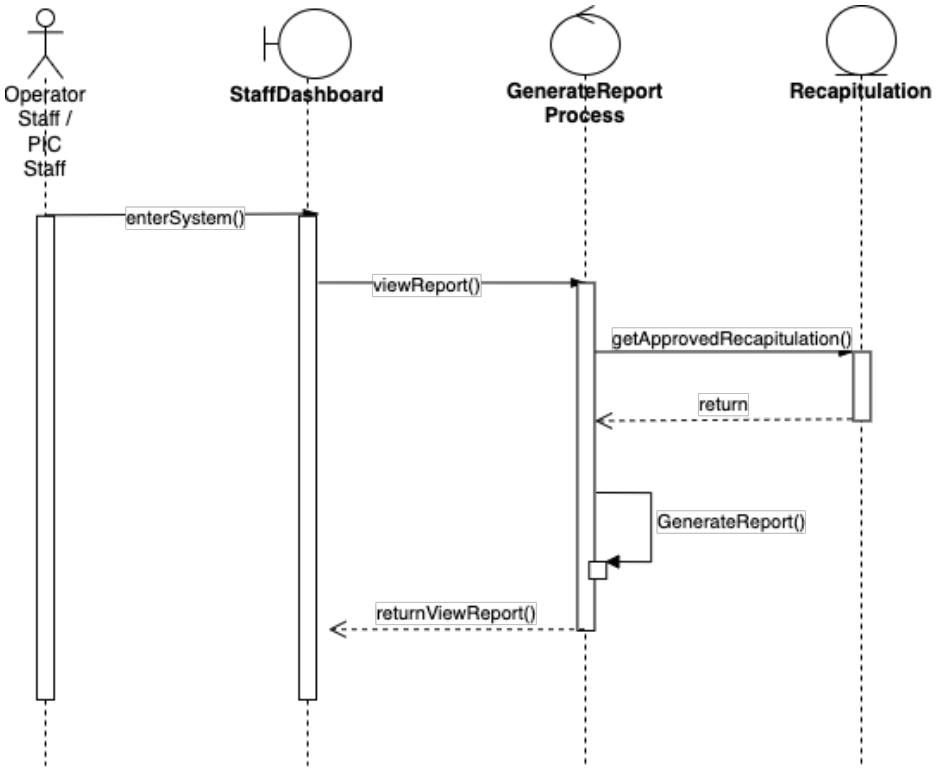
3.2.2.2 **Class Diagram**

CD002 Class diagram for Report

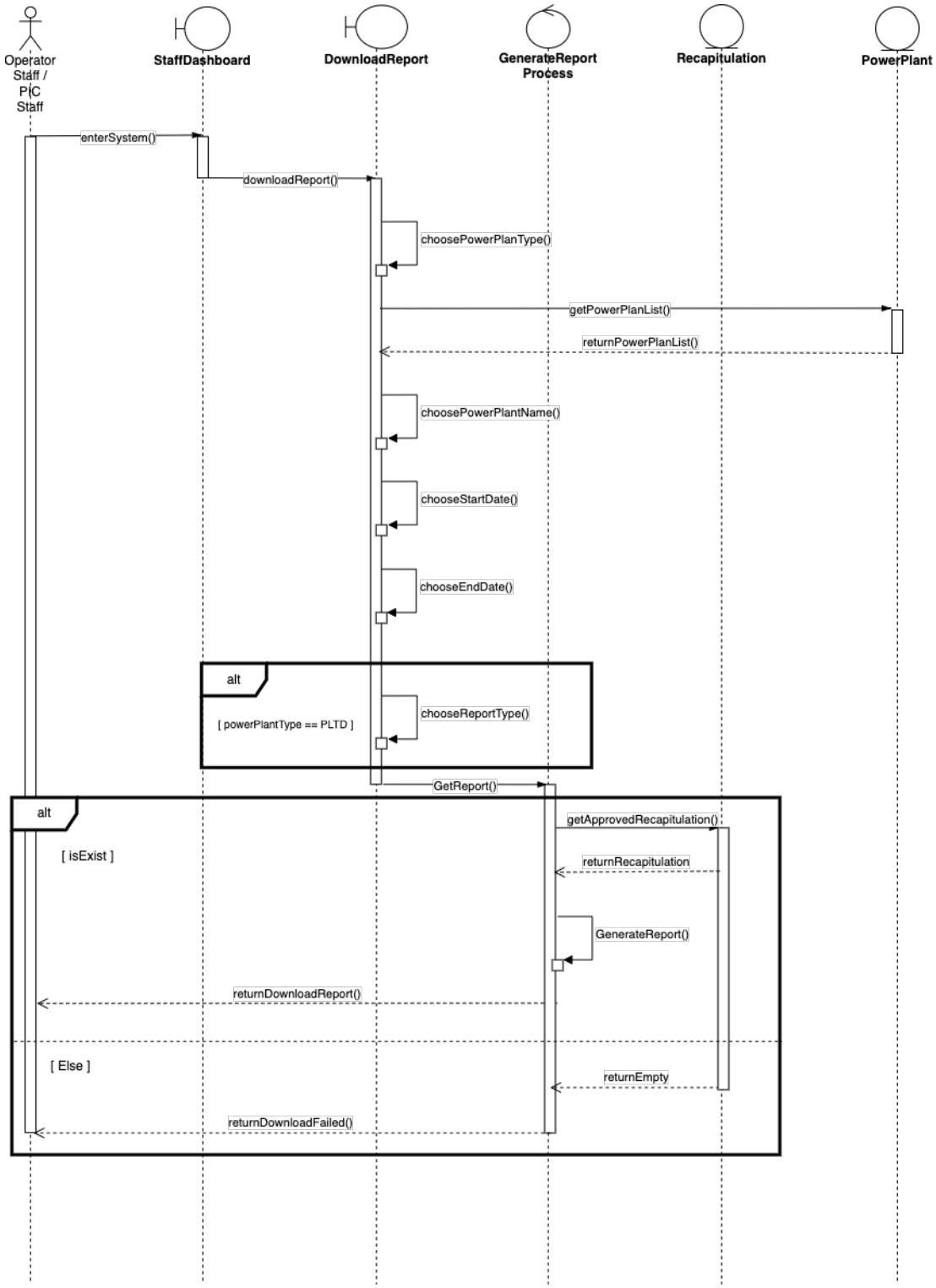
3.2.2.3 **Sequence Diagrams**



SD005 Sequence Diagram of Get Report



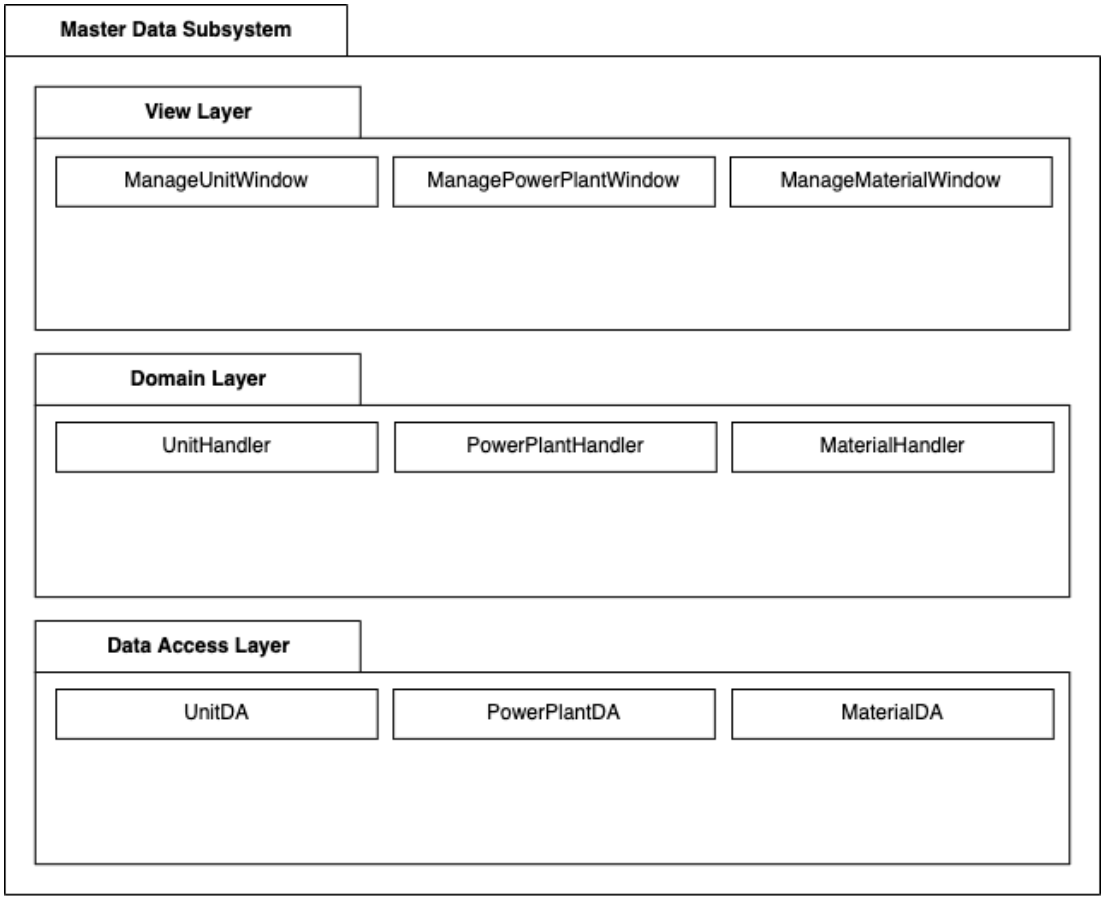
SD006 Sequence Diagram of View Record



SD007 Sequence Diagram of Download Record

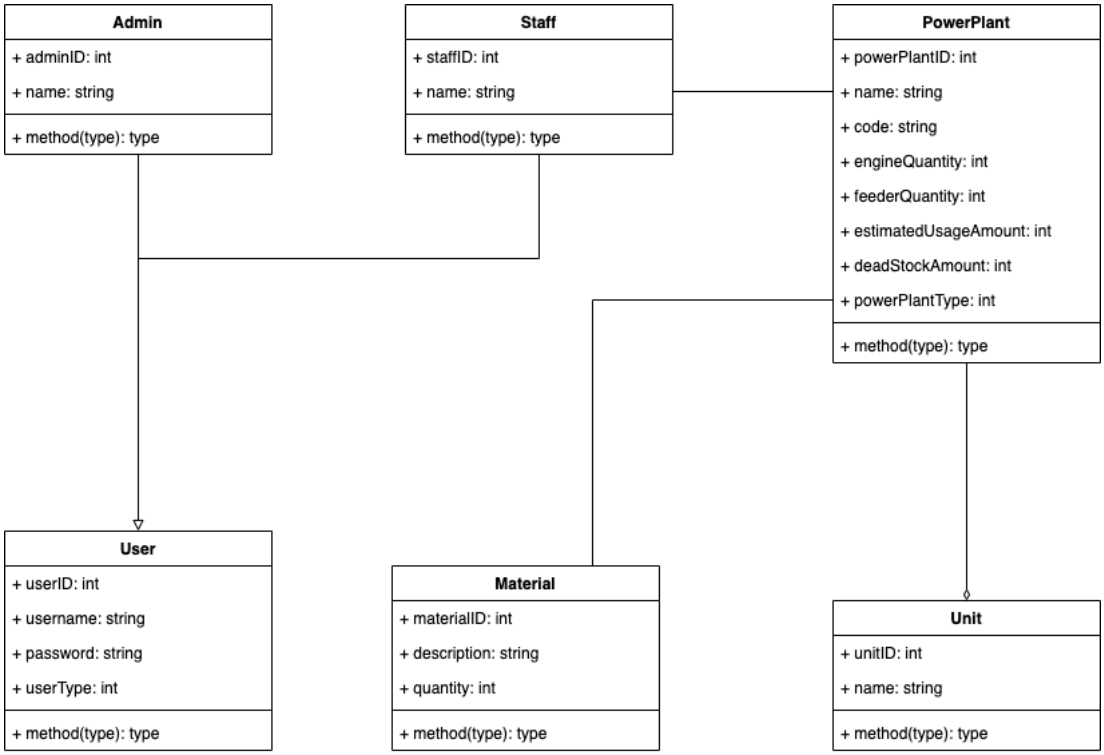
3.2.3 **Subsystem Master Data**

3.2.3.1 **P003: Package Master Data**



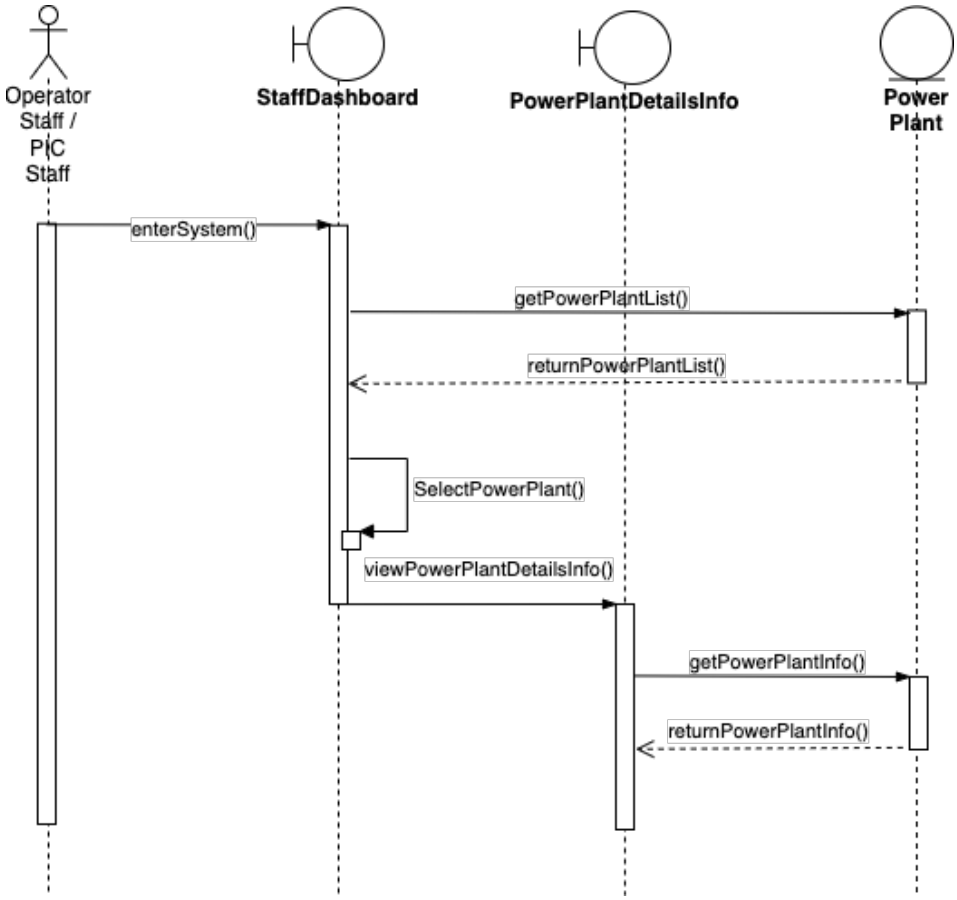
PD003 Package Diagram of Master Data

3.2.3.2 **Class Diagram**

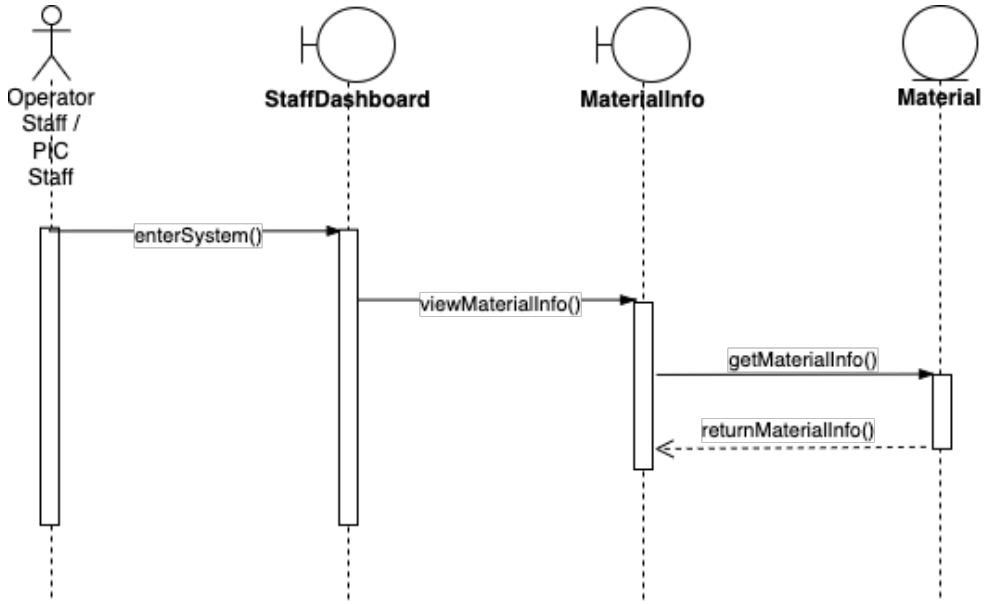


CD003 Class diagram for Master Data

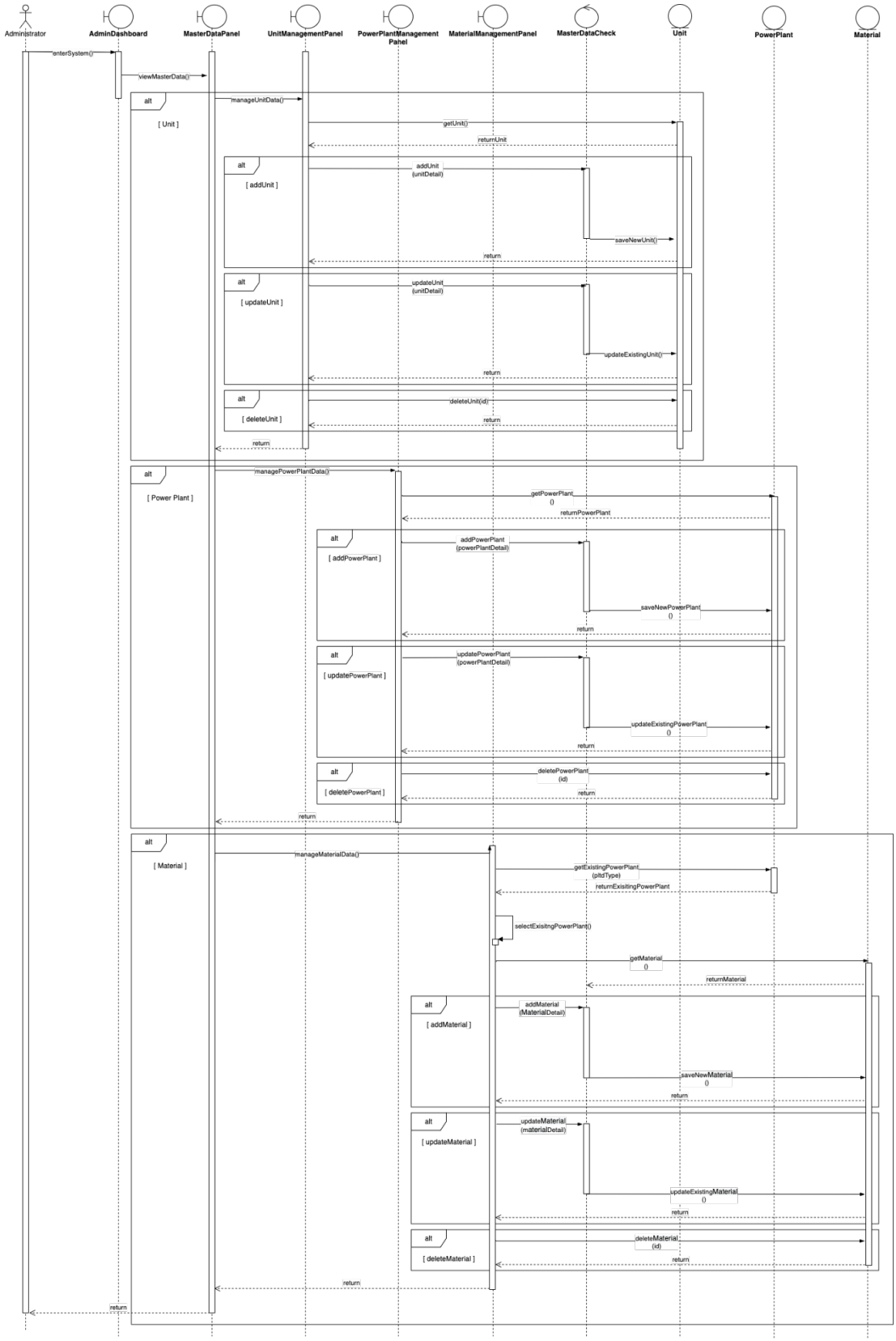
3.2.3.3 **Sequence Diagrams**



SD008 Sequence Diagram of View Power Plant



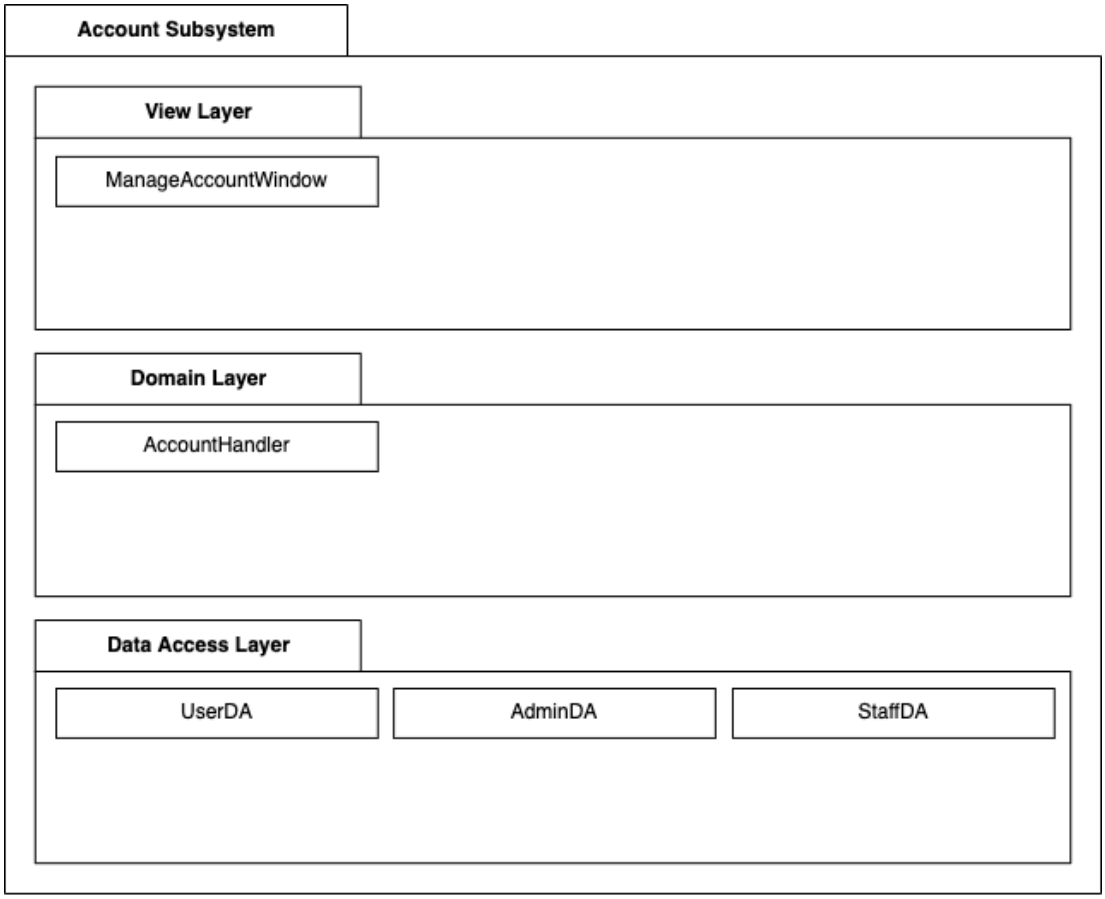
SD009 Sequence Diagram of View Material



SD010 Sequence Diagram of Manage Master Data

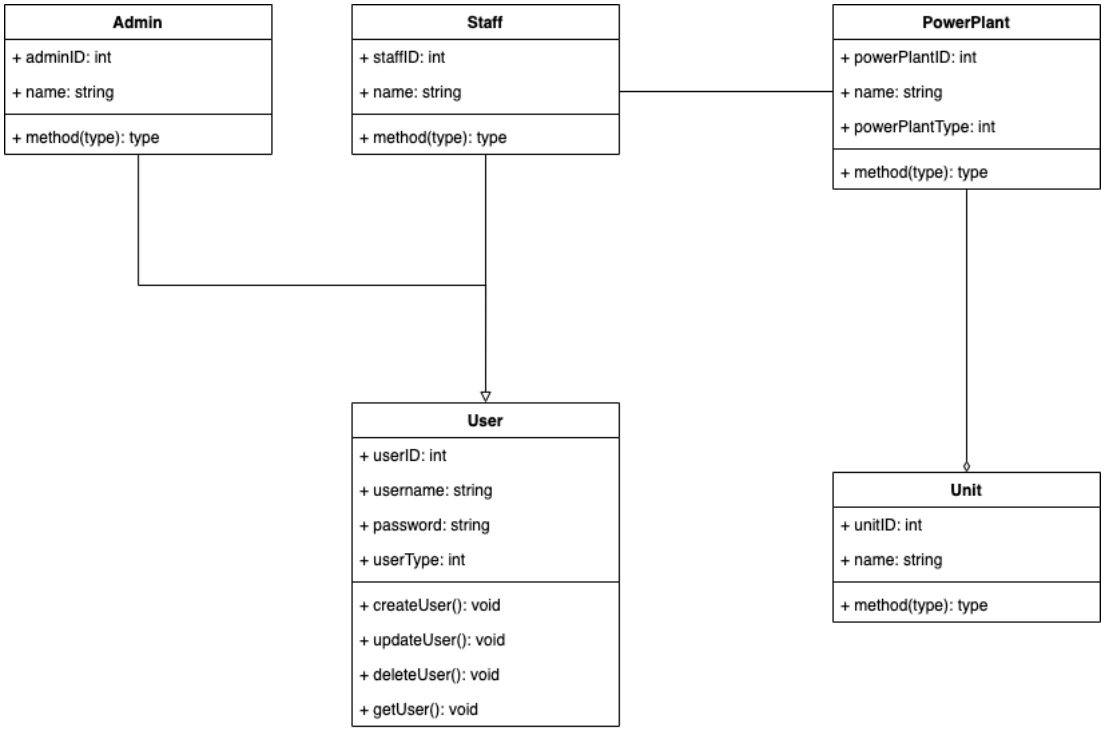
3.2.4 **Subsystem Account**

3.2.4.1 **P004: Package Account**



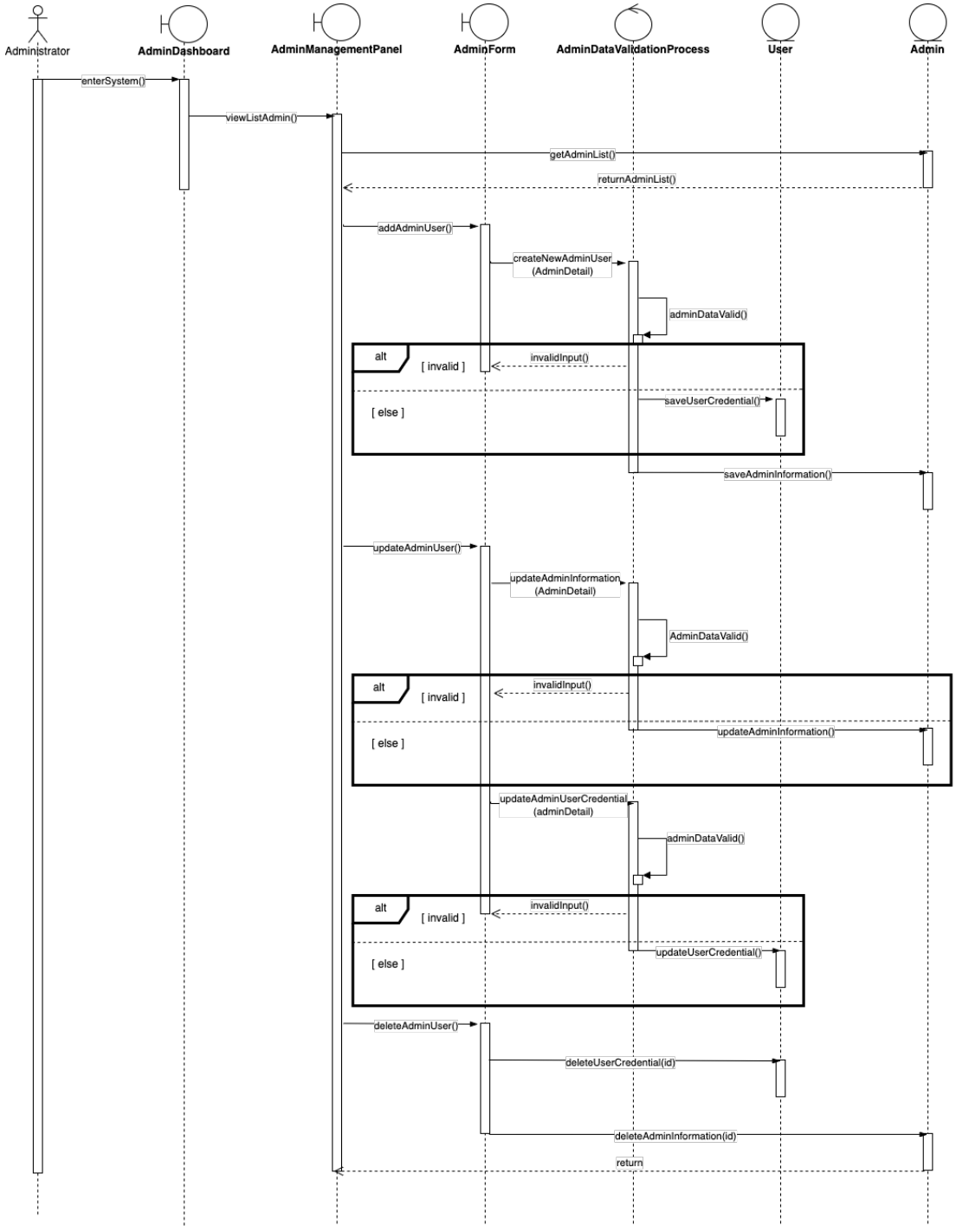
PD004 Package Diagram of Account

3.2.4.2 **Class Diagram**

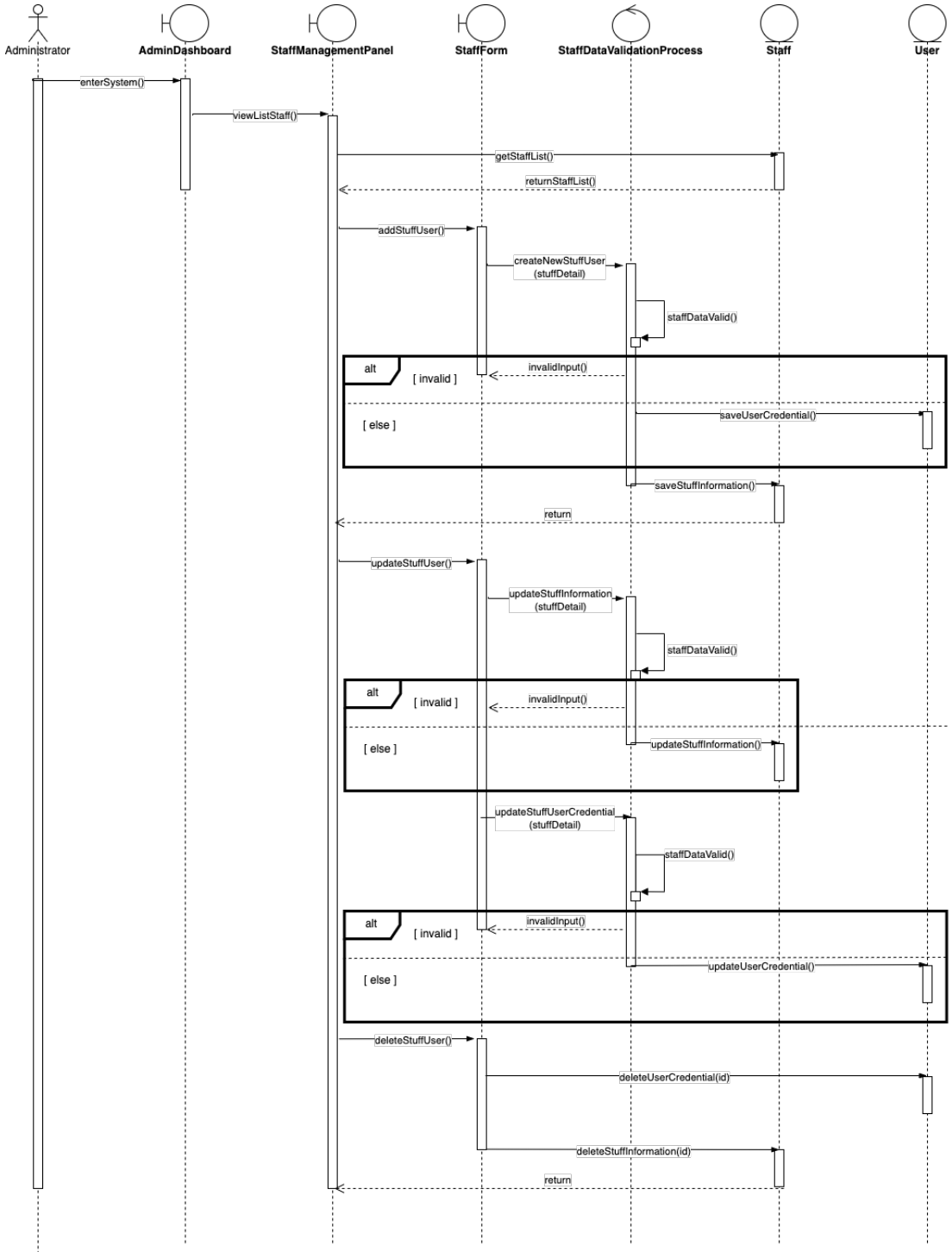


CD004 Class diagram for Account

3.2.4.3 **Sequence Diagrams**



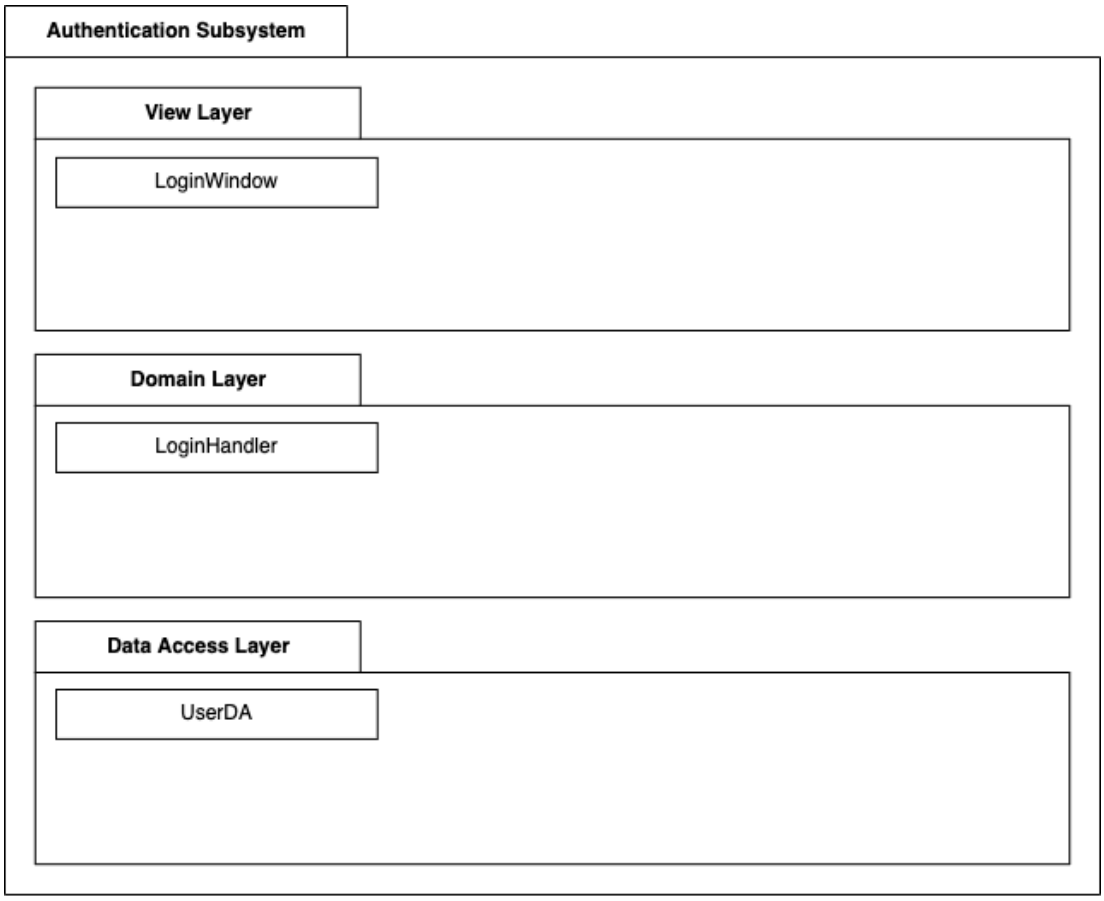
SD011 Sequence Diagram of Manage Admin User Account



SD012 Sequence Diagram of Manage Staff User Account

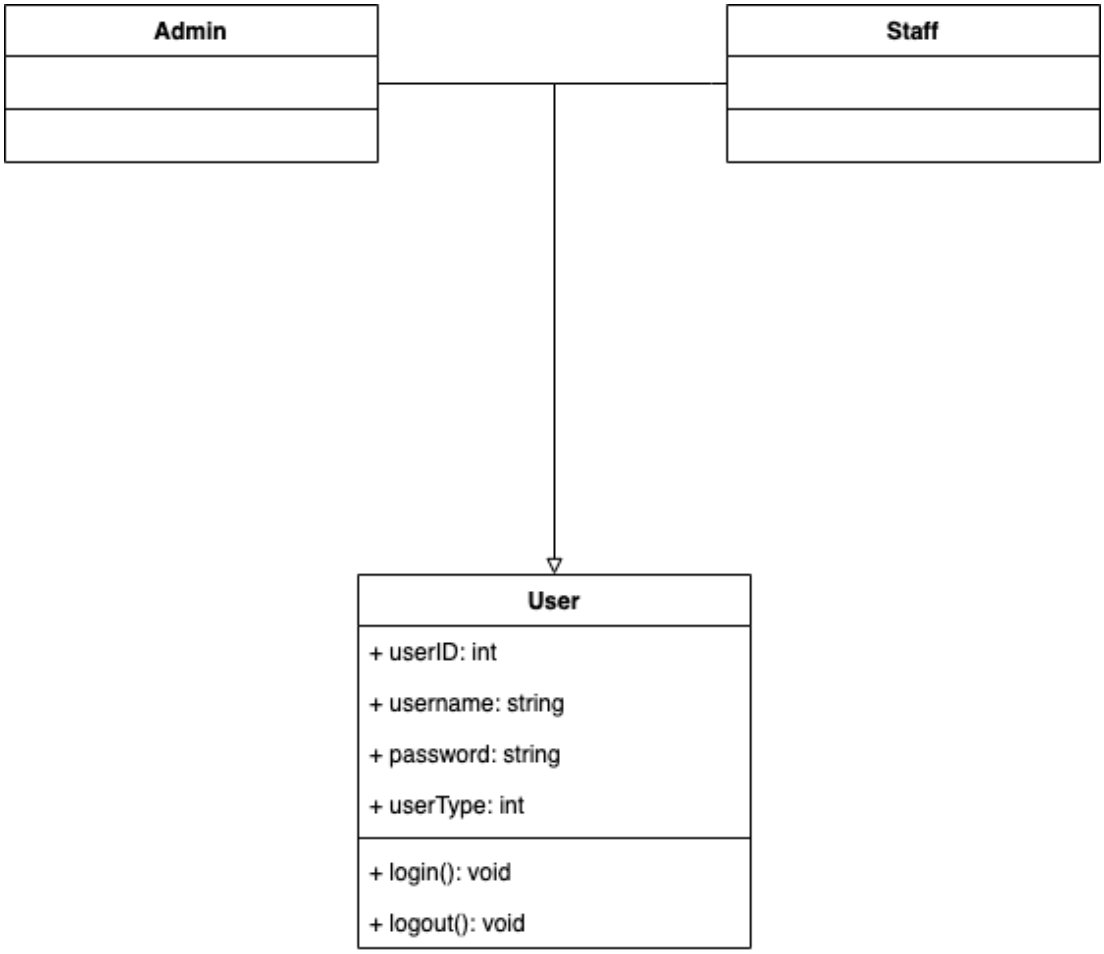
3.2.5 **Subsystem Master Data**

3.2.5.1 **P005: Package Authentication**



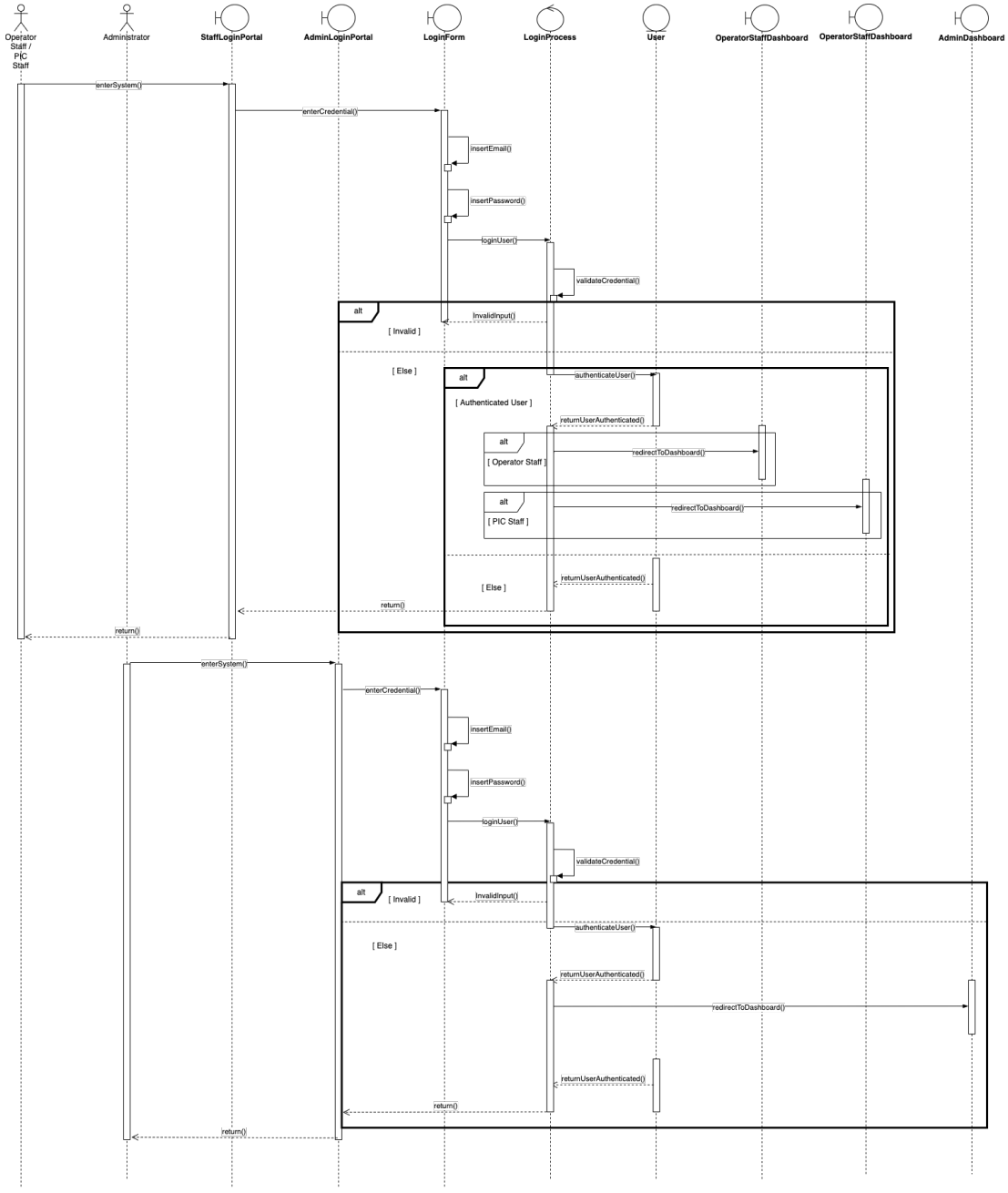
PD005 Package Diagram of Authentication

3.2.5.2 **Class Diagram**



CD005 Class diagram for Authentication

3.2.5.3 **Sequence Diagrams**

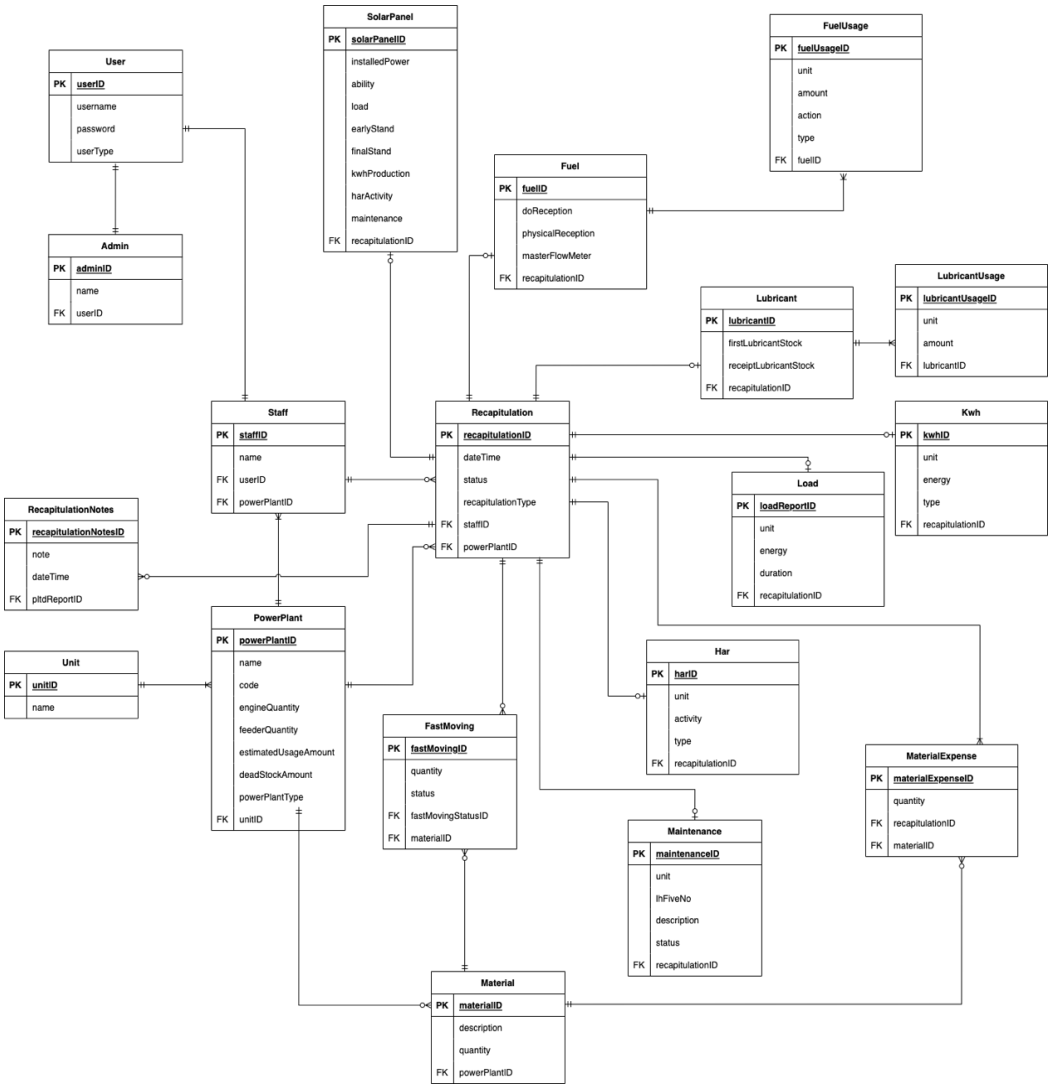


SD013 Sequence Diagram of Sign In

4. DATA DESIGN

4.1 Data Description

This section explains how the Power Plants Performance Monitoring System (P3MS) for PT PLN (Persero) UP3 Pamekasan database was designed for the use of proposed system. In the process of developing, designing, and implementing a system, one of the most important roles played is that of database design. The data of this system can be well organized by using good database design principles.



ERD000 Entity Relationship Diagram (ERD) of P3MS

Entity Name	**Description**
User	It stores account credentials for every user, such as username and password.
Admin	It stores the detailed information of every administrator.
Staff	It stores the detailed information of every staff member.
PowerPlant	It stores all the general information related to the power plant.
Unit	It stores all the general information related to the unit.
Material	It stores all the information related to the stock of the materials for every power plant.
Recapitulation	It stores all the records of recapitulation for every power plant.
RecapitulationNotes	It stores all the evaluation notes for every recapitulion.
MaterialExpense	It stores all the records of material expenses that on primary use for every power plant.
SolarPanel	It stores all the daily general information related to solar panels in every power plant.
Fuel	It stores all the daily general information related to fuel in every power plant.
Fuel Usage	It stores all the records of fuel usage for every power plant.
Lubricant	It stores all the daily general information related to lubricants in every power plant.
Lubricant Usage	It stores all the records of lubricant usage for every power plant.
Kwh	It stores all the daily general information related to voltage (Kwh) in

	every power plant.
Load	It stores all the daily general information related to load in every power plant.
Har	It stores information related to repairement (Har) in every power plant.
Maintenance	It stores information related to maintenance in every power plant.
FastMoving	It stores all the records of material income and material expenses that outside of primary use for every power plant.

4.2 Data Dictionary

DD000 Data Dictionary for P3MS

Field Name	Datatype	Constraint	Description
User Table			
userID	BIGINT	Primary Key	Unique ID for User
username	VARCHAR	Not Null	Username of the user account
password	VARCHAR	Not Null	password of the user account
userTypeID	BIGINT	Foreign Key	Type of user
Admin Table			
adminID	BIGINT	Primary Key	Unique ID for Admin
name	VARCHAR	Not Null	Name of the admin
userID	BIGINT	Foreign Key	The ID of user's credential information
Staff Table			
staffID	BIGINT	Primary Key	Unique ID for Staff
name	VARCHAR	Not Null	Name of the staff
userID	BIGINT	Foreign Key	The ID of user's credential information

powerPlantID	BIGINT	Foreign Key	The ID of the power plant who under the staff
Unit Table			
unitID	BIGINT	Primary Key	Unique ID for Unit
name	VARCHAR	Not Null	Name of the unit
PowerPlant Table			
powerPlantID	BIGINT	Primary Key	Unique ID for PowerPlant
name	VARCHAR	Not Null	Name of the power plant
code	CHAR	Not Null	The power plant code identifier
engineQuantity	INT	Not Null	The number of engine under the power plant
feederQuantity	INT	Not Null	The number of feeder under the power plant
estimatedUsageAmount	INT	Not Null	Amount of estimated usage
deadStockAmount	INT	Not Null	Amount of dead stock
powerPlantTypeID	BIGINT	Not Null	The power plant type
unitID	BIGINT	Foreign Key	The ID of unit

Material Table			
materialID	BIGINT	Primary Key	Unique ID for Material
description	VARCHAR	Not Null	Material name
quantity	INT	Not Null	The number of the material
powerPlantID	BIGINT	Foreign Key	The ID of power plant who have this information
SolarPanel Table			
solarPanelID	BIGINT	Primary Key	Unique ID for SolarPanel
installedPower	INT	Not Null	Amount of installed power in megawatt (MW)
ability	INT	Not Null	Amount of ability in megawatt (MW)
load	DOUBLE	Not Null	Amount of load in kilowatt (kW)
earlyStand	DOUBLE	Not Null	Amount of earlyStand in kilowatt (kW)
finalStand	DOUBLE	Not Null	Amount of finalStand in kilowatt per hour (kWh)

khwProduction	DOUBLE	Not Null	Amount of khwProduction in kilowatt per hour (kWh)
harActivity	TEXT	Nullable	The detail explanation of har Activity
gangguan	TEXT	Nullable	The detail explanation of gangguan
pltsReportID	BIGINT	Foreign Key	The ID of PLTS report that hold this detail information
MaterialExpense Table			
materialExpenseID	BIGINT	Primary Key	Unique ID for MaterialExpense
quantity	INT	Not Null	The quantity of material that used for ‘har’ activity
materialID	BIGINT	Foreign Key	The ID of material that used for gangguan
recapitulationID	BIGINT	Foreign Key	The ID of rcapitulation that hold this detail information
Recapitulation Table			

recapitulationID	BIGINT	Primary Key	Unique ID for Recapitulation
dateTime	TIMESTAMP	Not Null	Date and time of the report insertion
status	BIGINT	Not Null	The report status wether it is on progress, submitted, approved or rejected
recapitulationType	BIGINT	Not Null	The recapitulation type
staffID	BIGINT	Foreign Key	The ID of the staff who make this report
powerPlantID	BIGINT	Foreign Key	The ID of power plant who have this report
Fuel Table			
fuelID	BIGINT	Primary Key	Unique ID for Fuel
doReception	DOUBLE	Not Null	Amount of 'do' reception in liter (L)
physicalReception	DOUBLE	Not Null	Amount of physical reception in liter (L)
masterFlowMeter	DOUBLE	Not Null	Amount of master flow meter in liter (L)
recapitulationID	BIGINT	Foreign Key	The ID of recapitulation that hold this detail

			information
FuelUsage Table			
fuelUsageID	BIGINT	Primary Key	Unique ID for FuelUsage
unit	INT	Not Null	The unit number
amount	DOUBLE	Not Null	Amount of daily tank stock for engine unit in liter (L)
action	INT	Not Null	The action type
type	INT	Not Null	The usage type
fuelID	BIGINT	Foreign Key	The ID of fuel that hold this detail information
Lubricant Table			
lubricantReportID	BIGINT	Primary Key	Unique ID for Lubricant
firstLubricantStock	DOUBLE	Not Null	Amount of first lubricant stock in liter (L)
receiptLubricantStock	DOUBLE	Not Null	Amount of receipt lubricant stock in liter (L)
recapitulationID	BIGINT	Foreign Key	The ID of recapitulation that hold this detail information

LubricantUsage Table			
lubricantUseID	BIGINT	Primary Key	Unique ID for LubricantUsage
unit	INT	Not Null	The unit number
amount	DOUBLE	Not Null	Amount of lubricant used for engine unit in liter (L)
lubricantReportID	BIGINT	Foreign Key	The ID of lubricant report that hold this detail information
Kwh Table			
kwhID	BIGINT	Primary Key	Unique ID for Kwh
unit	INT	Not Null	The unit number
energy	DOUBLE	Not Null	Amount of kWh engine module for engine unit in kilowatt per hour (kWh)
type	INT	Not Null	The type of Kwh
recapitulationID	BIGINT	Foreign Key	The ID of recapitulation that hold this detail information
Load Table			
loadID	BIGINT	Primary Key	Unique ID for Load
unit	INT	Not Null	The unit number

energy	DOUBLE	Not Null	Amount of load for engine unit in kilowatt (kW)
duration	DOUBLE	Not Null	Duration of load operating hour for engine unit in hour (h)
recapitulationID	BIGINT	Foreign Key	The ID of recapitulation that hold this detail information
Har Table			
harID	BIGINT	Primary Key	Unique ID for Har
unit	INT	Not Null	The unit number
activity	TEXT	Nullable	The explanation of the activity
type	INT	Not Null	The type of Har
recapitulationID	BIGINT	Foreign Key	The ID of recapitulation that hold this detail information
Maintenance Table			
maintenanceID	BIGINT	Primary Key	Unique ID for Maintenance
unit	INT	Not Null	The unit number
lhFiveNo	VARCHAR	Not Null	Permit number

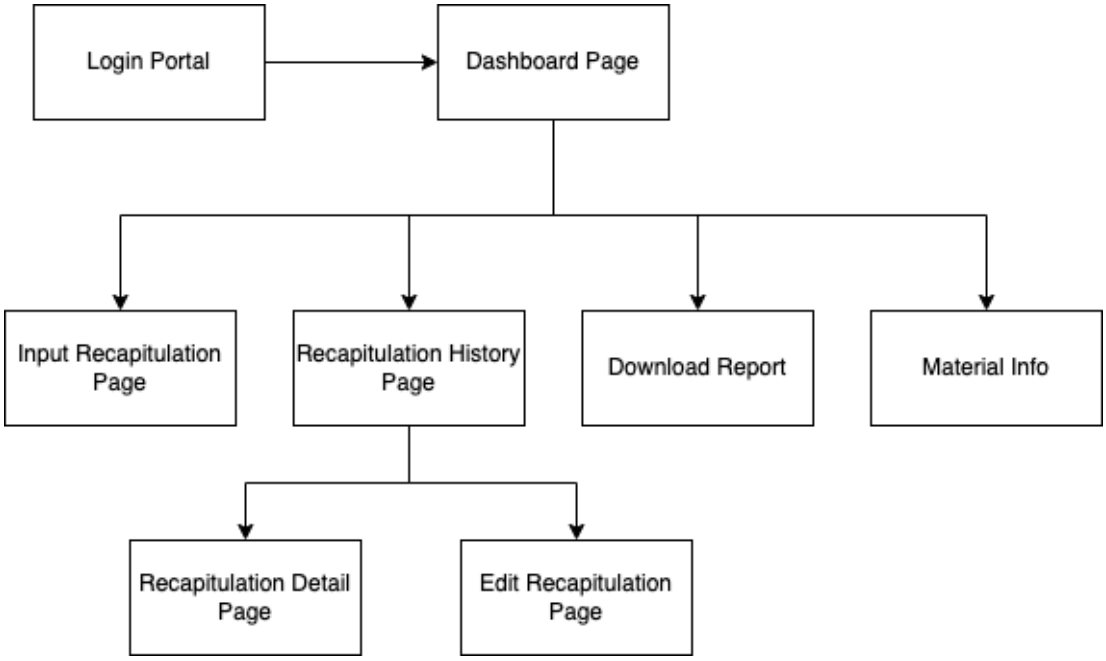
description	TEXT	Nullable	The detail of gangguan
status	INT	Nullable	The status of maintenance
recapitulationID	BIGINT	Foreign Key	The ID of recapitulation that hold this detail information
FastMoving Table			
fastMovingID	BIGINT	Primary Key	Unique ID for FastMoving
quantity	INT	Not Null	The quantity of material that used for fast moving
status	INT	Nullable	The status of fast moving
materialID	BIGINT	Foreign Key	The ID of the material that used for fast moving
RecapitulationNotes Table			
recapitulationNotesID	BIGINT	Primary Key	Unique ID for RecapitulationNotes
note	TEXT	Nullable	Note for report
dateTime	TIMESTAMP	Not Null	Date and time of the note insertion
recapitulationID	BIGINT	Foreign Key	The ID of

			recapitulation that hold this detail information

5. USER INTERFACE DESIGN

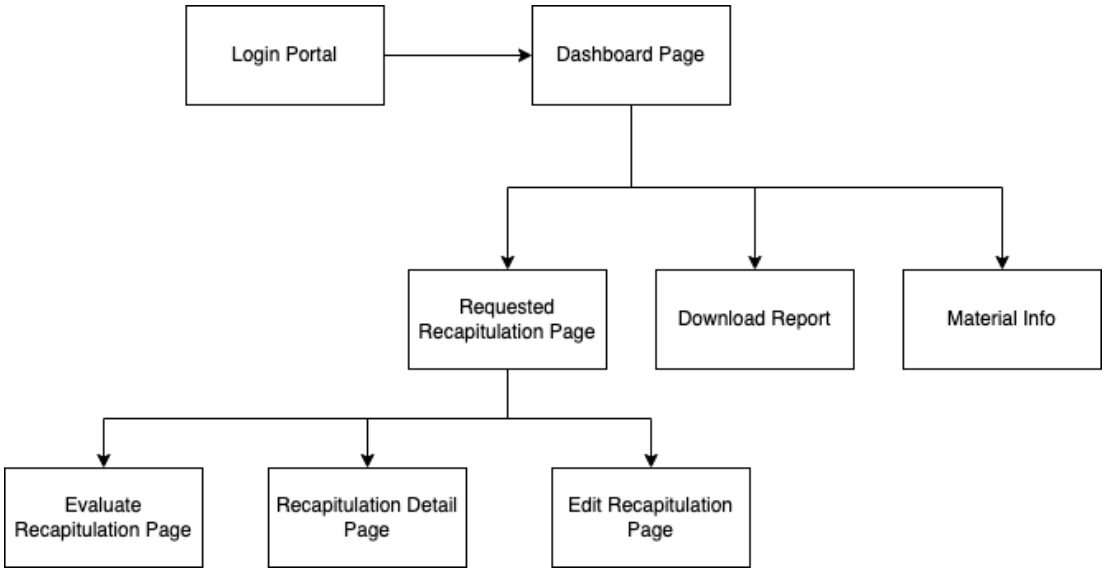
5.1 Overview of User Interface

This section demonstrates the interface design that is being used by the Power Plants Performance Monitoring System (P3MS) for PT PLN (Persero) UP3 Pamekasan. This section will include the design of the page's navigation, which will demonstrate how the page is organized. In addition to that, the user interface design that is shown to the end-user will also be included.



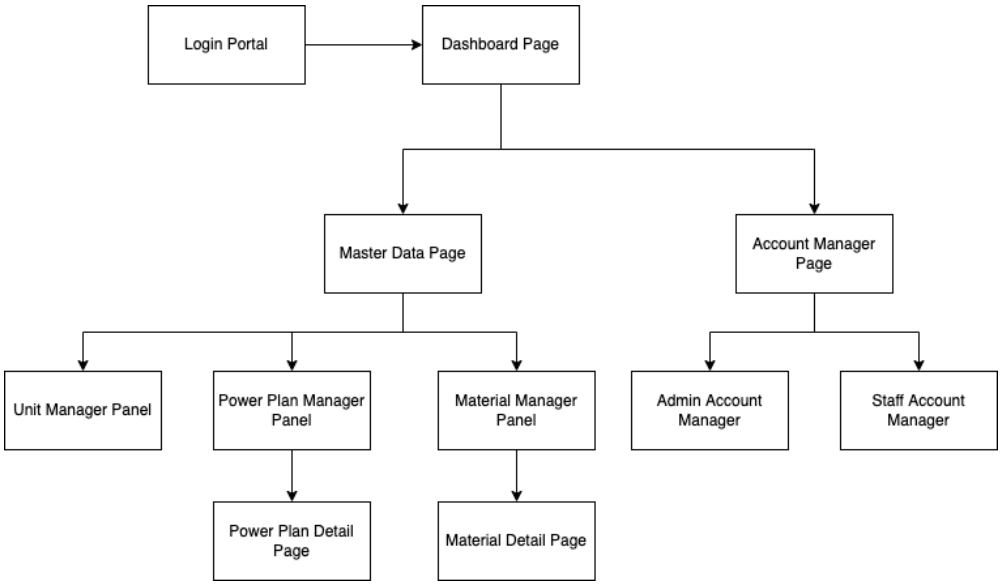
PN001 Page Navigation of Operator Staff in P3MS

The operator staff will be taken directly to the dashboard page of the system once they have successfully logged in to the system. From the dashboard page, the operator staff has the option to navigate to the pages that allow them to manage input recapitulation, view recapitulation history, download reports, and view material information.



PN002 Page Navigation of PIC Staff in P3MS

The PIC staff will be taken directly to the dashboard page of the system once they have successfully logged in to the system. From the dashboard page, the PIC staff has the option to navigate to the pages that allow them to manage requested recapitulation, download reports, and view material information.



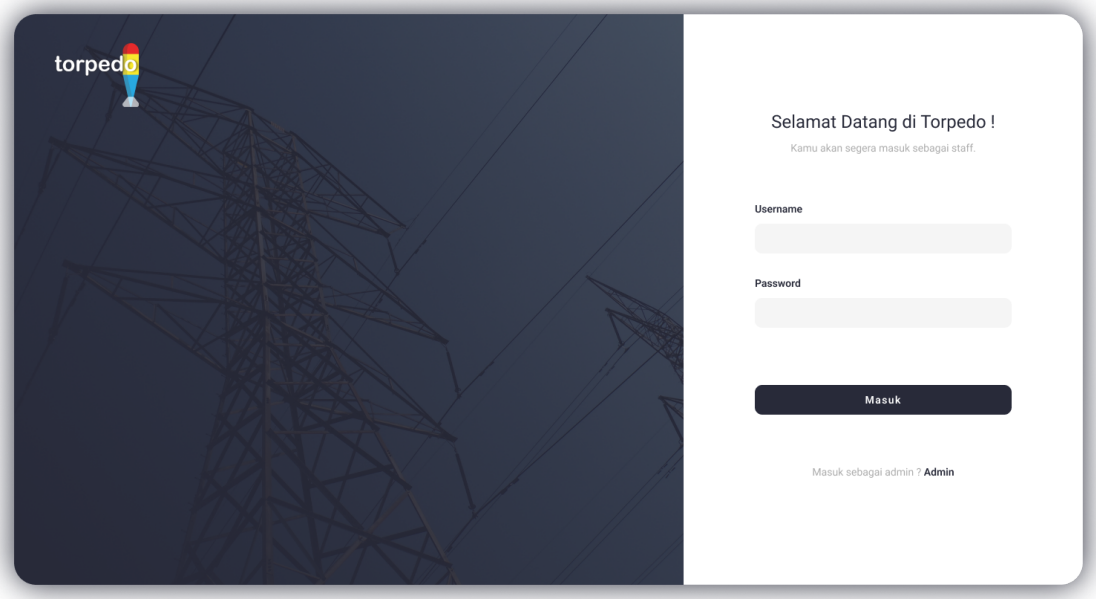
PN003 Page Navigation of Administrator in P3MS

The administrator will be taken directly to the dashboard page of the system once they have successfully logged in to the system. From the dashboard page, the admin has the option to navigate to the pages that allow them to manage master data or accounts.

5.2 Screen Images

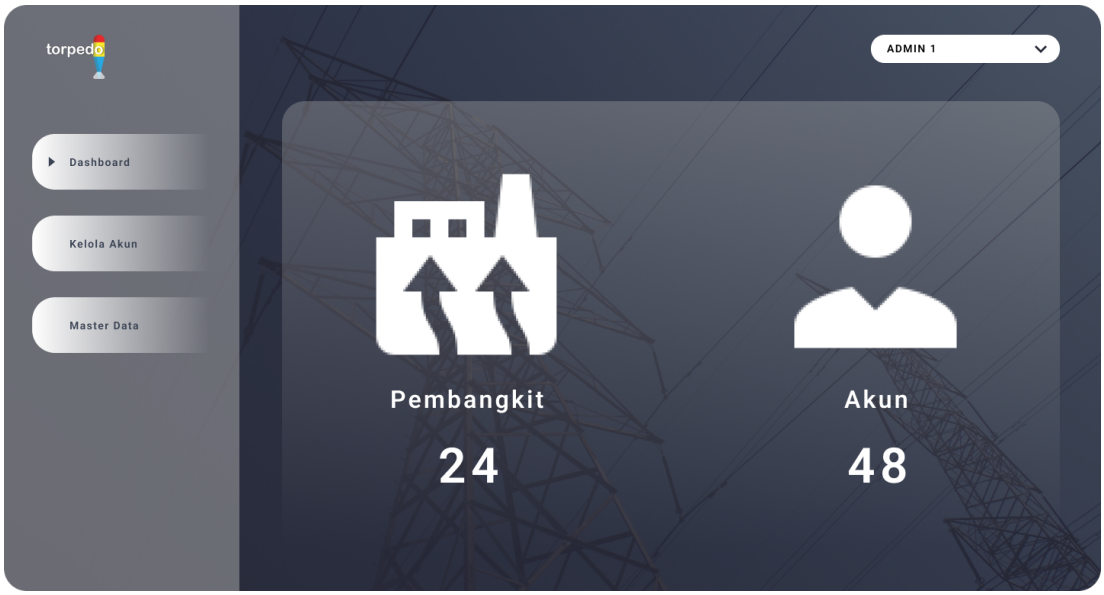
5.2.1 Login Screen

SN001 Administrator Login Screen

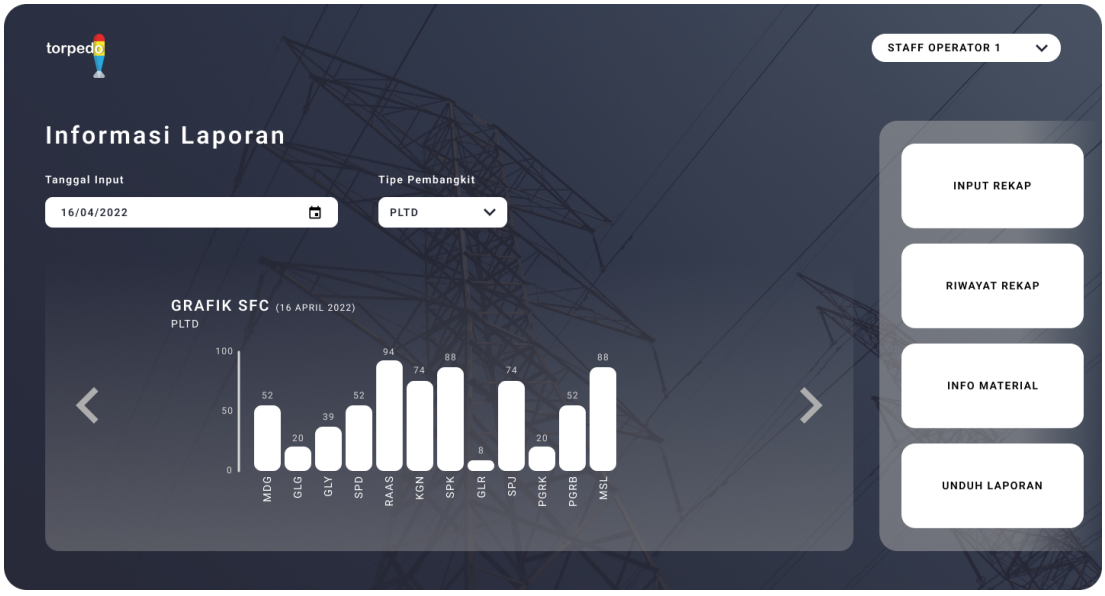


SN002 Staff Login Screen

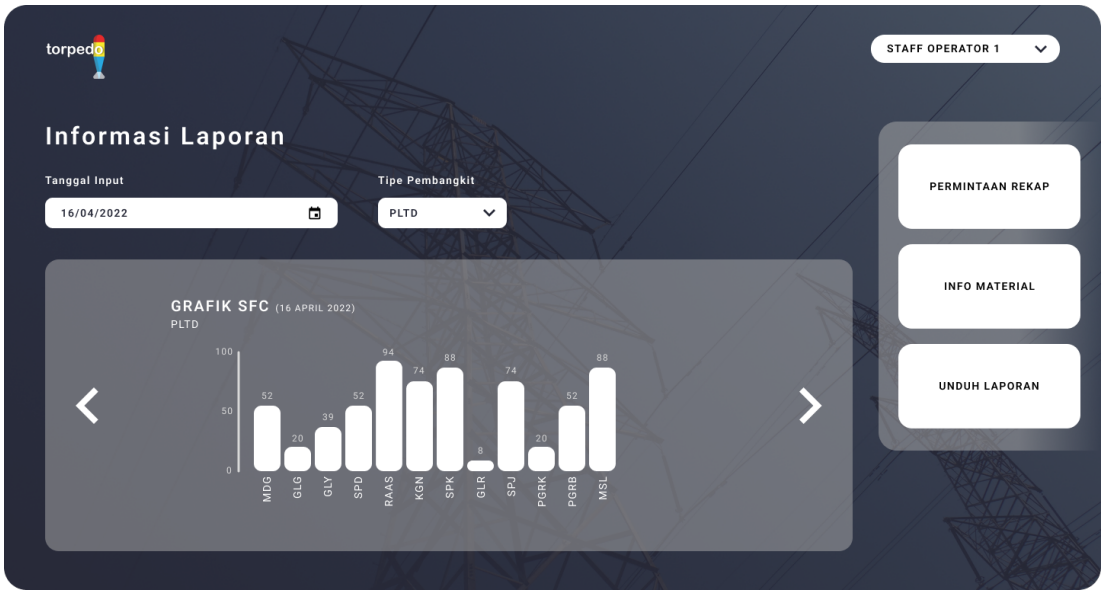
5.2.2 Dashboard Screen



SN003 Administrator Dashboard Screen

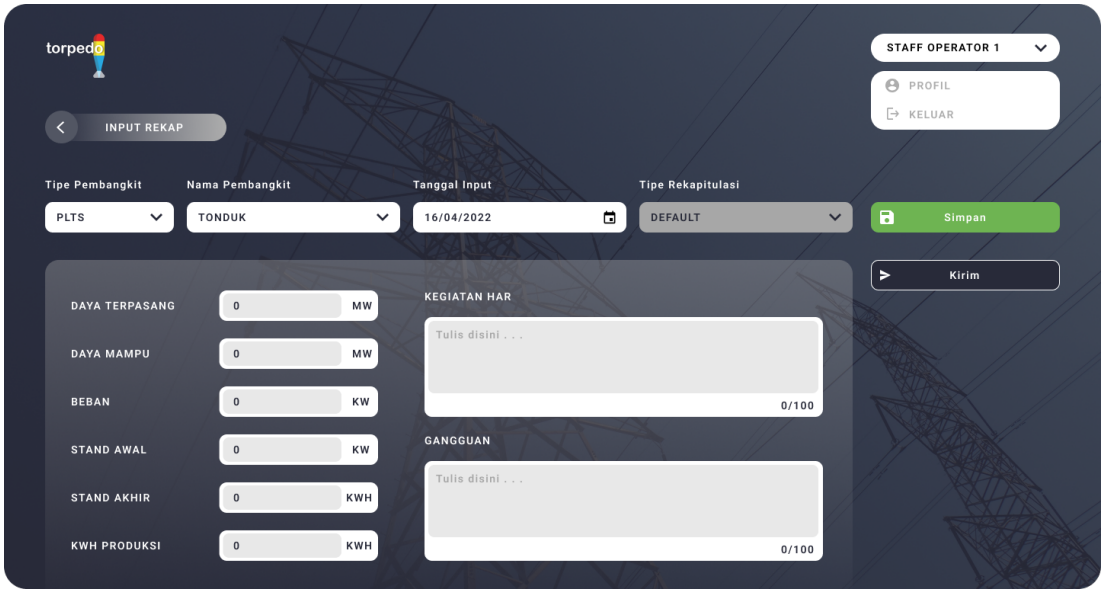


SN004 Operator Staff Dashboard Screen



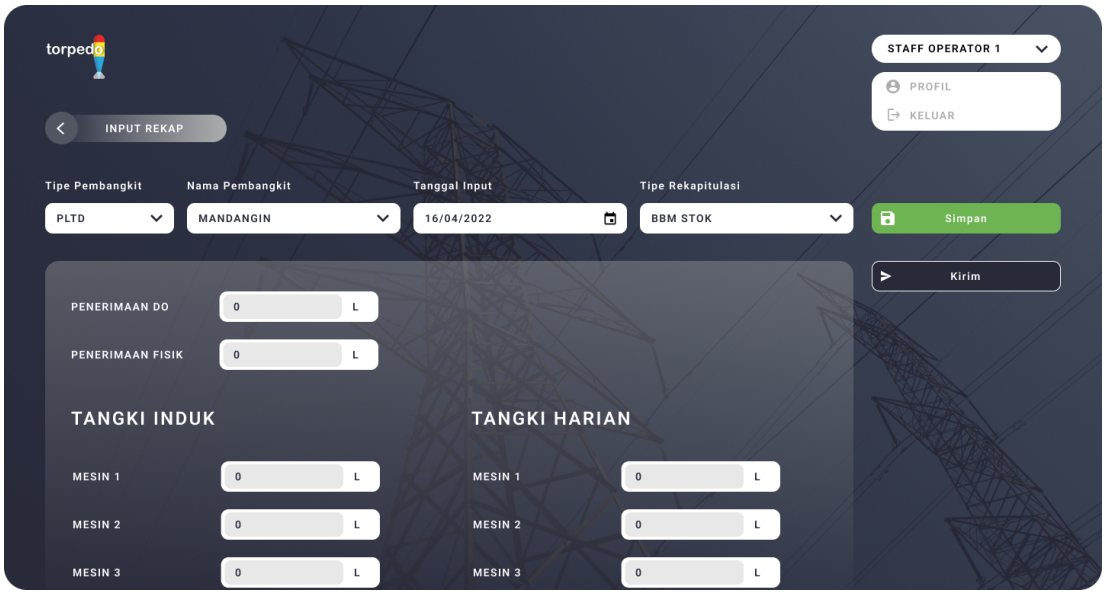
SN005 PIC Staff Dashboard Screen

5.2.3 Input Recapitulation Screen

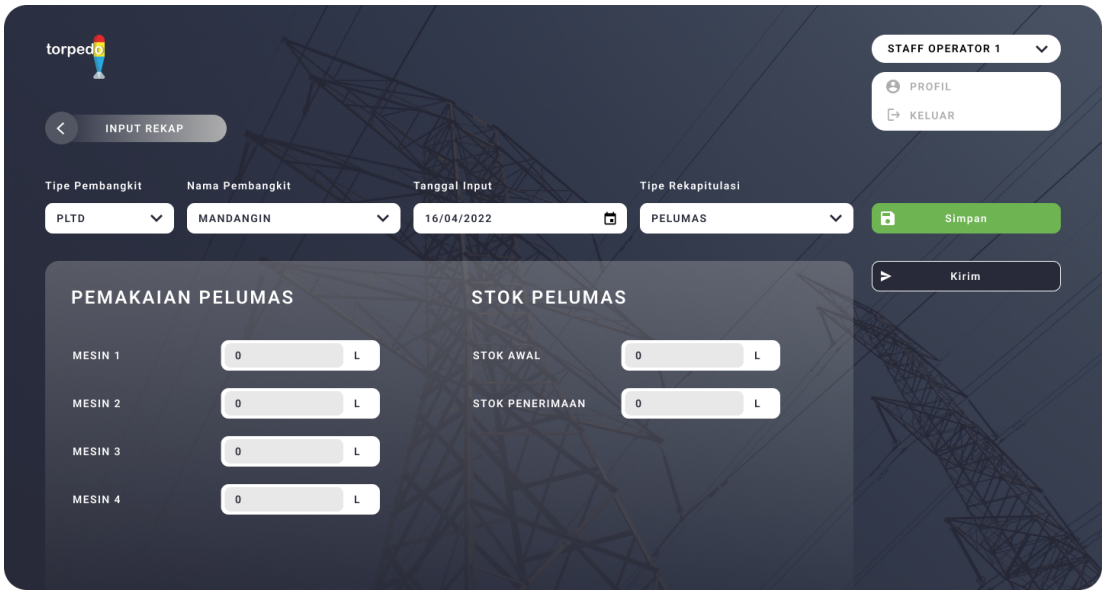


SN006 Input Recapitulation Screen (PLTS - Default Type)

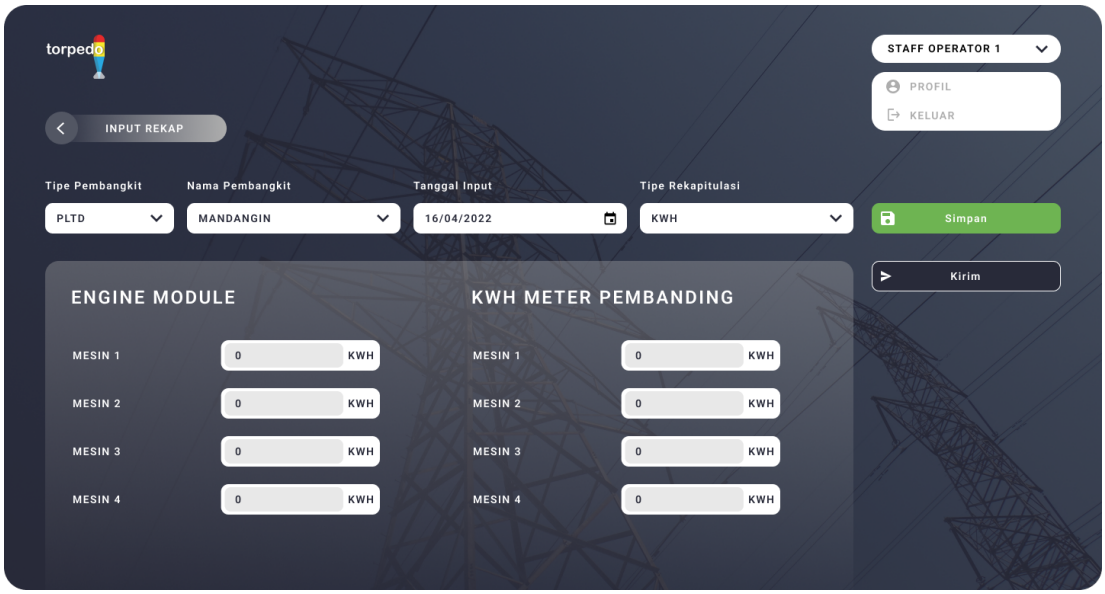
SN007 Input Recapitulation Screen (PLTD - BBM Pemakaian Type)



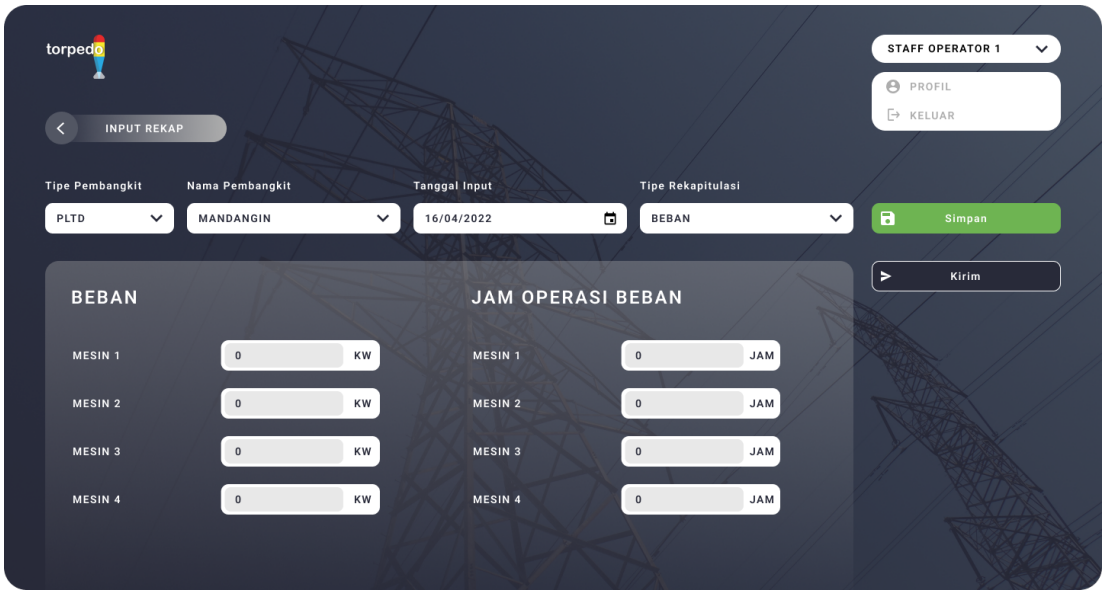
SN008 Input Recapitulation Screen (PLTD - BBM Stok Type)



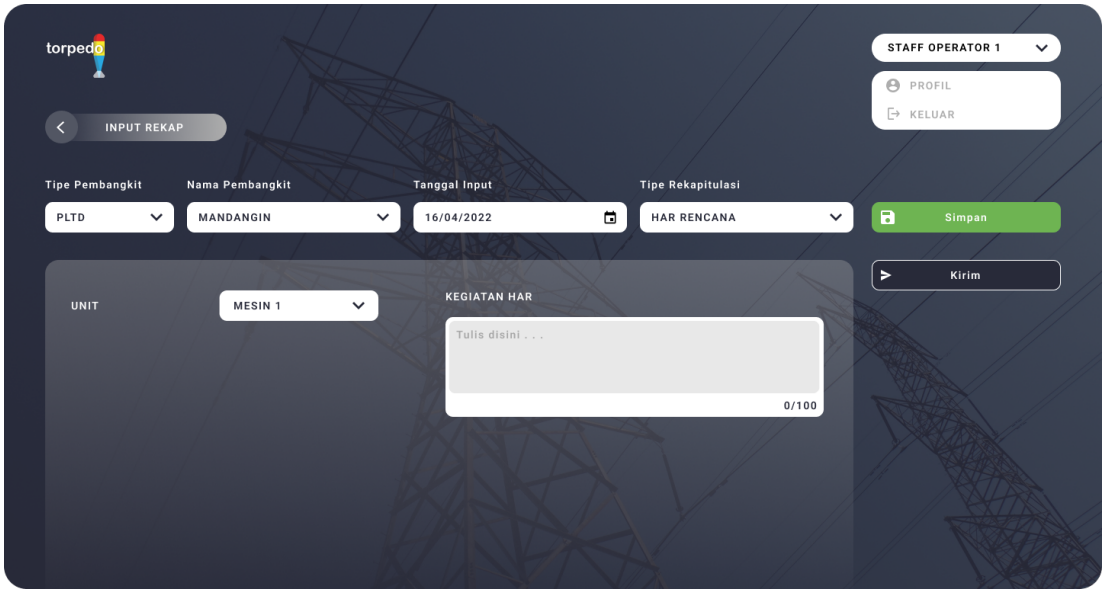
SN009 Input Recapitulation Screen (PLTD - Pelumas Type)



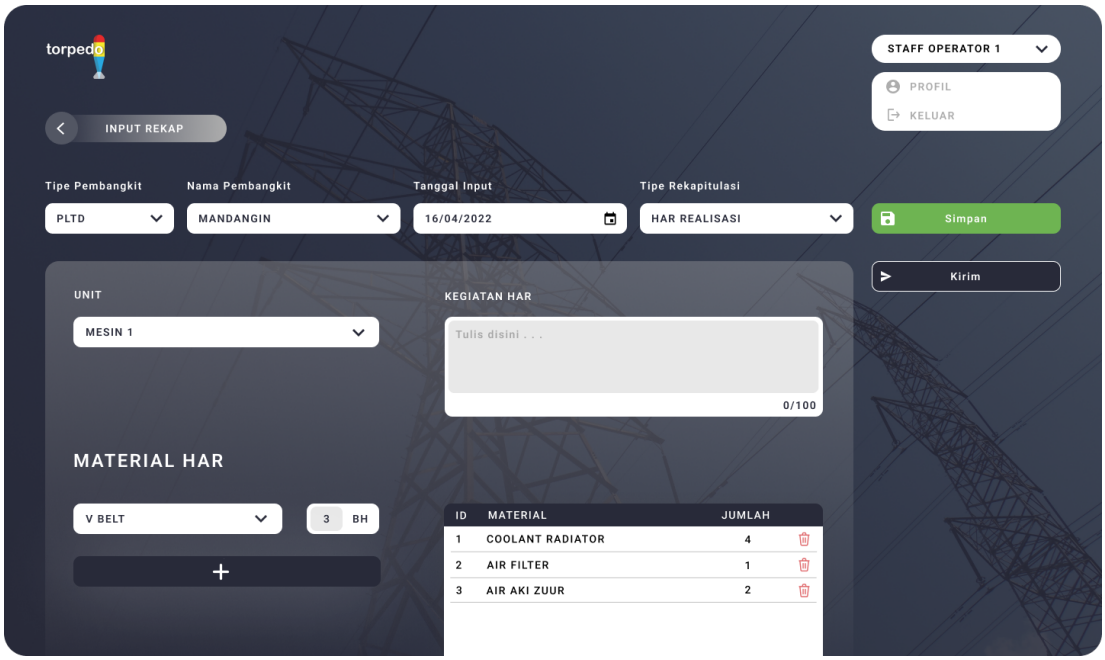
SN010 Input Recapitulation Screen (PLTD - Kwh Type)



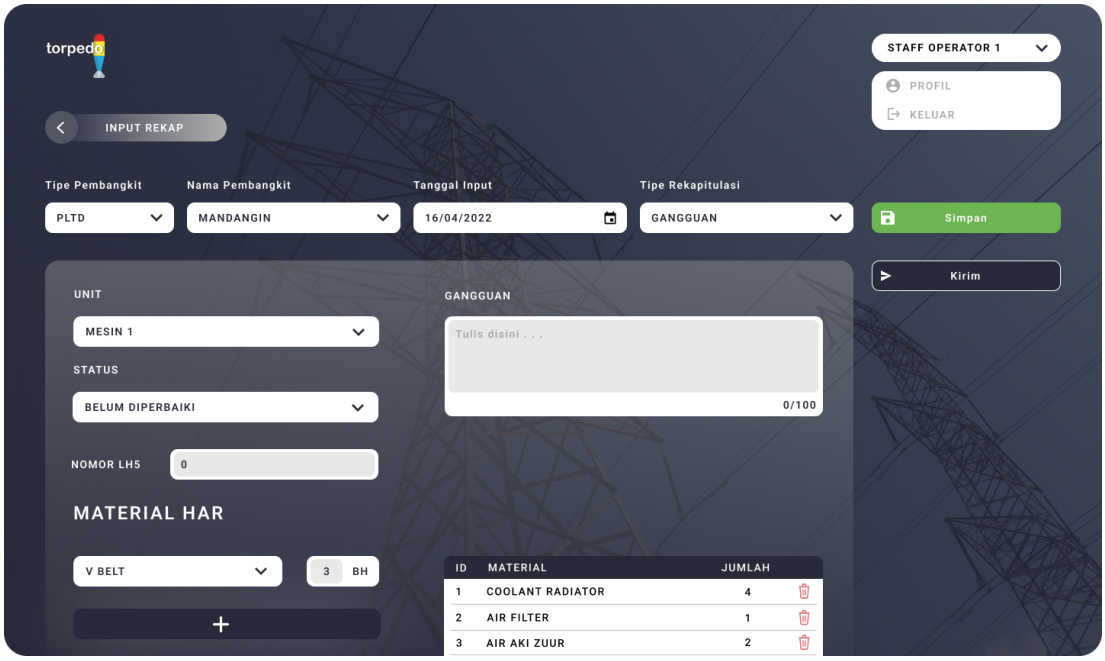
SN011 Input Recapitulation Screen (PLTD - Beban Type)



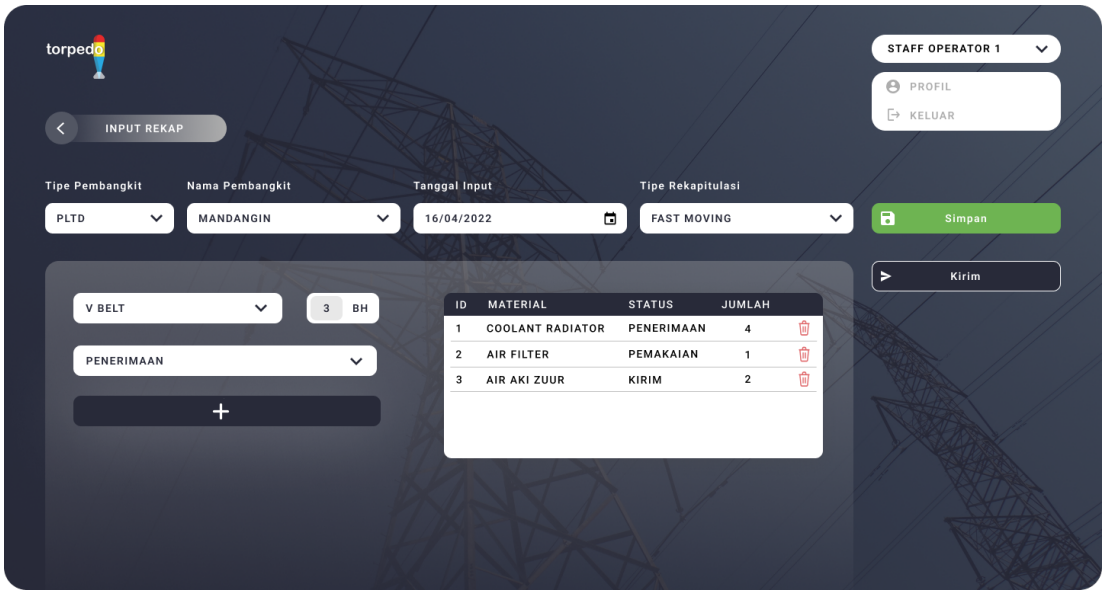
SN012 Input Recapitulation Screen (PLTD - Har Rencana Type)



SN013 Input Recapitulation Screen (PLTD - Har Realisasi Type)

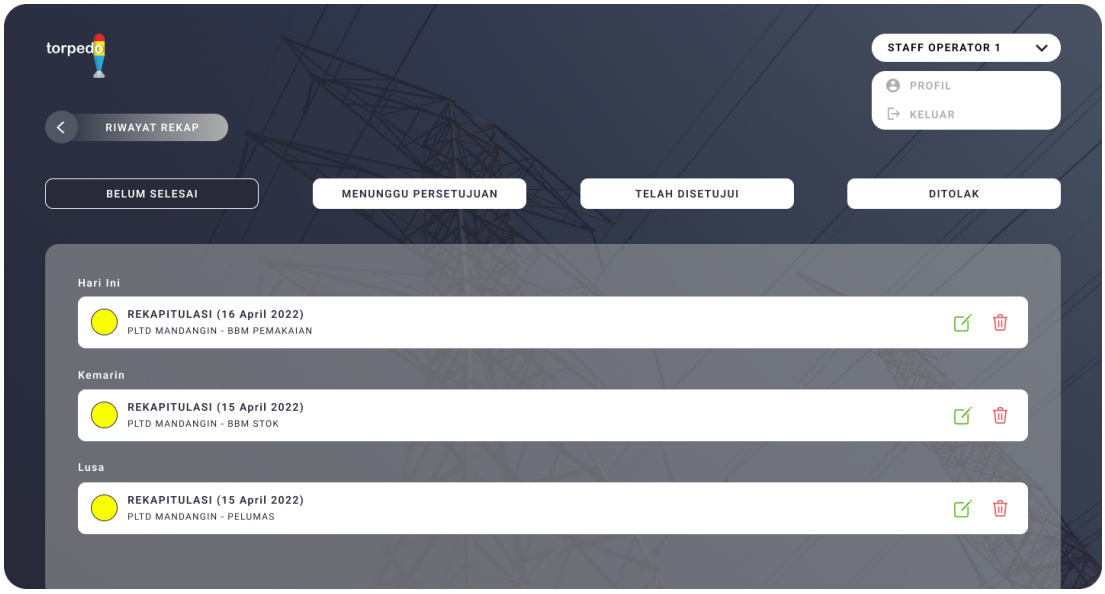


SN014 Input Recapitulation Screen (PLTD - Gangguan Type)



SN015 Input Recapitulation Screen (PLTD - Fast Moving Type)

5.2.4 Recapitulation History Screen

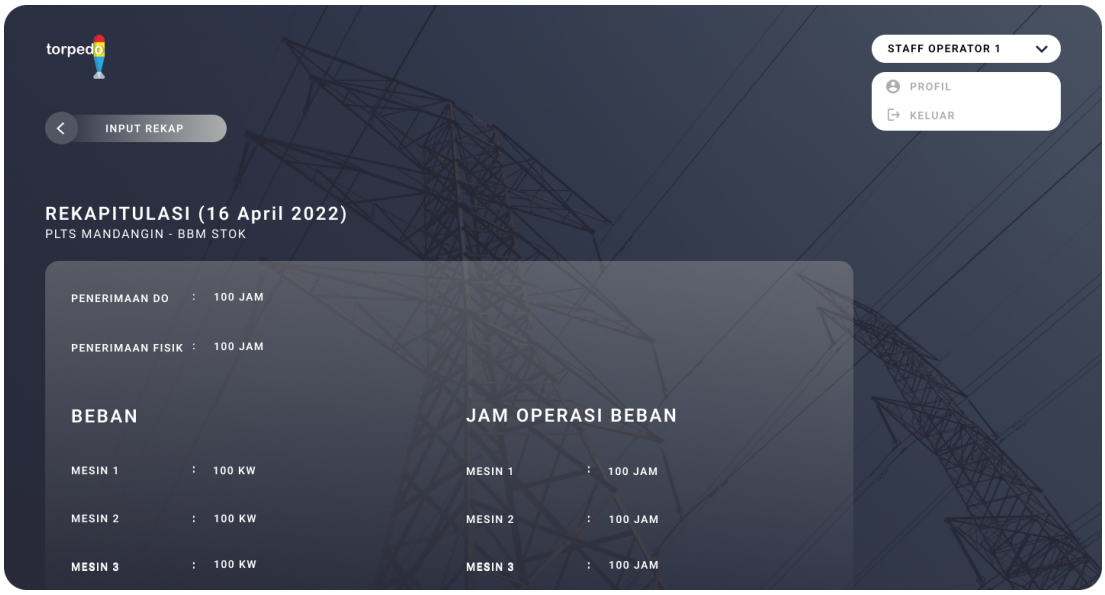


SN016 Recapitulation History Screen

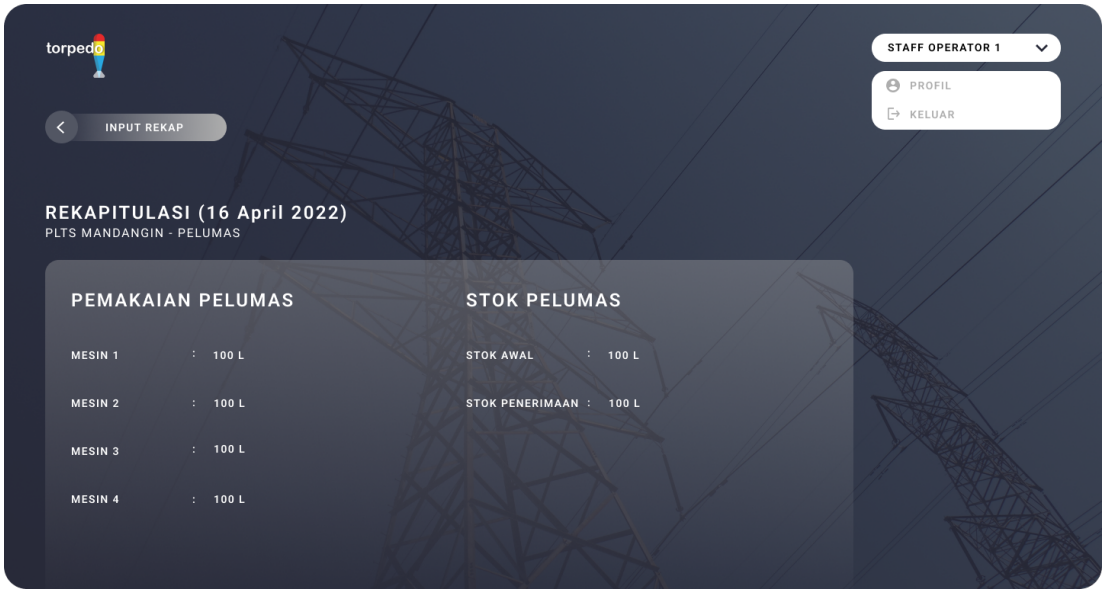
5.2.5 Input Recapitulation Screen

SN017 View Recapitulation Screen (PLTS - Default Type)

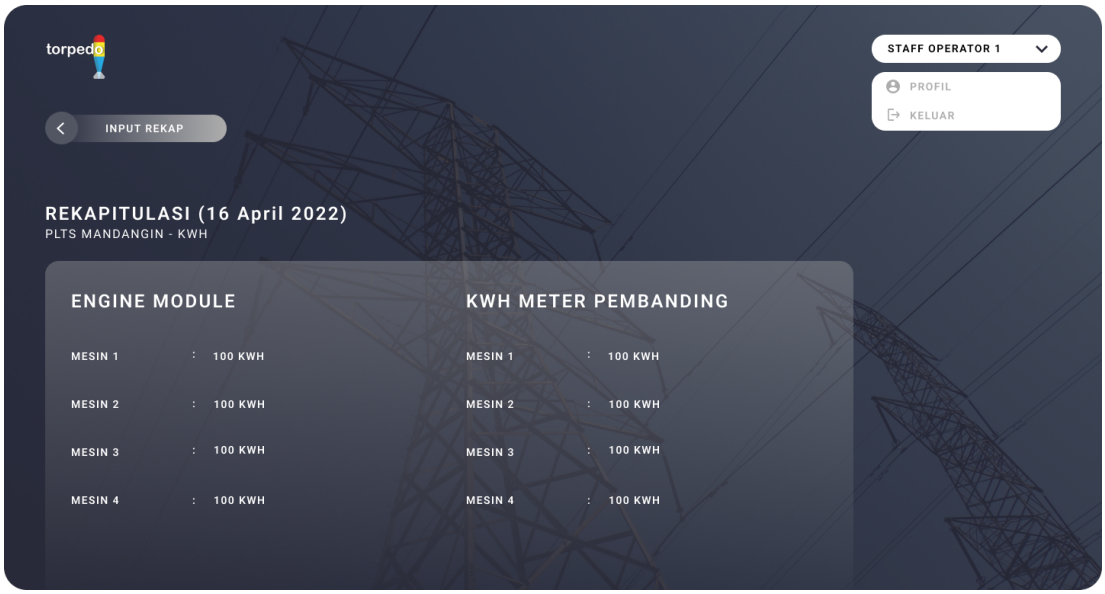
SN018 View Recapitulation Screen (PLTD - BBM Pemakaian Type)



SN019 View Recapitulation Screen (PLTD - BBM Stok Type)



SN020 View Recapitulation Screen (PLTD - Pelumas Type)



SN021 View Recapitulation Screen (PLTD - Kwh Type)

SN022 View Recapitulation Screen (PLTD - Beban Type)

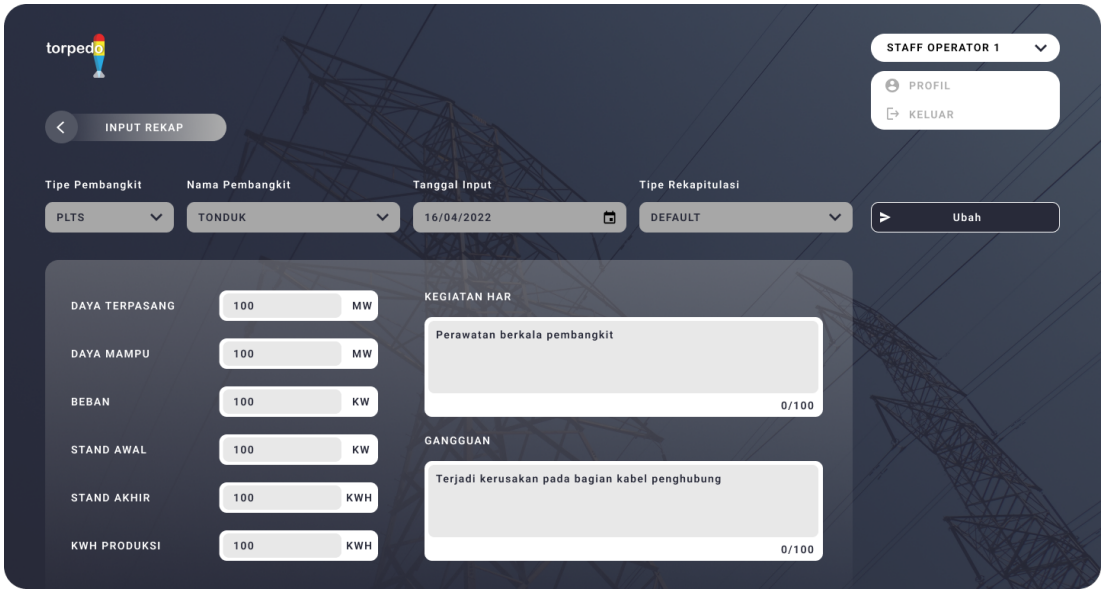
SN023 View Recapitulation Screen (PLTD - Har Rencana Type)

SN024 View Recapitulation Screen (PLTD - Har Realisasi Type)

SN025 View Recapitulation Screen (PLTD - Gangguan Type)

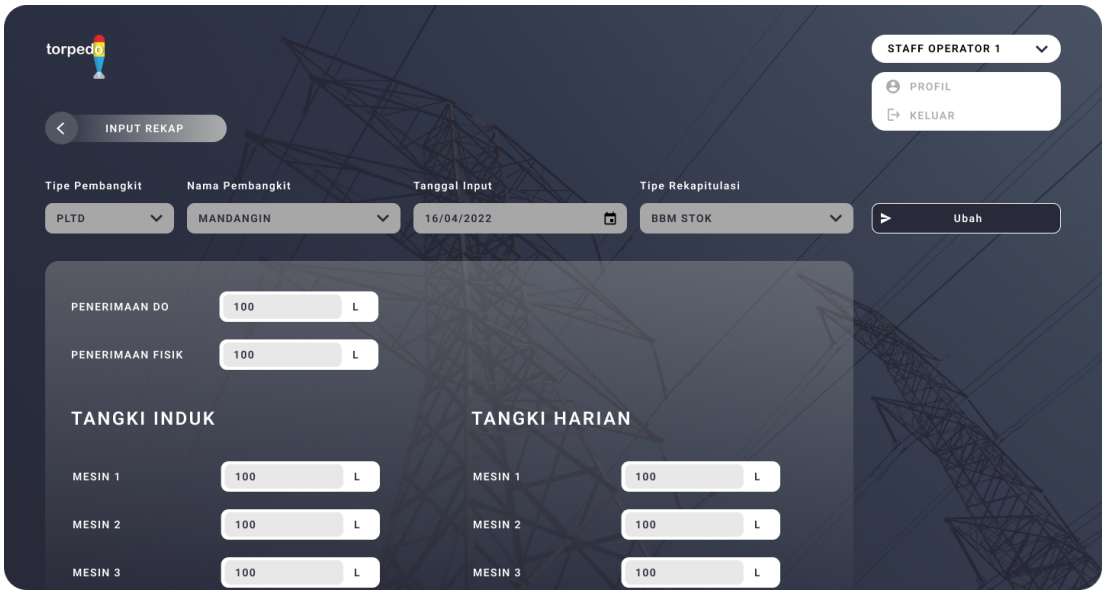
SN026 View Recapitulation Screen (PLTD - Fast Moving Type)

5.2.6 Update Recapitulation Screen

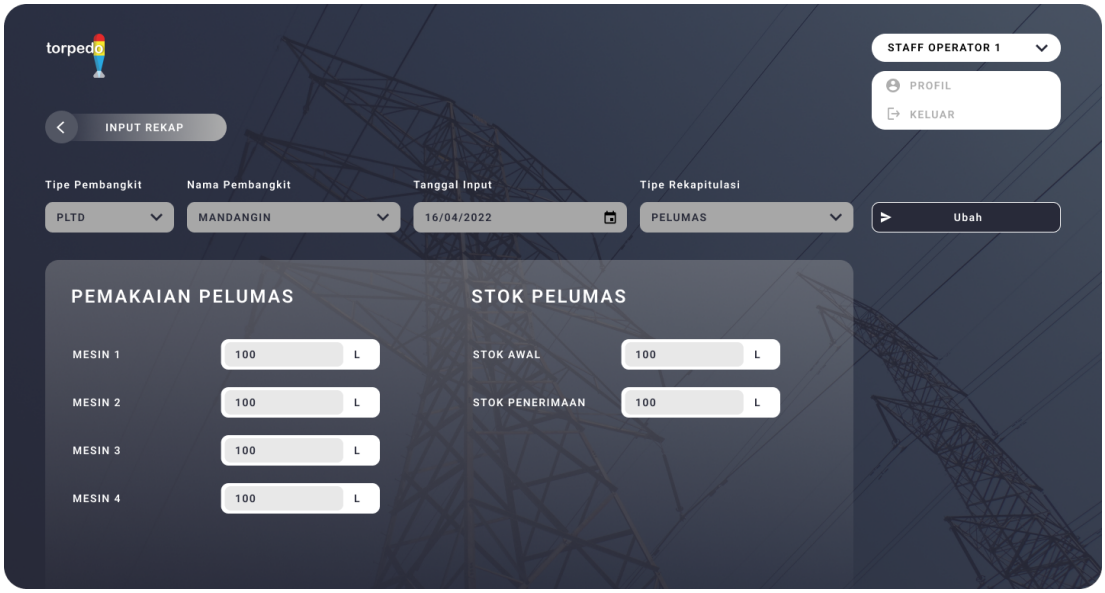


SN027 Update Recapitulation Screen (PLTS - Default Type)

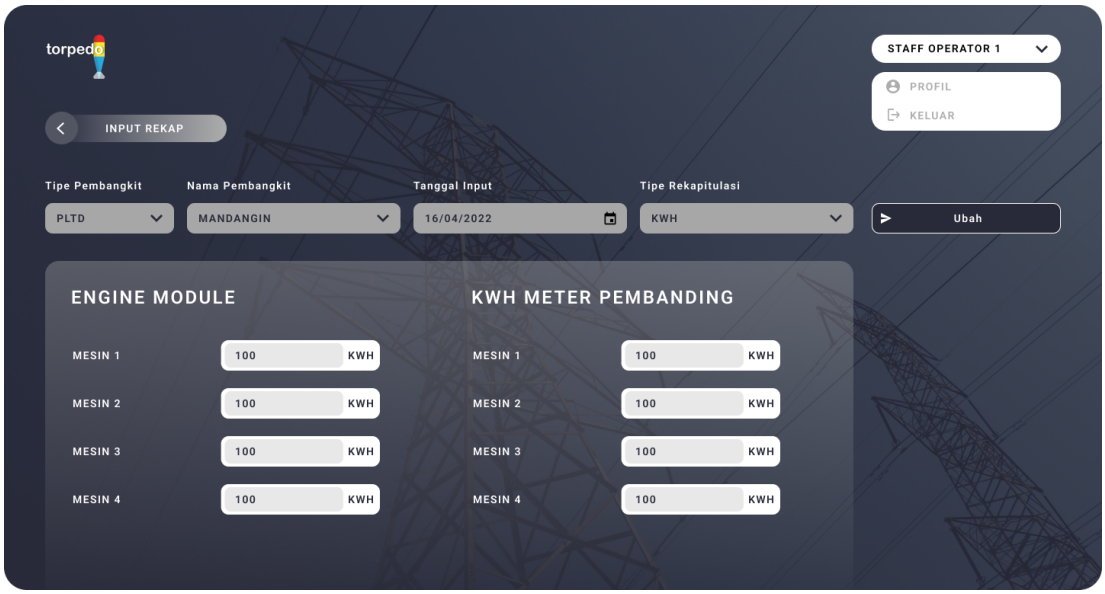
SN028 Update Recapitulation Screen (PLTD - BBM Pemakaian Type)



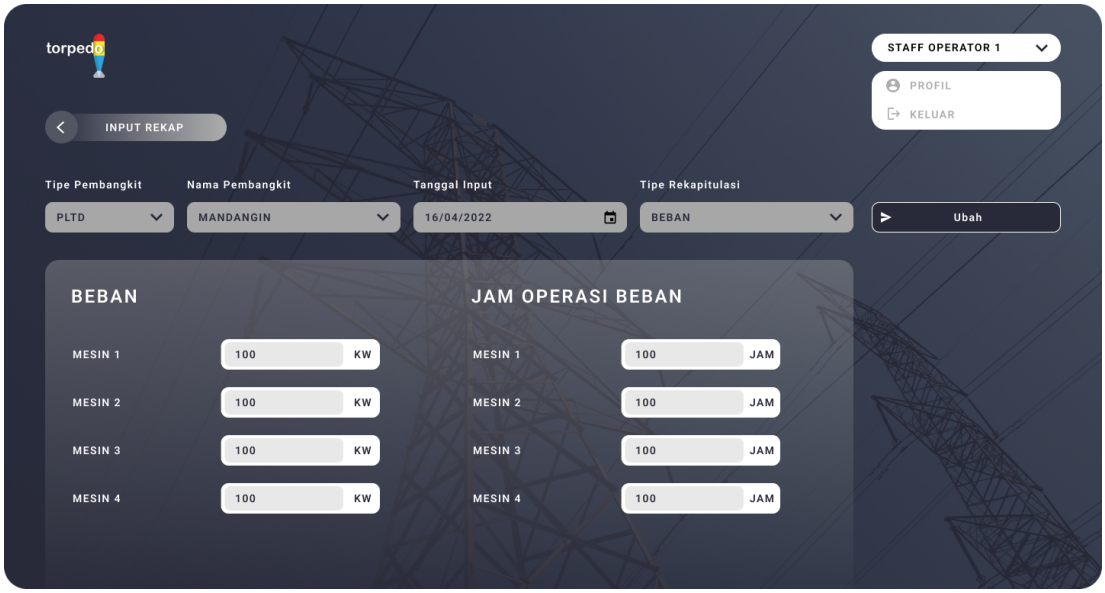
SN029 Update Recapitulation Screen (PLTD - BBM Stok Type)



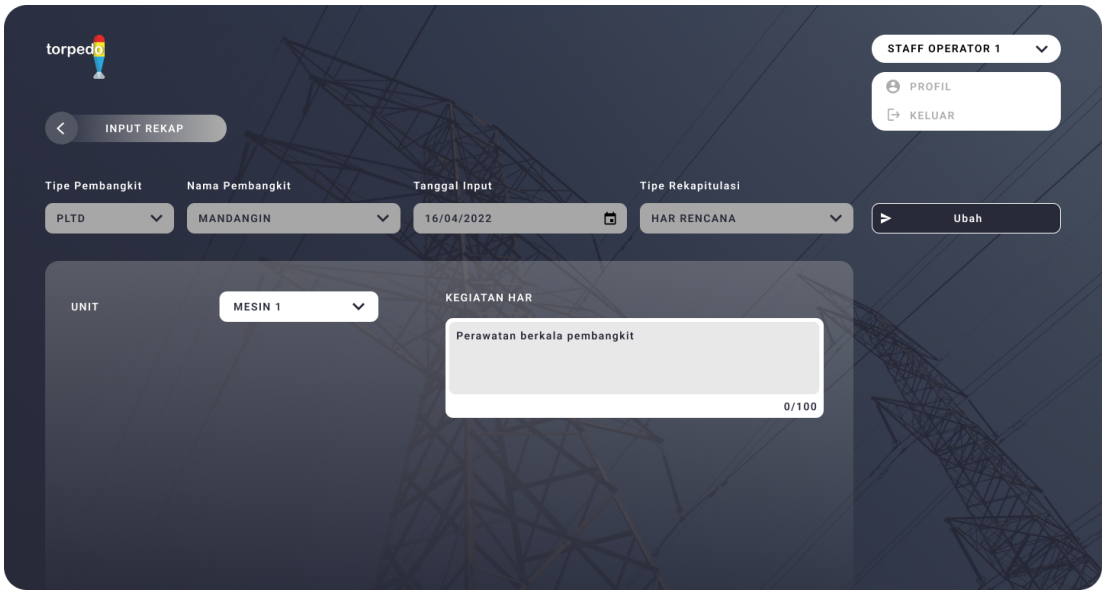
SN030 Update Recapitulation Screen (PLTD - Pelumas Type)



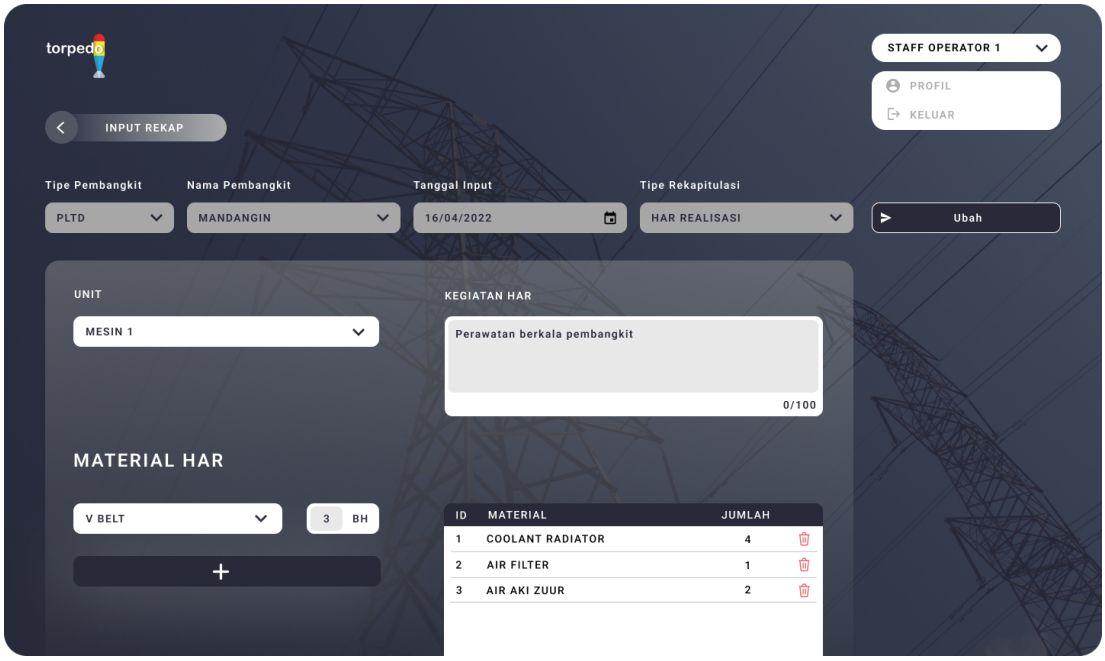
SN031 Update Recapitulation Screen (PLTD - Kwh Type)



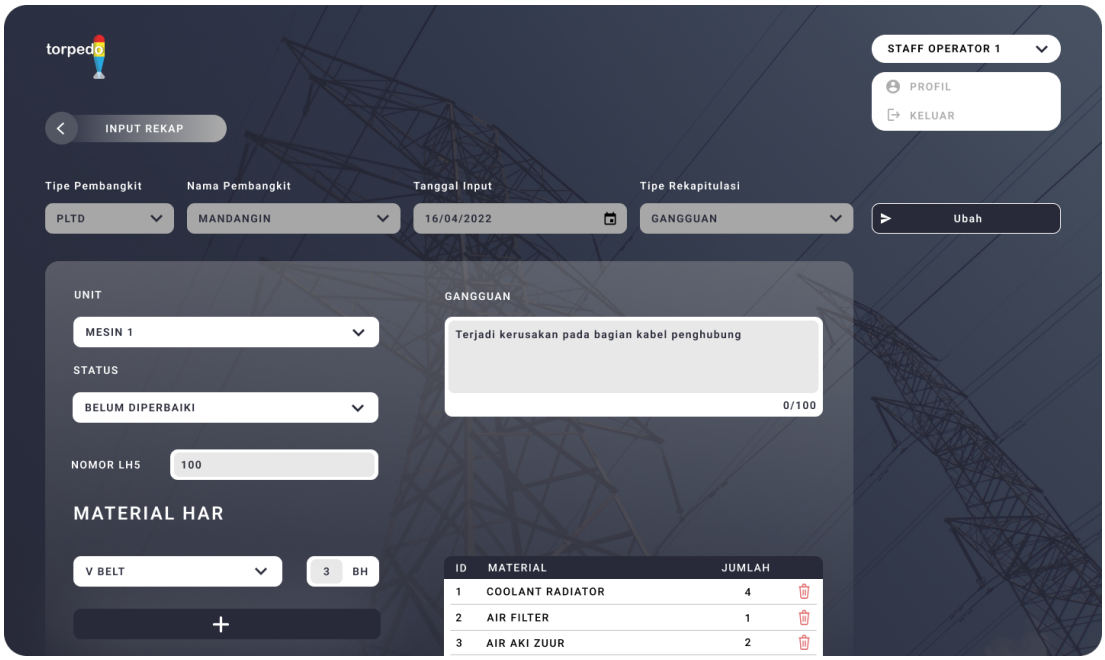
SN032 Update Recapitulation Screen (PLTD - Beban Type)



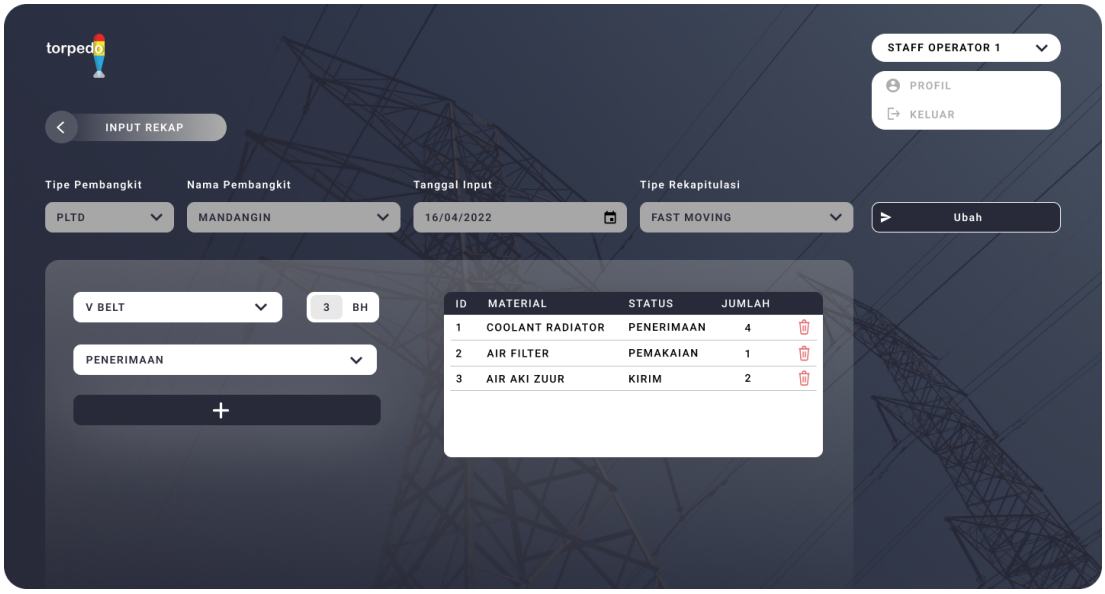
SN033 Update Recapitulation Screen (PLTD - Har Rencana Type)



SN034 Update Recapitulation Screen (PLTD - Har Realisasi Type)

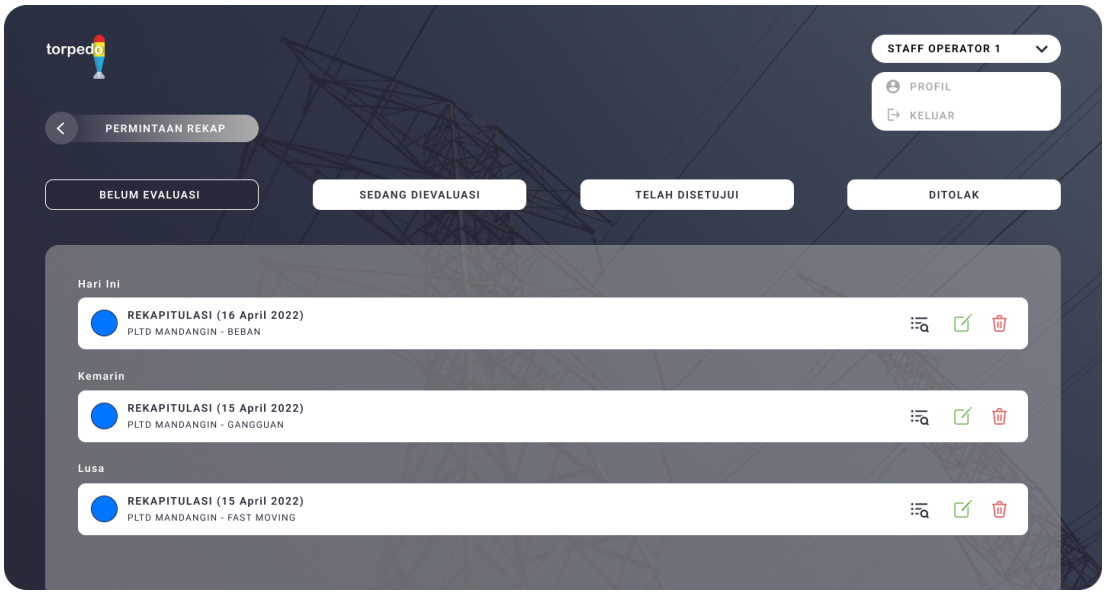


SN035 Update Recapitulation Screen (PLTD - Gangguan Type)



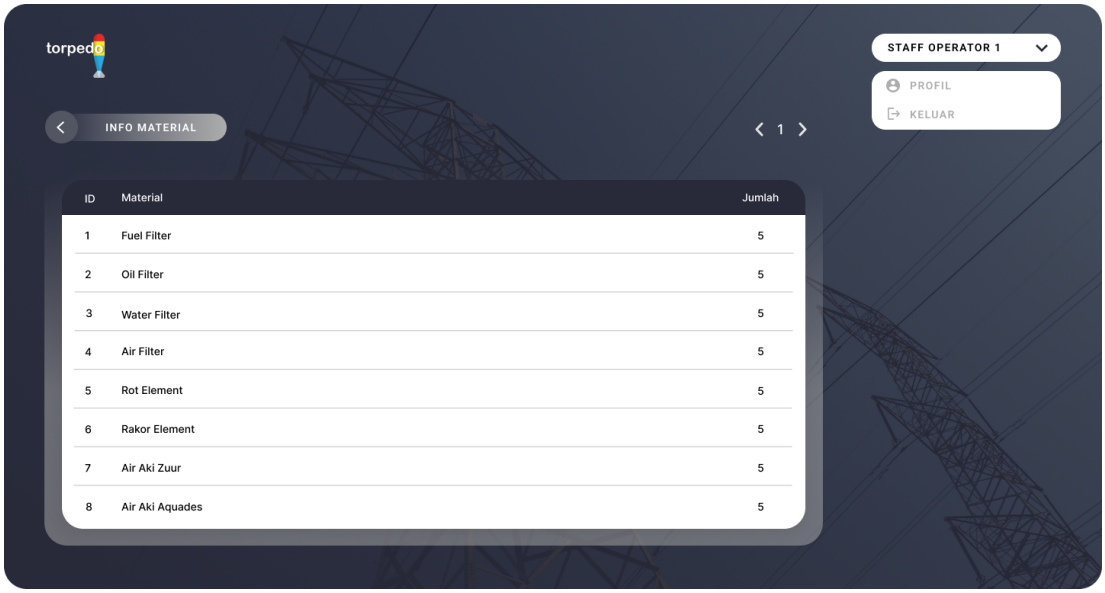
SN036 Update Recapitulation Screen (PLTD - Fast Moving Type)

5.2.7 Requested Recapitulation Screen



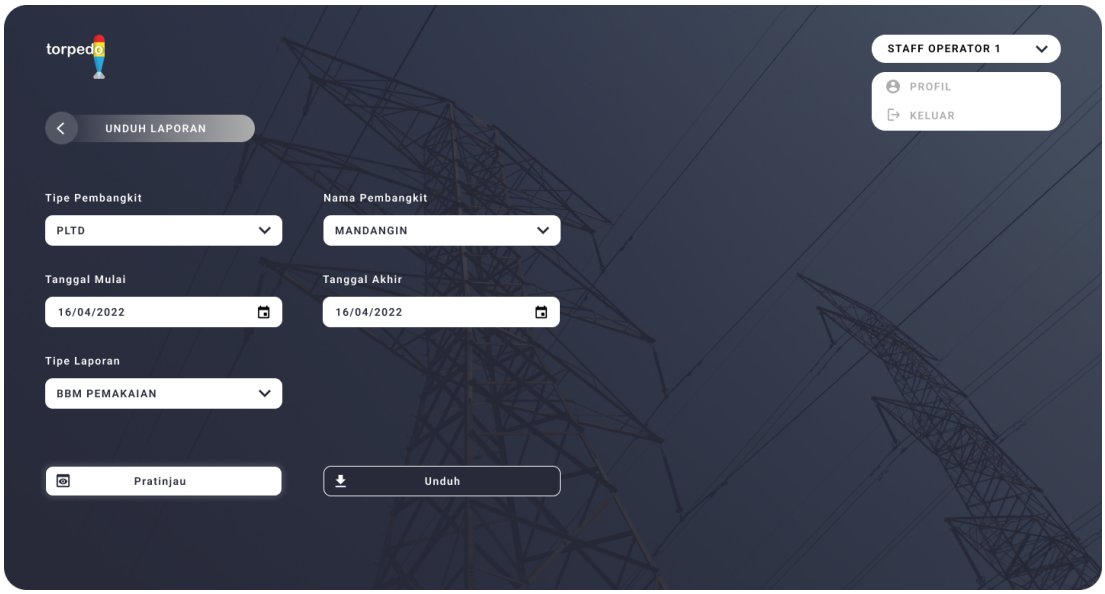
SN037 Requested Recapitulation Screen

5.2.8 Material Info Screen



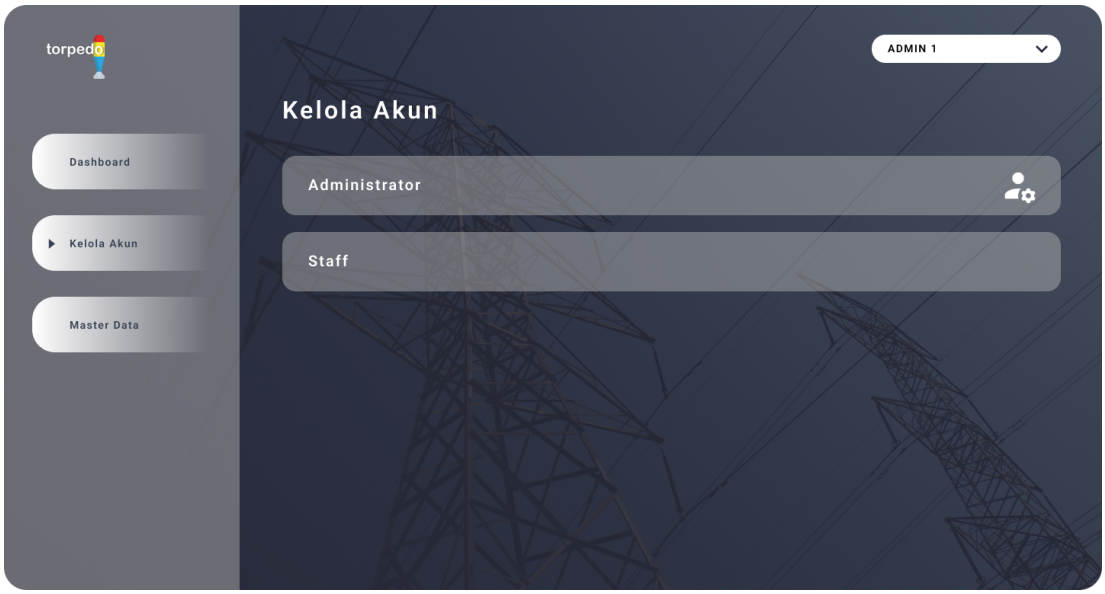
SN038 Material Info Screen

5.2.9 Download Report Screen

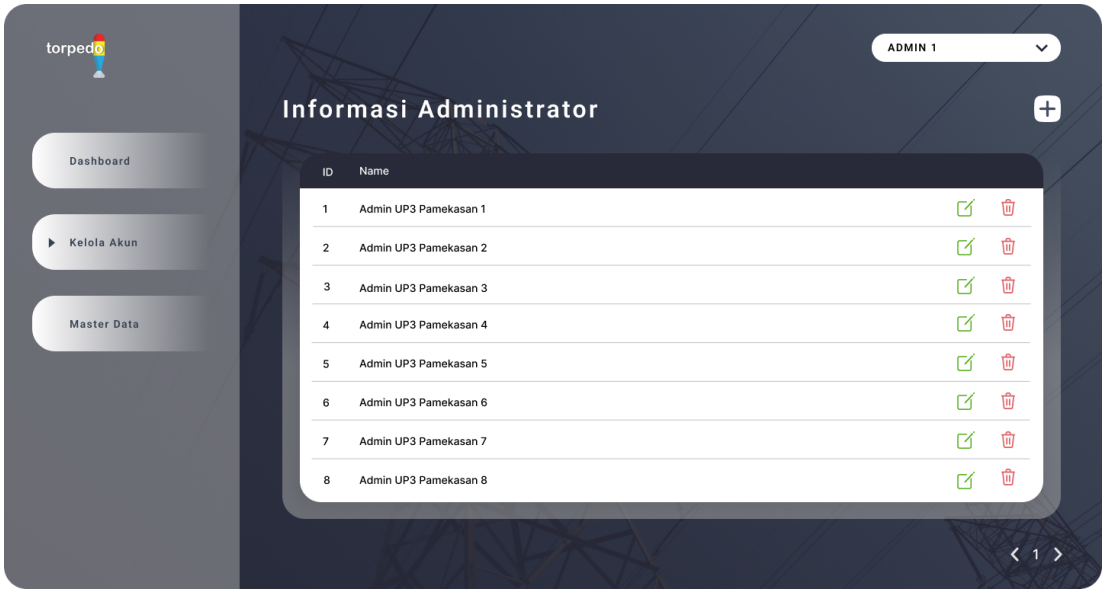


SN039 Download Report Screen

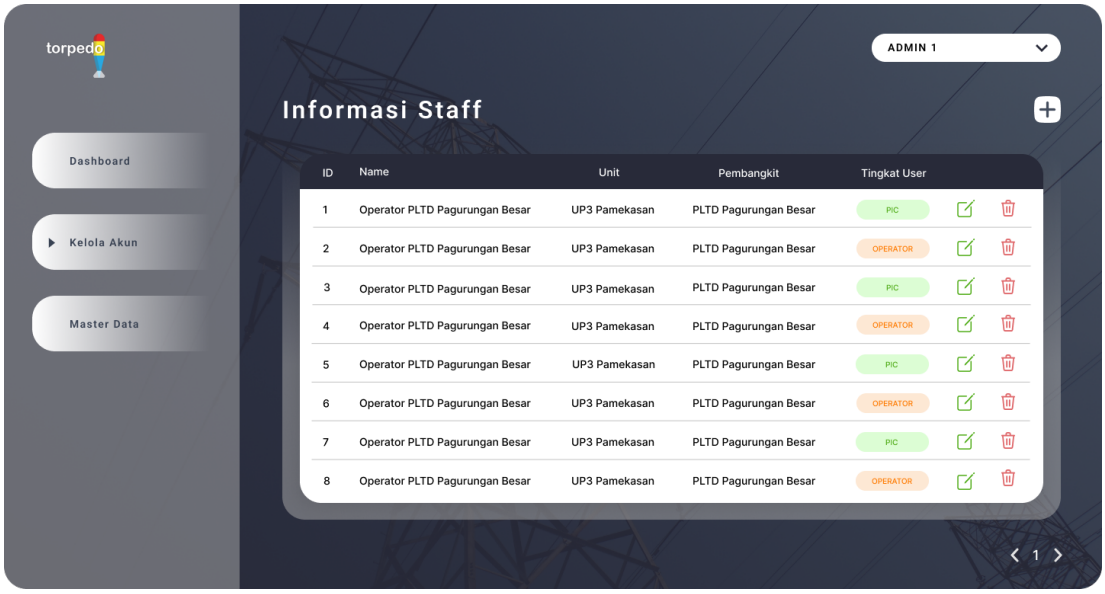
5.2.10 Account Manager Screen



SN040 Account Mangaer Screen



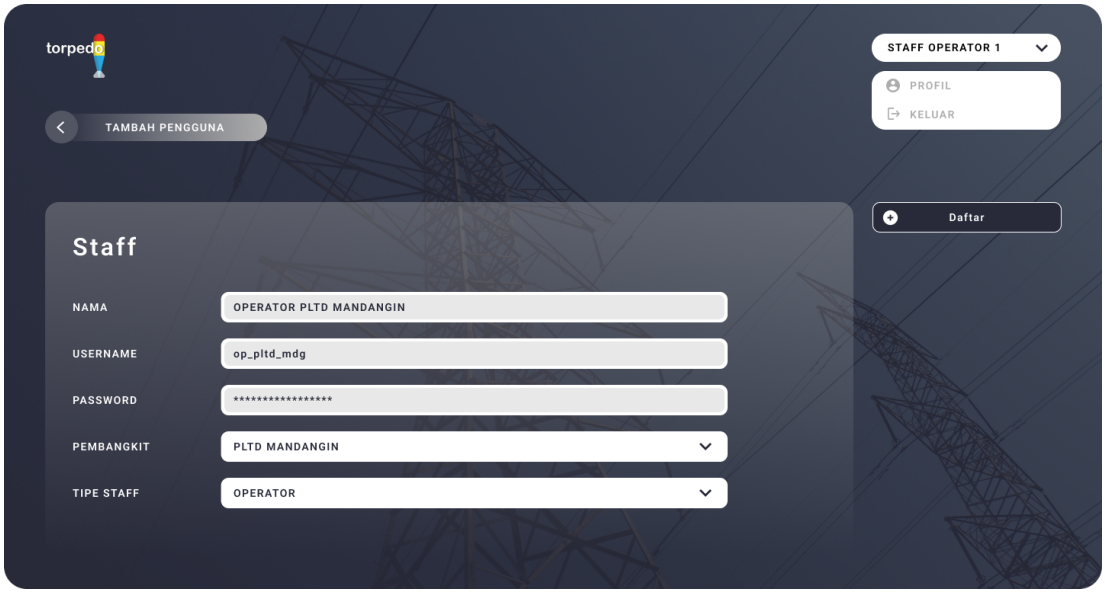
SN041 Administrator Account Information Screen



SN042 Staff Account Information Screen

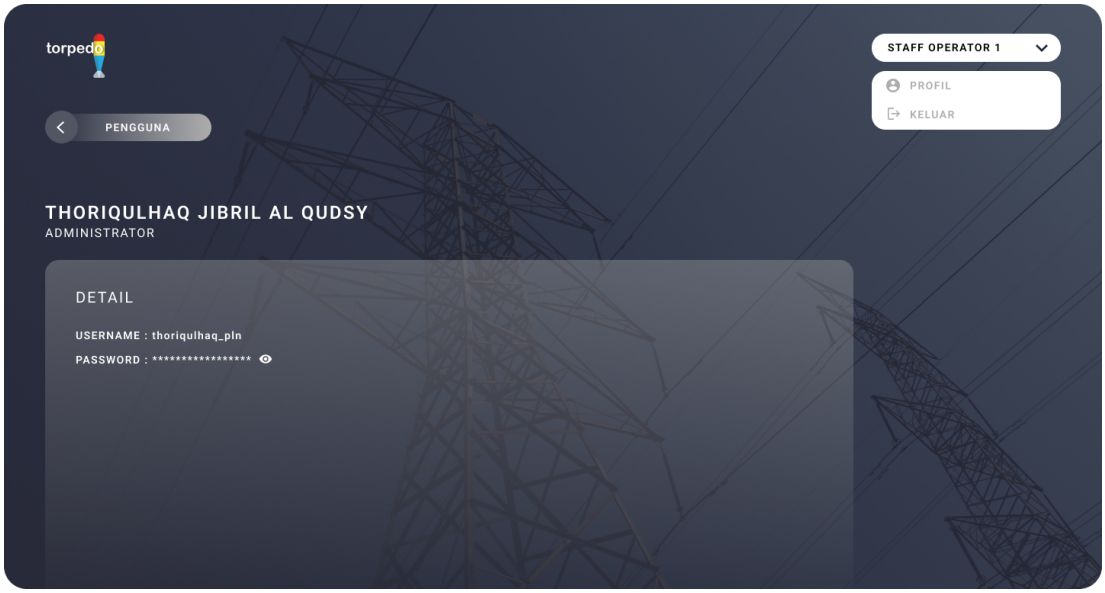
5.2.11 Add Account Screen

SN043 Add Administartor Account Screen



SN044 Add Staff Account Screen

5.2.12 View Account Screen



SN045 View Administartor Account Screen

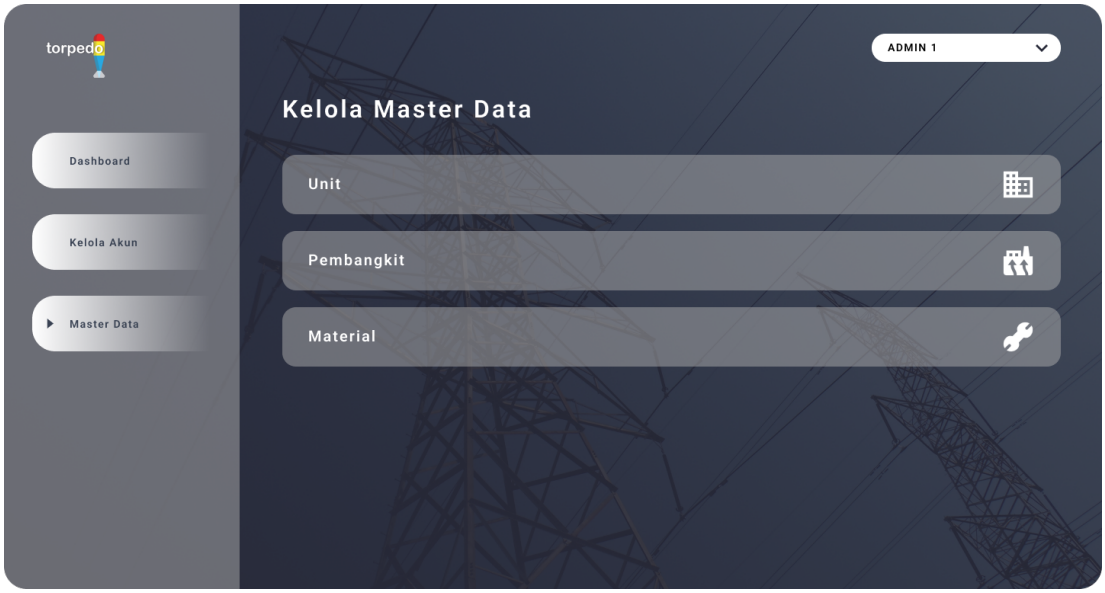
SN046 View Staff Account Screen

5.2.13 Edit Account Screen

SN047 Edit Administartor Account Screen

SN048 Edit Staff Account Screen

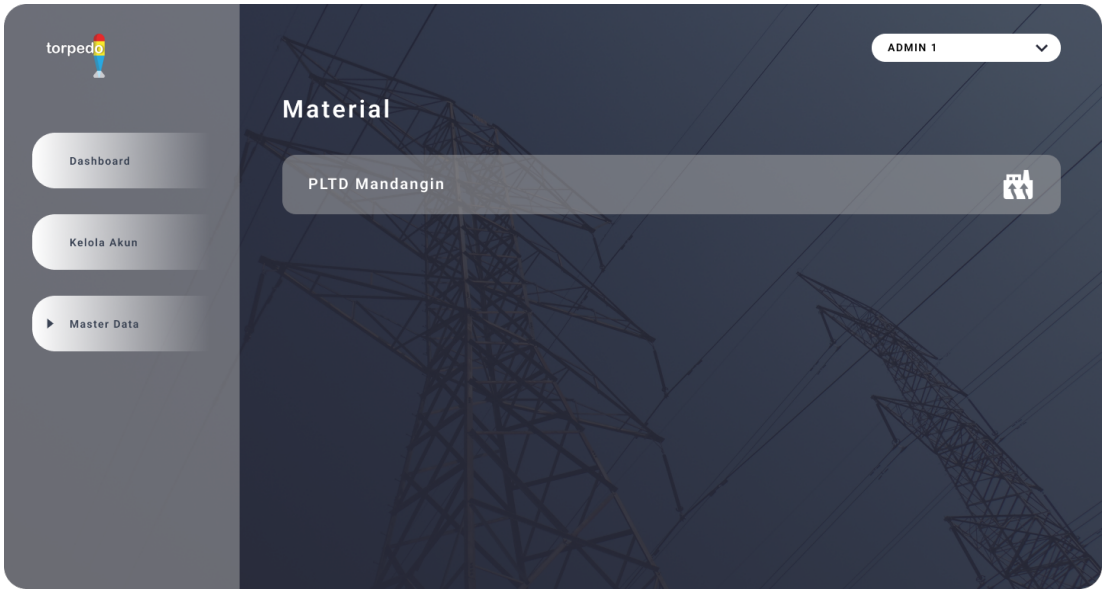
5.2.14 Master Data Manager Screen



SN049 Master Data Manager Screen

SN050 Unit Information Screen

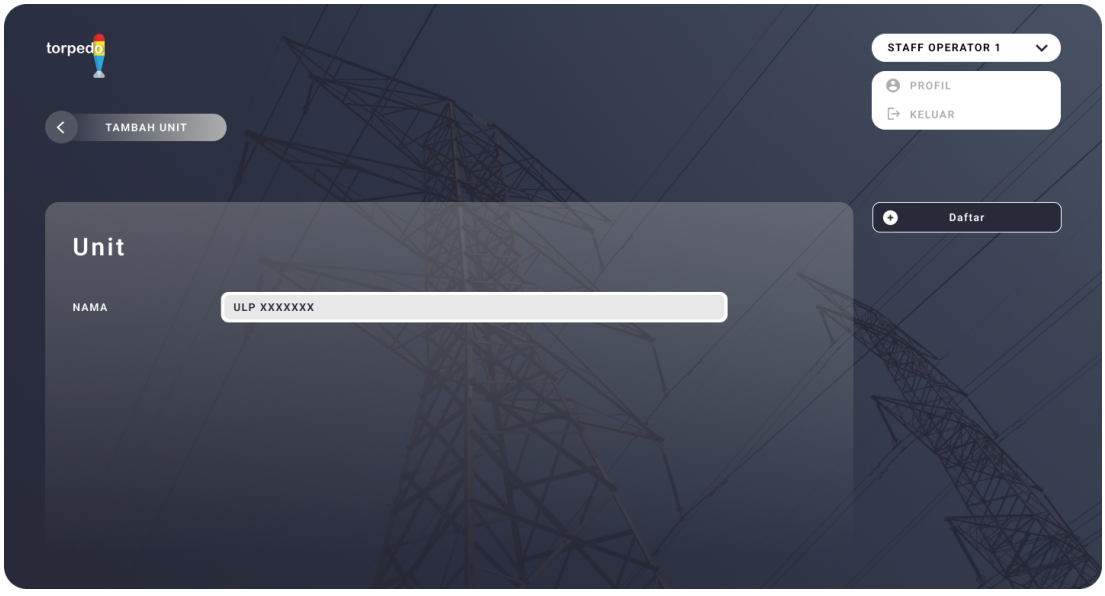
SN051 Power Plant Information Screen



SN052 Material Manager Screen

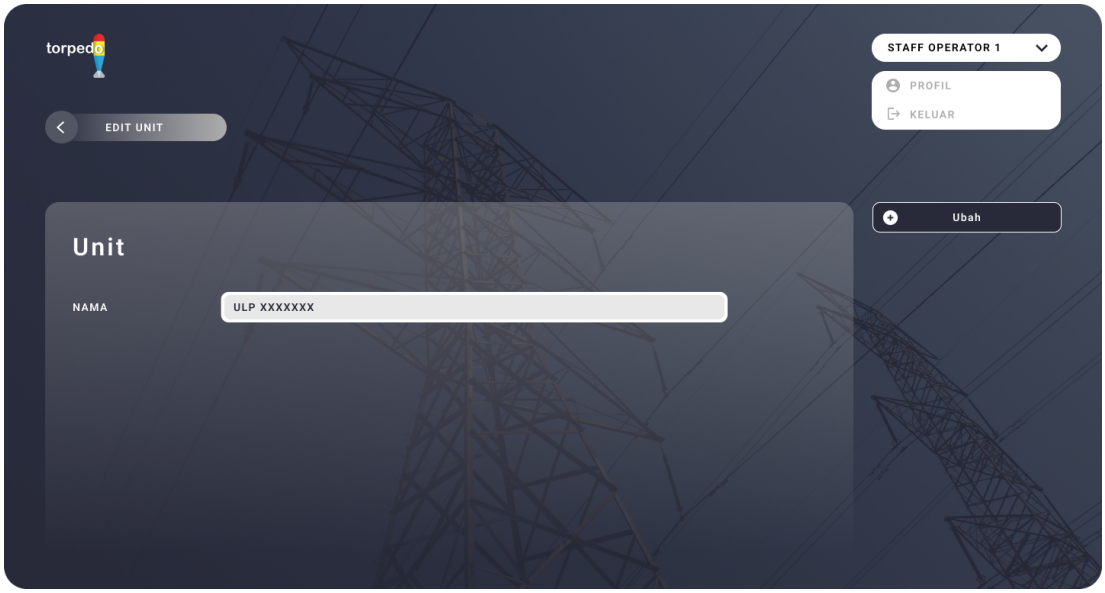
SN053 Material Information Screen

5.2.15 Add Unit Screen



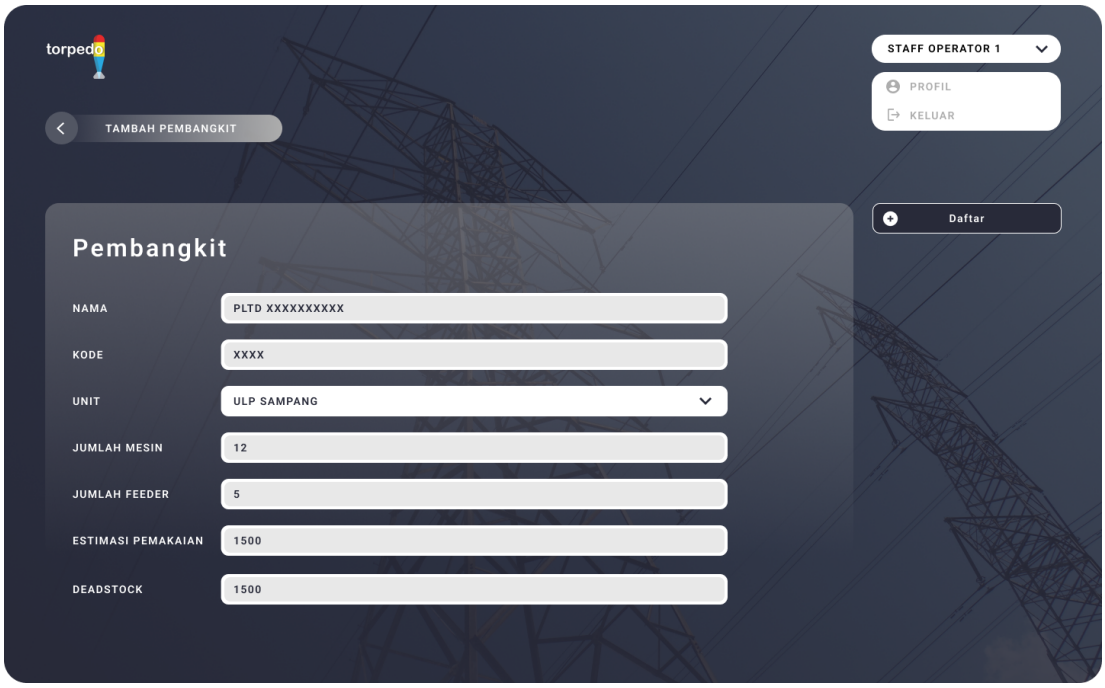
SN054 Add Unit Screen

5.2.16 Edit Unit Screen



SN055 Edit Unit Screen

5.2.17 Add Power Plant Screen



SN056 Add Power Plant Screen

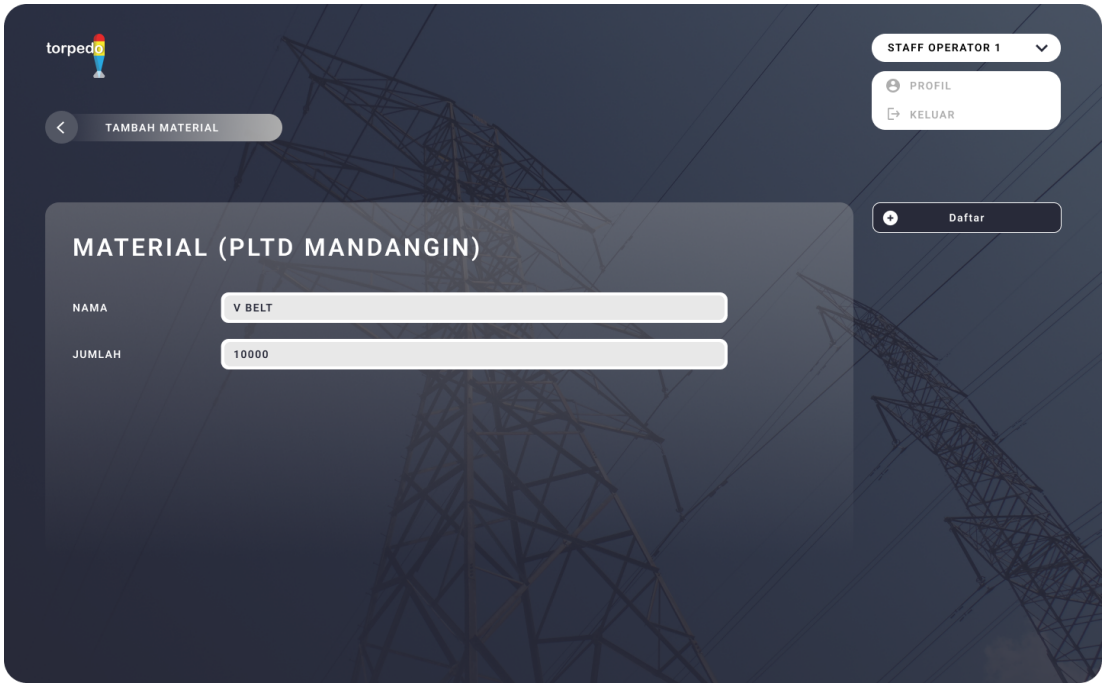
5.2.18 View Power Plant Screen

SN057 View Power Plant Screen

5.2.19 Edit Power Plant Screen

SN058 Edit Power Plant Screen

5.2.20 Add Material Screen

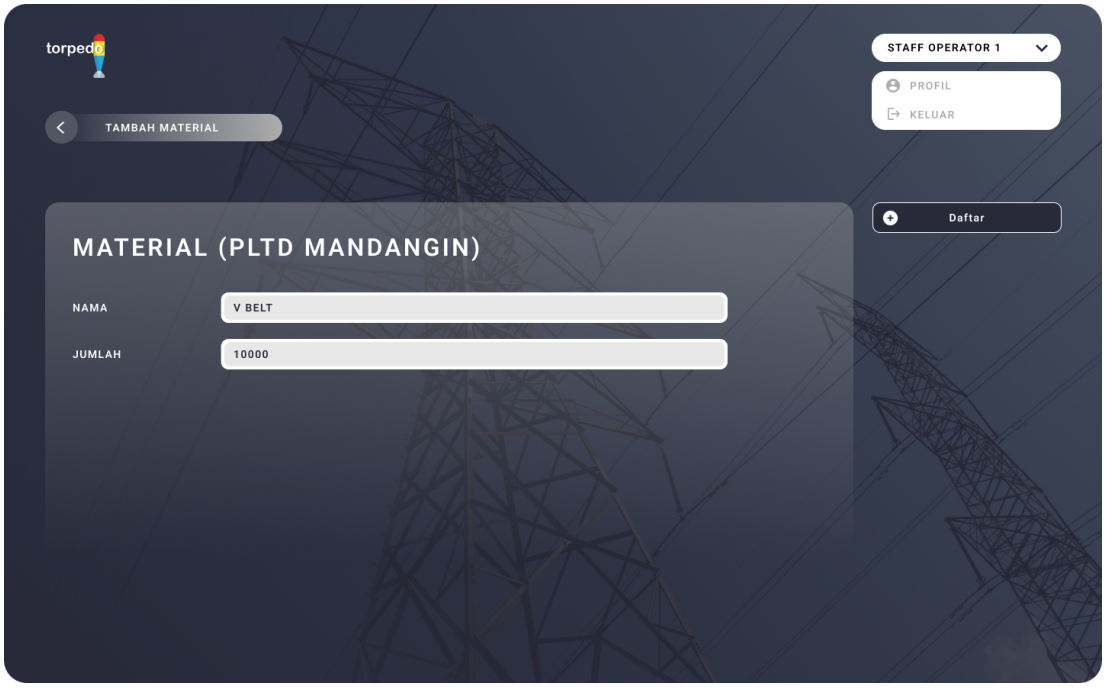


SN059 Add Material Screen

5.2.21 View Material Screen

SN060 View Material Screen

5.2.22 Edit Material Screen



SN061 Edit Material Screen

Requirements Matrix

	SD001	SD002	SD003	SD004	SD005	SD006	SD007	SD008	SD009	SD010	SD011	SD012	SD013
UC001	X												
UC002		X											
UC002			X										
UC004				X									
UC005					X								
UC006						X							
UC007							X						
UC008								X					
UC009									X				
UC010										X			
UC011											X		
UC012												X	
UC013													X

6. APPENDICES

There are no appendices.

Appendix C System Testing Documentation

Software Testing Documentation

Power Plants Performance Monitoring System for PT PLN (Persero) UP3 Pamekasan

Version 1.0

23 June 2022

School Of Computing

Prepared by: Thoriqulhaq Jibril Al Qudsy

REVISION PAGE

a. **Overview**

This is the first draft of the Software Testing Documentation for Power Plants Performance Monitoring System (P3MS)

b. **Target Audience**

- Ms. Habibah Zahra Faluqi, Supervisor, PT PLN (Persero)
- Stakeholder of PT PLN (Persero) UP3 Pamekasan

c. **Project Team Members**

- Thoriqulhaq Jibril Al Qudsy

d. **Version Control History**

Version	**Primary Author(s)**	**Description of Version**	**Date Completed**
Version 1.0	Thoriqulhaq Jibril Al Qudsy	SDT 1.0 of Power Plants Performance Monitoring System for PT PLN (Persero) UP3 Pamekasan	23 June 2022

Note:

This template is an annotated outline for a software testing document. It is based on IEEE standards 829, 1008, 1012 and 1012a. This document covers: unit testing (the verification of individual sub-systems or components of the system against their specifications), integration testing (the testing of inter-operating sub-systems or components against their specifications) and system testing (both verification against the system specification, and validation against the user requirements).This template has been simplified and customized to meet the need of SCSJ2203 course at Faculty of Computing, UTM. Compiled by Ruhaidah Samsudin, PhD and checked by Masitah Ghazali, PhD and Shahida Sulaiman, PhD (revised on 14 May 2016).

TABLE OF CONTENTS

1. INTRODUCTION

This section gives a scope and system overview description of everything included in this STD document. The purpose of this document is also described, and a list of abbreviations and definitions is provided.

1.1 **Purpose**

The purpose of this Software Testing Document (STD) document is to prepare templates that can be used during the testing phase. STD describes the activities of the test cases for the Power Plants Performance Monitoring System for PT PLN (Persero) UP3 Pamekasan. The test case template based on each use case is provided in this document. By referring to this document, the testing teams can understand the workflow of the system's functionalities deeper as all the detailed step actions and expected results are stated clearly in the test case templates.

1.2 **Scope**

The proposed system is named Power Plants Performance Monitoring System (P3MS). This system will be specially designed for PT PLN (Persero) UP3 Pamekasan to transform the manual monitoring process into a computerized system, which makes them easier to report, organize and monitor the power plants in future. A web-based system that provides various functionalities such as employee profile management, leave and overtime allowance management, schedule management and attendance record management will be implemented to benefit the organization. The design of this system is user friendly, easy to use and understand so that the end-users can learn quickly and can perform tasks by using this system. There are some limitations of this system. This system will not cover the salary, payroll and performance management of the employees.

1.3 **Definitions, Acronyms and Abbreviation**

Acronyms	Definitions
P3MS	Power Plants Performance Monitoring System
SRS	Software Requirement Specification
PT PLN (Persero) UP3 Pamekasan	Targeted company of this system
UML	Unified Modelling Language
PIC	Person In Charge

1.4 **System Overview**

This SDD document contains the test cases to be executed during the testing phase of the Power Plants Performance Monitoring System for PT PLN (Persero) UP3 Pamekasan.

2. TEST CASES, DATA AND EXPECTED RESULTS

2.1 Test TC001 for Module Recapitulation: Manage Recapitulation (UC001)

Test Case ID	TC001_1		
Test Case Description	Able to create new recapitulation.	**Test Priority**	High
Pre-Requisite	Able to login to the system as operator staff		

Test Execution Steps:

No	Action	Inputs	Expected Output
1	Access operator staff dashboard	-	Operator staff dashboard is displayed
2	Choose "Input Recapitulation" menu	-	Input recapitulation page is displayed
3	Select power plant type	Tipe Pembangkit: "PLTD"	List of available power plant with type "PLTD" is displayed
4	Select power plant name	Nama Pembangkit : "Mandangin"	Power plant information is full-filled
5	Select date input	Tanggal : "23 Juni 2022"	Date input is fully full-filled
6	Select recapitulation type	Tipe Rekapitulasi: "Har Rencana"	A Recapitulation with type "Har Rencana" is displayed
7	Fill recapitulation form	Unit : "Mesin 1" Kegiatan Har : "Perbaikan feeder"	Recapitulation form is full-filled
8	Click "Kirim" button	-	Successfully create recapitulation.

Test Case ID	TC001_2		
Test Case Description	Able to view the existing recapitulation.	**Test Priority**	High
Pre-Requisite	Able to login to the system as operator staff		

Test Execution Steps:

No	**Action**	**Inputs**	**Expected Output**
1	Access operator staff dashboard	-	Operator staff dashboard is displayed
2	Choose “Recapitulation History” menu	-	Recapitulation History is displayed
3	Click one existing recapitulation	-	Recapitulation content is displayed.

Test Case ID	TC001_3		
Test Case Description	Able to update the existing recapitulation.	**Test Priority**	High
Pre-Requisite	Able to login to the system as operator staff		

Test Execution Steps:

No	**Action**	**Inputs**	**Expected Output**
1	Access operator staff dashboard	-	Operator staff dashboard is displayed
2	Choose “Recapitulation History” menu	-	Recapitulation History is displayed
3	Click on edit button in existing recapitulation	-	Edit recapitulation form is displayed.
4	Fill update recapitulation form	Unit : “Mesin 2” Kegitan Har : “Perbaikan feeder yang miring”	Update recapitulation form is full-filled
5	Click “Ubah” button	-	Successfully update recapitulation

Test Case ID	TC001_4		
Test Case Description	Able to delete existing recapitulation.	**Test Priority**	High
Pre-Requisite	Able to login to the system as operator staff		

Test Execution Steps:

No	**Action**	**Inputs**	**Expected Output**
1	Access operator staff dashboard	-	Operator staff dashboard is displayed
2	Choose “Recapitulation History” menu	-	Recapitulation History is displayed
3	Click on delete button in existing recapitulation	-	Selected Recapitulation is deleted

2.2 Test TC002 for Module Recapitulation: View Recapitulation (UC002)

Test Case ID	TC002		
Test Case Description	Able to view the existing recapitulation.	**Test Priority**	High
Pre-Requisite	Able to login to the system as PIC staff		

Test Execution Steps:

No	**Action**	**Inputs**	**Expected Output**
1	Access PIC staff dashboard	-	PIC staff dashboard is displayed
2	Choose "Requested Recapitulation" menu	-	Recapitulation History is displayed
3	Click one existing recapitulation	-	Recapitulation content is displayed.

2.3 Test TC003 for Module Recapitulation: Update Recapitulation (UC003)

Test Case ID	TC003		
Test Case Description	Able to update the existing recapitulation.	**Test Priority**	Medium
Pre-Requisite	Able to login to the system as PIC staff		

Test Execution Steps:

No	Action	Inputs	Expected Output
1	Access PIC staff dashboard	-	PIC staff dashboard is displayed
2	Choose "Requested Recapitulation" menu	-	Requested recapitulation is displayed
3	Click on edit button in existing recapitulation	-	Edit recapitulation form is displayed.
4	Fill update recapitulation form	Unit : "Mesin 2" Kegitan Har : "Perbaikan feeder yang miring"	Update recapitulation form is full-filled
5	Click "Ubah" button	-	Successfully update recapitulation

2.4 Test TC004 for Module Recapitulation: Evaluate Recapitulation (UC004)

Test Case ID	TC004		
Test Case Description	Able to evaluate the requested recapitulation.	**Test Priority**	High
Pre-Requisite	Able to login to the system as PIC staff		

Test Execution Steps:

No	Action	Inputs	Expected Output
1	Access PIC staff dashboard	-	PIC staff dashboard is displayed
2	Choose "Requested Recapitulation" menu	-	Requested recapitulation is displayed
3	Click on evaluate button in existing recapitulation	-	Evaluate recapitulation page is displayed.
4	Click "Approved" button to approve recapitulation	-	Successfully approve recapitulation

2.5 Test TC005 for Module Report: Get Report (UC005)

Test Case ID	TC005		
Test Case Description	Able to get the generated report.	**Test Priority**	High
Pre-Requisite	Able to login to the system as operator staff or PIC staff		

Test Execution Steps:

No	Action	Inputs	Expected Output
1	Access staff dashboard	-	Staff dashboard is displayed
2	Fill sort field to query the generated report or keep default to take current date default power plant type.	Tanggal Mulai : "23 Mei 2022" Tipe Pembangkit : "PLTD"	Generated Report will be displayed as a bar chart.
3	Choose "Download Report" menu	-	Download report page is displayed
4	Fill sort field to query the generated report	Tipe Pembangkit : "PLTD" Nama Pembangkit : "Mandangin" Tanggal Mulai : "23 Mei 2022" Tanggal Akhir : "23 Juni 2022" Tipe Rekapitulasi : "Har Rencana"	Sort field is full-filled
5	Click download button	-	Generated report will be downloaded as an excel file

2.6 Test TC006 for Module Report: View Report (UC006)

Test Case ID	TC006		
Test Case Description	Able to view the generated report.	**Test Priority**	High
Pre-Requisite	Able to login to the system as operator staff or PIC staff		

Test Execution Steps:

No	Action	Inputs	Expected Output
1	Access staff dashboard	-	Staff dashboard is displayed
2	Fill sort field to query the generated report or keep default to take current date default power plant type.	Tanggal Mulai : “23 Mei 2022” Tipe Pembangkit : “PLTD”	Generated Report will be displayed as a bar chart.

2.7 Test TC007 for Module Report: Download Report (UC007)

Test Case ID	TC007		
Test Case Description	Able to download the generated report.	**Test Priority**	High
Pre-Requisite	Able to login to the system as operator staff or PIC staff		

Test Execution Steps:

No	Action	Inputs	Expected Output
1	Access staff dashboard	-	Staff dashboard is displayed
2	Choose "Download Report" menu	-	Download report page is displayed
3	Fill sort field to query the generated report	Tipe Pembangkit : "PLTD" Nama Pembangkit : "Mandangin" Tanggal Mulai : "23 Mei 2022" Tanggal Akhir : "23 Juni 2022" Tipe Rekapitulasi : "Har Rencana"	Sort field is full-filled
4	Click download button	-	Generated report will be downloaded as an excel file

2.8 Test TC008 for Module Master Data: View Power Plant (UC008)

Test Case ID	TC008		
Test Case Description	Able to view all the available power plant.	**Test Priority**	Medium
Pre-Requisite	Able to login to the system as administrator		

Test Execution Steps:

No	Action	Inputs	Expected Output
1	Access admin dashboard	-	Operator staff dashboard is displayed
2	Choose “Master Data” menu	-	Master Data option is displayed
3	Click power plant option	-	Power plant list is displayed.

2.9 Test TC009 for Module Master Data: View Material (UC009)

Test Case ID	TC009		
Test Case Description	Able to view all the available material.	**Test Priority**	Medium
Pre-Requisite	Able to login to the system as administrator		

Test Execution Steps:

No	**Action**	**Inputs**	**Expected Output**
1	Access admin dashboard	-	Operator staff dashboard is displayed
2	Choose “Master Data” menu	-	Master Data option is displayed
3	Click material option	-	Power plant list is displayed.
4	Click one of the power plant	Power Plant Name : “PLTD Mandangin”	List of material for PLTD Mandangin is displayed

2.10 Test TC010 for Module Master Data: Manage Master Data (UC010)

Test Case ID	TC010_1		
Test Case Description	Able to create new master data.	**Test Priority**	High
Pre-Requisite	Able to login to the system as administrator		

Test Execution Steps:

No	Action	Inputs	Expected Output
1	Access admin dashboard	-	Operator staff dashboard is displayed
2	Choose “Master Data” menu	-	Master Data option is displayed
3	Choose one of Master Data Option	Master Data : “Unit”	Unit list is displayed
4	Click “Add” button	-	Add unit form is displayed
5	Fill unit form	Unit Name : “ULP Sumenep”	Unit form is full-filled
6	Click “Tambah” button	-	New unit is successfully added

Test Case ID	TC010_2		
Test Case Description	Able to view the existing master data.	**Test Priority**	High
Pre-Requisite	Able to login to the system as administrator		

Test Execution Steps:

No	**Action**	**Inputs**	**Expected Output**
1	Access admin dashboard	-	Operator staff dashboard is displayed
2	Choose “Master Data” menu	-	Master Data option is displayed
3	Choose one of Master Data Option	Master Data : “Unit”	Unit list is displayed
4	Click one of existing unit	-	The detail of selected unit is displayed

Test Case ID	TC010_3		
Test Case Description	Able to update the existing master data.	**Test Priority**	High
Pre-Requisite	Able to login to the system as administrator		

Test Execution Steps:

No	**Action**	**Inputs**	**Expected Output**
1	Access admin dashboard	-	Operator staff dashboard is displayed
2	Choose “Master Data” menu	-	Master Data option is displayed
3	Choose one of Master Data Option	Master Data : “Unit”	Unit list is displayed
4	Click “Edit” button on one of existing unit	-	Update unit form is displayed
5	Fill update unit form	Unit Name : “ULP Kangean”	Unit form is full-filled
6	Click “Ubah” button	-	Existing unit is successfully edited

Test Case ID	TC010_4		
Test Case Description	Able to delete the existing master data.	**Test Priority**	High
Pre-Requisite	Able to login to the system as administrator		

Test Execution Steps:

No	**Action**	**Inputs**	**Expected Output**
1	Access admin dashboard	-	Operator staff dashboard is displayed
2	Choose “Master Data” menu	-	Master Data option is displayed
3	Choose one of Master Data Option	Master Data : “Unit”	Unit list is displayed
4	Click “Delete” button on one of existing unit	-	Selected unit is successfully deleted

2.11 Test TC011 for Module Account: Manage Admin User Account Management (UC011)

Test Case ID	TC011_1		
Test Case Description	Able to create new admin user account.	**Test Priority**	Low
Pre-Requisite	Able to login to the system as administrator		

Test Execution Steps:

No	**Action**	**Inputs**	**Expected Output**
1	Access admin dashboard	-	Operator staff dashboard is displayed
2	Choose "Account Manager" menu	-	Account type option is displayed
3	Choose one of account type Option	Account Type: "Admin"	Admin user account list is displayed
4	Click "Add" button	-	Add admin user account form is displayed
5	Fill admin user account form	Nama : "Admin UP3 Pamekasn 1" Username : "admin1.up3pamekasan" Password : "up3pamekasan.jaya"	Admin user account form is full-filled
6	Click "Tambah" button	-	New admin user account is successfully added

Test Case ID	TC011_2		
Test Case Description	Able to view, the existing admin user account.	**Test Priority**	Low
Pre-Requisite	Able to login to the system as administrator		

Test Execution Steps:

No	Action	Inputs	Expected Output
1	Access admin dashboard	-	Operator staff dashboard is displayed
2	Choose "Account Manager" menu	-	Account type option is displayed
3	Choose one of account type Option	Account Type: "Admin"	Admin user account list is displayed
4	Click one of existing admin user account	-	The detail of selected admin user account is displayed

Test Case ID	TC011_3		
Test Case Description	Able to update the existing admin user account.	**Test Priority**	Low
Pre-Requisite	Able to login to the system as administrator		

Test Execution Steps:

No	Action	Inputs	Expected Output
1	Access admin dashboard	-	Operator staff dashboard is displayed
2	Choose "Account Manager" menu	-	Account type option is displayed
3	Choose one of account type Option	Account Type: "Admin"	Admin user account list is displayed
4	Click "edit" button	-	Update admin user account form is displayed
5	Fill admin user account form	Nama : "Operator PLTD Mandangin" Username : "op_pltd_mdg" Password : "up3pamekasan.mdg" Pembangkit : "PLTD Mandangin" Tipe Staff : "Operator"	Admin user account form is full-filled
	Click "Ubah" button	-	Existing admin user account is successfully edited

Test Case ID	TC011_4		
Test Case Description	Able to delete the existing admin user account.	**Test Priority**	Low
Pre-Requisite	Able to login to the system as administrator		

Test Execution Steps:

No	**Action**	**Inputs**	**Expected Output**
1	Access admin dashboard	-	Operator staff dashboard is displayed
2	Choose "Account Manager" menu	-	Account type option is displayed
3	Choose one of account type Option	Account Type: "Admin"	Admin user account list is displayed
4	Click "Delete" button one of existing admin user account	-	Selected admin user account is successfully deleted

2.12 Test TC012 for Module Account: Manage Staff User Account Management (UC012)

Test Case ID	TC012_1		
Test Case Description	Able to create new staff user account.	**Test Priority**	High
Pre-Requisite	Able to login to the system as administrator		

Test Execution Steps:

No	Action	Inputs	Expected Output
1	Access admin dashboard	-	Operator staff dashboard is displayed
2	Choose "Account Manager" menu	-	Account type option is displayed
3	Choose one of account type Option	Account Type: "Staff"	Staff user account list is displayed
4	Click "Add" button	-	Add staff user account form is displayed
5	Fill staff user account form	Nama : "Operator PLTD Mandangin1" Username : "op_pltd_mdg1" Password : "up3pamekasan.mdg" Pembangkit : "PLTD Mandangin" Tipe Staff : "Operator"	Staff user account form is full-filled
6	Click "Tambah" button	-	New staff user account is successfully added

Test Case ID	TC012_2		
Test Case Description	Able to view the existing staff user account.	**Test Priority**	High
Pre-Requisite	Able to login to the system as administrator		

Test Execution Steps:

No	**Action**	**Inputs**	**Expected Output**
1	Access admin dashboard	-	Operator staff dashboard is displayed
2	Choose "Account Manager" menu	-	Account type option is displayed
3	Choose one of account type Option	Account Type: "Staff"	Staff user account list is displayed
4	Click one of existing staff user account	-	The detail of selected staff user account is displayed

Test Case ID	TC012_3		
Test Case Description	Able to update the existing staff user account.	**Test Priority**	High
Pre-Requisite	Able to login to the system as administrator		

Test Execution Steps:

No	Action	Inputs	Expected Output
1	Access admin dashboard	-	Operator staff dashboard is displayed
2	Choose "Account Manager" menu	-	Account type option is displayed
3	Choose one of account type Option	Account Type: "Staff"	Staff user account list is displayed
4	Click "edit" button		Update staff user account form is displayed
5	Fill staff user account form	Nama : "Admin UP3 Pamekasn 2" Username : "admin2.up3pamekasan" Password : "up3pamekasan.jaya"	Staff user account form is full-filled
6	Click "Ubah" button	-	Exisitng staff user account is successfully edited

Test Case ID	TC012_4		
Test Case Description	Able to delete the existing staff user account.	**Test Priority**	High
Pre-Requisite	Able to login to the system as administrator		

Test Execution Steps:

No	**Action**	**Inputs**	**Expected Output**
1	Access admin dashboard	-	Operator staff dashboard is displayed
2	Choose "Account Manager" menu	-	Account type option is displayed
3	Choose one of account type Option	Account Type: "Staff"	Staff user account list is displayed
4	Click "Delete" button one of existing staff user account	-	Selected staff user account is successfully deleted

2.13 Test TC013 for Module Authentication: Sign In (UC013)

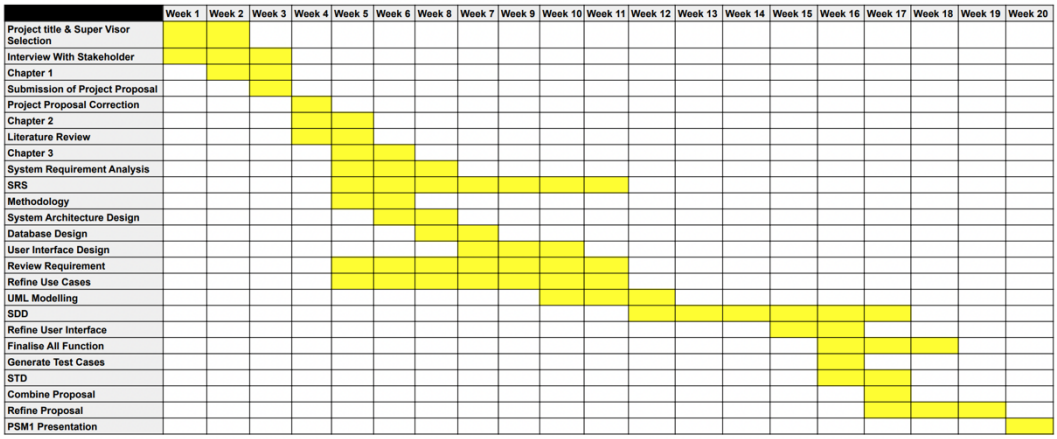
Test Case ID	TC013		
Test Case Description	Able to authenticate the user account credential	**Test Priority**	High
Pre-Requisite	A valid user account		

Test Execution Steps:

No	Action	Inputs	Expected Output
1	Access to the system login portal based on user type.	-	Login portal is viewed
2	Input login credential	Username : “op.pltd.mandangin” Password : “up3pamekasanmdg”	Login credential field is full-filled
3	Click “Masuk” button	-	User will be redirected to the dashboard page based on user type.

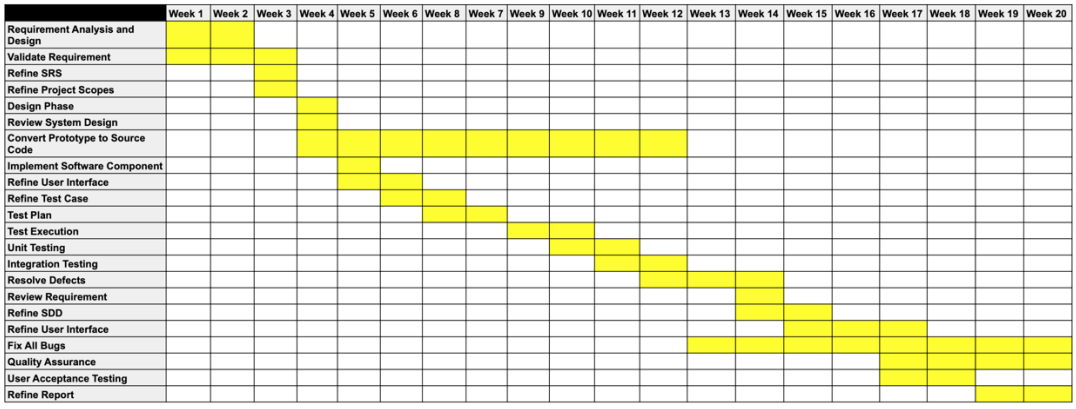
Appendix D Gantt Chart

PSM1 Gantt Chart



	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 8	Week 7	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Week 15	Week 16	Week 17	Week 18	Week 19	Week 20
Project title & Super Visor Selection																				
Interview With Stakeholder																				
Chapter 1																				
Submission of Project Proposal																				
Project Proposal Correction																				
Chapter 2																				
Literature Review																				
Chapter 3																				
System Requirement Analysis																				
SRS																				
Methodology																				
System Architecture Design																				
Database Design																				
User Interface Design																				
Review Requirement																				
Refine Use Cases																				
UML Modelling																				
SDD																				
Refine User Interface																				
Finalise All Function																				
Generate Test Cases																				
STD																				
Combine Proposal																				
Refine Proposal																				
PSM1 Presentation																				

PSM 2 Gantt Chart



	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 8	Week 7	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Week 15	Week 16	Week 17	Week 18	Week 19	Week 20
Requirement Analysis and Design																				
Validate Requirement																				
Refine SRS																				
Refine Project Scopes																				
Design Phase																				
Review System Design																				
Convert Prototype to Source Code																				
Implement Software Component																				
Refine User Interface																				
Refine Test Case																				
Test Plan																				
Test Execution																				
Unit Testing																				
Integration Testing																				
Resolve Defects																				
Review Requirement																				
Refine SDD																				
Refine User Interface																				
Fix All Bugs																				
Quality Assurance																				
User Acceptance Testing																				
Refine Report																				