Voltage data reporting application on the electrical substation at PT. Haleyora Powerindo Merauke

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Abstract. This journal aimed to answer the problems encountered from carrying out measurements and inspections of electrical substations that still have problems including limited technicians in making measurements, writing errors often occur in measurement results, and the accuracy of the data from the calculation results that are sometimes not under operational standards at PT Haleyora Powerindo Merauke as part of PT PLN (Persero) in Merauke area. Data collection carried out in this journal is by interview, observation, literature study, with system development methods using the Waterfall method. The results of application testing show that Applications can display information about the results of measurements at each substation and transformer with accurate data because measurements are carried out in real-time. This application also provides information on substation inspections where at each inspection of this substation, this application can help technicians in measuring and inspecting substations, Reporting process results of measurements and inspections on substations and transformers can be reported directly to PT PLN (Persero) as the supervisor quickly while the area is still affordable by the internet network.

1. Introduction
PT. Haleyora Powerindo is a company engaged in the electricity and power generation engineering services and is a subsidiary of a company from PT PLN (Persero) [1]. PT Haleyora Powerindo now has branch companies in various cities and districts throughout Indonesia, from Sabang to Merauke, PT Haleyora Powerindo currently handles technical services from PT PLN (Persero) Merauke area [2]. In PT Haleyora Powerindo, there are also several parts and work functions, including the APKT (complaints by public complaints) section, Yandal (reliable service), which has a duty of 1x24 hours to serve customers if there is a power outage, and also the generation of coconut PLTD 5 Merauke and the last is the Maintenance section. In the maintenance section, it’s also divided into 2 work functions, the first work function is to maintain medium voltage networks and low voltage networks. The following function is to conduct measurements and inspections of electrical substations in which function PT Haleyora Powerindo must take measurements and inspections of all electricity substations in the work area of PT PLN (Persero) Merauke [3].

Electric substations contained in the map of the work area of PT PLN Persero amounted to 242 substations, which were divided into 7 feeders namely Penyulang Kota 1, Kota 2, Polder, Muli, Kompi 1, Kompi 2, Kelapa lima, and the furthest substations which were in Tomerau, Naukenjerai District. PT Haleyora Powerindo has a minimum target of inspecting and measuring 242 substations within a period of every 3 months, where the problems often occurred during the process of carrying out work in measuring and inspecting electrical substations, including limited of technicians who often make mistakes in writing the results of electrical substation inspection measurements, inaccurate data in handling work that is in accordance with the standard operating procedures that have been determined.
In addition, there are problems that occur due to the reporting process of the measurement results and inspection of substations that are still in the manual form which made PT Haleyora Powerindo experience time constraints in submitting these reports to the PT PLN (Persero) Merauke area. Based on this problem, it is necessary to make a Voltage Substation Data Reporting Application that can help PT Haleyora Powerindo in the process of evaluating and inspecting electrical substations that can improve the performance of technicians in inspecting and measuring substations in accordance with operating system standards and with admin support in Reporting data to the PT PLN (Persero) Merauke area. The application uses a web-base, so that the reporting process is getting easier and faster [4].

2. Methods
The waterfall method is a traditional software development process that is commonly used in most development software projects. This is a sequential model, so the completion of a set of activities causes the start of the next activity [5]. some main principles of the project are divided into several sequential phases, emphasis on planning, schedule (schedule), deadlines, budget, and implementation of the entire system at once, and strict control in the project life cycle using written documentation help [6].

While the advantages of the waterfall method include this model has easy to understand, easy to use, the system is stable, good in management control, and works well when quality is preferred over costs and schedules (deadlines).

![Waterfall method](image.png)

**Figure 1.** Waterfall method

3. Results and discussion
The voltage data reporting process at the electric substation starts with WO (Work Order) issued by PT PLN inspection and measurement of substations to PT Haleyora Powerindo Merauke, then inspections and measurements conducted by technicians. The results of the data are then returned to be examined by the network supervisor. If the data is safe, it will be archived, if not then a WO will be followed up to PT Haleyora Powerindo Merauke.
Figure 2. The current system

Reporting electricity substations measurements and inspections [7] conducted PT Haleyora Powerindo Merauke has done to the Supervisor, and Asman jar (Network Assistant) PT PLN Persero is still felt through a long and time-consuming process, based on the results of an ongoing system analysis and field observations. The requirements needed for system development are as follows.

3.1 Needs
The reporting process of electrical substation measurements and inspections conducted by PT Haleyora Powerindo Merauke requires an application that can assist the reporting process.

Problems:
1) Inspection time and measurement of substations that do not match the peak load time that has been determined according to standard operating procedures.
2) Measuring in the field is still having problems because the technician must carry a lot of stationery equipment to carry out inspections and measurements.
3) Inputting measurement data and inspections is still undergoing a long and time-consuming process.

3.2 Result conducted
Create a Web-based voltage substation data reporting application so it can help PT. Haleyora Powerindo Merauke in carrying out the reporting process to PT PLN (Persero) in the Merauke area.
3.3 Data flow diagram
Data flow diagrams (DFD) are one of the important model tools or modeling tools and are used to describe the flow of data in the new system, the source, and destination of data, the process that processes the data and also stores data [8]. Data flow diagram in this journal can be seen in figure 5.
Figure 5. DFD Level 0

1) Process 1.0
Process 1.0 is the login process. Admin input user data and password to get administrator rights on the system.

2) Process 2.0
Process 2.0 is a named master data management whose input is in the form of user data and substation data. The output got from this input is a user and substation information.

3) Process 3.0
Process 3.0 is a WO (Work Order) process. WO input is a WO number on the date of WO and WO Target.

4) Process 4.0
Process 4.0 is the WO verification process, this is done if the WO target meets the requirements for measurement and inspection.

5) Process 5.0
This process is named the measurement process, this process is carried out if the WO has been verified. Data input for measurement is substation data, location, feeder, clock, date, power and so on.

6) Process 6.0
Process 6.0 is a verification process, the process by which the results are verified. If it has been verified, the measurement data can be displayed on the work report with the status complete.

7) Process 7.0
Process 7.0 is the reporting process. The report can view data on each substation that has been measured and inspected.

4. Conclusion
After conducting research and completing the making of the application of voltage data reporting on the electric Substation, the following conclusions are drawn.

1) Applications can display information about the results of measurements at each substation and transformer with accurate data because measurements are carried out in real-time. This application also provides information on substation inspections where at each inspection of this substation,
provides detailed information about the state of the substation starting from the voltage, repetition, component conditions and measurement time at the substation.

2) This application can help technicians in measuring and inspecting substations. This application can make the results of measurements and inspections on the transformer or substation, according to the standard operating procedures that have been determined.

3) Reporting process results of measurements and inspections on substations and transformers can be reported directly to PT PLN (Persero) as the supervisor quickly while the area is still affordable by the internet network.

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