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Delay in the Electric Pole Construction Project at the Units Electricity Project Implementation (UP2K) of PT XYZ South Sulawesi Region on Kalatoa Island, Pasilambena District, Selayar Regency

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Abstract

The Electricity Project Implementation Unit (UP2K) is one of the units at PT XYZ for the South Sulawesi Region which is fully responsible for the implementation of the electricity pole construction project on Kalatoa Island, Pasilambena District, Selayar Regency. This project experienced delays in its implementation, for this reason this study aims to identify the causes of project delays and as a proposal to improve project delays using the Critical Path Method (CPM). The results of this study note that the cause of the delay in the construction project for the Kalatoa Island

electricity pole, kec. Pasilambena, Kab. Selayar due to the difficulty of access to the location. This was identified in the fourth activity, namely the delivery of materials from Makassar to locations that experienced delays. So the proposed improvement for the delay in the construction project for the Kalatoa Island electricity pole, Pasilambena District, Selayar Regency with project scheduling using the CPM method. Where with this method results are obtained for 87 calendar days with an acceleration of time for 3 days from a predetermined schedule.

Keywords: Project Delay, Power Pole Construction Project, Critical Path Method (CPM)

1. Introduction

Infrastructure development is one of the important and vital aspects. Infrastructure has a positive effect on the growth and development of a country. The electricity sector is classified as a very influential basic infrastructure of the many existing infrastructure sectors. Because electricity itself is a very fundamental need for society ^[1]. Therefore, it needs special handling from the government regarding the development of electricity sector infrastructure in Indonesia as stated in government regulation Number 12 of 2015 concerning the Acceleration of Priority Infrastructure Preparation ^[2] and ^[3].

PT XYZ South Sulawesi Region is one of the branches of PT XYZ located in South Sulawesi, Makassar City. PT XYZ is a state-owned enterprise responsible for meeting the country's electricity needs. Similar to other companies in general, PT XYZ is also divided into several work units. The Electricity Project Implementation Unit (UP2K) is a work unit at PT XYZ which has the main target of building electricity networks in villages and hamlets that have not been electrified. In UP2K itself, there are several divisions such as Planning, Risk, and Construction Divisions. UP2K Construction Division is a division that is fully responsible for implementing electricity pole projects in villages and hamlets that have not been electrified. However, if reviewed from the last few years, there are several projects that have experienced delays. Where the project completion age does not match the planning age at the beginning of the project.

The electricity pole construction project in Pasilambena sub-district, Selayar district is planned to be completed in 90 calendar days. The project started on November 19, 2018 and was planned to be completed on February 16, 2019. However, on February 16, 2019 the progress of the new work reached a weight of 14.01%, so that 85.99% of the project remained unresolved and there was an increase in project time until March 22, 2020 or for 400 calendar days until the project was completed. Project delays at PT XYZ have also been discussed in previous studies, namely in research ^[4] which discusses the factors of delay in the COD of the Kalbagtim PLN project with a percentage of 52.71% delay and ^[5] which discusses delays in construction projects at PT XYZ (PERSERO) UIP Sumbangut with a percentage of 65% delay.

Based on the Time Schedule of project realization and the history of previous research, it can be seen the time of delay and the urgency of further discussion of this research. The delay of this project will have a bad impact on PT XYZ and worsen PT

PLN's image in the community because it seems unable to complete the project in accordance with the agreed contract. In addition, this will have an impact on equalizing electricity coverage in villages that have not been electrified. And it indirectly hampers the process of progress in this country.

2. Methods

2.1 Place and time of study

The place of study in this writing was conducted at PT XYZ (PERSERO) Unit Induk Wilayah Sulselrabar at the Electricity Project Implementation Unit (UP2K) South Sulawesi Region on Jl. Letjen Hertasing No. Blok B, Makassar 90222 for 1 month.

2.2 Methods

Data analysis techniques are carried out systematically and logically according to the theoretical basis which aims to obtain the truth of an object of the problem, so that later it will make it easier to accumulate time scheduling and using the Critical Path Method (CPM) method according to [6], [7] and [8]. The data analysis techniques carried out in the implementation of the study of the samples taken, namely:

1. Detailing the plan and sequence of work activities.
2. Planning scheduling implementation with consideration of productivity efficiency using Critical Path Method (CPM).
3. Use of Microsoft Project 2019 application, used for

project time planning.

2.3 Data Collection

2.3.1 Identification of Activities

The main work of the UP2K electricity pole construction project of PT XYZ (PERSERO) South Sulawesi Region Kalatoo Island, Pasilambena sub-district, Selayar district, among others: 1. The signing of the SPB 2. The SPBJ was received at PT Fanhy Mulya Mandiri 3. Survey of the work location 4. Material is sent from Makassar to the location 5. Start cleaning and restoring the poles at the location 6. Unloading material arrives at the port location 7. Material is distributed to the location site 8. Construction service work 9. Inspection of completed work.

The work included in the construction services work of the UP2K electricity pole construction project of PT XYZ (PERSERO) South Sulawesi Region Kalatoo island, Pasilambena sub-district, Selayar district, namely: 1) Installation of tensile and compressive poles 2) Installation of Bushings and Insulators of Support and Pull 3) Withdrawal of JTM Wire (AAACS 70mm²) 4) Installation of LVTC Accessories 5) Withdrawal of JTR Wire (LVTC) 6) Installation of Distribution Transformers 7) Up/Down Cable Installation 8) Fuse Cut Out Installation 9) Grounding Installation.

2.3.2 Project Realization

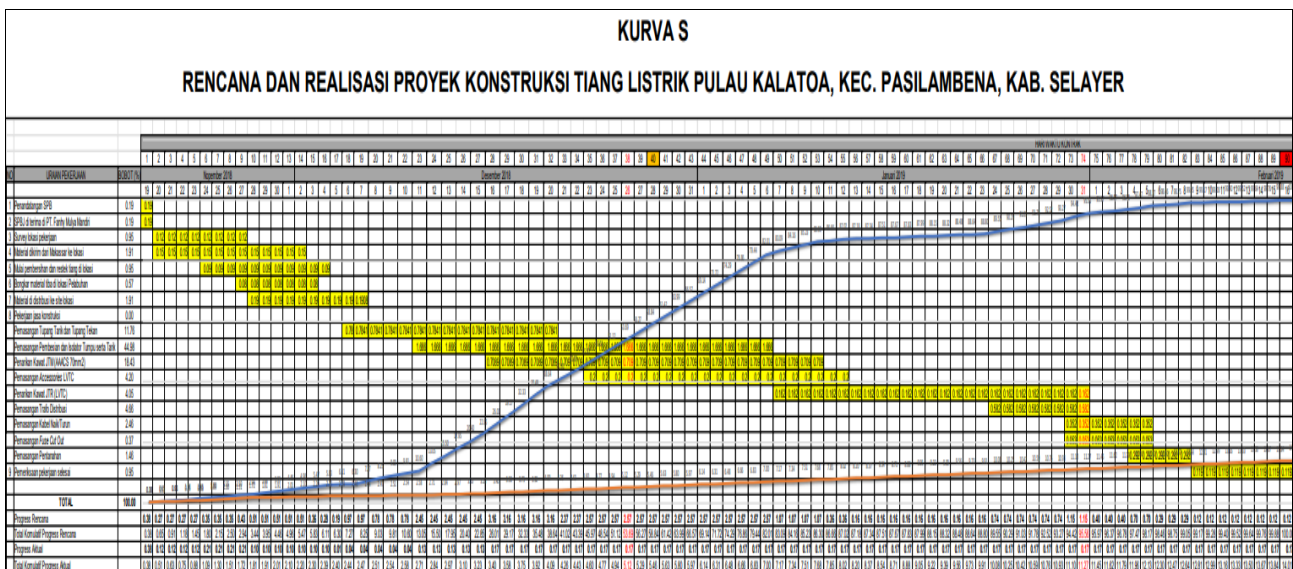


Fig 1: Project Realization S-curve

From the data of the work realization curve of the UP2K electricity pole construction project of PT XYZ (PERSERO) South Sulawesi Region Kalatoo island, Pasilambena subdistrict, Selayar district, it can be seen that the work that does not have a realization value shows the description of the work that is delayed. The electricity pole construction project in Pasilambena sub-district, Selayar district is planned to be completed in 90 calendar days. The project started on November 19, 2018 and was planned to be completed on February 16, 2019. However, on February 16, 2019 the progress of the new work reached a weight of

14.01%, so that 85.99% of the project remained unresolved and there was an increase in project time until March 22, 2020 or for 400 calendar days until the project was completed.

2.3.3 Job Description and Realization Time

Data on the activity description of the UP2K PT XYZ (PERSERO) South Sulawesi Region Kalatoo island power pole construction project, Pasilambena sub-district, Selayar district with one time estimate to illustrate the Network Path can be seen in the table below:

Table 1: Job Description and Project Realization Time

Activity Code	Job Description	Duration (Day)
A	Signing of SPB	1
B	SPBJ received at PT Fanhy Mulya Mandiri	1
C	Survey of work location	8
D	Materials shipped from Makassar to the site	13
E	Start cleaning and restoring the poles at the site	11
F	Unloading material arrives at the port location	7
G	Material is distributed to the site Construction service work	10
H1	Installation of tensile and compressive poles	15
H2	Installation of Support and Tensile Insulators and Fixings	27
H3	JTM Wire Pulling (AAACS 70mm ²)	26
H4	Installation of LVTC Accessories	21
H5	JTR wire pulling (LVTC)	25
H6	Installation of Distribution Transformer	8
H7	Up/Down Cable Installation	7
H8	Fuse Cut Out Installation	7
H9	Grounding Installation	5
I	Inspection of completed work	8

2.4 Data Processing

2.4.1 Activity Dependency Relationship

Table 2: Activity Dependency Relationship

Activity Code	Job Description	Predececor	Sucesor	Duration (Day)
A	Signing of SPB	-	B	1
B	SPBJ received at PT Fanhy Mulya Mandiri	A	C D E	1
C	Survey of work location	B	F	8
D	Materials shipped from Makassar to the site	B	F	13
E	Start cleaning and restoring the poles at the site	B	F	11
F	Unloading material arrives at the port location	C D E	G	7
G	Material is distributed to the site	F	H1 H2 H3 H4 H5	10
Construction service work				
H1	Installation of tensile and compressive poles	G	H6	15
H2	Installation of Support and Tensile Insulators and Fixings	G	H6	27
H3	JTM Wire Pulling (AAACS 70mm ²)	G	H6	26
H4	Installation of LVTC Accessories	G	H6	21
H5	JTR wire pulling (LVTC)	G	H6	25
H6	Installation of Distribution Transformer	H1 H2 H3 H4 H5	H7 H8	8
H7	Up/Down Cable Installation	H6	H9	7
H8	Fuse Cut Out Installation	H6	H9	7
H9	Grounding Installation	H7 H8	I	5
I	Inspection of completed work	H9	-	8

2.4.2 Forward Pass and Backward Pass Calculation

Table 3: Forward Pass (ES – EF) and Backward Pass (LS – LF) Calculation Results

Activity Kode	Activity Time	Predececor	Earliest Start	Earliest Finish	Latest Start	Latest Finish
A	1	-	0	1	0	1
B	1	A	1	2	1	2
C	8	B	2	10	7	15
D	13	B	2	15	2	15
E	11	B	2	13	4	15
F	7	C D E	15	22	15	22
G	10	F	22	32	22	32
H1	15	G	32	47	44	59
H2	27	G	32	59	32	59
H3	26	G	32	58	33	59
H4	21	G	32	53	38	59
H5	25	G	32	57	34	59
H6	8	H1 H2 H3 H4 H5	59	67	59	67
H7	7	H6	67	74	67	74
H8	7	H6	67	74	67	74
H9	5	H7 H8	74	79	74	79
I	8	H9	79	87	79	87

Table 4: Earliest Event Time (EET) and Lates Event Time (LET) Calculation Results

Activity Kode	Activity Time	Prodececor	Earliest Event Time	Latest Event Time
A	1		1	1
B	1	A	2	2
C	8	B	10	15
D	13	B	15	15
E	11	B	13	15
F	7	C D E	22	22
G	10	F	32	32
H1	15	G	47	59
H2	27	G	59	59
H3	26	G	58	59
H4	21	G	53	59
H5	25	G	57	59
H6	8	H1 H2 H3 H4 H5	67	67
H7	7	H6	74	74
H8	7	H6	74	74
H9	5	H7 H8	79	79
I	8	H9	87	87

2.4.3 Critical Path Determination

Table 5: Project CPM Method Calculation Results

Activity	Activity Time	Prodececor	ES	EF	LS	LF	EET	LET	Slack	On Critical Path
A	1		0	1	0	1	1	1	0	YES
B	1	A	1	2	1	2	2	2	0	YES
C	8	B	2	10	7	15	10	15	5	NO
D	13	B	2	15	2	15	15	15	0	YES
E	11	B	2	13	4	15	13	15	2	NO
F	7	C D E	15	22	15	22	22	22	0	YES
G	10	F	22	32	22	32	32	32	0	YES
H1	15	G	32	47	44	59	47	59	12	NO
H2	27	G	32	59	32	59	59	59	0	YES
H3	26	G	32	58	33	59	58	59	1	NO
H4	21	G	32	53	38	59	53	59	6	NO
H5	25	G	32	57	34	59	57	59	2	NO
H6	8	H1 H2 H3 H4 H5	59	67	59	67	67	67	0	YES
H7	7	H6	67	74	67	74	74	74	0	YES
H8	7	H6	67	74	67	74	74	74	0	YES
H9	5	H7 H8	74	79	74	79	79	79	0	YES
I	8	H9	79	87	79	87	87	87	0	YES

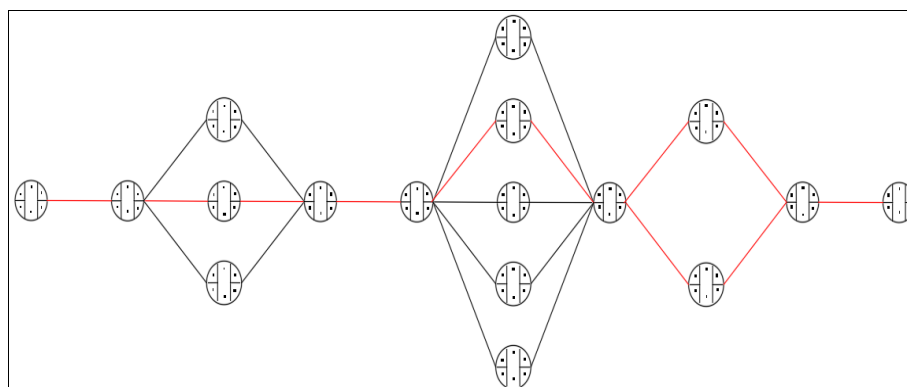


Fig 2: Critical Path Proyek

Table 6: Activities in Critical Path

S. No	Activities In Critical Path	Duration (Day)
1	A	1
2	B	1
3	D	13
4	F	7
5	G	10
6	H2	27
7	H6	8
8	H7/H8	7
9	H9	5
10	I	8
	<i>Procejt</i>	87

3. Results and Discussion

3.1 Findings

After knowing the prodececor and successor of each project activity, the forward pass and backward pass calculations will be carried out. After the calculation, it can be concluded that the work network of the electricity pole construction project at UP2K PT XYZ (PERSERO) South Sulawesi Region Kalatoo Island, Pasilambena District, Selayar Regency using the Critical Path Method (CPM). At this stage, the calculation of slack or free time is carried out to determine critical activities. For two-pass slack calculation, if the value of $LS - ES$ OR $LF - EF = 0$, then the activity is a critical activity and the work time cannot be delayed. For EET and LET slack calculations, if the $EET = LET$ value, then the activity is a critical activity and the work time cannot be delayed.

Based on the precedence diagram of the electricity pole construction project at UP2K PT XYZ (PERSERO) South Sulawesi Region Kalatoo Island, Pasilambena District, Selayar Regency, there are two critical path activities. The first critical path activity is starting from the SPB Signing activity, SPBJ received at PT. Fanhy Mulya Mandiri, Material sent from Makassar to the location, Unloading material at the Port location, Material distributed to the location, Installation of Pulling and Pressing Poles, Installation of Support and Pulling Insulators, Installation of Distribution Transformers, Up/Down Cable Installation, Grounding installation, and Inspection of completed work. And there are a total of 87 calendar days of work.

The second critical path activity is starting from the SPB Signing activity, SPBJ received at PT. Fanhy Mulya Mandiri, Material sent from Makassar to the location, Unloading material at the Port location, Material distributed to the location, Installation of Tensile and Pressed Tupang, Installation of Support and Tensile Insulators, Installation of Distribution Transformers, Installation of Fuse Cut Out, installation of Grounding, and Inspection of completed work. And there are a total of 87 calendar days of work. So, the critical path activity of the electricity pole construction project at UP2K PT XYZ (PERSERO) South Sulawesi Region Kalatoo Island, Pasilambena District, Selayar Regency is 87 calendar days.

The following is a comparison of the duration of the electricity pole construction project at UP2K PT XYZ (PERSERO) South Sulawesi Region Kalatoo Island, Pasilambena District, Selayar Regency between the results of the work carried out by the company, the company's contract and the results of project acceleration using the CPM method. The duration of the project time on the results of the work carried out by the company is 490 calendar

days. As for the time duration in the company contract is 90 calendar days. And based on the results of the CPM method, the time duration is 87 calendar days.

3.2 Comparison with previous studies

On Analyzing the Application of Time Management in the Lubuk Ulak Suspension Bridge Construction Project with the Cpm Method. The results showed that in the implementation of the work there were 18 job descriptions, there were 2 job descriptions that were included in the critical path and the implementation time was very influential, namely: BJT 280 Fin Reinforcement Steel Work and Steel Frame Bridge Installation Work. In order to save time, additional labor or overtime work is carried out^[9]. Then in the research Comparative Implementation of Critical Chain Project Management with Critical Path Method Repowering Ship Mv. Sinar Ambon. The results showed that replating productivity was 23 kg / day with a total duration using CCPM of 41 days and 6 days faster than the CPM method which had a duration of 46 days. In terms of cost, CCPM is 37% superior to CPM with a difference of Rp.49,365,000, -^[10]. In the research Analysis of Time Management Implementation of Electrical Installation Work Pt. Duta Bangun Sentosa with Critical Path Method (Cpm) on Lampung City Project. The results showed that obtaining a critical path to work $A(1) \rightarrow B(1) \rightarrow C(2) \rightarrow F(5) \rightarrow I(5) \rightarrow L(5) \rightarrow P(5) \rightarrow Q(1) \rightarrow R(1)$ with a total work of 26 weeks at a cost of Rp. 3,732,000,000 (three billion seven hundred thirty-two million rupiah). This resulted in an acceleration of the project from the initial plan of 32 weeks. Although it is costly, this project can reduce the duration of work to achieve the project target^[11]. In the study Project Development Management of Rungkut Tower Apartments with Critical Path Method Approach and Pert. Project management is a science that is concerned with organizing and managing resources by techniques to the results determined the purpose of this study is to analyze the needs of the time and resources required, determine the critical path of the project, analyzing the timing of completion and cost of the project acceleration. This study uses a CPM (critical path method) and PERT. CPM is used to plan and supervision the project with the network system and time required to complete the project. Results of this research project scheduling with CPM can be completed earlier than conventional scheduling the number of labor costs Rp. 220.370.000. So that project can be completed faster with less cost that the scheduling PT. Tata Bumi Raya^[12]. In the research Evaluation of Fixed Bridge Project Implementation Using Cpm and Pert Methods. The Fixed Bridge project was delayed for 1 month due to delays in drying the Apron

project from other subcontractors. This study aims to evaluate the implementation of the Sultan Hasanudin Airport Fixed Bridge project in Makassar. Using the CPM (Critical Path Method) and PERT (Project Evaluation and Review Technique) methods. The CPM method is useful for knowing the critical path of the project, while the PERT method is useful for calculating the probability of project completion time according to the critical path. The data used are S Curve, Bill of Quantity, daily reports, documentation and interviews so that the results obtained from CPM are 1 critical path with critical activities located therein. While the PERT results have an opportunity of 57.14% with a project completion time duration of 43 weeks. If you want to get a higher probability the project can be completed for 45 weeks with a probability level of 98.98%^[13]. And in the research Evaluation of the Scheduling of the 500 GT RO-RO Ferry Ship Project Through the CPM and PERT Method Approach Case Study of PT. XYZ. This research uses the CPM (Critical Path Method), PERT (Program Evaluation and Review Technique) method. The results of the scheduling evaluation at PT XYZ using the CPM method on data analysis and processing by comparing the time on the company's time schedule for 36 weeks, 252 days with the results of the analysis using the CPM method obtained work time for 42 weeks, 292 days. It can be concluded that using the CPM method can complete the project on time according to the realization time compared to using the company's time schedule method with a difference of 6 weeks. Meanwhile, using the PERT method obtained the results of workmanship with an optimal time of 43 weeks^[14].

Meanwhile, the results of this study found that the cause of the delay in the Kalatoa island power pole construction project, Pasilambena sub-district, Selayar district is due to the difficulty of access to the location. This was identified in the fourth activity, namely Material sent from Makassar to the location that experienced delays. So that the proposed improvements to the delay in the Kalatoa Island power pole construction project, Kec. Pasilambena Kab. Selayar by scheduling the project using the CPM method. Where with this method the results are obtained for 87 calendar days with an acceleration of time for 3 days from the predetermined schedule.

3.3 Limitations of the work in the study

This research only focuses on accelerating project scheduling, so it is hoped that further research can expand the scope of the discussion on the cost analysis used. So that the amount of costs incurred can be known in the acceleration of project scheduling that has been carried out.

4. Conclusion

The cause of the delay in the Kalatoa island power pole construction project, Pasilambena sub-district, Selayar district was due to difficult access to the location. This was identified in the fourth activity, namely Material sent from Makassar to the location which experienced delays. Thus, making all subsequent activities hampered.

Proposed improvements to the delay in the Kalatoa island power pole construction project, Pasilambena sub-district, Selayar Regency by scheduling the project using the CPM method. Where with this method the results are obtained for 87 calendar days with an acceleration of time for 3 days from the predetermined schedule. The sequence of activities that can be done simultaneously after accelerating

scheduling is the activity of surveying the work location, sending materials from Makassar to the location and starting cleaning and restoring poles at the location. Furthermore, the activities of installing tensile and compressive poles, installing support and tensile insulators, withdrawing JTM wire (AAACS 70mm²), installing LVTC accessories, and withdrawing JTR wire (LVTC). And also, in the activities of Up/Down cable installation and Fuse Cut out Installation.

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