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REVIEW OF WORK USING THE EARNED VALUE ANALYSIS METHOD ON THE PLTG GRATI TO PESANGGARAN BALI PROJECT

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ABSTRACT
In construction projects, acceleration work has significant relevance in the modern construction industry. The Grati Gas Power Plant (PLTG) Relocation project to Pesanggaran Bali has a work implementation period of 460 days or 15 months. However, the Job Owner requested to complete it with a duration of 10 months. This study uses the Earned Value Analysis (EVA) method with direct observation in accelerating the work. By accelerating the work on the Grati Gas Power Plant (PLTG) Relocation project to Pesanggaran Bali, it can be estimated that the work can be completed on time according to the job owner's request, which is 10 months. Regarding the cost implications that occur due to the acceleration of the work, the estimated expenditure is smaller than the planned budget so that the project is estimated to have potential profit. And also make an estimated calculation in carrying out the acceleration of the work and record all costs incurred in implementing the acceleration of the work, so that the costs incurred (Actual Cost) are not greater than the budget planned at the beginning of the work or Budget At Complection (BAC).
Keywords: Review, Work Acceleration, Earned Value Analysis (EVA) Method, Cost, Time

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ABSTRACT
In construction projects, acceleration work has significant relevance in the modern construction industry. The work of the Grati Gas Power Plant (PLTG) Relocation project to Pesanggaran Bali has a work implementation period of 460 days or 15 months. However, the Job Owner asked to complete it with a duration of 10 months. In this study, the Earned Value Analysis (EVA) method was used with direct observation in accelerating work. With the acceleration of work on the Relocation of the Grati Gas Power Plant (PLTG) project to Pesanggaran Bali, it can be estimated that the work can be completed on time according to the request of the job owner, which is 10 months. Regarding the cost implications that occur due to the acceleration of work, it is estimated that the expenditure is smaller than the planned cost budget so that the project is estimated to have potential profits. And also make calculations of estimates in carrying out the acceleration of work and record all costs incurred in the implementation of the acceleration of work, so that the costs incurred (Actual Cost) are not greater than the cost budget planned at the beginning of the work or Budget At Complection (BAC).
Keywords: Review, Work Acceleration, Earned Value Analysis (EVA) Method, Cost, Time

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INTRODUCTION

The relocation project of the Grati Gas Power Plant (PLTG) to Pesanggaran Bali, is a strategic initiative taken in order to meet the electricity needs of the island of Bali, as well as show Indonesia's commitment to promoting clean and sustainable energy and supporting the transition to renewable energy and protecting the environment on the vulnerable island of Bali. On May 14, 2024, a Cooperation Contract was carried out between the Work Owner and the Main Contractor regarding the Relocation of the Grati 2 x 100 MW Gas Power Plant (PLTG) to Pesanggaran Bali. For the period of implementation of the work of 2 power plant units for 460 days or no later than August 17, 2025. At the beginning of the work period, the Work Owner asked the Main Contractor to be able to complete one of the generating units faster than planned, in order to support the electricity supply to be more reliable on the island of Bali, namely on February 24, 2025. Where in general the completion of work on one power plant unit is 15 months, while upon request the Main Contractor must complete the work of one power plant unit with a duration of 10 months. The impact of the Project Owner's request is a change in work targets and planning schedules. So that the Main Contractor takes a strategic step, namely carrying out acceleration work to complete the work on time and give the best to the Job Owner. Taking these strategic steps has several effects on cooperation contracts. The biggest effect is the change in work schedules and milestones. Changes in work schedules and milestones are readjusted to the duration of the work targeted by the Job Owner. These changes are evidenced by recovery schedules and work milestones. With the change in schedule and work milestones, the engineering team re-designed several civil works. The re-design aims to achieve recovery schedules and work milestones without reducing quality. At the time of the implementation of the work, the re-design carried out by the Main Contractor causes the additional work to be less than the bill of quantity (BOQ) of the cooperation contract. However, during the implementation in the field, there are often inconsistencies in the planned re-design. With the emergence of inconsistencies in the field and the effects that occur due to changes in work schedules and milestones, it has implications for work costs.

Based on the description above, the acceleration of work during the implementation period of the work has a very large impact on the cooperation contract. Therefore, it is necessary to conduct research on Work Review with the Earned Value Analysis Method on the Relocation Project of the Grati Gas Power Plant (PLTG) to Pesanggaran Bali.

RESEARCH METHODS

To support this research, the data to be used in this analysis were obtained based on the data collection method. The data collection in question is the collection of written report data that is always updated during the project, such as: Budget At Completion, Actual Cost and S-Curve. The data analysis method used in this study is inferential data analysis.

1. Work Analysis with Earned Value Analysis (EVA) Method on Costs
   In analyzing and processing the data in this study, several aspects were carried out, including: 1. Actual Cost Work Performed (ACWP), 2. Budgeted Cost of Work Schedule (BCWS), 3. Budgeted Cost of Work Performed (BCWP), 4. Cost Variances (CV), 5. Schedule Variance (SV), and 6. Cost Performance Index (CPI), and Schedule Performance Index (SPI)
2. Job Analysis with Earned Value Analysis (EVA) Method

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In analyzing the data on work acceleration with the EVA method on time in this study, a study was conducted by looking for Time Estimated (TE) or the estimated time needed to complete the planned work, it is assumed that the situation is as it was when the evaluation was carried out. For the calculation of TE the following formula is used.

TE=ATE+ (OD-(ATE x SPI))/SPI
Information:
ATE/Actual Time : the time that has been taken
OD : planned time
SPI : SPI value in the current period (7th Month)

After the data analysis was carried out, the results of the analysis were discussed. From the results of the analysis, the following were obtained:

a. Discussion of the Results of Earned Value Analysis (EVA) on costs
   1) Estimate To Complete (ETC)
      is to estimate and project completion time. This forecast can be useful as an early warning of things to happen in the future. The method used to calculate is:
      ETC for physical progress < 50 %
      ETC = Budget - BCWP
      ETC for physical progress > 50 %
      ETC = (Budget - BCWP) / CPI
      Estimate And Completion (EAC)
   2) EAC is to estimate the remaining cost of work by assuming project performance will remain (constant) until the end of the project completion. The method used to calculate is:
      EAC = ACWP + ETC
b. Discussion of the results of Earned Value Analysis (EVA) on time.
   In this discussion, the results of data analysis on time are obtained, namely the estimated time needed to complete the planned work.

RESULTS AND DISCUSSION

1. Work Analysis on the Grati Power Plant Relocation Project to Pesangaran Bali with *the Earned Value Analysis* Method on Costs
   a. ACWP Analysis
      The following are the results of the recapitulation of the ACWP value

Table 1 ACWP Value Recapitulation

JURNAL ILMIAH METADATA, E-ISSN :2723-7737, Vol.7 No.2
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No	Periode	Personel (IDR)	Expenses (IDR)	Material (IDR)	Total (IDR)
1	Bulan Ke-1	20.503.958	41.587.448	6.605.389.987	6.667.481.393
2	Bulan Ke-2	84.817.060	65.974.091	14.367.705.302	14.518.496.453
3	Bulan Ke-3	189.698.018	353.849.072	6.272.649.758	6.816.196.848
4	Bulan Ke-4	176.179.750	310.940.276	34.654.905.765	35.142.025.791
5	Bulan Ke-5	113.983.785	126.929.497	-948.616.690	-707.703.408
6	Bulan Ke-6	92.705.647	2.915.669.568	21.900.988.788	24.909.364.003
7	Bulan Ke-7	105.302.893	1.655.037.818	54.136.562.616	55.896.903.327

Source : Project Data

b. BCWS Analysis

The following is the calculation of BCWS at the time of the project in the 7th month period.

BCWS = (% plan) x (BAC)
BCWS = 78.80% x Rp. 191,606,408,647,-
BCWS = Rp. 150,985,850,014,-

With the calculation as above, here is a recapitulation of the value of BCWS during the 7-month project.

Table 2 BCWS Value Recapitulation

No	Periode	BAC (IDR)	Progres Rencana (%)	BCWS (IDR)
1	Bulan Ke-1	191.606.408.647	5,88	11.266.456.828
2	Bulan Ke-2		10,72	20.540.207.007
3	Bulan Ke-3		20,96	40.160.703.252
4	Bulan Ke-4		42,03	80.532.173.554
5	Bulan Ke-5		55,21	105.785.898.214
6	Bulan Ke-6		65,79	126.057.856.249
7	Bulan Ke-7		78,80	150.985.850.014
8	Bulan Ke-8		85,94	164.666.547.591
9	Bulan Ke-9		93,37	178.902.903.754
10	Bulan Ke-10		100	191.606.408.647

Source : Processed Research Data

c. BWCP Analysis

The following is the calculation of the BCWP in the 7th month period.

BCWP = (% actual) x (BAC)
BCWP = 78.73% x Rp. 191,606,408,647,-
BCWP = Rp. 150,851,725,528,-

With the calculation as above, here is a recapitulation of the value of BCWP during the 7-month project.

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Edition May 2025, Published : 30-05-2025, Page: 145-153
DOI: 10.47652/metadata.v7i2.620

Table 3 BCWP Value Recapitulation

No	Periode	BAC (IDR)	Progres Aktual (%)	BCWP (IDR)
1	Bulan Ke-1	191.606.408.647	5,88	11.266.456.828
2	Bulan Ke-2		10,49	20.099.512.267
3	Bulan Ke-3		20,99	40.218.185.175
4	Bulan Ke-4		41,02	78.596.948.827
5	Bulan Ke-5		53,91	103.295.014.902
6	Bulan Ke-6		66,07	126.594.354.193
7	Bulan Ke-7		78,73	150.851.725.528

Source : Processed Research Data

d. Cost Variance Analysis
The value of cost variation (CV) is the difference between the amount of the BCWP value of the project realization and the planned BCWS value.
CV = BCWP – ACWP
= Rp. 150,851,725,528 - Rp. 55,896,903,327 = Rp. 94,954,822,201,-
With the calculation as above, here is a recapitulation of the CV value when the project ran for 7 months.

Table 4 CV Value Recapitulation

No	Periode	BCWP (IDR)	ACWP (IDR)	CV (IDR)
1	Bulan Ke-1	11.266.456.828	6.667.481.393	4.598.975.435
2	Bulan Ke-2	20.099.512.267	14.518.496.453	5.581.015.814
3	Bulan Ke-3	40.218.185.175	6.816.196.848	33.401.988.327
4	Bulan Ke-4	78.596.948.827	35.142.025.791	43.454.923.036
5	Bulan Ke-5	103.295.014.902	-707.703.408	102.587.311.494
6	Bulan Ke-6	126.594.354.193	24.909.364.003	101.684.990.190
7	Bulan Ke-7	150.851.725.528	55.896.903.327	94.954.822.201

Source : Processed Research Data

e. Schedule Variant Analysis
The value of schedule variation (SV) is the difference between the amount of the BCWP value of the project realization and the planned BCWS value.
SV = BCWP – BCWS
= Rp. 150,851,725,528 - Rp. 150,985,850,014= (-) Rp. 134,124,486,-

Table 5 Recapitulation of SV Values

No	Periode	BCWP (IDR)	BCWS (IDR)	SV (IDR)
1	Bulan Ke-1	11.266.456.828	11.266.456.828	0
2	Bulan Ke-2	20.099.512.267	20.540.207.007	-440.694.740
3	Bulan Ke-3	40.218.185.175	40.160.703.252	57.481.923
4	Bulan Ke-4	78.596.948.827	80.532.173.554	-1.935.224.727
5	Bulan Ke-5	103.295.014.902	105.785.898.214	-2.490.883.312
6	Bulan Ke-6	126.594.354.193	126.057.856.249	536.497.944
7	Bulan Ke-7	150.851.725.528	150.985.850.014	-134.124.486

Source : Processed Research Data

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f. Cost Performance Index Analysis
The value of the project cost performance index (CPI) for each period is a comparison between the realized BCWP and the planned ACWP.
CPI = BCWP : ACWP
= IDR 150,851,725,528 : IDR 55,896,903,327 = 3
With the calculation as above, here is a recapitulation of the CPI value during the 7-month project

Table 6 CPI Value Recapitulation

No	Periode	BCWP (IDR)	ACWP (IDR)	CPI
1	Bulan Ke-1	11.266.456.828	6.667.481.393	2
2	Bulan Ke-2	20.099.512.267	14.518.496.453	1
3	Bulan Ke-3	40.218.185.175	6.816.196.848	6
4	Bulan Ke-4	78.596.948.827	35.142.025.791	2
5	Bulan Ke-5	103.295.014.902	-707.703.408	-146
6	Bulan Ke-6	126.594.354.193	24.909.364.003	5
7	Bulan Ke-7	150.851.725.528	55.896.903.327	3

Source : Processed Research Data

g. Schedule Performance Index Analysis
The project performance index (SPI) value for each period is a comparison between the BCWP realization and the planned BCWS.
SPI = BCWP : BCWS
= IDR 150,851,725,528 : IDR 150,985,850,014 = 0.9991
With the calculation as above, the following is a recapitulation of the SPI value during the 7-month project.

Table 7 SPI Value Recapitulation

No	Periode	BCWP (IDR)	BCWS (IDR)	SPI
1	Bulan Ke-1	11.266.456.828	11.266.456.828	1.0000
2	Bulan Ke-2	20.099.512.267	20.540.207.007	0.9785
3	Bulan Ke-3	40.218.185.175	40.160.703.252	1.0014
4	Bulan Ke-4	78.596.948.827	80.532.173.554	0.9760
5	Bulan Ke-5	103.295.014.902	105.785.898.214	0.9765
6	Bulan Ke-6	126.594.354.193	126.057.856.249	1.0043
7	Bulan Ke-7	150.851.725.528	150.985.850.014	0.9991

Source : Processed Research Data

2. Work Analysis on the Grati to Pesanggaran Bali Relocation Project with *the Earned Value Analysis* Method on Time
In the analysis of work acceleration data using the EVA method on time in this study, a study was carried out by looking for Time Estimated (TE) or the estimated time needed to complete the planned work, it is assumed that the situation is as it was when the evaluation was carried out. To calculate TE, there are several things that need to be known, which are as follows.

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ATE (Actual Time) : 7 Months
OD (planned time) : 10 Months
SPI for the 7th Month Period : 0.9991
And the calculation of TE in the 7th month period can be done using the following formula equation.
TE=ATE+ (OD-(ATE x SPI))/SPI
TE=7+ (10-(7 x 0.9991))/0.9991
TE=10.0089 Months ~ 10 Months

3. Discussion of the Results of Work Analysis on the Grati PLTG Relocation Project to Pesanggaran Bali with *the Earned Value Analysis* (EVA) Method on Costs.
   a. Estimate to Complete (ETC) Analysis
      ETC is an estimate of the costs required to complete the remaining work. The ETC value is obtained from the comparison between the remaining plan time and the work performance index (CPI). ETC can be calculated with the following calculation equation.
      ETC = (BAC – BCWP) / CPI
      = (Rp. 191,606,408,647 - Rp. 150,851,725,528) / 3 = Rp. 15,101,322,669,-
      With the calculation as above, here is a recapitulation of the ETC value during the 7-month project.

Table 8 ETC Value Recapitulation

No	Periode	BAC (IDR)	BCWP (IDR)	CPI	ETC (IDR)
1	Bulan Ke-1	191.606.408.647	11.266.456.828	2	106.725.059.304
2	Bulan Ke-2		20.099.512.267	1	123.884.710.916
3	Bulan Ke-3		40.218.185.175	6	25.657.346.973
4	Bulan Ke-4		78.596.948.827	2	50.528.441.764
5	Bulan Ke-5		103.295.014.902	-146	-605.046.375
6	Bulan Ke-6		126.594.354.193	5	12.792.110.196
7	Bulan Ke-7		150.851.725.528	3	15.101.322.669

Source : Processed Research Data

   b. Estimate At Completion (EAC) Analysis
      EAC is an estimate of the cost of project completion by summing up the reporting ACWP and the time required to complete the remaining work (ETC).
      EAC =ACWP + ETC
      = IDR 55,896,903,327 + IDR 15,101,322,669
      = Rp. 70,998,225,996,-

Table 9 Recapitulation of EAC Values

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DOI: 10.47652/metadata.v7i2.620

No	Periode	ACWP (IDR)	ETC (IDR)	EAC (IDR)
1	Bulan Ke-1	6.667.481.393	106.725.059.304	113.392.540.697
2	Bulan Ke-2	14.518.496.453	123.884.710.916	138.403.207.369
3	Bulan Ke-3	6.816.196.848	25.657.346.973	32.473.543.821
4	Bulan Ke-4	35.142.025.791	50.528.441.764	85.670.467.555
5	Bulan Ke-5	-707.703.408	-605.046.375	-1.312.749.783
6	Bulan Ke-6	24.909.364.003	12.792.110.196	37.701.474.199
7	Bulan Ke-7	55.896.903.327	15.101.322.669	70.998.225.996

Source : Processed Research Data

From the value of EAC in the 7th month of the implementation of the work, to be able to find out the estimate that this project will experience profit or loss can be calculated with the following formula.

BAC – EAC
IDR 191,606,408,647 – IDR 70,998,225,996
Rp. 120.608.182.651,-

Based on this formula, it can be estimated that the Grati Gas Power Plant (PLTG) Relocation project to Pesanggaran Bali has a profit with a nominal value of Rp. 120,608,182,651,-.

4. Discussion of the results of the work analysis on the Grati Power Plant Relocation Project to Pesanggaran Bali using *the Earned Value Analysis* method on time.
After the Time Estimated (TE) analysis was carried out, in the discussion of the results of this analysis, an estimate of the time needed to complete the planned work, which is for 10 months, it can be interpreted that the Main Contractor can complete the project on time according to the request of the Job Owner.

CONCLUSION

From the results of the discussion, it can be concluded as follows:

1. Review of Work on the Relocation Project of PLTG Grati to Pesanggaran Bali with the Earned Value Analysis (EVA) Method on Costs
Based on the results of the discussion of the work analysis on the PLTG grati to Bali relocation project using the earned value analysis (EVA) method on costs, it can be concluded that with the remaining implementation time to complete all planned work requiring a cost (EAC) of Rp. 70,998,225,996,- that with the project's budget at completion (BAC) of Rp. 191,606,408,647,- and the value of the EAC, it can be estimated that the project has a profit of Rp. 120. 608.182.651,-.
2. Review of Work on the Relocation Project of PLTG Grati to Pesanggaran Bali with the Earned Value Analysis (EVA) Method on Time
From the calculation of the Time Estimate (TE), the calculation results are 10 months, this value shows that the project completion time is the same as what has been planned (the Work Owner's request) or can be on time in completing the project.

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DOI: 10.47652/metadata.v7i2.620

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