



Gradual Payment Scheme Investment Fee for Power Plant Operation and Maintenance (O&M) Services

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ABSTRACT

PT Pebangkitan Jawa-Bali (PJB) as a subsidiary of PT PLN (Persero) (PLN) has business fields which include: Electricity Generation, Electrical Building Construction, Installation of electrical equipment; Maintenance and/or operation of electrical equipment; and Trading and/or supporting business activities in the context of optimizing the utilization of the Company's resources. PJB has experience in operating and maintaining PLN power plants (O&M) with a total capacity of 6,246 MW. There are 2 schemes in power plant O&M services, namely as asset operator and asset manager. By using the asset manager scheme, PLN can make investment payments in stages with an agreed IRR target of 7%. In this study, analyze the gradual payment options which are divided into 3 options to compare the current gradual payment scheme with the proportion of payments evenly distributed each year. From the analysis results, it is known that gradual payment changes through option-1, option-2 and option-3 can reduce the total return on investment costs that will be received by PLN while maintaining the IRR target of 7% and a Positive NPV. Of the three options, option-3 is able to reduce the cost of return on investment by Rp. 9,970 million with an IRR of 7.38% and an NPV of Rp. 8,660 million. And through option-3, the investment return burden that must be paid by PLN at the end of the period is only 32% of the total investment return for 5 years.

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INTRODUCTION

PT Pebangkitan Jawa-Bali (PJB) is a Subsidiary of PT PLN (Persero) which was established in 1995 with business fields including: Electricity Generation, Electrical Building Construction, Installation of electrical equipment; Maintenance and/or operation of electrical equipment; and Trade and/or supporting business activities in the context of optimizing the utilization of the Company's resources, including giving assignments to Subsidiaries (Annual Report PJB, 2020).

PJB manages power plants spread throughout Indonesia with a total capacity of 20,957 MW in 2022 and contributes 28% of the national installed capacity of 73,736 MW. Where 19,352 MW of

power plants are in the operating phase and 1,605 MW are in the construction phase (Company Profile, 2022).



Figure 1. PJB Operational Area

Power Plant Operation and Maintenance (O&M) services are one of PJB's business lines that contribute 13.75% of the company's total revenue in 2021. PJB is trusted by PLN to manage the power plants owned by PLN to be able to operate efficiently and reliably where there are 17 generators or around 1,168 MW PLN generators located outside Java, around 5,078 MW PLN plants located in Java (Company Profile, 2022).

In carrying out the operation and maintenance of the plant (O&M), PJB offers 2 (two) business schemes where PJB is the 1) Asset Operator and 2) Asset Manager. As an Asset Operator, PJB is only responsible for the operation of the power plant and routine maintenance of the power plant. Where the cost component in this scheme is the cost of the Operating Budget (AO) which is paid in monthly lump sums with the agreed work value for a certain period of time. If PLN wants to increase the reliability and efficiency of the generator through major repairs, PLN can assign PJB to do the work with a reimburseable payment mechanism after the work is completed. The weakness of this scheme is that PLN cannot estimate and prepare a budget for the operating costs of the power plant for a certain period of time so that the O&M service costs may become less competitive or expensive.



Figure 2. Operation & Maintenance Power Plant (O&M)

Under the Asset Manager scheme, PJB is not only responsible for the operation of the power plant and routine maintenance of the power plant but also plans and proposes repairs to the power

plant to maintain and improve the reliability of the power plant. There are 2 (two) cost components in the Asset Manager scheme, namely: 1) Operational Budget (AO) which is routine maintenance costs for power plants which is paid in monthly lump sum and 2) Investment Budget (AI) namely costs for power plant repairs to increase reliability and efficiency of power plants.

In the payment of the Investment Budget (AI), several power plants are paid in stages until the end of the work period taking into account the IRR target agreed between PLN and PJB. The distribution of payments in stages is carried out proportionally evenly until the remaining work period. When the investment work is carried out in the 1st (first) year and the work period is 5 years, the investment payment will be paid annually 25% of the agreed work value.

With this Asset Manager scheme, PLN can estimate and prepare a budget for plant maintenance for a certain period of time. However, this affects the company's cash flow (PJB) because the return on investment costs (AI) is paid in stages by PLN with an even proportion of installments. Therefore, in this study, an analysis will be carried out on the proportion used by the gradual return scheme to see the efficiency of payments received by PLN while maintaining the mutually agreed Internal Rate of Return (IRR) target.

RESEARCH METHOD

The analytical method used in this study is divided into 2 (two) of them: 1) Net Present Value (NPV) and 2) Internal Rate of Return (IRR).

1) Net Present Value (NPV)

Net present value can be interpreted as the present value of the income stream generated by investment (Khotimah, 2014). NPV is the result of subtracting income with discounted costs. Mathematically, the NPV calculation can be formulated as follows:

$$NPV = \sum_{t=0}^n \frac{B_t - C_t}{(1+i)^t} \quad (1)$$

Information:

NPV = Net Present Value (Rp)

B_t = Benefits or benefits in year t

C_t = Cost or cost in year t

i = interest rate used

t = year t

The feasibility indicator is: if the NPV is positive (NPV > 0) then the business is feasible to run. Conversely, if the NPV is negative (NPV < 0) then the business is not feasible to run.

2) Internal Rate of Return (IRR)

Internal Rate of Return (IRR) is the maximum interest rate that can return the costs invested (Khotimah, 2014). Mathematically the IRR calculation can be formulated as follows:

$$IRR = i_1 + \frac{NPV_1}{NPV_1 - NPV_2} \times (i_1 - i_2) \quad (2)$$

Information:

IRR = Internal Rate of Return

i₁ = interest rate that produces a positive NPV

i₂ = interest rate that produces a negative NPV

NPV₁ = positive NPV

NPV₂ = Negative NPV

The feasibility indicator is: if the IRR is greater than the prevailing bank interest rate ($IRR > DR$) then the business is feasible to run. On the other hand, if the IRR is less than the prevailing interest rate ($IRR < DR$), the business is not feasible.

RESULTS AND DISCUSSIONS

In conducting the calculation analysis, the parameters that are used as reference in the feasibility calculation are determined, then the investment feasibility is calculated in terms of Net Present Value (NPV) and Internal Rate of Return (IRR).

1) Calculation Parameters

The parameters used in this study are used as information in calculating investment feasibility, including:

Table 1. Parameter Perhitungan

Parameter	Value
Target IRR	7%
Deposit Interest Rate	5%
Term of Work	5 Years
PPN	11%
Investment Work Value (Exc PPN)*	Year 1 : Rp. 116.198.817.606,- Year 2 : Rp. 75. 487.875.750,- Year 3 : Rp. 35.256.421.238,- Year 4 : Rp. 45.982.783.750,- Year 5 : Rp. 28.937.949.000,-
TOTAL : Rp. 301.863.847.344,-	

** because the value is confidential, the value of the work is adjusted from the value of the offer*

2) Return on Investment Proportion

There are 4 schemes for the proportion of investment returns that will be used in the analysis of investment feasibility calculations including:

a. Even Proportion of Returns

Table 2. Even Proportion of Returns

Investment Year-	Return Proportion				
	1	2	3	4	5
Year-1		25%	25%	25%	25%
Year-2			33,33%	33,33%	33,33%
Year-3				50%	50%
Year-4					100%
Year-5					100%

b. Option 1

Table 3. Option-1's Return Proportion

Investment Year-	Return Proportion				
	1	2	3	4	5
Year-1		40%	30%	20%	10%
Year-2			40%	35%	25%
Year-3				70%	30%
Year-4					100%
Year-5					100%

c. Option 2

Table 4. Option-2's Return Proportion

Investment Year-	Return Proportion				
	1	2	3	4	5
Year-1		45%	35%	10%	10%
Year-2			45%	35%	20%
Year-3				75%	25%
Year-4					100%
Year-5					100%

d. Option 3

Table 5. Option-3's Return Proportion

Investment Year-	Return Proportion				
	1	2	3	4	5
Year-1		50%	30%	15%	5%
Year-2			50%	30%	20%
Year-3				80%	20%
Year-4					100%
Year-5					100%

3) Even Proportion of Returns

By using the proportion of equal returns as shown in table 2 above, the total investment payment that must be paid by PLN for 5 years by calculating the 11% Value Added Tax (VAT) is Rp. 380,0009 million with an NPV of Rp. 10,665 million and an IRR of 7.27%.

Table 6. Feasibility Analysis of Equitable Return Scheme

Component	Year-1	Year -2	Year -3	Year -4	Year -5	TOTAL
Cash Out	116.199	75.488	35.256	45.983	28.938	301.864
Cash In	-	34.244	62.993	82.474	162.639	342.351
Cash Flow	(116.199)	(41.243)	27.736	36.491	133.701	40.487
PLN Payment	-	49.312	72.480	86.760	171.457	380.009

* in million rupiah

4) Option-1

By using the proportion of equal returns as shown in table 3 above, the total investment payment that must be paid by PLN for 5 years by calculating the Value Added Tax (VAT) of 11% is Rp. 373,682 million with an NPV of Rp. 9,438 million and an IRR of 7.35%.

Table 7. Option-1 Feasibility Analysis

Component	Year-1	Year -2	Year -3	Year -4	Year -5	TOTAL
Cash Out	116.199	75.488	35.256	45.983	28.938	301.864
Cash In	-	53.088	73.939	83.322	126.301	336.650
Cash Flow	(116.199)	(22.400)	38.683	37.339	97.363	34.786
PLN Payment	-	67.687	83.323	87.552	135.119	373.682

* in million rupiah

5) Option-2

By using the proportion of equal returns as shown in table 4 above, the total investment payment that must be paid by PLN for 5 years by calculating the 11% Value Added Tax (VAT) is Rp. 371,608 million with an NPV of Rp. 9,085 million and an IRR of 7.40%.

Table 8. Option-2 Feasibility Analysis

Component	Year-1	Year -2	Year -3	Year -4	Year -5	TOTAL
Cash Out	116.199	75.488	35.256	45.983	28.938	301.864
Cash In	-	59.137	84.180	71.601	119.864	334.782
Cash Flow	(116.199)	(16.351)	48.924	25.618	90.926	32.918
PLN Payment	-	73.593	93.514	75.819	128.683	371.608

* in million rupiah

6) Option-3

By using the proportion of equal returns as shown in table 5 above, the total investment payment that must be paid by PLN for 5 years by calculating the 11% Value Added Tax (VAT) is Rp. 370,039 million with an NPV of Rp. 8,660 million and an IRR of 7.38%.

Table 9. Option-3 Feasibility Analysis

Component	Year-1	Year -2	Year -3	Year -4	Year -5	TOTAL
Cash Out	116.199	75.488	35.256	45.983	28.938	301.864
Cash In	-	65.242	81.394	75.499	111.233	333.369
Cash Flow	(116.199)	(10.246)	46.138	29.516	82.295	31.505
PLN Payment	-	79.595	90.689	79.704	120.052	370.039

* in million rupiah

Based on the above calculation, the investment payment scheme gradually provides investment feasibility for PJB, this can be seen from the positive NPV value and the IRR deposit interest rate of 5%. With the change in the payment scheme, providing benefits from the PLN side by reducing the total investment return for 5 years while maintaining the feasibility of the investment received by PJB with an IRR target of 7% and a positive NPV.

The NPV and IRR methods are also carried out to analyze the feasibility of investment as has been done in several previous studies. Based on Zualihah's research (2019), an investment feasibility study using the capital budgeting method provides an Initial Cash Flow of 16,982,600.00; Depreciation Expense 433,266,667; Projected Profit and Loss 6,052,756,937; Cash Flow 77,832,283,248; NVP Rp. 37,395,209,689.58; Profitability Index 4.58; Payback Period 2 years 223 days; IRR 38.98%, with the conclusion that the investment is worth doing. Based on Sakinah's research (2021), where the Surabaya maritime axis tower office construction project provides a positive NPV value of Rp. 32,995,643,307.00, IRR value of 12.08%, ROI 15.76% and BCR of 3.2. Based on Prohastono's (2015) research, engine investment in CV Djarum Mulia provides a Net Present Value of Rp. 273,455,696 is greater than 0, the Internal rate of Return is 51.47% greater than the required interest rate, which is 7.50% so that the investment is feasible.

CONCLUSION

The gradual return on investment scheme still provides investment feasibility for PJB with an IRR target of 7% and a positive NPV. However, the return on investment with equal proportions as Table 6 above provides a fairly large return burden at the end of the period for PLN where PLN must pay 45% of the total return to be paid for 5 years.

By changing the proportion of returns to option -1, option-2 and option-3 can reduce the total return on investment that must be paid by PLN so that it can become a profit from the PLN side while maintaining the IRR Target of 7% and a Positive NPV. Of the three options above, option-3 provides the greatest efficiency from the PLN side where there is a cost savings of return on investment of Rp. 9,970 million and reduce the burden that must be paid by PLN at the end of the period. Where PLN only pays 32% of the total return that must be paid for 5 years.

References

- Purnatiyo, Dwinanto. Analisis Kelayakan Investasi Alat Dna Real Time Thermal Cycler (RT-PCR) Untuk Pengujian Gelatin. *Jurnal PASTI*, Volume VIII No 2, 212 – 226
- Ridwam, Ahmad Fauzi., Romli, Zacnudin., Soeroto, Wisudanto Mas. 2022. Analisa Kelayakan Investasi Proyek Penggantian Secondary Crusher Pada Pt Berau Coal Site Binungan. *Jurnal Sebatik*, Vol. 26 No.1
- Putra, M. Hengki Riaran., Fadah, Isti., Sukarno, Hari. 2016. Evaluasi Kelayakan Yang Mempertimbangkan Ketidakpastian Pada Investasi Mesin Produksi Botol Pada PT. SPT Jember. *Bisma Jurnal Bisnis dan Manajemen*, Vol.10. 95-103
- Manullang, Dame W., Karamoy, Herman., Pontoh, Winston. 2019. Analisis Kelayakan Investasi Aktiva Tetap (Studi Kasus Pada Cincin Jo, Blencho Dan Brownice Unit Kreativitas Mahasiswa Universitas Sam Ratulangi). *Jurnal EMBA* ISSN 2303-1174, Vol. 7 No.2. 2561-2570
- Hasugian, Ivo Andika., Ingrid, Fionna., Wardana, Khairunisa. 2020. Analisis Kelayakan Dan Sensitivitas : Studi Kasus Ukm Mochi Kecamatan Medan Selayang. *Buletin Utama Teknik* Vol. 15, No. 2
- Susilowati, Ety., Kurniati, Haruni. 2018. Analisis Kelayakan Dan Sensitivitas: Studi Kasus Industri Kecil Tempe Kopti Semanan, Kecamatan Kalideres, Jakarta Barat. *Jurnal BISMA*, Volume 10, Nomor 2
- Saida, Hilda Rosmalia., Nurhayati, Nurhayati. 2014. Analisis Kelayakan Finansial Produk Kopi Herbal Instan Terproduksi Oleh Ud. Sari Alam. *Jurnal Agroteknologi* Vol. 08 No. 02
- Wulandari, Lita., Siregar, Hermanto., Tanjung, Hendri. 2017. Analisis Investasi dan Sensitivitas Unit Usaha Pembiayaan Syariah menuju Spin Off (Studi Kasus: Adira Finance). *Jurnal Al-Muzara'ah* Vol. 5 No.2
- Nainggolan, Elisia Worlinda., Chumaidiyah, Endang., Prambudia, Yudha. 2020. Analisis Kelayakan Pengembangan Bisnis Pembukaan Toko Offline Motiviga Di Bandung. *e-Proceeding of Engineering* : Vol.7, No.2
- Swaputra, Ida Bagus., Ratini, Putu Mela., Agustina. 2015. Analisis Kelayakan Investasi Aktiva Tetap Pada PT Steel Pipe Industry Of Indonesia Tbk. *Prosiding Seminar Nasional*
- Zulaihah, Lilik., Waluyo, Mohammad Rachman., Mardhiyya, Akalily. 2019. Analisa Studi Kelayakan Investasi Dengan Metode Capital Baudgeting. *Jurnal IKRA-ITH TEKNOLOGI*, Vol 3 No.3
- Sukinah, Eka Nurus., Putra, I Nyoman Dita Pahang., Rumintang, Anna. 2021. Analisis Kelayakan Ekonomi Pada Pembangunan Perkantoran Tower Poros Maritim Surabaya. *Jurnal Paduraksa*, Vol. 10 No. 2
- Prihastono, Endro., Hayati, Enti Nur. 2015. Analisis Kelayakan Investasi Mesin Untuk Meningkatkan Kapasitas Produksi (Studi Kasus di CV Djarum Mulia Embriodery Semarang). *Jurnal Dinamika Teknik*, Vol IX No. 2, 47-60
- Rachadian, Febri Muhammad., Agassi, Ereika Arie., Sutopo, Wahyudi. 2013. Analisis Kelayakan Investasi Penambahan Mesin Frais Baru Pada CV. XYZ. *Jurnal J@TI Undip*, Vol III No. 1
- Pramana, Yudha., Wiguna I Putu Artana. 2017. Evaluasi Kelayakan Investasi The Safin Hotel di Kabupaten Pati, Jawa Tengah. *Jurnal Teknik ITS*, Vol. 6 No. 2, 2337-3520
- Yasuha, Julay Xty Ludea., Saifi, Muhammad. 2017. Analisis Kelayakan Investasi Atas Rencana Penambahan Aktiva Tetap (Stud Kasus pada PT Pelabuhan Indonesia III (Persero) Cabang Tanjung Priok Terminal Nilam. *Jurnal Administrasi Bisnis (JAB)*. Vol. 46 No. 1
- Qomaruddin, Muhammad., Wardana, Febrita Kusuma., Soeroto, Wisudanto Mas. 2021. Analisis Kelayakan Investasi Dengan Pendekatan Aspek Financial dan Strategi Pemasaran Pada Program Ayam Petelur di Bumi Desa Bumi Makmur. *Jurnal Sebatik*, Vol. 25 No. 2
- Priyo, Mandito. 2012. Studi Kelayakan Investasi Proyek Perumahan Pada Proyek Pembangunan Aura Tirta Graha Banjarnegara. *Jurnal Ilmiah Semesta Teknika*, Vol. 15 No. 02, 120-132
- Takaeb, Meksiadi Zakarias., Kelen, Lusianus Heronimus Sinyo. 2021. Analisis Kelayakan Investasi Pada Usaha Barbershop di Kabupaten Sumba Timur. *Jurnal Riset Ekonomi*, Vol. 1 No. 2
- Ruminta, Darkiman. 2020. Analisis Perbandingan Perhitungan Kelayakan Finansial Konvensional dan Syariah. *Jurnal Ecodemica*, Vol. 4 No.1
- Handjojo, Eko Suwito., Syarief, Rizal., Sugiyono. 2017. Analisis Kelayakan Bisnis Usaha Teh Papua (Vernonia Amygdalina). *Jurnal Manajemen IKM*, Vol. 12 No. 2