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# OIL PRICES SENSITIVITY TO THE POWER SUPPLY PROCUREMENT PROJECT AT PT PEP SUKOWATI

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**Abstract—** *This study intends to determine the sensitivity of changes in oil prices to investment in power supply projects from the financial aspect. The investment analysis conducted is an evaluation of Net Present Value (NPV) using the production sharing contract (PSC) model with a profit sharing system. Based on the analysis conducted, the sensitivity of changes in oil prices has a very significant effect on the project NPV. Changes in oil prices by 60% from the base case to US \$ 80 caused NPV to rise by 183%. But on the contrary if the price of oil touches the figure of US \$ 20 or -60% from the base case, it will make the NPV negative, so the project is not economical to proceed. In addition, it know that the acceptance limit of investment in power supply projects is at oil prices greater than US \$ 34 per barrel. This significant change in both the decline and increase in oil prices to the NPV is very logical because oil prices determine the amount of revenue earned from this project.*

**Keywords—** *NPV; Oil Prices; PSC; Sensitivity*

## 1. Introduction

The oil and gas industry is an activity with very high costs, advanced technology and high risk [1]. Therefore, investment in oil and gas contactors in the oil and gas sector has two possibilities, including the possibility that the investment will be successful and get a large profit, and get a high return on capital [2]. Or in the second possibility, the investments made do not benefit or even investors suffer losses that are large and less than expected [3]. In the oil and gas business, the form of cooperation between the Indonesian government and the oil and gas contracting company is referred to as the Cooperation Contract Contractor [2]. One of the contract models used in Indonesia is the production sharing contract or called the Production Sharing Contract (PSC) [4]. PT PEP as a Cooperation Contract Contractor is a party that has a cooperation contract with the government of the Republic of Indonesia represented by the Special Oil and Gas Working Unit (SKK Migas).

For the purpose of efficiency and increasing the reliability of the electric power system, PT PEP invested in the Power Supply project in Sukowati A & B. The aim of the project is to replace the electric power source from the Diesel Genset into a power source from PT Perusahaan Listrik Negara (PT. PLN). This investment project consists of an agreement on the sale and purchase price of electricity with PT PLN and the Engineering Procurement and Construction (EPC) activities for the power system facilities in the oil and gas field of PT PEP Sukowati.

According to [5] the variable change in oil prices is one that affects the return on investment of an oil and gas industry project. This will affect all investments that are being carried out. Furthermore, based on the history of world crude oil prices [6], it is known that there have been unpredictable price changes in the last 20 years. Based on the fluctuations in changes in the investment variable oil prices, a sensitivity study of the investment variable for a power supply procurement project must be conducted. Sensitivity analysis is used to find out how much the impact of predetermined investment parameters is allowed to change in value due to the situation and conditions during the investment period [7]. Sensitivity analysis is needed to determine the impact of changes in investment variables on project economic indicators, especially NPV[8]. This is because in the base case condition of investment variables, there are assumptions that have uncertainty.

In this study, the project's economic acceptance limit will be calculated. The investment analysis carried out is the net present value (NPV) evaluation using the production sharing contract model with a profit sharing system. Net Present Value (NPV) is the sum of cash outflows for initial investment plus the present value of future cash flows discounted at the obstacle level [9]. The present assumption is to explain the initial time of calculation at the time of evaluation or in the zero year period in the calculation of cash flow investments [10]. The Production Sharing Contract (PSC) calculation model with a cost recovery system is regulated according to Law No.22 of the Republic of Indonesia 2001 [11]. According to [12] the provisions in the calculation of profit sharing include First Trance Petroleum, Cost Recovery, Domestic Market Obligation, taxes and the portion of sharing split. These components will affect the profit sharing and final income between the contractor and the government [13].

The results obtained are used as a basis for sensitivity analysis of investment variables to the NPV value. After the analysis and calculation above, it is expected to know at what extent the investment of power supply procurement project to continue or stop with the change in investment variable. The results can be used for evaluation and reference by management in making decisions to take appropriate actions on power supply investments

## 2. Methods

The purpose this research is to obtain investment acceptance limits and to perform investment sensitivity to project power supply procurement using a financial model. The investment will be analyzed by calculating the Net Present Value (NPV) based on the cash flow created. Cash flow in this project will use the Production Sharing Contract (PSC) calculation model with a revenue sharing system between the government and the contractor. The technique used to calculate cash flow in this study is by using a Production Sharing Contract (PSC) or profit sharing system in accordance with Law No.22 of 2001. The method used for calculating project cash flow using a PSC with the following steps [13]:

- a. Gross Revenue (R) = Production x Oil Price
- b. First Trance Petroleum = R x % FTP.
- c. Depreciation = Declining Balance Method
- d. Operating Cost (OC) = Production Cost x Production
- e. Cost Recovery (CR) = Depreciation + OC + UR
- f. Recovery (Rec) in case:
  - CR > R - FTP, then Rec = R - FTP
  - CR < R - FTP, then Rec = CR
- g. Equity to be split (ES) = R - FTP - Rec
- h. Contractor share (CS) = ES x %CS
- i. DMO, If (25% x Revenue x Share) > Contractor share, then:
  - DMO = Contractor Share
  - If not, then DMO = 25% x Revenue x Share
- j. Government share (GS) = ES x % GS
- k. Contractor Taxable Income (CTI) = CS + (FTP x %CS)
- l. Net contractor share (NCS) = CTI - (Tax Rate x CTI).
- m. Net government share (NGS) = GS + (FTP x %GS)+(Tax Rate x CTI)
- n. Expenditure = C + NC + OC
- o. Contractor Cash Flow (CCF) = NCS + Rec - Expenditure

The results of the financial model that is the NPV calculation base case will be used as a basis for analyzing the sensitivity by changes oil price variables. Determination of the sensitivity variable will be used to analyze oil prices based on historical data and measure the data using a statistical approach in the form of an average value, the lowest value and the highest value.

## 3. Result and Discussion

### 3.1 Investment Cost Estimation

Investment costs in the power supply procurement project include the cost of the contract assignment (6235 KVA Skw A & B) with PT PLN and the cost of procurement of electricity support system facilities in Sukowati A and B. Total investment cost for this project is US\$ 5,546,571

### 3.2 Investment Period

The investment period is assumed that the investment period of this project is from 2019 to 2038 or 19 years which is the time of the Tuban block contract by PT PEP.

### 3.3 Discount Factor

The discount factor in this study is determined based on the sum of the safe rate and the level of risk. Safe rate is assumed with the do nothing investment rate, which in this case is the average 1-year deposit rate of banks in Indonesia at 5.25%. The level of risk in this project is assumed to be the same as the safe rate of 5.25%, so that the discount factor obtained in this study is 10.5%.

### 3.4 Cost Recovery Estimation

Based on the Republic of Indonesia Government Regulation No. 79 of 2010 [11], which can be categorized as cost recovery include: operating costs, depreciation of assets, general and administrative costs such as employee salaries, transportation costs, office operating costs and also costs after the completion of upstream oil and gas operations. The calculation of cost recovery in this study consists of operational and maintenance costs, other operational costs, and depreciation. Operational and maintenance costs are the payment of electricity bills to PT PLN in accordance with the usage and maintenance costs of the Motor Control Center (MCC) building and the cost of replacing transformer oil. Other operational costs consist of all other operational costs related to oil production using the power system. Depreciation is calculated using the straight line depreciation method, by dividing the investment equally in the investment period so that there is no residual value.

#### 3.4.1 Operating and Maintenance Cost Project

Operational and maintenance costs for power supply are all costs directly related to the power supply system activities at PT PEP Sukowati. These costs consist of the use of electric power to meet the needs of Electric Submersible Pump (ESP) pumps and production support systems (utilities and water injection pumps).

#### 3.4.2 Operating and Maintenance Cost Non Project

These costs include system operating costs at Central Processing Area (CPA), piping system maintenance costs, etc. Based on the YTD financial performance report for 2019, this fee is assumed as a percentage of US \$ 1.8 times the barrel of oil produced

#### 3.4.3 Depreciation Cost

The depreciation calculation method in this study uses the declining balance method in which depreciation is calculated based on the use of assets,

Total cost recovery (CR) in this project can be calculated as a sum of the components mentioned above,

Total CR = Total OP projects + Total non-project OP + Depreciation

### 3.5 Revenue

The revenue in this project is oil and gas production which can be generated using a power supply system times the price of oil. The total revenue estimate from 2021 to 2038 for this project is US\$ 130,438,872

### 3.6 Cash Flow Analysis

The investment will be analyzed by calculating the Net Present Value (NPV) based on the cash flow created. Cash flow in this project will use the calculation of the Production Sharing Contract (PSC) model with a profit sharing system between the government and the contractor. Production data uses oil and gas production forecasts, oil prices are used based on the agreement in WP&B 2020 with SKK Migas. FTP, share contractor and share government and tax parameters are obtained from internal data which is an agreement between PT PEP and the government. The depreciation method uses the declining balance. The assumption data used as a base case in the calculation of cash flows in power supply investment projects, figure in the Table 1 below:

Table 1. Base Case Assumptions for Calculation of Project Investment Cash Flow

Parameter	Unit	Value
Oil Production	Barrel	2.608.777
Oil Price	US\$/Barrel	50
Gross Revenue	US\$	130,438,872
Investment Periode	Year	19
First Trance Petroleum (FTP)	%	20
Investment Cost	US\$	5,546,571
Operating Cost Project	US\$	1,5
Operating Cost non Project	US\$	1,8
Discount Factor	%	10.5
Government Share	%	70

Contractor Share	%	30
Tax	%	40.5
Depreciation Method	-	<i>Declining Balance</i>
Depreciation Periode	Years	5

Calculation of cash flow for base case projects using the assumptions in Table 1. Base on calculation, cash flow obtained for the government and contractors shown in Table 2 and Figure 1 below:

Table 2. Cash Flow Analysis at Base Case Condition

Parameter	Value (US\$)
Gross Revenue (GR)	130,438,872
First Trance Petroleum (FTP) 20%	26,087,774
GR – FTP	104,351,097
Cost Recovery (Depreciation + Cost/Barrel)	12,851,628
Equity To Be Split	91,499,469
Government FTP Share (20%)	3,652,288
Government Share (70%)	64,049,629
Tax (40,5%)	11.117.186
Net Government Income	78,819,103
Contractor FTP Share (20%)	1,565,266
Contractor Share (30%)	27,449,841
Tax (40,5%)	(11,117,186)
Net Contractor Cash Flow	17,897,922
Investment	(5.546.571)
Discount Factor	10.5 %
NPV Project	3,039,149

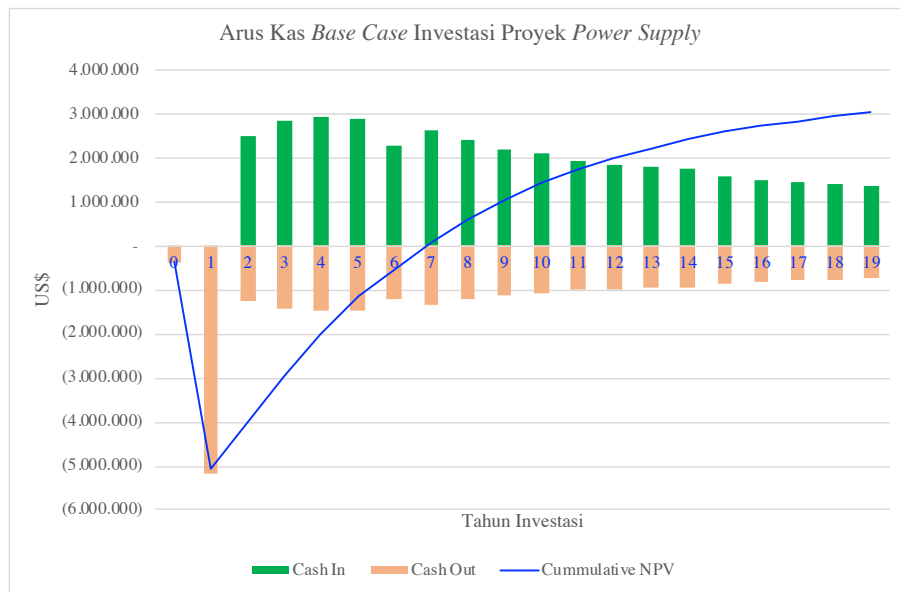


Figure 1. Cash Flow Base Case Project

Base on Table 2 and Figure 1 above, cash in project consists of returning cost recovery and share revenue (FTP plus contractor share), and then cash out consists of operational expenditure fees and taxes. Based on the base case cash flow analysis above, it know that the cumulative NPV is positive ( $NPV > 0$ ). This means that in this condition, the investment of this project is financially acceptable and profitable to run. But in the base case condition there is an assumption of uncertainty oil price, so it is necessary to do a sensitivity analysis of the variables oil prices that are very likely to experience changes in the future.

### 3.7 Sensitivity Analysis of Changes in Oil Prices to NPV

From the data of oil prices from 1980 to 2019 by considering inflation factor, the average in oil prices change is 1.2% with the highest value of 60% and the lowest -51%. So the assumptions used for fluctuations oil prices are  $\pm 60\%$  of the base case.

Based on calculations, changes in oil prices relative to the base case make NPV changes very significant. Table 3 and Figure 2 below show the changes in the sensitivity analysis of oil prices to the NPV base case.

% Change	Oil Prices (US\$)	NPV (US\$)	% Change NPV
Base Case (0%)	50	3,039,149	0%
60%	80	8,592,404	183%
-33%	34	0	-100%
-60%	20	(2,514,106)	-183%

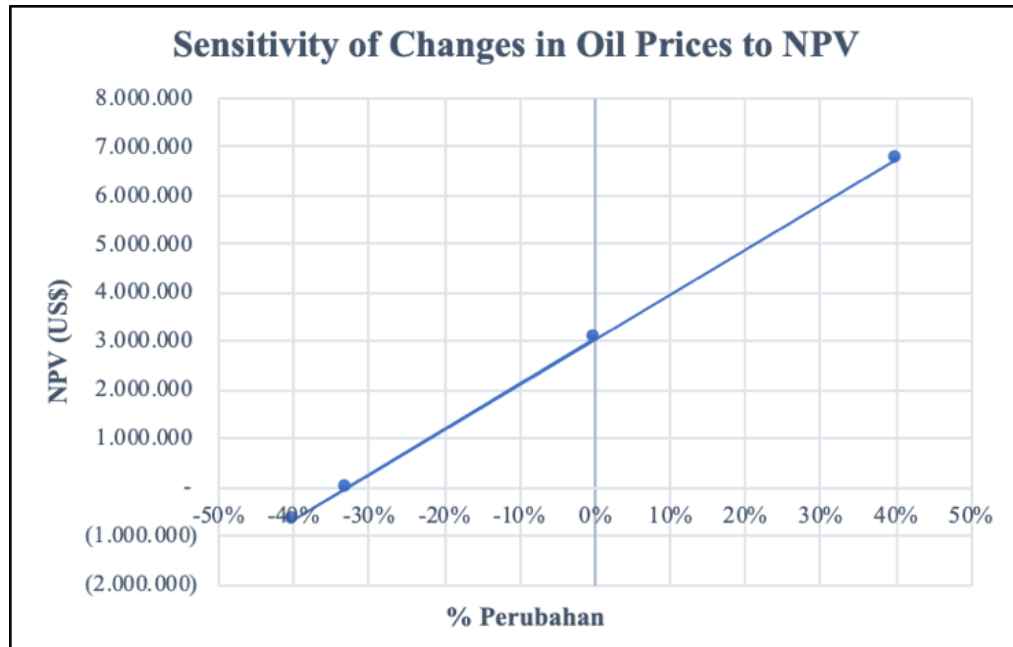


Figure 2. Sensitivity of Changes in Oil Prices to NPV

From the calculation of oil price sensitivity above, it can be seen that oil prices change relative to the base case have a very significant effect on NPV. The 60% increase in oil prices from the base case to US \$ 80 caused the NPV rise by 183% so the project revenue would be increase to US \$ 8,592,404. But on the other side if the price of oil at the level US \$ 20 or 60% of the base case, it will make the NPV negative, so the project is not economical to proceed. From Table 3 above, it knowing that the limit of investment acceptance for power supply projects is at the price of oil greater than US \$ 34 per barrel or a decrease of -33% from the base case.

This significant change in the decline and increase in oil prices to the NPV is very logical because oil prices determine the amount of income earned from this project. The higher the price of oil, the more economical the power supply project will be carried out. And falling oil prices will make the economic value of this project go down and not be able to continue.

#### 4. Conclusion

At the base case, it know that the cumulative NPV is positive ( $NPV > 0$ ), that means in this condition, the investment of project power supply is financially acceptable and profitable. The limit of investment acceptance for power supply projects ( $NPV \geq 0$ ) is at the price of oil greater than US \$ 34 per barrel or a decrease of -33% from the base case. Changes in oil prices relative to the base case cause a very significant change in NPV project. It's because oil prices determine the amount of income earned from this project. The higher price of oil, the more economical the power supply project will be carried out. And decreasing of oil prices will make the economic value of this project go down and not be able to continue.

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