Comparative Study of Economic Evaluation of PSC Cost Recovery and PSC Gross Split Scheme for Expiry Block, Case Study Field A in Sumatera

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Article History:	Abstract
	In August 2021, there was an alteration in the production-sharing contract for Field A, which is located at Rokan Block, Riau Province. In Field A, the methods that were applied were waterflood and artificial lift by using an Electrical Submersible Pump (ESP). This block is an expiry block, whereas a new block is due to contract expiry from the previous contractor. The contract previously used was a Production Sharing Contract (PSC) Cost Recovery, which changed to PSC Gross Split. This contract comparison aims to synergistically evaluate the comparison of the two economic models and also to determine a more efficient and appropriate scheme to be applied to field A, as well as to analyze the parameters that can affect the economic indicators of field A. The results of the economic analysis that has been carried out show that the PSC Gross Split scheme is better than the PSC Cost Recovery scheme. The NPV of the PSC Gross Split scheme for 30 wells was \$37,903,000, and the PSC Cost Recovery scheme for 30 wells was \$13,850,000. From 30 wells, the result decided on the A6 Well, which the NPV of A6 Well has the best NPV for both schemes based on the contractor's point of view, \$494,000 for the PSC Cost Recovery, and \$ 1,380,000 for the PSC Gross Split. The Pay Out Time (POT) is derived as well from A6 Well for both schemes, which is 1.39 years for PSC Cost Recovery and 1.2 years for PSC Gross Split. The Interest Rate of Return (IRR) of PSC Cost Recovery is 146% on the A19 Well, and for PSC Gross Split is 408% on the A4 Well. The sensitivity analysis that has been carried out shows that the parameters of the amount of oil production and the price of oil have a significant effect on both schemes.
Keywords:	

INTRODUCTION

There are two types of production-sharing contracts in the oil and gas industry, namely PSC Cost Recovery and PSC Gross Split. PSC Cost Recovery, namely the return of operating costs in the amount incurred by the contractor (Ariyon et al., 2020). Meanwhile, PSC Gross Split, components from PSC Cost Recovery such as Equity to be Split (ETS) and First Tranche Petroleum (FTP) are eliminated, and contractors who use the PSC Gross Split will receive a larger additional split, especially if the work area has higher risk and more complicated and challenging operation activities (Adityawarman et al., 2020). Based on the work system, PSC can be analogized and also illustrated by the existence of a work contract, namely between the state as the owner and holder of natural resources, and the contractor who has the role of investor (Afiati et al., 2020).

In this case, the contractor in carrying out and carrying out its activities will receive compensation in the form of production from oil and gas fields. If it produces, then there is a distribution of income that will be received by the executor and the state party, and also based on the principle of consensual in an agreement. This research was conducted to find out which contract scheme is profitable for a field by using the data owned and assumed (Sidqi et al., 2022).

This research is located in the Rokan Block, Riau Province. In the working area, 30 wells from field A will be analysed. This field uses the PSC Gross Split scheme, which previously used the PSC Cost Recovery scheme. The new contract in this Working Area starts from 2021 to 2041. The purpose of this change in the scheme is so that oil and gas exploration and exploitation activities can be more effective and efficient. The government also does not need to bear the burden, because the investment and operational costs are fully borne by the contractor in the PSC Gross Split scheme (Daniel, 2017). With this change in the contract scheme, something should be done by the contractor to attain a good result of economic feasibility (Irham et al., 2018).

METHOD

This research was conducted to find out and evaluate the economic results of the two schemes. The collection of data is by secondary data. The comparison of PSC Cost Recovery and Gross Split schemes can be seen as the following Figure 1.
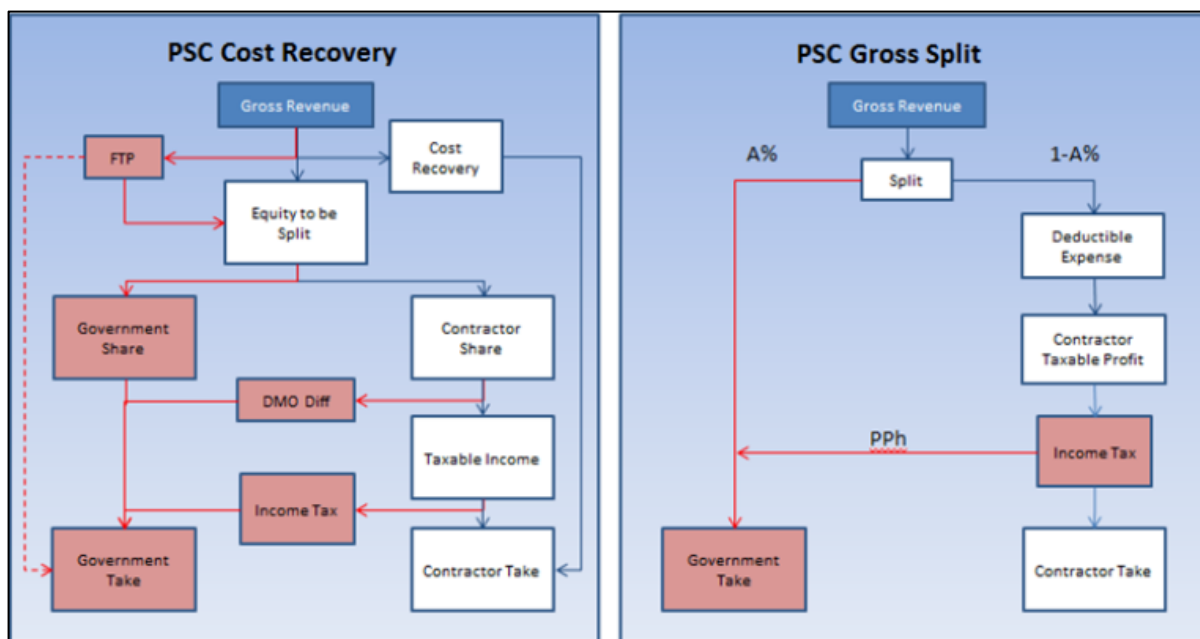

Figure 1. Comparison of PSC Cost Recovery and Gross Split schemes (Anjani & Baihaqi, 2018)

The most significant difference between the two schemes is the presence and absence of cost recovery, and the government is no longer burdened with cost recovery from the oil and gas development (Anjani & Baihaqi, 2018).

In PSC Cost Recovery, the Indonesian government and contractor have the authority to seize 20% of gross income prior to the cost recovery process (Kesumaputri & Irham, 2016). This is referred to as first tranche petroleum (FTP). Unlike royalty, the proportion of FTP is split between the government and the contractor. The percentages for the government and contractor in terms of oil share are 71.1538% and 28.8462%, respectively (Giranza & Bergmann, 2018). In the PSC Cost Recovery scheme, State Revenue Tax uses the assume and discharge principle, where the calculation of the state's share and the contractor's share already includes a tax component, therefore the contractor is not charged any other additional taxes and is not a component of CAPEX and OPEX. PSC Cost recovery is the return of costs incurred by the contractor for exploration, development, and operating costs beyond gross income. Most production-sharing contracts have limits on the amount of contractor income recognized to get a refund but not all costs can be requested for repayment, such as last year's funding, and refunded in the event year. The limitation of cost recovery or the limit of the refund limit as commonly known ranges from 30% - 60%. Generally, there are cost controllable costs in administering administration, while uncontrollable costs include efforts to find additional reserves through exploration and development activities and the addition of production facilities (Arifin & Hidayat, 2021).

The PSC Gross Split, does not have a cost recovery mechanism; therefore, PSC contractor income comes solely from its gross production sources and also has to pay income tax to the government in connection with this income (Irham & Julyus, 2018). Government revenue will consist of the government's gross share of production, bonuses, PSC contractors' income taxes, and indirect taxes paid by PSC Contractors. According to the Regulation of the Minister of Energy and Mineral Resources of Indonesia No. 52 of 2017, the basic division for PSC Contractors is 43% for oil and 48% for gas (Ariyon et al., 2020). The oil split can

be increased or decreased through variable split and progressive split, according to Minister Regulation No. 08/2017 on Indonesian PSC Gross Split (Pramadika & Satiyawira, 2019). The variable split is an oil split modification depending on field factors such as field status, field location, block status, reservoir depth, reservoir type, supporting infrastructure availability, carbon dioxide concentration, and domestic component level. This split will also be altered based on progressive criteria such as oil price, cumulative oil and gas output, and economic levels (Giranza & Bergmann, 2018).

Referring to Figure 2 below, the data referred to the whole of oil production data, Capital Expenditure (CAPEX) and Operating Expenditure (OPEX) costs, oil prices, and also contract policies. The data is used to calculate the economy, and also for sensitivity analysis using the economic parameters that have been obtained. The figure below shows the steps of the research as depicted on flowchart as follows.
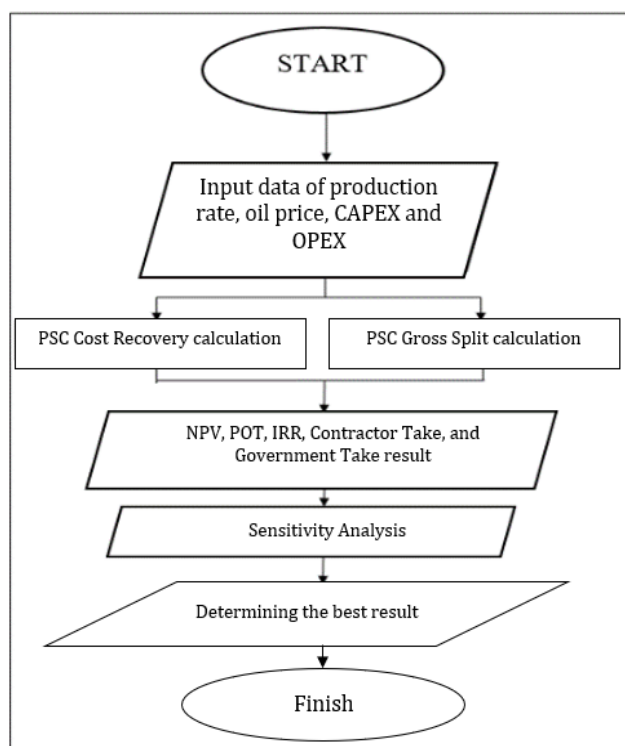

Figure 2. Research Workflow

Based on the flowchart above, the first step taken for this research was to enter production rates, oil prices, and expenditures (CAPEX and OPEX). Furthermore, the following step was with the available fiscal terms, the economic calculation is carried out using the PSC Cost Recovery and PSC Gross Split schemes. After obtaining the economic results from the PSC Cost Recovery and PSC Gross Split schemes, economic indicators (NPV, IRR, POT, Contractor Take, and Government Take) are calculated. Moreover, the next step was analysing the sensitivity of economic indicators. The final step was determining which scheme is the most appropriate and optimal for this field.

RESULT AND DISCUSSION
This field was only managed oil. Before calculating, data input is done first, such as production data, oil prices, CAPEX, and OPEX. The oil price at that period was $69 and the average oil production was 135,000 barrels. From the data that has been obtained, then calculations are carried out for both schemes. Gross Revenue earned was $9,281,000.

Table 1. Expenditures Per Well for Field A

Expenditures	Total ($)
CAPEX	1,136,000
OPEX	1,436,000

The table above (Table 1), CAPEX is divided into two classifications; tangible and intangible costs. Tangible costs are the costs of basic materials, sort of casing, tubing, wellheads, casing accessories, and well equipment subsurface. In addition, intangible costs are service costs, sort of rig rental, well service,

completion, general, and other production facilities. Meanwhile, OPEX is a cost incurred by a company for operation and maintenance.

Table 2. Fiscal Terms Contract Scheme PSC Cost Recovery

Indicator	PSC Cost Recovery
FTP	20%
Government Share (after tax)	85%
Contractor Share (after tax)	15%
Tax	40.5%
DMO Volume	25%
DMO fee (market price)	15%
Depreciation rate	25%
Depreciation life	5 years

In table 2, there are fiscal terms for the PSC Cost Recovery scheme, these terms are used when the work area still has a contract with the previous contractor and the contract ends in August 2021. The FTP distribution for the government and contractors is 20% of gross revenue, the contractor also submits a Domestic Market Obligation (DMO) of 25% of the total production obtained. Contract depreciation is 25% for 5 years, the depreciation method used is decline balance.

In the PSC Gross Split scheme, the split between the contractor and the government is divided into three, namely a base split, a variable split, and a progressive split. This refers to the Regulation of the Minister of Energy and Mineral Resources no. 52 of 2017. The base split for contractors is 43% and for the government 57%. After the base split, the next determination is the variable split, the comparison between standard classification and Field A (as the part of expiry block), as shown on Table 3 as below.

Table 3. Variable Split

Parameter	Condition Standard	Split Adjustment	Condition Field A	Split Adjustment
Field Status	POD I	5%	No POD	0%
	POD II	3%		
	No POD	0%		
Field Location	Onshore	0%	Onshore	0%
	Offshore (0<h≤20 m)	8%		
	Offshore (150<h≤1000 m)	14%		
	Offshore (>1000 m)	16%		
Reservoir Depth	<2500 m	0%	<2500 m	0%
	>2500 m	1%		

Table 3. Variable Split (extended)

Parameter	Condition	Split Adjustment	Condition	Split Adjustment
	Standard		Field A	
Infrastructure	Well Developed	0%	Well Developed	0%
	New Frontier Offshore	2%		
	New Frontier Onshore	4%		
Reservoir Condition	Conventional	0%	Conventional	0%
	Non-Conventional	16%		
CO_2 (%mol)	<5%	0%	<5%	0%
	5%≤x≤10%	0.5%		
	40%≤x≤60%	2%		
	x≥60%	4%		
H_2S (ppmV)	<100	0%	<100	0%
	100≤x<1000	1%		
	1000≤x<2000	2%		
	2000≤x<3000	3%		
	3000≤x<4000	4%		
	x≥4000	5%		
Specific Gravity Oil	API<25	1%	API>25	0%
	API≥25	0%		
Local Content (%)	30%≤X≤50%	2%	50%<x<70%	3%
	50%≤x≤70%	3%		
	70%≤x<100	4%		
Production Phase	Primary	0%	Secondary	6%
	Secondary	6%		
	Tertiary	10%		

After the variable split is determined, the next step is to determine the progressive split based on the cumulative annual oil production and oil prices.

Table 4. Progressive Split

Parameter	Condition	Split Adjustment
Oil Price	(85-ICP) x 2.5%	3.75%
Cumulative Production	>30 MMBOE	0%

This working area split adjustment is 3.75%. Because of Cumulative Production was more than > 30 MMBOE in 2022, the split adjustment is 0% based on the Table 4 above.

Furthermore, Figure 3 below shows the economic results based on NPV of 30 wells from Field A with the PSC Cost Recovery and PSC Gross Split contract scheme. The NPV of the PSC Cost Recovery scheme contractor from A6 Well is $494,000. Meanwhile, the NPV of the PSC Gross Split scheme contractor from A6 Well is $1,380,000. Both from two PSC schemes, A6 Well has the highest NPV compared to other wells, therefore A6 Well is the well with the best prospects.
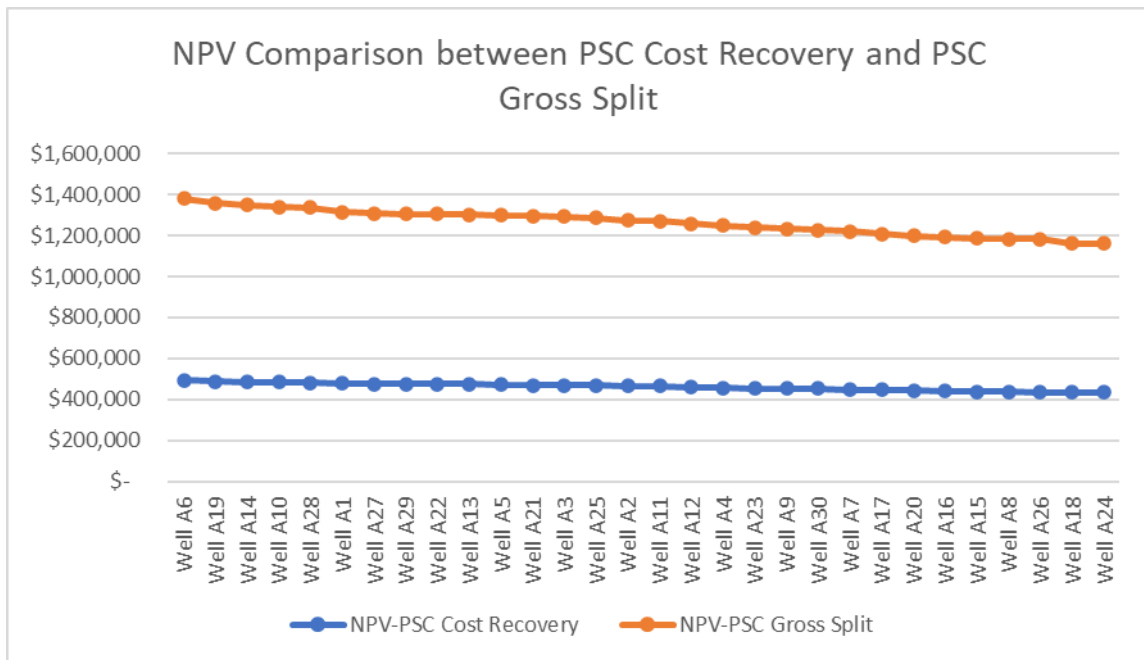
Figure 3. NPV Comparison between PSC Cost Recovery and PSC Gross Split

After the comparison of NPV, Figure 4 below will be shown the comparison of the POT between both schemes, PSC Cost Recovery and Gross Split. The graphic of POT is shown in a year and conversely, the shortest its year, the most profitable the project will be. The graphic can be seen as follows:
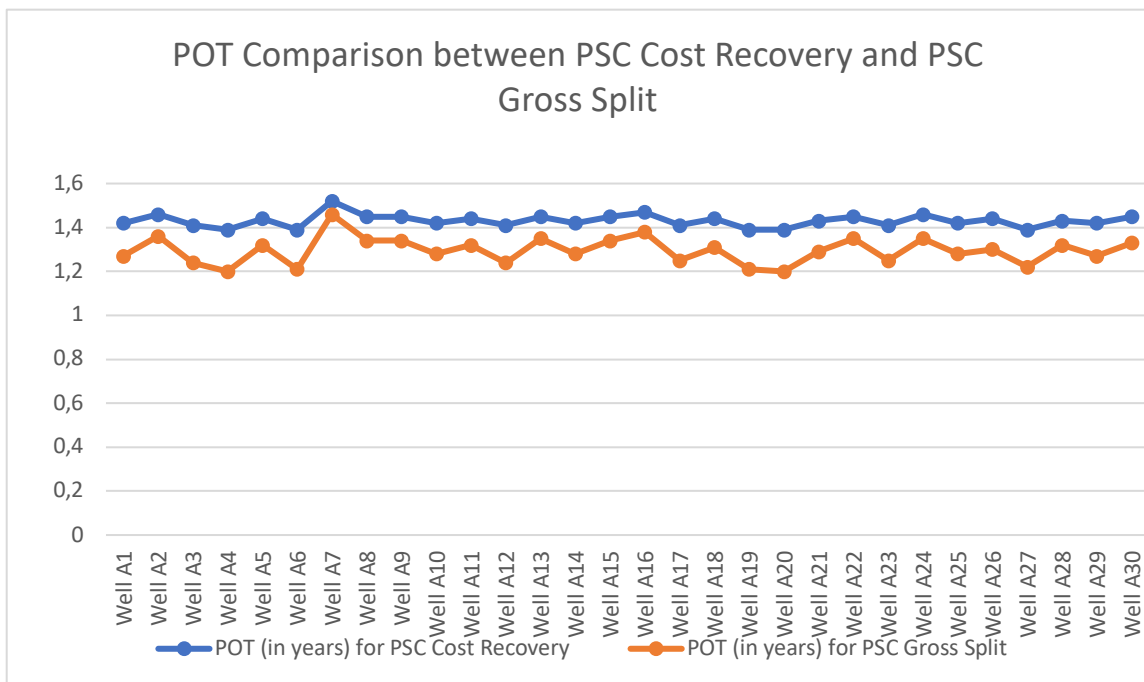

Figure 4. POT Comparison between PSC Cost Recovery and PSC Gross Split

According to the Figure 4 above, the shortest POT for PSC Cost Recovery scheme is Well A4, A6 and A27 with 1.39 years. Meanwhile, the POT for PSC Gross Split scheme is Well A4 with 1.2 years. As the result, the shortest year of them all is Well 4 for PSC Gross Split scheme, with 1.2 years.

After determining the POT, the following Figure 5 will be shown another indicator the IRR, which has been compared between PSC Cost Recovery and Gross Split. Conversely, the decent IRR amount is above the MARR (Minimum Attractive Rate of Return), which for this company, the MARR is 10%. The figure can be seen as follows:
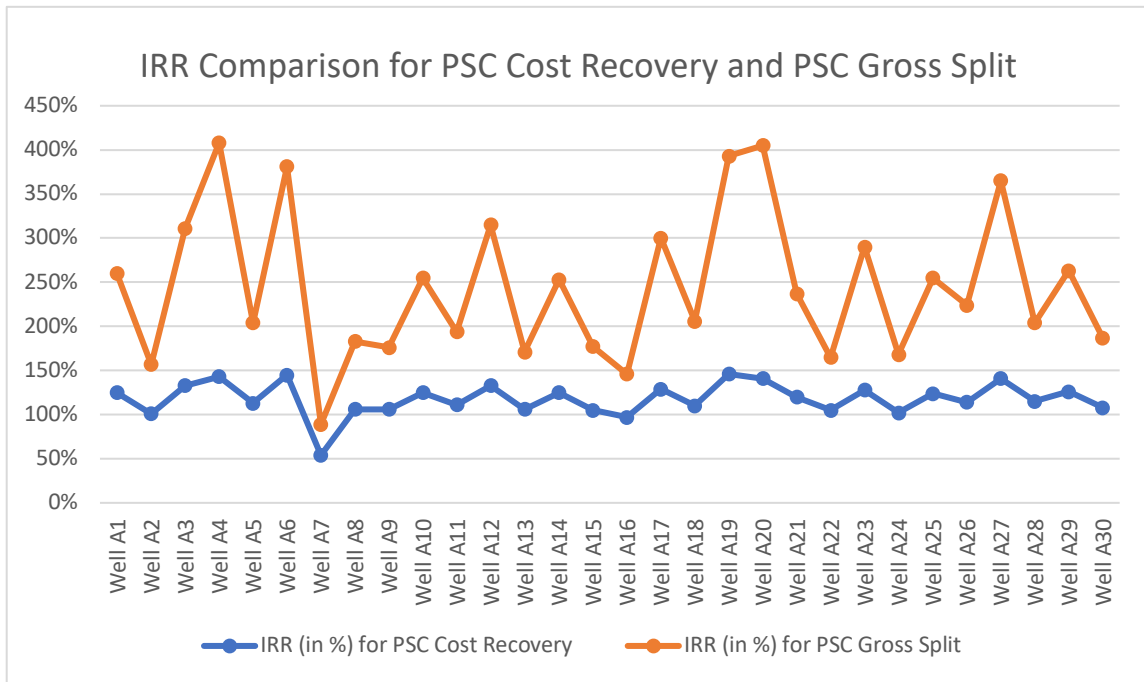
Figure 5. IRR Comparison between PSC Cost Recovery and PSC Gross Split

As the result above, the highest IRR for PSC Cost Recovery is 146% on Well A19, meanwhile, the highest IRR for PSC Gross Split is 408% on Well A4. Collecting from the highest results, it can be determined that the first place goes to, Well A4 PSC Gross Split scheme.

The following indicator is Contractor Take, which is to indicate the total share owned by the contractor, after the tax deduction for the government. The comparison graph can be seen at Figure 6 as follows:
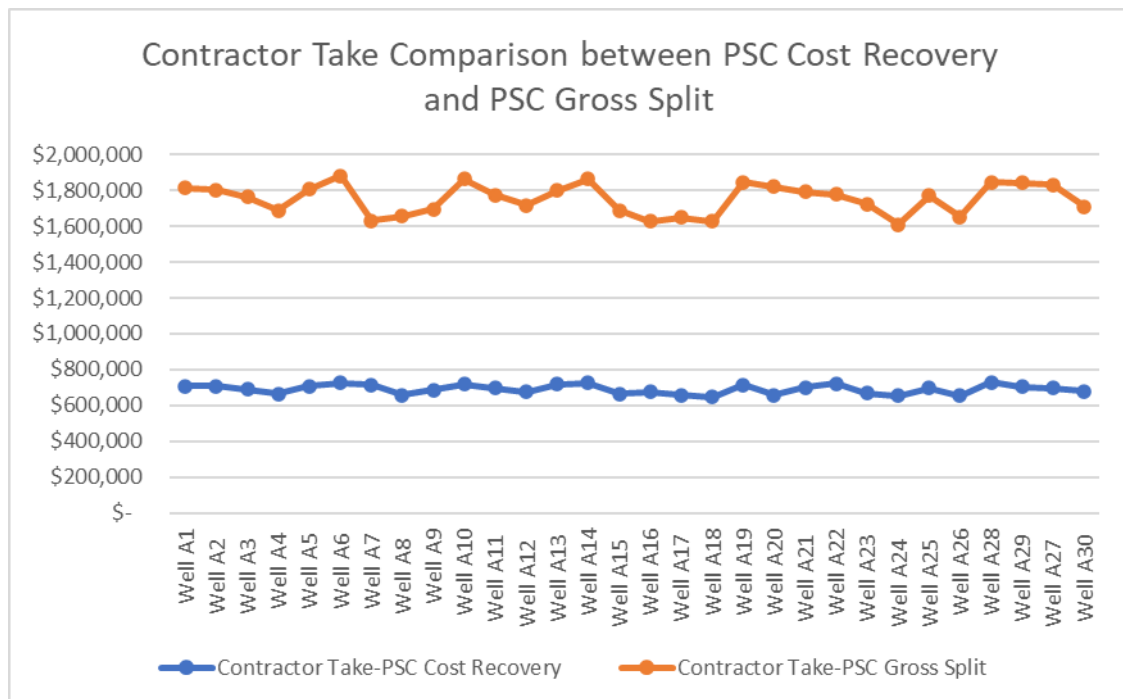

Figure 6. Contractor Take Comparison between PSC Cost Recovery and PSC Gross Split

Referring to Figure 6, the highest amount Contractor Takes for PSC Cost Recovery is $ 728,000 on Well A28. On the other hand, for PSC Gross Split is $ 1,879,000 on Well A6. As same as the previous indicators, the greatest amount is still at PSC Gross Split.

The last indicator to be compared in this research is Government Take as the portion received by the government, as well as added taxes from the contractor. The graph can be seen in Figure 7 as follows:
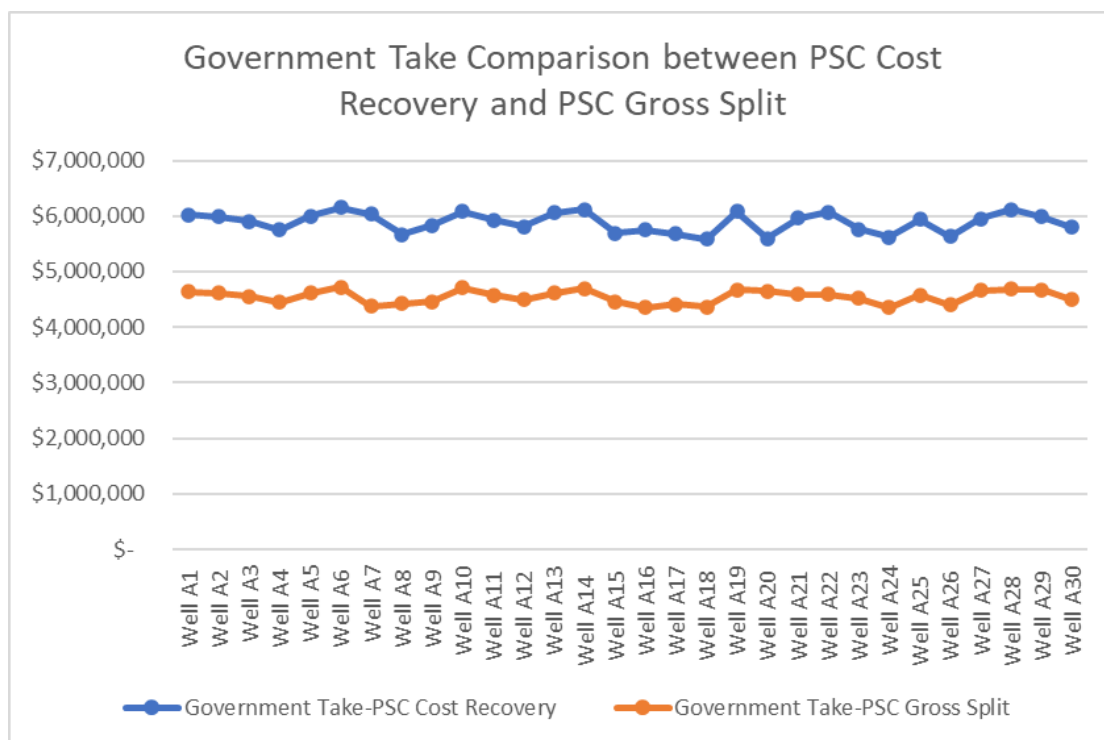
Figure 7. Government Take Comparison between PSC Cost Recovery and PSC Gross Split

Based on Figure 7, it can be determined that the highest amount of Government Take for PSC Cost Recovery is $ 6,154,000 on Well A6, then for PSC Gross Split is $ 4,721,000 on Well A6. Both wells showed the highest amount of Government Take, however, the highest amount was taken by the PSC Cost Recovery.

As the result of the indicators that has been compared, the highest results from both schemes are shown in Table 5 as follows:

Table 5. Calculation Results of the Best PSC Cost Recovery and Gross Split

Indicator	Well (CR & GS)	Cost Recovery	Gross Split
NPV	A6 & A6	$ 494,000	$ 1,380,000
POT	A6 & A6	1.39 year	1.2 year
IRR	A19 & A4	146%	408%
Contractor Take ($)	A28 & A6	$ 728,000	$ 1,879,000
Government Take ($)	A6 & A6	$ 6,154,000	$ 4,721,000

The table above (Table 5) shows the best well results from the indicators of the two schemes. These results indicate which well to drill first, according to the NPV results. This is because the drilling is done based on the highest economic results.

The following figure (Figure 8), there will be shown about four parameters are carried out for sensitivity analysis: oil production, CAPEX, OPEX, and oil prices. In this scheme, oil production and oil prices are very sensitive and affect the NPV, this can happen because, if the sensitivity percentage is increased or decreased, there will be a significant increase or decrease. Some parameters are analysed for sensitivity, the same as PSC Cost Recovery. Even in the PSC Gross Split scheme, the amount of oil production and oil prices are very sensitive to the NPV, but in this scheme, oil production changes more significantly than oil prices. The well used is well A6, which is well with the best NPV of the other wells. The well has been analyzed for sensitivity and shows that the amount of oil production and the price of oil in the PSC Cost Recovery scheme are very influential and sensitive to NPV, this is because if the percentage of sensitivity when the amount of oil production and the price of oil are reduced, a very significant decrease occurs, and if the sensitivity of the amount of oil production and the price of oil is increased, a very significant increase occurs.
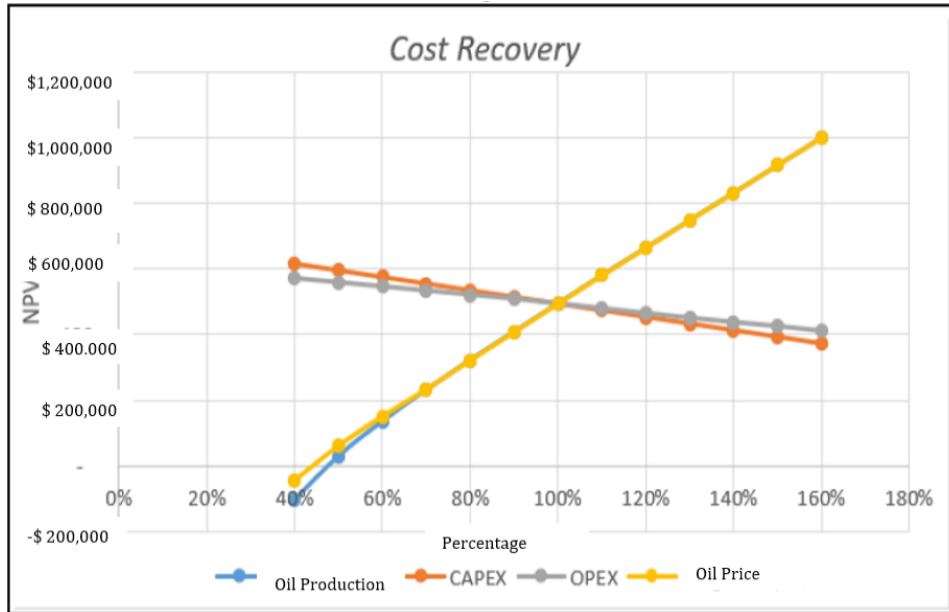
Figure 8. NPV Sensitivity Analysis on Best Well for PSC Cost Recovery

In Figure 9 below, some parameters are analysed for sensitivity, as same as PSC Cost Recovery. Even in the PSC Gross Split scheme, the amount of oil production and oil prices are very sensitive to the NPV, but in this scheme, oil production changes more significantly than oil prices. This is because if the sensitivity percentage of the amount of oil production and the price of oil is decreased or increased, there will be a very significant decrease and increase.
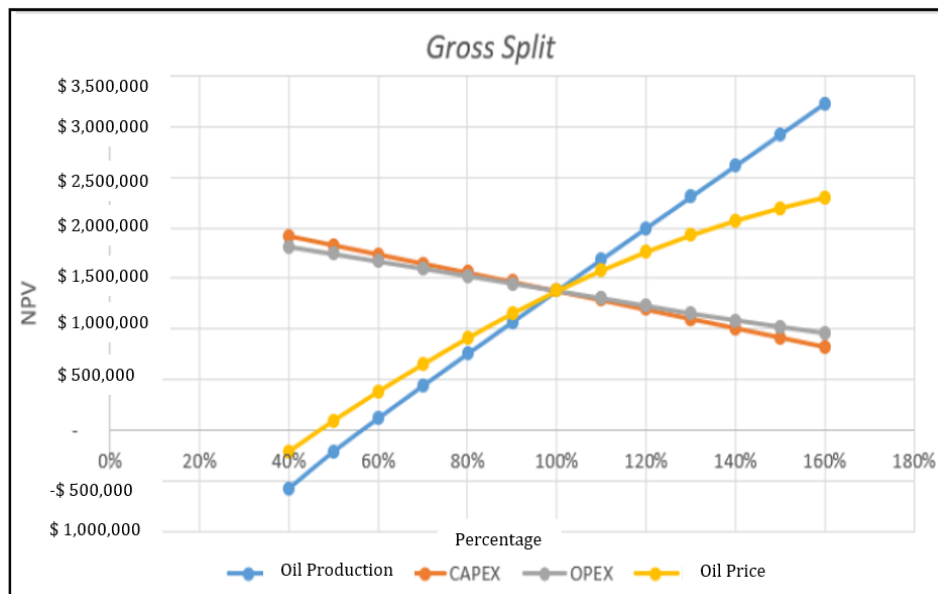

Figure 9. NPV Sensitivity Analysis on Best Well for PSC Gross Split

DISCUSSION

The PSC Gross Split produced better value than the PSC Cost Recovery scheme in terms of contractor income. The value of CAPEX and OPEX from the PSC Cost Recovery and PSC Gross Split schemes has differences, because in the PSC Gross Split scheme, state revenue tax is the full responsibility of the contractor, and OPEX is included in state revenue tax in this scheme.

The NPV of the PSC Gross Split scheme for 30 wells was $ 37,903,000; and the PSC Cost Recovery scheme for 30 wells was $ 13,850,000. Therefore, the NPV of the PSC Gross Split is greater than the PSC Cost Recovery in the 30 wells in Field A based on the point of view contractor.

After that, from 30 wells, the result decided on the A6 Well, which the NPV of A6 Well has the best NPV for both schemes based on the contractor's point of view, which is $ 494,000 for the PSC Cost Recovery, and $ 1,380,000 for the PSC Gross Split. The best period of POT derived from A6 Well for both schemes, which is

1.39 years for PSC Cost Recovery and 1.2 years for PSC Gross Split. The percentage of IRR has been determined on its greatest amount for both schemes that derived from A19 Well for PSC Cost Recovery in 146% and A4 Well for PSC Gross Split in 408%.

The contractor take for 30 wells in Field A with the PSC Gross Split scheme was higher than the PSC Cost Recovery. The contractor takes from PSC Gross Split amounted to $52,544,000; while Contractor takes from PSC Cost Recovery amounted to $20,741,000.

The government take from 30 wells in Field A with the PSC Cost Recovery scheme is higher than the Gross Split PSC. The government take for the PSC Cost Recovery scheme was $176,588,000, and for the Gross Split PSC scheme was $136,400,000.

CONCLUSION

According to the research that has been done and the discussion that has been described, it can be concluded that the NPV of the Gross Split PSC scheme for 30 wells is greater than the PSC Cost Recovery. A6 Well is well with the best NPV in both contract schemes. The Contractor Takes 30 wells with PSC Gross Split greater than PSC Cost Recovery. Meanwhile, for the Government Take 30 wells, the PSC Cost Recovery scheme is larger than the Gross Split PSC.

Based on the sensitivity analysis that has been carried out by increasing and decreasing the value of the economic parameter by approximately 60% of the original value, it can be concluded that the higher the percentage value of the total production and oil price, the better the NPV. However, for CAPEX and OPEX, it will be better if the percentage value is lower.

The advice that can be given is, contractors who use the Gross Split PSC contract scheme to be able to better maintain production levels but with the use of effective and efficient costs, this is because the increase in CAPEX and OPEX costs in the Gross Split PSC scheme is more sensitive to NPV compared to the PSC scheme Cost Recovery.

ACKNOWLEDGEMENT

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