The new management policy: Indonesian PSC-Gross split applied on CO_2 flooding project

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Abstract. “SIAD” oil field will be developed by CO_2 flooding. CO_2, a famous pollutant gas, is injected into the oil reservoir to optimize the oil recovery. This technique should be conducted economically according to the energy management policy in Indonesia. In general, Indonesia has two policy contracts on oil and gas: the old one is PSC-Cost-Recovery, and the new one is PSC-Gross-Split (introduced in 2017 as the new energy management plan). The contractor must choose between PSC-Cost-Recovery and PSC-Gross-Split which makes more profit. The aim of this paper is to show the best oil and gas contract policy for the contractor. The methods are calculating and comparing the economic indicators. The result of this study are (1) NPV for the PSC-Cost-Recovery is -46 MUS$, while for the PSC-Gross-Split is 73 MUS$, and (2) IRR for the PSC-Cost-Recovery is 9%, whereas for the PSC-Gross-Split is 11%. The conclusion is that the NPV and IRR for PSC-Gross-Split are greater than the NPV and IRR of PSC-Cost-Recovery, but POT in PSC-Gross-split is longer than POT in PSC-Cost-Recovery. Thus, in this case, the new energy policy contract can be applied for CO_2 flooding technology since it yields higher economic indicators than its antecendent.
Keywords: CO_2 flooding, new energy management policy, PSC-Gross-Split

1. Introduction

"SIAD" oil field is located in the southwest of Cirebon City, West Java, particularly in the basin of the northern West Java. There are two main layers in the "SIAD" oil field, consisting of D1 and F layers. The discussion on this case is limited to the latter only. All reservoir parameters, production, and characteristics refer to solely Layer F [1].

Layer F on the “SIAD” oil field has been produced since 1973. The field “SIAD” has an Original Oil In Place of 55 MMBBL. The latest production status in December 2015 has a recovery factor of 17.8% with a cumulative production of oil (Np) of 9.8 MMBBL and the maximum allowable or so-called estimated ultimate recovery (EUR) of 37 MMBBL, while the remaining reserve that can still be taken is 27 MMBBL [1].

The remaining reserve of Layer F will be developed by using CO2 flooding technology. CO2 flooding is enhanced oil recovery method. The pollutant CO2 gas is injected down into the reservoir to get more oil producing from the well [2], [7]. This technique should be conducted economically according to Indonesia’s oil and gas management policy. Referring to the regulation of the Minister of Energy No. 8/2017 on PSC-Gross-Split [5], the contractor must choose between PSC-Cost-Recovery or PSC-Gross-Split which makes more profit.

2. Research Method

This study needs some data to compute the economic indicators. “SIAD” field has a cumulative production of 175 MBBL for 16 years to be calculated in this research, an investment of 1557 MUS$, an operating cost of 1864 MUS$, and an average oil price of $50/BBL[1], [7].

This project will be evaluated for 20 years. For four years from starting of the project, the oil production is still zero. Yearly incremental oil production of MBBL/year consecutively are : (0,0); (0,0); (0,0); (0,0); 26.8; 23.1; 19.9; 17.1; 14.7; 12,7; 10.9; 9.4; 8.1; 7.0; 6.0; 5.2; 4.4; 3.8; 3.3; and 2.8.

Early in project life, some amount of investment must be available for capital and noncapital expenditure. Investment expenditure in M$/year are : 518; 426; 594; and 19. The total amount of investment is 1557 MUS$ for the four years of the early project [1].

To produce oil from the reservoir into the surface will take production cost which estimated 10 US$/BBL of oil. And to protect the environment from all damage and to do the land restoration at the end of project, some of cost is also needed, which is called Abandon Site Restoration cost (ASR cost). The sum of production cost and Abandon Site Restoration cost is called Operating Cost. Yearly operating cost of M$/year for entirely the CO2 flooding project, consecutively are : (0,0); (0,0); (0,0); (0,0); 275; 238; 206, 178; 154; 134; 116; 101; 88; 77; 67; 59; 51; 45; 40; and 35 [1]. The total amount of operating cost is 1864 MUS$.

Those data will be the same input for both energy management policy : PSC-Cost-Recovery and PSC-Gross-Split.

In PSC-Cost-Recovery, the contractor can calculate the cash flow for 16 years on oil production. The revenue distribution splits after tax are 85% for the government and 15% for the contractor. The outcomes of this analysis are NPV, IRR, and POT. There are some differences between PSC-Cost-Recovery and PSC-Gross-Split. PSC-Gross-Split has a discrete revenue distribution split and tax. There are neither cost recovery nor FTP on PSC-Gross-Split, so the contractor must pay the cost recovery for all their operational costs[3], [4], [5], [6]. The revenue distribution splits for PSC-Gross-Split are 64% for the contractor and 36% for the government since there are additional progressive split and variable split in PSC-Gross-Split . Summary of data input and petroleum fiscal term for both petroleum management policy (PSC-Cost-Recovery and PSC-Gross-Split) is put in Table 1.

Following the results regarding the economic indicators, a sensitivity analysis was conducted for both model managements by changing input data of cumulative production, oil price, investment, and operating cost. Comparison of the output and sensitivity for both models was then carried out to determine the conclusions from the profitability index and sensitivity analysis.

Table 1. Summary of data input, and comparison of fiscal term.

DATA INPUT		OIL AND GAS FISCAL		
NP	9.8 MMBBL	PSC-Cost-Recovery		
Tax	40.5%		Government	Contractor
oil price	50 $/BBL	Base Split	85%	15%
Investment	1157 MUS$			
Opex	1864 MUS$			
		PSC-Gross-Split		
NP	9.8 MMBBL		Government	Contractor
Tax	40.5%	Base Split	57%	43%
oil price	50 $/BBL	Variabel Split	0	8.5%
Investment	1157 MUS$	Progresive Split	0	10%
Opex	1864 MUS$	Final Split	34.5%	65.5%

3. Results and Discussion

3.1. PSC-cost-recovery revenue distribution

PSC-Cost-Recovery is an original Indonesia oil and gas contract [3], [4], [6]. According to the contract terms and conditions, 20% of the gross revenue will take as cost recovery ceiling. The government and contractors shall be entitled to take and receive each year 10% of all Petroleum produced and saved before any deduction for the recovery of Investment Credit and Operating Cost. Such First Tranche Petroleum shall be shared between government and contractor in accordance with sharing splits. The revenue after FTP can be used for cost recovery. Remaining revenue after FTP and cost recovery, which is called Equity To be Split, or ETS, will be shared between government and contractor in accordance with sharing splits. Contractor share is subject of government tax [4], [6].

For the entire 20 years of the assuming CO_2 flooding project, it will give the revenue in MUS$, consecutively from the start of project : (0,0), (0.0); (0.0); (0,0); 1,342; 1,155; 994; 856; 736; 634; 545; 470; 404; 348; 299; 258; 222; 191; 164; and 141. The cumulative gross revenue is 8,759 MUS$.

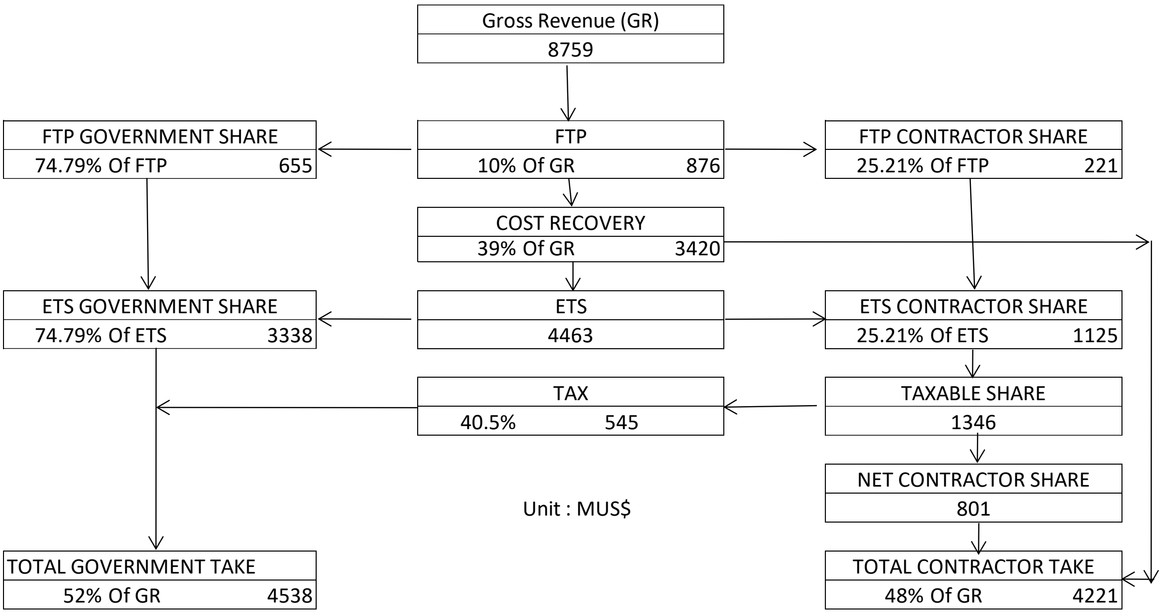


Figure 1. Revenue distribution results of PSC-Cost-Recovery.

The final results for PSC-Cost-Recovery revenue distribution are Gross Revenue of 8,759 MUS$, Contractor Tax of 40.5%, FTP of 876 MUS$ from 10% of Gross Revenue, Cost Recovery of 3,420 MUS$, Total Government Take of 4,538 MUS$ from 52% of Gross Revenue, and Total Contractor of 4221 MUS$ from 48% of Gross Revenue (Figure 1).

3.2. PSC-gross-split revenue distribution

PSC-Gross-Split scheme is simple in calculation of revenue distribution. According to PSC-Gross-Split terms and conditions, 51.5% of the gross revenue will goes to government, and the remaining 38.5% of gross revenue is equity of contractor. Contractor have to pay 40.5% profit tax to the government. There are no First Tranche Petroleum (FTP), nor Cost Recovery. All expenses is under contractor self control [5].

PSC-Gross-Split revenue distribution for Gross Revenue of 8,759 MUS will give Total Government Take is 4,799 MUS$ from 90% of Gross Revenue, Total Contractor Take is 540 MUS$ from 10% of Gross Revenue (Figure 2).

It is clear and simple to see that PSC-Gross-Split cannot be the choice of the contractor of the project. The contractor is receive more money with PSC-Cost-Recovery contract scheme.

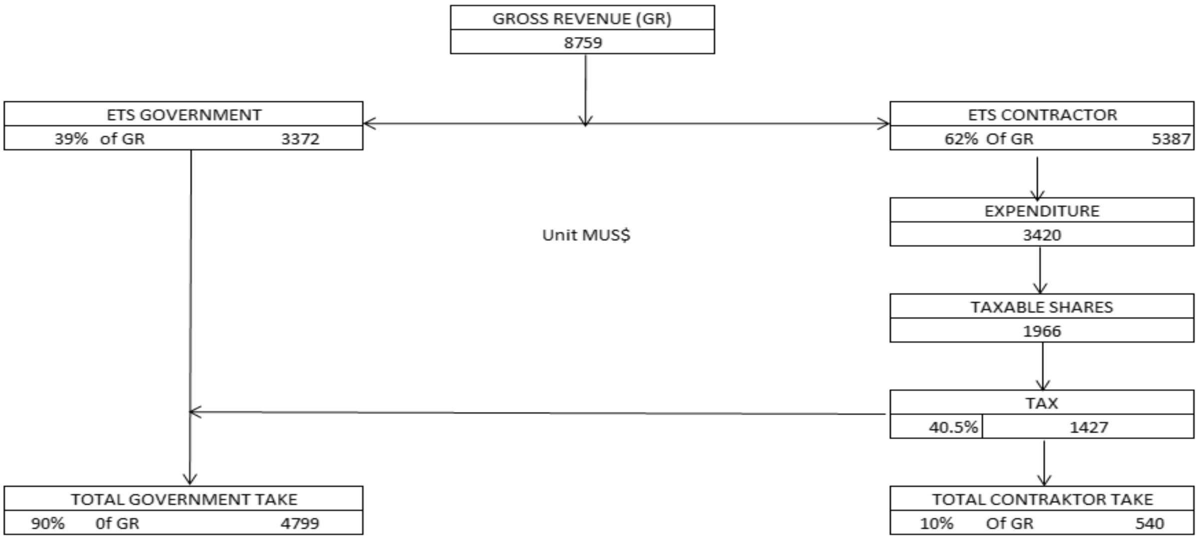


Figure 2. Revenue distribution results of PSC-Gross-Split.

3.3. Economic indicator results

For the entire 20 years of the assuming CO_2 flooding project, although the input data are the same for predicted yearly oil production, assuming oil price, estimated investment , tax rate , and estimated operating cost, the contractor cash flow will be definitely difference for both PSC-Cost-Recovery and PSC-Gross-Split.

Consider of PSC-Cost-Recovery scheme, the contractor cash flow in MUS$, consecutively are : (-518); (-426); (-594); (-19); 952; 650; 136; 102; 87; 75; 64; 55; 47; 41; 35; 30; 26; 22; 19; and 16. The cumulative cash flow is 801 MUS$.

According to PSC-Gross-Split scheme, the contractor cash flow in MUS$, consecutively are : (-518); (-426); (-594); (-19); 327; 281; 241; 207; 178; 152; 131; 112; 96; 82; 70; 60; 51; 43; 36; and 31. The cumulative cash flow is 540 MUS$.

The economic indicator was then calculated from that cash flow. Table 2 shows the economic output comparison between PSC-Cost-Recovery and PSC-Gross-Split.

The results of this comparison are NPV@10% for the PSC-Cost-Recovery of -46 MUS$ and the PSC-Gross-Split of -377 MUS$, while IRR for the PSC-Cost-Recovery of 9% and for the PSC-Gross-Split of 4%. The conclusion is NPV and IRR values of PSC-Gross-Split are smaller than thoseof PSC-Cost-Recovery, and PSC-Gross-Split POT is longer than POT in PSC-Cost-Recovery.

Because of negative value on NPV, and small value of IRR, this CO_2 flooding project project cannot be implemented economically for both energy management policy.

Let us see on the economic indicator of NPV, IRR, and POT. On the government side, the new management policy (PSC-Gross-Split) for the petroleum (oil and gas) exploration and exploitation is more attractive than the old one (PSC-Cost-Recovery). On the contractor side, the new management policy (PSC-Gross-Split) for the petroleum (oil and gas) exploration and exploitation is less attractive than the old one (PSC-Cost-Recovery). For this case of CO_2 flooding project, if there is opportunity to choose the type of government management policy contractor will tend to prefer the PSC-Cost-Recovery rather than PSC-Gross-Split.

From the economic calculation, PSC-Cost-Recovery contract model provides better results compared to the PSC-Gross-Split or the new petroleum management policy.

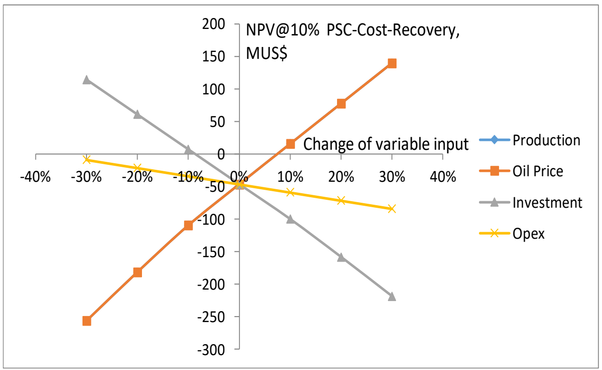
Table 2. Economic output comparison between PSC-Cost-Recovery vs PSC-Gross-Split.

N0	Indicator	Unit	PSC-CR	PSC-GS
1	Oil Production	MBBL	175	175
2	Oil Price	US$/BBL	50	50
3	Total Gross Revenue	MUS$	8759	8759
4	FTP	MUS$	876	
	Total Cont. FTP	MUS$	221	
	Total Gov. FTP	MUS$	655	
5	Investment	MUS$	1557	1557
6	Invesment Credit (IC)	MUS$		
7	Total Operating Cost	MUS$	1864	1864
	Operating Cost	MUS$	1752	1752
	Abandonment & Site Restoration Cost	MUS$	112	112
8	Cost Recoverable	MUS$	3420	3420
	(% Of Gross Revenue)	%	39%	39%
	Unrecovered Cost	MUS$	0	0
	(% Of Gross Revenue)	%	0%	0%
9	Equity to be Split	MUS$	4463	8759
	Cont. Equity	MUS$	1125	5387
	Gov. Equity	MUS$	3338	3372
10	Contractor			
	Net Cash Flow	MUS$	801	540
	(% thd. Gross Rev)	%	9%	6%
	IRR	%	9%	4.3%
	NPV@10%	MUS$	-46	-377
	POT	years	5.0	11.6
11	Government			
	FTP	MUS$	655	
	Equity	MUS$	3338	3372
	Tax	MUS$	545	1427
	Net Cash Flow	MUS$	4538	4799
	(% Of Gross Revenue)	%	52%	55%
	Gov. PV @ 10%	MUS$	1731	2061

3.4. Sensitivity analysis of PSC-cost-recovery and PSC-gross-split

Sensitivity analysis was performed to figure out the change of project economic indicators as well as changes of the input data, such as production, investment, and operating cost. The result of sensitivity analysis are presented in Figure 3A, and Figure 3B.

There is no discrepant sensitivity in price, investment, and operating cost between PSC-cost-recovery and PSC-gross-split (Figure 3).



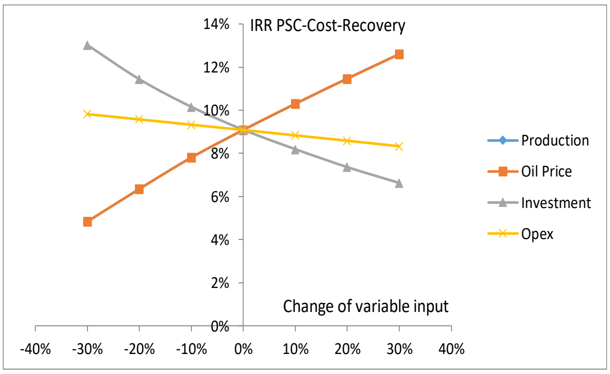


Figure 3A. PSC-Cost-Recovery : Sensitivity Analysis of NPV and IRR.

The line curve of production is the same as the line curve of oil price. The NPV and IRR of PSC-Cost-Recovery scheme of contract are very sensitive of investment and of oil price (Figure 3A).

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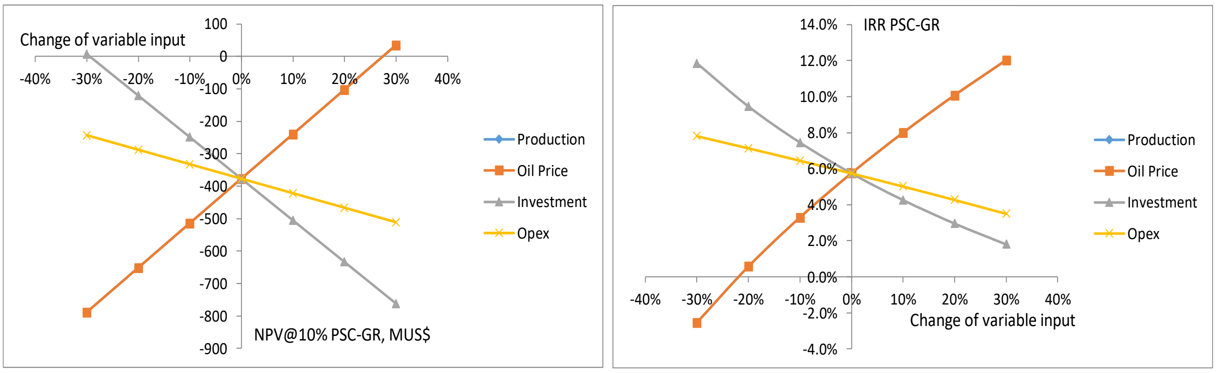

Figure 3B. PSC-Gross-Split : Sensitivity Analysis of NPV and IRR

The NPV and IRR of PSC-Cost-Recovery scheme of contract are very sensitive of investment and of oil price. It is must be noted that the line curve of production is the same as the line curve of oil price. (Figure 3B).

4. Conclusion

NPV for the PSC-Cost-Recovery is negative (-46) MUS$ and for the PSC-Gross-Split is also negative (-377) MUS$, while IRR for the PSC-Cost-Recovery is 9% and for the PSC-Gross-Split is 4.3%. NPV and IRR of PSC-Gross-Split are greater than of PSC-Cost-Recovery, and POT in PSC-Gross-split is longer than POT in PSC-Cost-Recovery. The new energy policy contract cannot be applied for this CO_2 flooding project technology because it yields lower economic indicators than the old one (PSC-Cost-Recovery).

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References

[1] Field Report Data CO2 Flood. PPPTMGB LEMIGAS, Jakarta.
[2] H.K Van Pollen and Associates, Inc., Fundamental of Enhanced Oil Recovery, Tulsa, Oklahoma, 1980.
[3] Harimurti D, Indonesian Milestone in Production-Sharing Contract in Perspective of Government Take, Contractor Take, Cost Recovery and Production Target, SPE-187008-MS, Society Of Petroleum Engineer, 2017
[4] Irham S, Pengelolaan Lapangan Migas, Universitas Trisakti, Jakarta, 2017.
[5] Kurniawan T and Jaenudin J, Proposed Modification of Abandonment and Site Restoration Mechanism in Gross Split PSC for Marginal Field in Indonesia, SPE-186378-MS, Society of Petroleum Engineer, 2017
[6] Lubiantara B, Ekonomi Migas: Tinjauan Aspek Komersil Kontrak Migas, Gramedia, Jakarta, 2012.
[7] http://www.migas.esdm.go.id/post/read/permen-esdm-nomor-08-tahun-2017-tentang-kontrak-bagi-hasil-gross-split
[8] Nasir A, Sejarah Sistem Fiskal Migas Indonesia, Grasindo, Jakarta, 2014.
[9] Patmosukismo S, Oil and gas : Politic, law and industry (MIGAS Politik, Hukum & Industry). ISBN 978-979-823189-6, 2011.
[10] Sismartono D, Studi Simulasi Injeksi CO_2 Dari Hasil Sampling Gasifikasi Low Rank Coal Pada Lapangan X dan Keekonomiannya, Tesis Program Studi Teknik Perminyakan Institut Teknologi Bandung, Bandung, 2013.