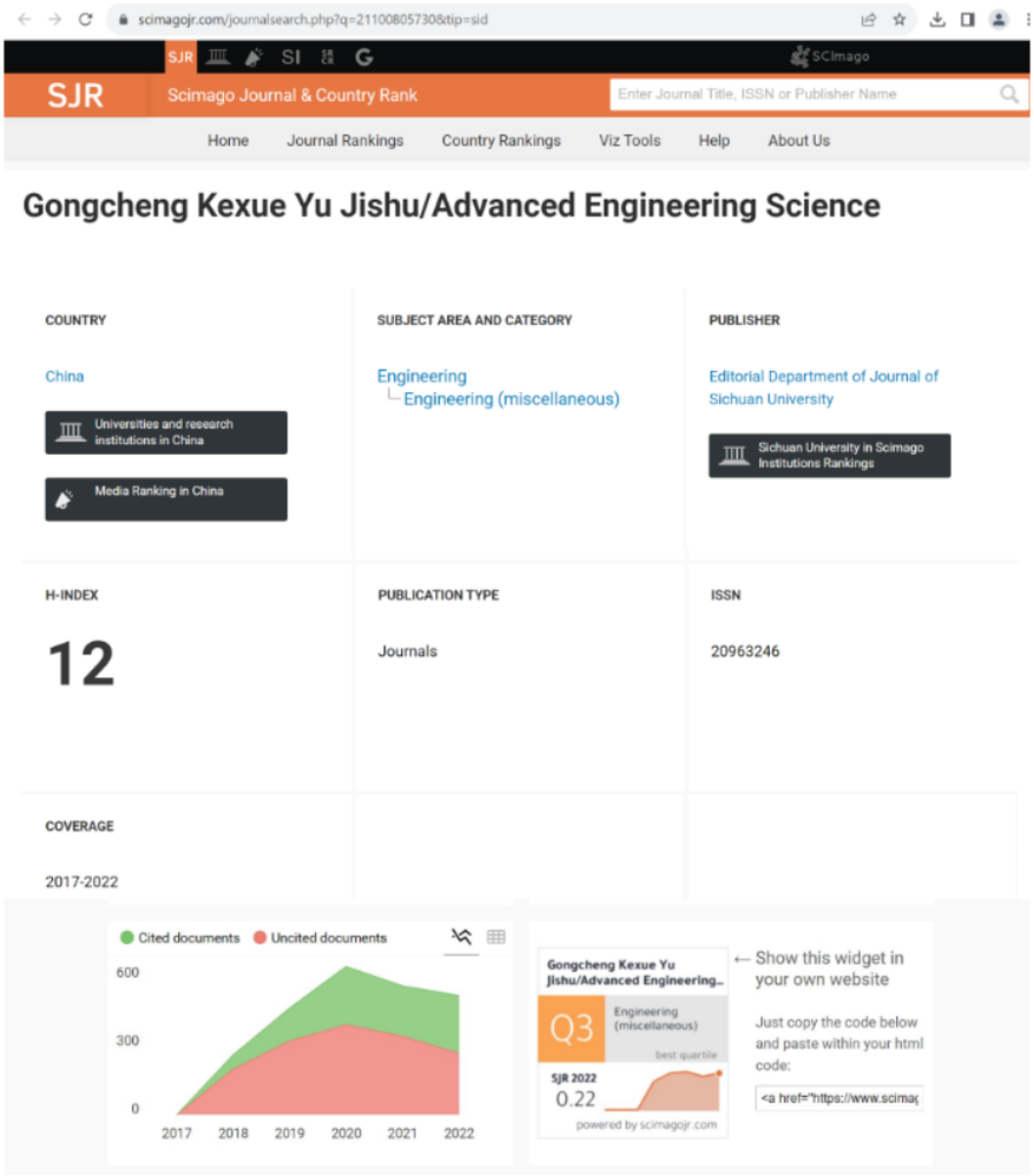
Economic Analysis Using the Production Sharing Contract Gross Split Scheme in the SHP Oil Field

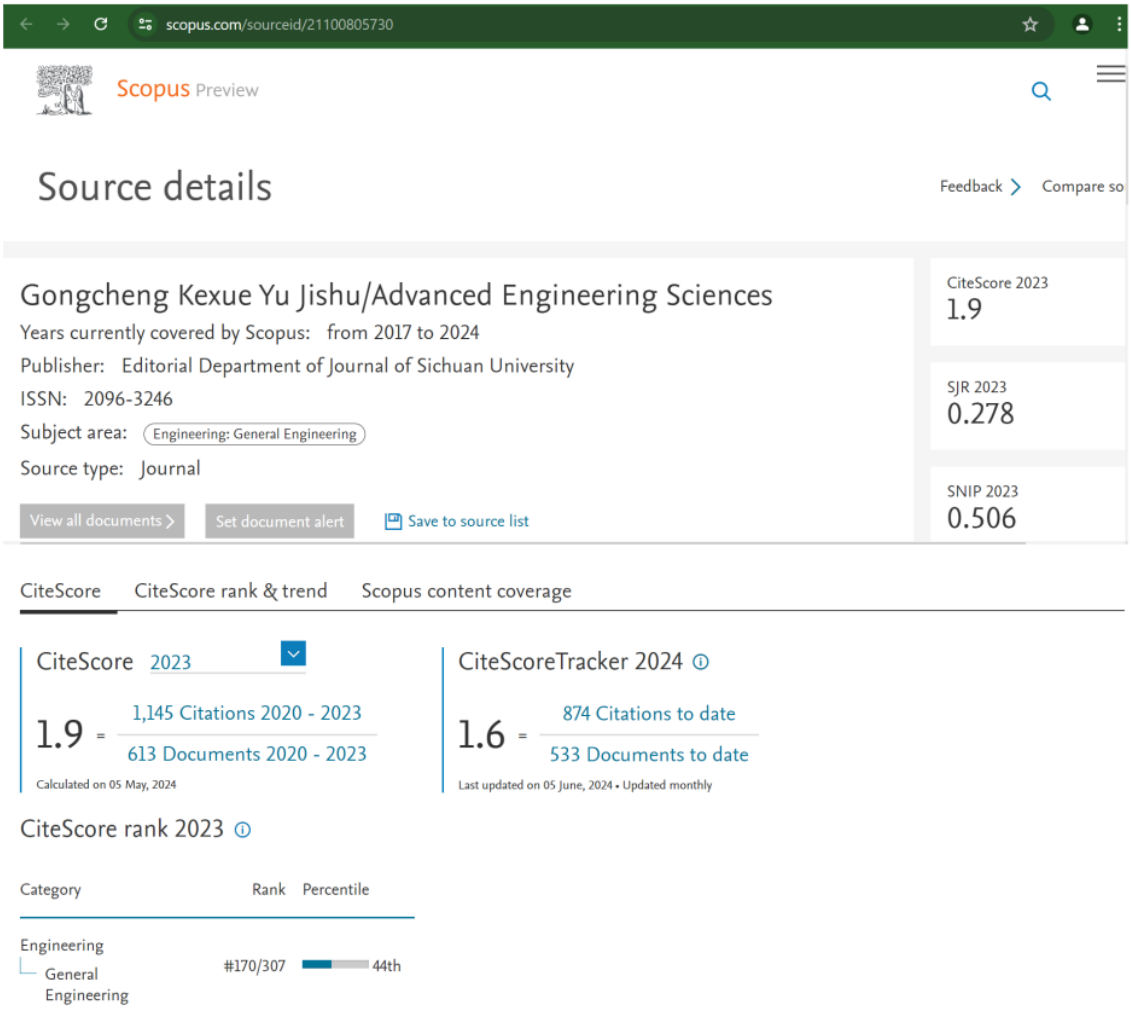
by eny suparni

Submission date: 01-Aug-2024 03:24PM (UTC+0700)
Submission ID: 2425720182
File name: 1-_Paper_AES-03-07-2024-722_Sayoga_Heru_P_3.pdf (2.05M)
Word count: 3622
Character count: 18798

Link Scimago AES: https://www.scimagojr.com/journalsearch.php?q=211008057308&tip=sid



Indexation Scopus Database Link: https://www.scopus.com/sourceid/21100805730



scopus.com/sourceid/21100805730

Scopus Preview

Source details

Feedback > Compare so

Gongcheng Kexue Yu Jishu/Advanced Engineering Sciences

Years currently covered by Scopus: from 2017 to 2024

Publisher: Editorial Department of Journal of Sichuan University

ISSN: 2096-3246

Subject area: Engineering: General Engineering

Source type: Journal

View all documents > | Set document alert | Save to source list

CiteScore 2023
1.9

SJR 2023
0.278

SNIP 2023
0.506

CiteScore | CiteScore rank & trend | Scopus content coverage

CiteScore 2023

1.9 = 1,145 Citations 2020 - 2023 / 613 Documents 2020 - 2023

Calculated on 05 May, 2024

CiteScoreTracker 2024

1.6 = 874 Citations to date / 533 Documents to date

Last updated on 05 June, 2024 • Updated monthly

CiteScore rank 2023

Category	Rank	Percentile
Engineering — General Engineering	#170/307	44th

ELSEVIER Terms and conditions ↗ Privacy policy ↗

Scopus Indexed (2024)

Gongcheng Kexue Yu Jishu/Advanced Engineering Science

Gongcheng Kexue Yu Jishu/Advanced Engineering Science (ISSN: 2096-3246) is a bi-monthly peer-reviewed international Journal. Gongcheng Kexue Yu Jishu/Advanced Engineering Science was originally formed in 1969 and the journal came under scopus by 2017 to now. The journal is published by editorial department of Journal of Sichuan University. We publish every scope of engineering, Mathematics, physics.

Gongcheng Kexue Yu Jishu/Advanced Engineering...
Q3 Engineering (miscellaneous)
best quartile
SJR 2022
0.22
powered by scimagojr.com

Advanced Engineering Science

Volume - 56 (2024), Issue - 06

Journal ID : **AES-19-07-2024-732**
An analysis of energy-efficient clustering algorithms for Wireless Sensor Networks (WSNs)
Ramachandra Ballary, Rajeshwari M.Hegde

Journal ID : **AES-11-07-2024-728**
Hydrocarbon accumulations in (Ad-Daww) basin, Syria Case- study of investigation for hydrocarbon bearing in (Al- Faid) field by using software programs
Asmaa Alkelany, Ramez Naser, Kayed Maalouleh

Journal ID : **AES-08-07-2024-725**
A Selective matrix for smart technological systems uses to develop existing educational buildings
Mohamed Ahmed Mohamed, Mohamed Reda Abdallah, Tarek Nasr

Journal ID : **AES-03-07-2024-722**
Economic Analysis Using the Production Sharing Contract Gross Split Scheme in the SHP Oil Field
Sayoga Heru Prayitno, Dedy Kristanto, Khusnul Athifa

https://www.gkyj-aes-20963246.com

A ES Home About us Contact Us Information & Guidelines Archive

Gongcheng Kexue Yu Jishu/Advanced Engineering Science

Gongcheng Kexue Yu Jishu/Advanced Engineering Science (ISSN: 2096-3246) is a bi-monthly peer-reviewed international Journal. Gongcheng Kexue Yu Jishu/Advanced Engineering Science was originally formed in 1969 and the journal came under scopus by 2017 to now. The journal is published by editorial department of Journal of Sichuan University. We publish every scope of engineering, Mathematics, physics.

Scopus Indexed (2024)

Gongcheng Kexue Yu Jishu/Advanced Engineering Science Editors-Panel

Prof. Arakawa Yutaka
Editor-in-Chief

ZHAGN Yan-ming
Co-Editor

DING Han
Associate-Editor

GUO Dong-ming
Sub-Editor

LIN Zhong-qin
Associate-Editor

TAN Run-hua
Associate-Editor

Prof. ZHA Jian-zhong
Associate-Editor

ISSN: 2096-3246
Volume 56, Issue 06, June, 2024

Economic Analysis Using the Production Sharing Contract Gross Split Scheme in the SHP Oil Field

Sayoga Heru Prayitno[1*], Dedy Kristanto[1*], Khusnul Athifa[1]

[1] Petroleum Engineering Department, Universitas Pembangunan Nasional "Veteran" Yogyakarta
Jl. Padjajaran 104 (Lingkar Utara) Condongcatur, D.I. Yogyakarta 55283, Indonesia[1]

Corresponding author: 1*

Keywords:
Economic analysis, Gross split, Production sharing contract, Sensityvity analysis.

ABSTRACT

Gross split is a production sharing contract for upstream oil and gas activities without any cost recovery. In the SHP oil field, an economic analysis will be carried out using the gross split production sharing contract (PSC) scheme to find out the value of the economic indicators that can provide benefits to the government and the contractor. The economic analysis carried out with parameters such as oil price of 70 US$/bbl adjusted for Indonesia crude price (ICP), escalation rate of 1%, tax of 22%, discount rate of 10%, minimum acceptable rate of return (MARR) of 10%, and operating cost of 12 US$/bbl. The portion of the split between the contractor and the government is 63.8% and 36.3%, which was obtained after carried out the base split, variable split and progressive split schemes. Based on the economic analysis that has been carried out, it is known that the SHP oil field has a positive value, as in the net present value (NPV) obtained of 92,052,412 US$, internal rate of return (IRR) of 52.14%, discounted profit to investment ratio (DPIR) of 1.25 and a relatively fast pay out time (POT) of 4.28 years from a contract period of 20 years. Furthermore, based on the analysis it is concluded that the SHP oil field could be further developed, which gave benefits to the government and contractor.

1. INTRODUCTION

Oil and gas resources are resources that are very influential in government revenues or the country's economy. To maintain production to remain stable, it is necessary to carry out various maintenance efforts for wells. With the very large need for oil and gas in Indonesia, it is necessary to balance the demand for and supply of existing petroleum. Therefore, it is necessary to explore new wells or oil fields that can support the target demand for oil and gas in Indonesia and increase oil productivity [1].

The SHP oil field is one of the new fields that will produce in 2026 to 2042, and located in the Central Sumatra Basin, which is one of the main basins as a producer of hydrocarbons in Indonesia. In the SHP oil field, an economic analysis will be carried out using the gross split production sharing contract (PSC) scheme.

The aims of economic analysis were to find out how much the value of the economic indicators is obtained and whether using this scheme can provide benefits to the contractor or the government. If the results of the analysis do not provide benefits, then could be checked in more detail on the existing calculation flow. Furthermore, if they still do not provide benefits, then can add discretion, which aims so that the results of the analysis carried out can provide benefits to the government and contractors, hence from these results we can conclude that this field can be developed, and the contract to be carried out is acceptable.

Economic calculations and analysis are required to be implemented, regarding exploration activities and oil-and-gas exploitation is a capital intensive, technologically advanced, and high-risk industry; that it requires meticulous calculation to find out its profit and other economic parameters. Principally, economic calculation on exploitation and production of oil and gas resources depends on the amount of hydrocarbon that would be produced, costs that have been and/or will be incurred, oil and gas prices per unit of volume, and economic calculation systems that are currently in use [2], [3]. [2- 4], explained that to understand whether a field development activity would give out a profitable value or not, it is imperative to carry out an economic analysis which use an economic valuation standard in petroleum industry by using economic indicators as such; net present value (NPV), rate of return (ROR), profit to investment ratio (PIR), discounted profit to investment ratio (DPIR), and pay out time (POT). [2], [5] also explained that cash flow analysis and calculation will be preceded by knowing the regulations and profit-sharing contract that will be used for calculation. Elements that are required in calculation of contractor cash flow are as such; gross revenues, investment, operating costs (OPEX), escalation rate, revenue share, taxable income, taxes, net contractor take (NCT), and government take.

The gross split PSC scheme is a calculation scheme for the distribution of the results of the management of oil and natural gas working areas between the government and oil and gas contractors which is calculated at the outset [6]. The gross split production sharing contract is a PSC in upstream oil and gas business activities which is based on the principle of sharing gross production (gross revenue) without any mechanism for returning operating costs [6], [7]. In the gross split PSC scheme, the government is not required to pay replacement costs (cost recovery) to the PSC, so that all capital and risks are the responsibility of the PSC. Gross split PSC was formed as a replacement for cost recovery PSC which was deemed no longer effective [6- 8]. In the PSC gross split scheme, applying a percentage variable for production division on a field-by-field basis, with the split adjusted based on the specific characteristics of the field and production obtained from the field under review. The schemes applied to the gross split method are base split, variable split, and progressive split. The production sharing contract is based on the regulation of Ministry of Energy and Mineral Resources Decree No. 52/2017 [6], [9].

In implementing the gross split PSC, the amount of initial profit sharing or base split is set where for oil fields it is 57% the state's share and 43% the contractor's share, while for natural gas fields it is 52% the state's share and 48% the contractor's share. The variable split component is determined using parameters such as work area status, field location, reservoir depth, availability of infrastructure, type of reservoir, carbon dioxide (CO_2) content, hydrogen sulfide (H_2S) content, specific gravity (specific gravity) of petroleum, level of domestic components, and production stages. The progressive split component is determined by several parameters such as oil prices, natural gas prices, cumulative amounts for oil and gas production [6], [8].

Calculation of cash flow in the gross split PSC scheme consists of parameters such as cash flow, net cash flow, investment, deductible expenses, government income tax, contractor taxable profit, contractor take and government take [9]. Depreciation is carried out for systematically allocated impairment or the useful

life of an item [10]. There are several economic indicator parameters such as net present value (NPV), minimum acceptable rate of return (MARR), internal rate of return (IRR), pay out time (POT), and discounted profit to investment ratio (DPIR) [2], [5], [8], [11]. Sensitivity analysis is carried out to find out what parameters affect the profits and losses that will occur so as to reduce risk and from the sensitivity analysis it can be seen whether a field is feasible to be developed or not [4], [12].

The decision-making judgement is based on a sensitivity analysis from a risk management analysis [4], [5]. Sensitivity analysis is defined as an analysis to perceive impacts of parameter changes which affects profit, such as oil prices, the amount of oil production, operational costs, and investment. The advantage of sensitivity analysis is that it aids on identifying the parameters that would affect profit by noticing on how much a profit would fluctuate from those parameter changes. An oil field would still be feasible to be developed, if it is projected to give out a relatively minute pay-out time (POT), a grand and positive net present value (NPV), a relatively substantial profit to investment ratio (PIR) and discounted profit-to-investment ratio (DPIR), and a rate of return value (ROR) that is far greater than bank interest [2], [3], [4].

2. RESEARCH METHODOLOGY

The analysis in the research was conducted to determine the economic indicators result using the PSC gross split scheme. Economic analysis using the PSC gross split scheme on the SHP oil field has a systematic work step as follows:

a. Data collection is divided into three parts, namely field data, economic data, and variable data split;
b. Performs data processing using the PSC gross split scheme;
c. Economic analysis by observing economic indicators;
d. Conducting a sensitivity analysis.

The research flowchart is shows in Figure 1.

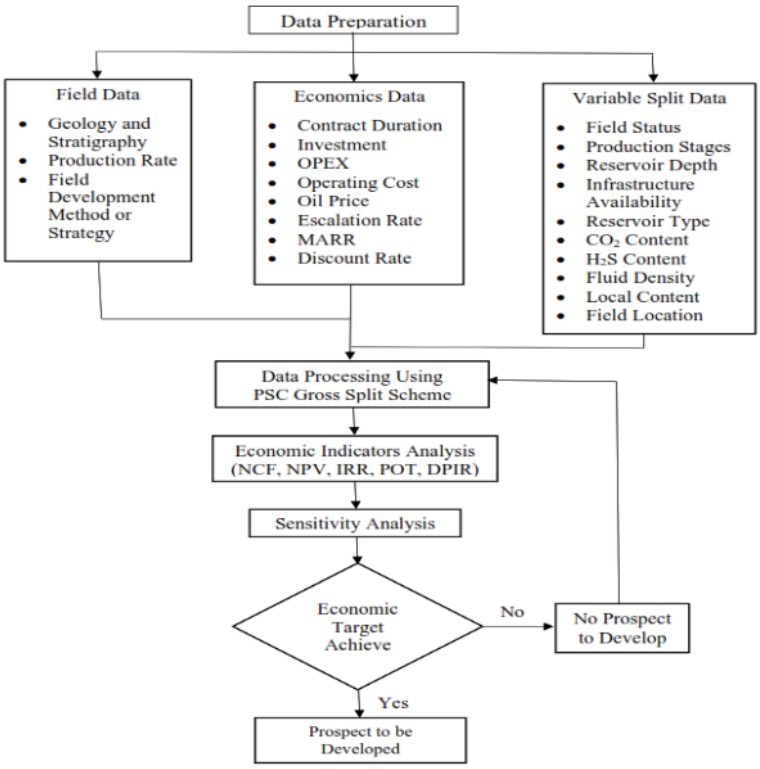


Figure 1. Flowchart methodology of the research

Furthermore, in carrying out an economic analysis, the first thing has to be done was to determine the net split obtained from the results of dividing the base split, variable split, and progressive split. After that, a cash flow calculation, then depreciation, and analyze it to get economic indicators, and finally a sensitivity analysis to prove whether the SHP oil field is profitable and feasible to develop.

3. RESULT AND DISCUSSION

The economic analysis used in the SHP oil field was the gross split production sharing contract (PSC) scheme that will produce in 2026 to 2042 within a 20 years contract period. The gross split PSC is one of the production sharing contracts for upstream oil and gas activities without any cost recovery. The required data to analyze the economics of the SHP oil field, includes field production forecast data, economic data covering the contract period, oil prices, estimates of capital and non-capital costs, operating costs, and other supporting data that will be used in the calculations.

3.1 Economic analysis

To find out the economic results of the SHP oil field, the first thing that needs to be done is the PSC gross split fiscal terms. Table 1 shows the fiscal terms of PSC gross split.

Table 1. Fiscal terms of PSC Gross split

Base Split	Contractor	Government
Oil	43 %	57 %
Gas	48 %	52 %
Domestic Market Obligation (DMO)	25 %	

Depresiation	Decline Balance (5 Years)
Tax Rate	22 %

Based on Table 1, it can be seen that the base split value for contractors is 43% for oil and 48% for gas. Then, it can be seen that the domestic market obligation (DMO) or part of contractor production that must be sold domestically in order to fulfill domestic commodities is 25%. The tax imposed on the gross split PSC scheme is 25%, this is based on the Indonesian Minister of Energy and Mineral Resources Regulation No. 52/2017. The depreciation method used in this gross split scheme is the declining balance method for 5 years. The DMO fee in the gross split PSC scheme is 100%, so that the DMO fee paid by the government to contractors for the delivery of oil and/or natural gas of 25% of the production to meet domestic needs is paid in full by the government (100%).

Before calculating the economics, first a determination or split calculation is carried out for contractors and the government. In the gross split profit-sharing scheme, there are three components in the split calculation, namely base split, variable split, and progressive split. The sum of the three components results in a split amount for contractors and the government to adjust. The government determines the amount of initial profit sharing (base split) with details for oil 57% for the state and 43% for contractors, for gas 52% for the state and 48% for contractors. In the variable split, there are components that receive split correction based on the characteristics of the working area as shows in Table 2, while for the progressive split in Table 3. respectively.

Based on the Table 2, it can be seen that the SHP oil field has an additional 7% split value. This additional figure is obtained from region status gets a split correction of 3%, local content level gets a split of 4%. So that the total of the split correction obtained for the split variable is 7%. After obtaining the variable split value, the next step is to calculate the addition of a progressive split based on oil and gas prices and cumulative production. The progressive split value will change every year, but in this field there is no change due to used the single price method.

Table 2. Variable split

Characteristics	Parameters	Contractor Split, %
Territory Status	POD II	3
Production Stages	Primary Recovery	0
Reservoir Depth	≤ 2500 (8202 ft)	0
Infrastructure Availability	Well Developed	0
Reervoir Type	Conventional	0
CO_2 Content	0	0
H_2S Content	0	0
Oil API	>25	0
Local Content	70 ≤ x < 100	4
Field Location	Onshore	0
Total		**7**

Table 3. Progressive split

Characteristics	Parameters	Contractor Split Correction, %
Oil Prices (US$/Bbl)	70	3.8
Gas Prices (US$/Scf)	0	0
Cummulative oil and gas production (MMBOE)	<30	10

Depresiation	13.75 %

With the split division after inputting the base split, variable split, and progressive split parameters and then adding some parameter data (oil and gas production profile, oil and gas prices, CAPEX and OPEX costs), economic calculations can be carried out on the SHP oil field. The assumptions used in the economic analysis of this field include an oil price of 70% based on the value of the Indonesian crude price (ICP), an operating cost of 12 US$/bbl, a tax of 22% with an escalation rate of 1%, a discount rate of 10%, MARR 10%, and the depreciation model used is a declining balance within 5 years. The calculation results for the SHP Oil Field using the PSC Gross Split scheme are shows in Table 4.

Table 4. Calculation results of PSC-Gross split of the SHP oil field

Economic Indicators	PSC-Gross split (Contractor)
Net Cash Flow (NCF), US$	147,012,073
Net Present Value (NPV), US$	44,410,431
Internal Rate of Return (IRR), %	52,14
Discounted Profit to Investment Ratio (DPIR)	1.25
Pay Out Time (POT), Years	4.28

3.2 Sensitivity analysis

Sensitivity analysis is defined as an analysis that carried out to observe the effects of parameter changes that will affect profit, seen from its economic indicator results [2- 4]. Parameters used for executing sensitivity analysis are cumulative oil production, oil prices, amount of investment, and lifting costs [2], [4]. This analysis is carried out by changing prices against sensitivity values, with decline as much as 10% through 40%; and increase as much as 10% through 40% each from the initial value. The results of sensitivity analysis are plotted into a spider diagram, then observing its sensitivity to NCF values, NPV values, IRR values, and DPIR values. The sensitivity analysis results are shows in Figure 2 through Figure 5, respectively.

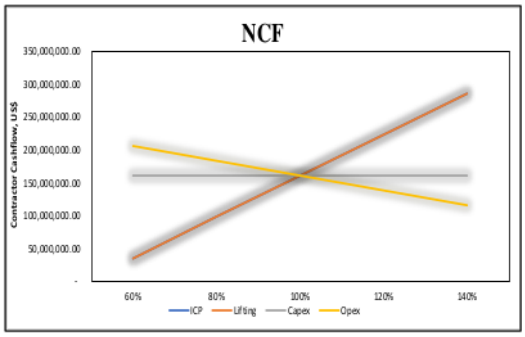


Figure 2. Sensitivity analysis result for contractor net cash flow (NCF)

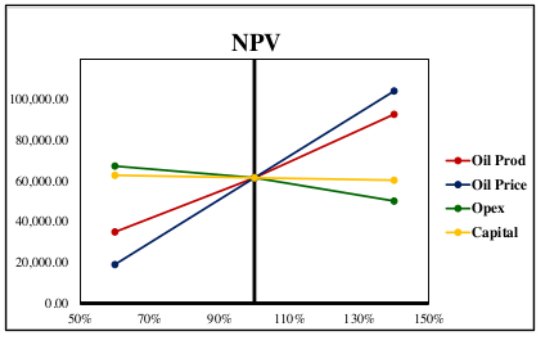


Figure 3. Sensitivity analysis result for net present value (NPV)

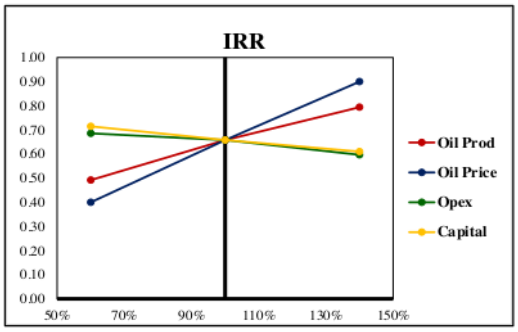


Figure 4. Sensitivity analysis result for internal rate of return (IRR)

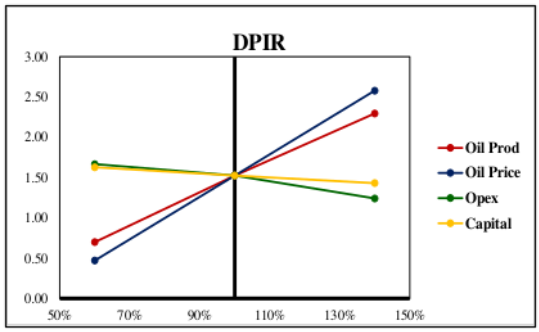


Figure 5. Sensitivity analysis result for discounted profit to investment ratio (DPIR)

Based on the results of sensitivity analysis on Figure 2 through Figure 5, it is known that a decrease and increase of 40% in parameter prices - parameters such as total oil production rate, oil price, OPEX and CAPEX in the SHP oil field provide benefits to the government and contractors. This can be seen by using a sensitivity analysis using a spider diagram for NCF, NPV, IRR, and DPIR, which have positive values. In addition, based on the sensitivity analysis, it is known that the parameters of oil production rate and OPEX are parameters that very sensitive to price changes in existing parameters. The oil price and CAPEX parameters are not quite sensitive to the increase and decrease in an oil price.

4. CONCLUSIONS

From the result and discussion above, it concludes that:

1. The SHP oil field has been analyzed using the PSC gross split scheme starting in 2022 to 2042 within a period of 20 years, which is expected to start producing oil in 2026. The largest share of the split in the SHP oil field was the contractor's share is 63.8% and the government's share is 36.3%.
2. The results of economic analysis at the SHP oil field obtained an NCF value of 147,012,073 US$, NPV of 44,410,431 US$, IRR of 52.14%, DPIR of 1.25, and POT of 4.28 years. Hence, the profits obtained for the contractor is 23.46% and for the government is 43.18%.
3. Based on the sensitivity analysis that has been carried out, it is known that changes as large as 40% in parameters as well as the amount of oil production rates, oil prices, and investment costs have an impact on the economic analysis of the SHP oil field. Meanwhile, parameters are very sensitive in calculating cash flow was the amount of lifting of oil production, while changes in parameters in investment costs do not have a significant impact.
4. Based on the results of the economic analysis of the SHP oil field, it is concluded that exceed the desired target, hence this field could be further developed due to it provides benefits to the government and contractors.

5. ACKNOWLEDGEMENTS

The authors would like to thank the Petroleum Engineering Department, Universitas Pembangunan Nasional "Veteran" Yogyakarta for the support in the completion of the research.

6. REFERENCES

[1] B. Widarsono, National natural gas reserves and production: An analysis on potentials and challenges, Lembaran Publikasi Minyak dan Gas Bumi, PPTMGB Lemigas, Jakarta, Vol. 47, No. 3, 2013, pp. 115-126, 2013.

[2] W. Partowidagdo, Management and economic of oil and gas, Development Study Program, Postgraduate Program Institut Teknologi Bandung, Indonesia, 2002, pp. 46-54; 74-82.

[3] Herianto, Economic analysis of data engineering on production sharing contract: Case study field A, Journal of Economics and Sustainable Development, ISSN 2222-1700, 2019.

[4] G. Allison, Economics of petroleum exploration and production, PennWell Publishing Company, United State of America (USA), 1992, pp. 67-75; 143-152.

[5] P. D. Newendrop, Decision analysis for petroleum exploration, PennWell Publishing Company, P. O. Box 1260, 1421 South Sheridan Road Tulsa, Oklahoma USA, 1975, pp. 84-96; 146-157.

[6] Ministry of Energy and Mineral Resources Republic of Indonesia Decree Number 52/2017, about Second changes of Ministry of Energy and Mineral Resources Republic of Indonesia Decree Number 08/2017 about Production sharing contract gross split, Minister of Energy and Mineral Resources Republic of Indonesia, Jakarta, 2020.

[7] S. L. Pulrba, Production sharing contract (PSC) cost recovery and gross split, Indonesia Energizing Forums, SKK Migas, Jakarta, 2017.

[8] B. R. Anjani, and I. Baihaqi, I., Comparative analysis of financial production sharing contract (PSC) cost recovery with PSC gross split: Case study in one of the contractors SKK Migas. Journal of Administrative and Business Studies, 2018, Vol. 4 (2), pp. 65-80.

[9] C. A. Pultri, Economic comparison of the huff and puff surfactant injection based on gross split scheme of the Ministry of Energy and Mineral Resources Decree No. 08/2017 and the Ministry of Energy and Mineral Resources Decree No. 52/2017 in the Dandelion field, Final report, 2020.

[10] M. Ariyon, and E. K. Delwi., Economic comparative studi of marginal oil field development using production sharing contract and gross split. National Seminar on Technology and Engineering, Jakarta, 2018, pp. 23-29.

[11] A. Nisrina, and H. Pramadika, Economic analysis of NSRN block by using PSC gross split and additional discretion, Julrnal Peltro Trisakti, 2020, Vol. IX (2), pp. 88-93.

[12] Pramadika, H., and Satiyawira, B., The influence of gas price and variable component through contractor profit on gross split scheme, Julrnal Peltro Trisakti, Vol. VII (3), 2018, pp. 113-117.

Economic Analysis Using the Production Sharing Contract Gross Split Scheme in the SHP Oil Field

ORIGINALITY REPORT

22%	20%	4%	4%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	article.sciencepublishinggroup.com Internet Source	14%
2	www.jcreview.com Internet Source	2%
3	ojs.stiami.ac.id Internet Source	2%
4	Submitted to Rudarsko-geološko-naftni fakultet / Faculty of Mining, Geology and Petroleum Engineering Student Paper	2%
5	himjournals.com Internet Source	2%

Exclude quotes	On	Exclude matches	< 2%
Exclude bibliography	On		