

An Example Shale Oil Field

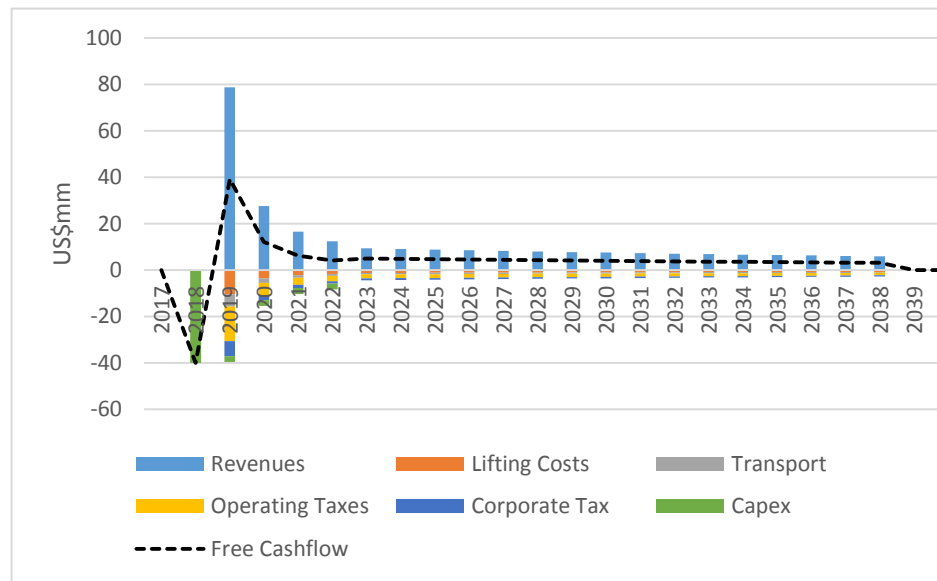
Sensitivities		1	0%
Oil Price	1	2	+15%
Production	1	3	+30%
Operating Costs & Transport	1	4	-15%
Capex	1	5	-30%

	2017	2018	2019	2020	2021	2022
Revenues	0	0	79	28	17	12
Operating Costs	0	0	-11	-4	-2	-2
Transport Costs	0	0	-5	-2	-1	-1
Operating Taxes	0	0	-15	-5	-3	-2
EBITDA	0	0	48	17	10	8
Depreciation	0	0	-15	-5	-3	-2
EBIT	0	0	33	11	7	5
Tax on EBIT	0	0	-7	-2	-1	-1
<i>Corporate Tax Rate</i>	<i>20%</i>					
Post tax cashflow	0	0	42	15	9	7
CAPEX	0	-40	-3	-3	-3	-3
Free Cashflow (FCF)	0	-40	39	12	6	4
Cumulative FCF	0	-40	-1	11	17	21
Discount Rate	9.3%					
Discount Factor	1.00	1.09	1.20	1.31	1.43	1.56
Discounted Cashflow (DCF)	0	-37	33	9	4	3
NPV (\$mm)	34					
IRR (%)	41%					
Payback (years)		When does cumulative cashflow turn positive				
Excel Calculation	\$34					
<i>Breakeven Oil Price Calculation</i>	<i>60.00</i>	<i>After Goal Seek Function in Data:What If</i>				
Alternative NPV (terminal value)						
FCF for 10 years	0	-40	39	12	6	4
Terminal Value						

Implied FCF	0	-40	39	12	6	4
Implied DCF	0	-37	33	9	4	3
NPV	37					
Plus Cash	0					
Less Debt	0					
Total NPV	37					
IRR	42%					

EBITDA Multiple 7

	2017	2018	2019	2020	2021	2022
Revenues	0	0	79	28	17	12
Lifting Costs	0	0	-11	-4	-2	-2
Transport	0	0	-5	-2	-1	-1
Operating Taxes	0	0	-15	-5	-3	-2
Corporate Tax	0	0	-7	-2	-1	-1
Capex	0	-40	-3	-3	-3	-3
Free Cashflow	0	-40	39	12	6	4



Base
High
Upside
Low
Downside

Results
NPV 34 US\$mm
IRR 41% %

2023	2024	2025	2026	2027	2028	2029	2030	2031
9	9	9	8	8	8	8	8	7
-1	-1	-1	-1	-1	-1	-1	-1	-1
-1	-1	-1	-1	-1	-1	-1	-1	0
-2	-2	-2	-2	-2	-2	-1	-1	-1
6	6	5	5	5	5	5	5	4
-2	-2	-2	-2	-2	-2	-2	-1	-1
4	4	4	4	3	3	3	3	3
-1	-1	-1	-1	-1	-1	-1	-1	-1
5	5	5	4	4	4	4	4	4
0	0	0	0	0	0	0	0	0
5	5	5	4	4	4	4	4	4
26	31	36	40	45	49	53	57	61
1.71	1.87	2.04	2.23	2.44	2.67	2.92	3.19	3.49
3	3	2	2	2	2	1	1	1
5	5	5	4	4				

5	5	5	4	4	34
3	3	2	2	2	13

2023	2024	2025	2026	2027	2028	2029	2030	2031
9	9	9	8	8	8	8	8	7
-1	-1	-1	-1	-1	-1	-1	-1	-1
-1	-1	-1	-1	-1	-1	-1	-1	0
-2	-2	-2	-2	-2	-2	-1	-1	-1
-1	-1	-1	-1	-1	-1	-1	-1	-1
0	0	0	0	0	0	0	0	0
5	5	5	4	4	4	4	4	4

2040

2032	2033	2034	2035	2036	2037	2038	2039	2040
7	7	7	6	6	6	6	0	0
-1	-1	-1	-1	-1	-1	-1	0	0
0	0	0	0	0	0	0	0	0
-1	-1	-1	-1	-1	-1	-1	0	0
4	4	4	4	4	4	4	0	0
-1	-1	-1	-1	-1	-1	-1	0	0
3	3	3	3	3	3	2	0	0
-1	-1	-1	-1	-1	-1	0	0	0
4	4	4	3	3	3	3	0	0
0	0	0	0	0	0	0	0	0
4	4	4	3	3	3	3	0	0
64	68	72	75	78	81	85	85	85
3.82	4.17	4.56	4.99	5.46	5.96	6.52	7.13	7.80
1	1	1	1	1	1	0	0	0

2032	2033	2034	2035	2036	2037	2038	2039	2040
7	7	7	6	6	6	6	0	0
-1	-1	-1	-1	-1	-1	-1	0	0
0	0	0	0	0	0	0	0	0
-1	-1	-1	-1	-1	-1	-1	0	0
-1	-1	-1	-1	-1	-1	0	0	0
0	0	0	0	0	0	0	0	0
4	4	4	3	3	3	3	0	0

Domestic Oil Price

Base Case	30.0	30.0	30.0	30.0	30.0	30.0
Scenario 2	34.5	34.5	34.5	34.5	34.5	34.5
Scenario 3	39.0	39.0	39.0	39.0	39.0	39.0
Scenario 4	25.5	25.5	25.5	25.5	25.5	25.5
Scenario 5	21.0	21.0	21.0	21.0	21.0	21.0

Domestic Gas Price

Base Case	0.0	0.0	0.0	0.0	0.0	0.0
Scenario 2	0.0	0.0	0.0	0.0	0.0	0.0
Scenario 3	0.0	0.0	0.0	0.0	0.0	0.0
Scenario 4	0.0	0.0	0.0	0.0	0.0	0.0
Scenario 5	0.0	0.0	0.0	0.0	0.0	0.0

Export Gas Price

Base Case	0.0	0.0	0.0	0.0	0.0	0.0
Scenario 2	0.0	0.0	0.0	0.0	0.0	0.0
Scenario 3	0.0	0.0	0.0	0.0	0.0	0.0
Scenario 4	0.0	0.0	0.0	0.0	0.0	0.0
Scenario 5	0.0	0.0	0.0	0.0	0.0	0.0

30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
34.5	34.5	34.5	34.5	34.5	34.5	34.5	34.5
39.0	39.0	39.0	39.0	39.0	39.0	39.0	39.0
25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5
21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

2040

0.0

0.0

0.0

30

60

0

0

0

0.0

0.0

0.0

0

0

0

0

0

0

0.0

0.0

+15%

0.0

+30%

0.0

-15%

0.0

-30%

0.0

0.0

+15%

0.0

+30%

0.0

-15%

0.0

-30%

60.0

69.0

78.0

51.0

42.0

30.0
34.5
39.0
25.5
21.0

0.0
0.0
0.0
0.0
0.0

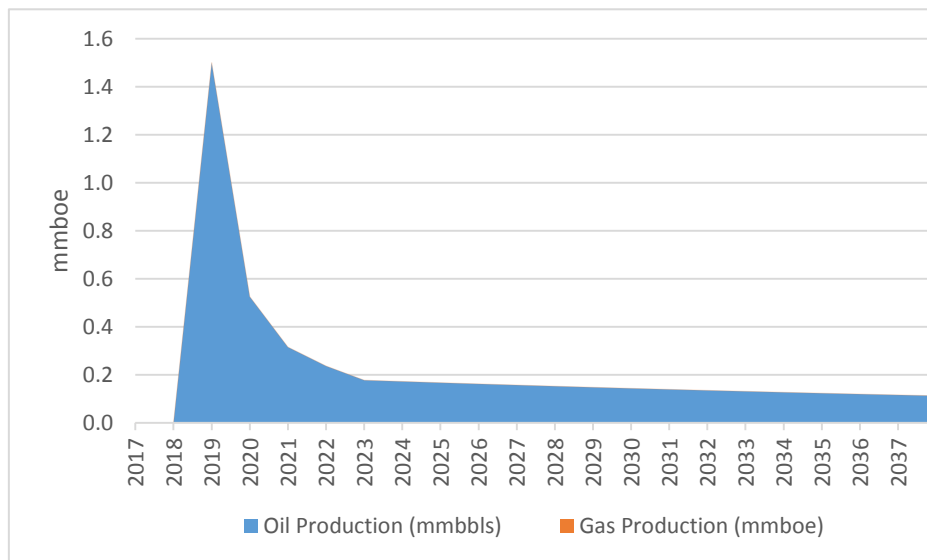
0.0
0.0
0.0
0.0
0.0

Production

	Oil				
	mmbbls	kbpd			
Resources	100				
Recovery Factor	5%				
Reserves	5				
Start date	5 years		Peak as %		
	after first		Reserves		
	capex				
Peak Production (mmbbls)	1.5	4	30%		
Time to Peak (yrs)	1				
Length of Peak (yrs)	1				
Decline rate (%)	65%	40%	25%	25%	3%

	First capex					
	2017	2018	2019	2020	2021	2022
Oil production			1.50	0.53	0.32	0.24
Total oil produced to 2040	4.9					
Barrels per day		0	4110	1438	863	647
Gas Production						
Total gas produced to 2040	0.0					

	2017	2018	2019	2020	2021	2022
Oil Production (mmbbls)	0.0	0.0	1.5	0.5	0.3	0.2
Gas Production (mmboe)	0.0	0.0	0.0	0.0	0.0	0.0
Total (mmboe)	0.0	0.0	1.5	0.5	0.3	0.2



Production Scenarios

Total Produced

Oil Production Scenarios

1	4.85
2	5.58
3	6.31
4	4.13
5	3.40

Gas Production Scenarios

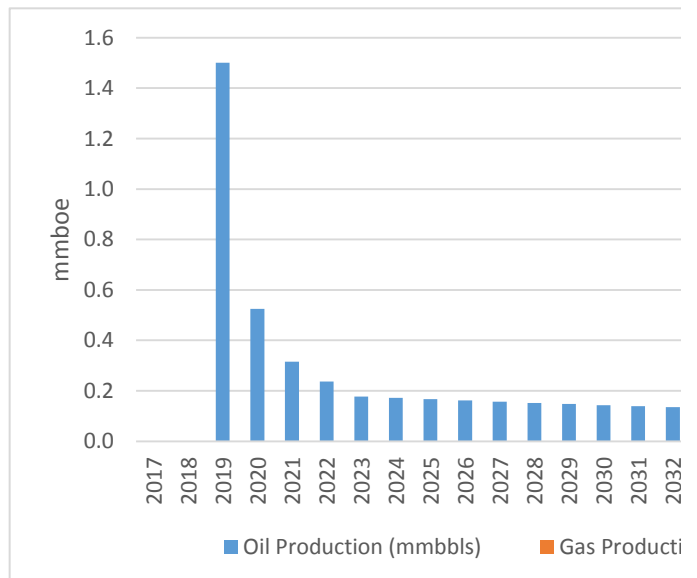
1	0.00
2	0.00
3	0.00
4	0.00
5	0.00

Gas
 Bcf mmcf/d

 0
 5 years
 after first
 capex
 0 0
 4
 1
 65%

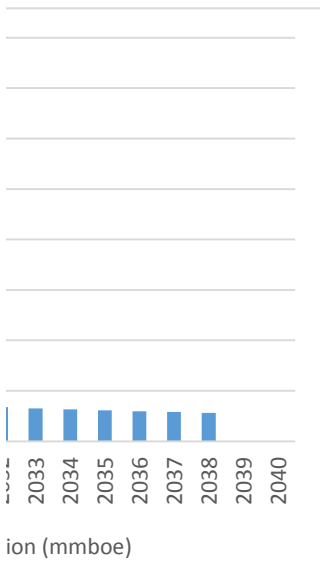
2023	2024	2025	2026	2027	2028	2029	2030	2031
0.18	0.17	0.17	0.16	0.16	0.15	0.15	0.14	0.14
485	471	457	443	430	417	404	392	380
				0.0	0.0	0.0	0.0	0.0

2023	2024	2025	2026	2027	2028	2029	2030	2031
0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1



2032	2033	2034	2035	2036	2037	2038	2039	2040
0.13	0.13	0.13	0.12	0.12	0.12	0.11		
369	358	347	337	327	317	307	0	0
0.0								

2032	2033	2034	2035	2036	2037	2038	2039	2040
0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0



Capital Expenditure

Reserves	5	
Capex per bbl	10.00	
Total capex	50	
Year 1	80%	40
Years 2-5	20%	10
Remainder	0%	0

	First Capex					
	2017	2018	2019	2020	2021	2022
US\$mm		40	2.5	2.5	2.5	2.5
Year 1	40					
Year 2-5	10					
Remainder	0					
Total	50					

Sensitivities

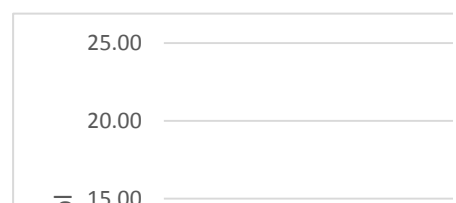
2	0	46	3	3	3	3
3	0	52	3	3	3	3
4	0	34	2	2	2	2
5	0	28	2	2	2	2
+15%						
+30%						
-15%						
-30%						

Field Comparisons

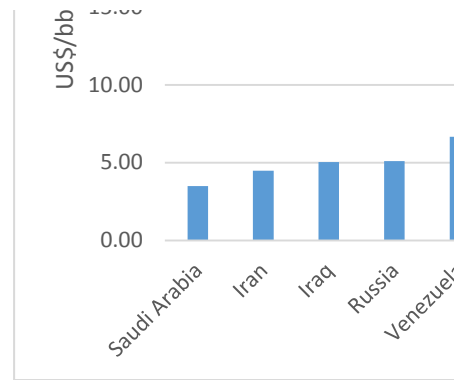
	Cost /bbl	Capex	Reserves	Peak Prod	Peak Prod
	US\$/bbl	US\$mm	mmbbls	kbpd	mmbbls
Kashagan (Kazakhstan)	10.46	136000	13000	1500	547.5
ACG (Azerbaijan)	4.00	20000	5000	620	226.3
Thunderhorse (Gulf of Mexico)	5.00	5000	1000	250	91.25
Novy Port (Russia onshore)	3.25	4500	1385	161	58.64
Ghawar (Saudi)	3.50	248500	71000	5000	1825
Lula (Brazil deep water)	9.04	75000	8300	500	182.5

Global Comparisons

	Capex US\$/bbl
Saudi Arabia	3.50
Iran	4.48
Iraq	5.03
Russia	5.10



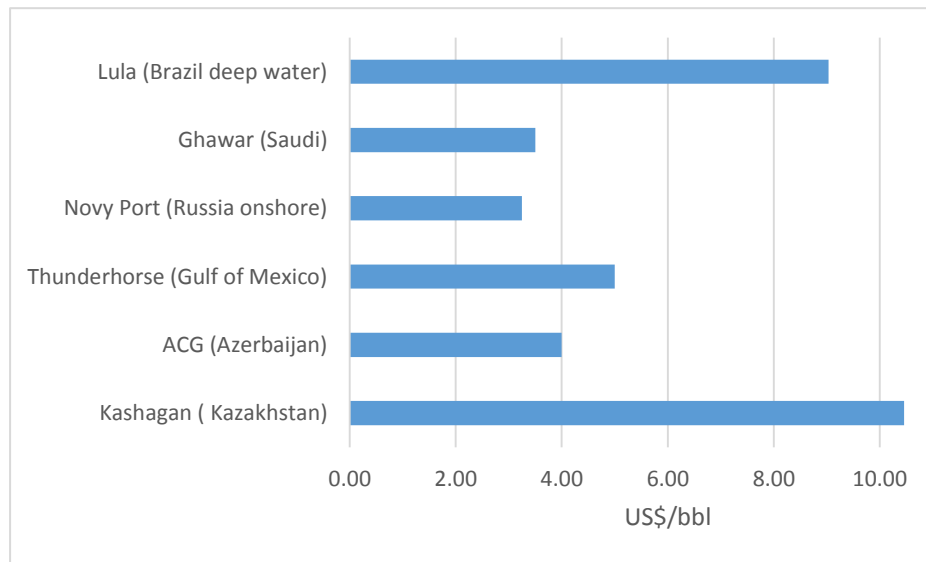
Venezuela	6.66
US shale	7.56
Indonesia	7.65
US conv	7.70
Canada	9.69
Nigeria	13.10
Norway	13.76
Brazil	16.09
UK	22.67

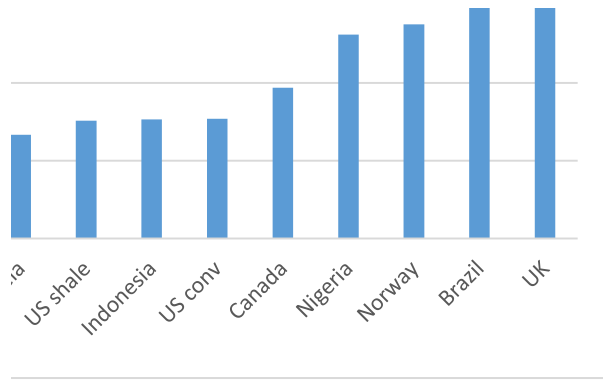


2023 2024 2025 2026 2027 2028 2029 2030 2031

0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

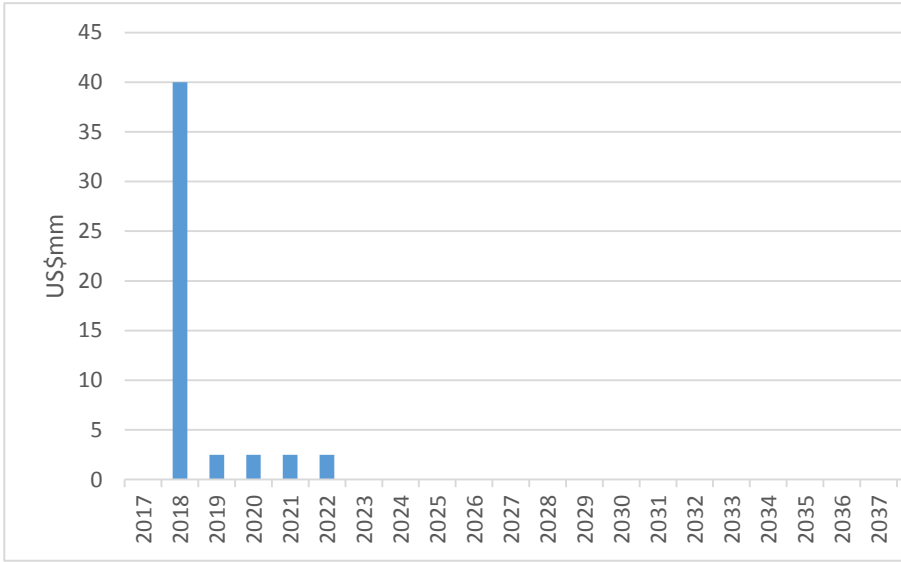
Capex/
peak bbl
US\$/bbl
248
88
55
77
136
411





2032 2033 2034 2035 2036 2037 2038 2039 2040

0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0





Depreciation

Straight Line

Total Capex	50
Years of Production	20
Annual Depreciation (US\$mm)	3

	2017	2018	2019	2020	2021	2022
Depreciation	0	0	2.5	2.5	2.5	2.5
<i>Production</i>	<i>0</i>	<i>0</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>
Total	50					

Unit of Production

Total Reserves	5
Total Produced	4.9
Total Capex	50
Depreciation per barrel	10.30

	2017	2018	2019	2020	2021	2022
Depreciation	0	0	15.4	5.4	3.2	2.4
Total	50					

2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
3	3	3	3	3	3	3	3	3	3
1	1	1	1	1	1	1	1	1	1

2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
1.8	1.8	1.7	1.7	1.6	1.6	1.5	1.5	1.4	1.4

2033	2034	2035	2036	2037	2038	2039	2040
3	3	3	3	3	3	0	0
1	1	1	1	1	1	0	0

2033	2034	2035	2036	2037	2038	2039	2040
1.3	1.3	1.3	1.2	1.2	1.2	0	0

Operating Costs

Lifting Costs 7 US\$/boe real
 Total for model 34 US\$mm

	2017	2018	2019	2020	2021	2022	2023
US\$mm		0.0	10.5	3.7	2.2	1.7	1.2
Total	34						

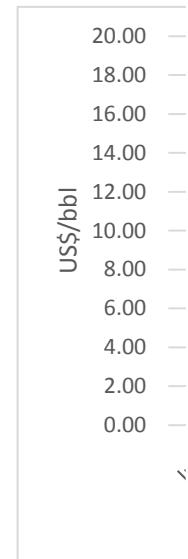
Sensitivities

1	3
2	+15%
3	+30%
4	-15%
5	-30%

Global Comparisons

	Lifting US\$/bbl		Transport US\$/bbl
Iran	1.94	Saudi Arabi	2.49
Iraq	2.16	Iran	2.67
Russia	2.98	Iraq	2.47
Saudi Arabia	3.00	Russia	2.69
Norway	4.24	Indonesia	3.63
US conv	5.15	US conv	3.11
US shale	5.85	Norway	3.12
Indonesia	6.87	US shale	3.52
Venezuela	7.94	Canada	2.92
Nigeria	8.81	Venezuela	2.54
Brazil	9.45	Nigeria	2.97
Canada	11.56	Brazil	2.80
UK	17.36	UK	4.30

Lifting Costs



Company examples

Rosneft	3.10
Lukoil	4.26
BP	6.90
Chesapeake	2.92

Transport Costs

Oil 3.52 US\$/bbl
 Gas 0.59 US\$/mcf

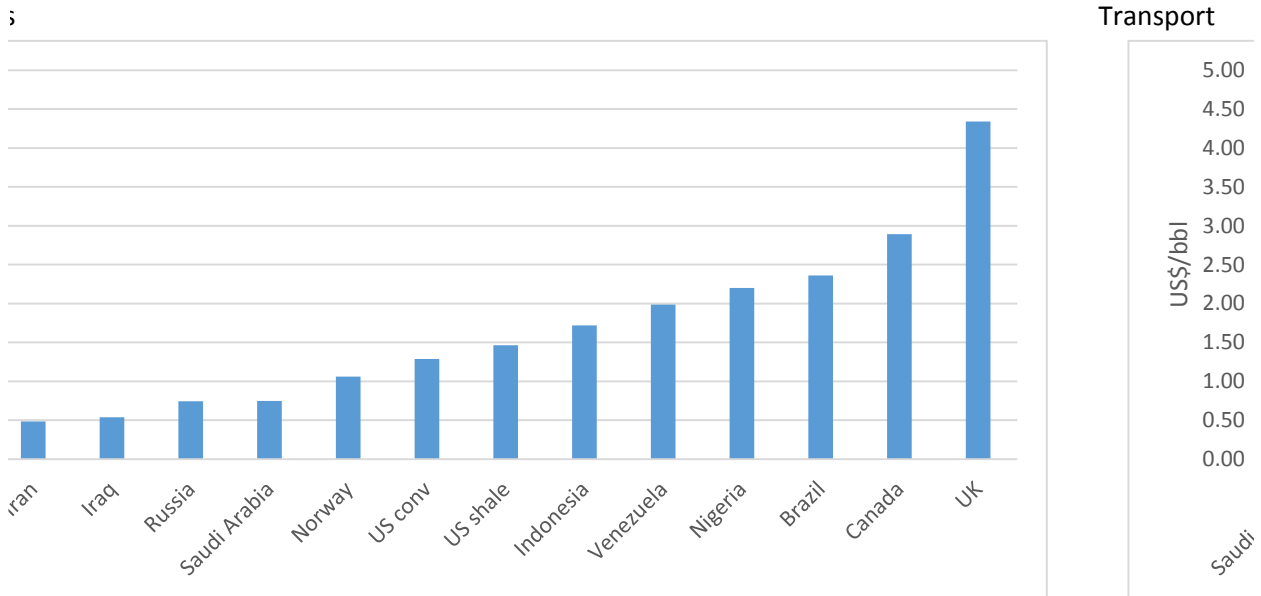
	2017	2018	2019	2020	2021	2022	2023
Oil (US\$mm)	0.0	0.0	5.3	1.8	1.1	0.8	0.6

Gas (US\$mm)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total (US\$mm)	0.0	0.0	5.3	1.8	1.1	0.8	0.6

Sensitivities

1	3.52
2	+15%
3	+30%
4	-15%
5	-30%

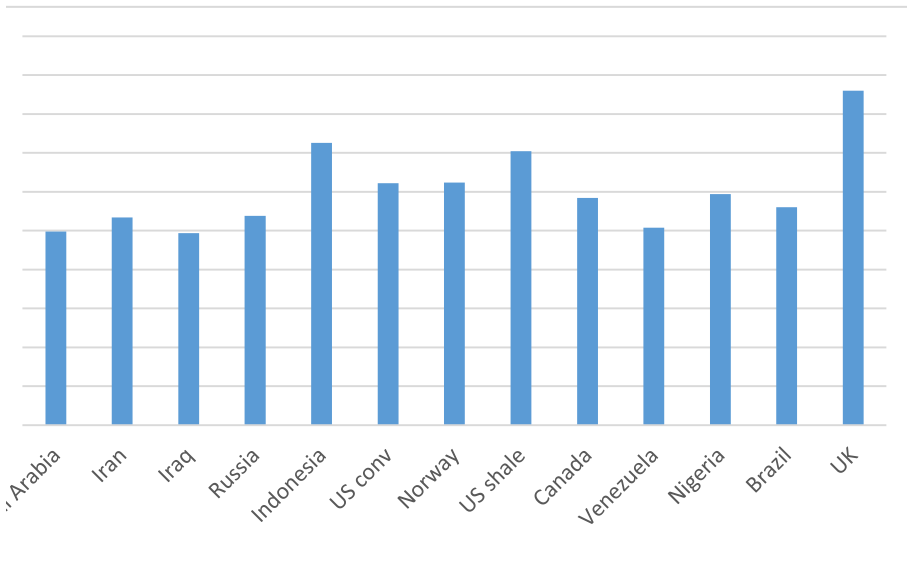
2024	2025	2026	2027	2028	2029	2030	2031
1.2	1.2	1.1	1.1	1.1	1.0	1.0	1.0



2024	2025	2026	2027	2028	2029	2030	2031
0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5

2032	2033	2034	2035	2036	2037	2038	2039
0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.0



2032	2033	2034	2035	2036	2037	2038	2039
0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.0

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.0

2040
0.0

2040
0.0

0.0

0.0

Operating Taxes

Oil Tax

Export Tax	Sliding	of export barrels
Royalty	5.0%	of oil revenues
Other taxes	1.0%	of total revenues

Export Oil Price	60	60	60	60	60	60
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	2017	2018	2019	2020	2021	2022
Export Tax	0.0	0.0	10.1	3.5	2.1	1.6
Royalty	0.0	0.0	3.9	1.4	0.8	0.6
Other	0.0	0.0	0.8	0.3	0.2	0.1
Total	0	0.0	14.9	5.2	3.1	2.3

Export Tax

Cut-off point	30	US\$/bbl
Tax	30%	above cut-off point

Export Tax (\$/bbl)	9	9	9	9	9	9
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Gas Tax

Export Tax	30%	export revenues
Royalty	0.5	US\$/mcf

	2017	2018	2019	2020	2021	2022
Export Tax						
Royalty						
Total	0	0	0	0	0	0
Total Operating Taxes	0	0	15	5	3	2
Total US\$/boe						

Gross Taxes

	US\$/bbl
Saudi Arabia	0
Iran	0
Iraq	0.91
Russia	8.44
Indonesia	1.55
US conv	5.03
Norway	0.19
US shale	6.42
Canada	2.48
Venezuela	10.48
Nigeria	4.11

Brazil
UK

6.66
0

60 60 60 60 60 60 60 60 60

2032	2033	2034	2035	2036	2037	2038	2039	2040
0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.0	0.0
0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.0	0.0
0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0
1.3	1.3	1.3	1.2	1.2	1.1	1.1	0.0	0.0

9 9 9 9 9 9 9 9 9

2032	2033	2034	2035	2036	2037	2038	2039	2040
0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	0	0
9.90	9.90	9.90	9.90	9.90	9.90	9.90	#####	#####

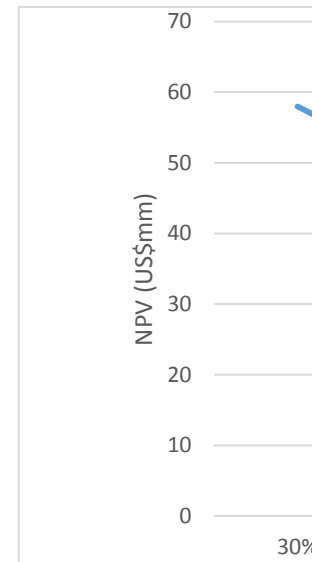
WACC Calculation

Risk Free Rate	1.50%	
Corporate Interest Rate	5.00%	
Equity market return	11.00%	
Company Beta	1.2	
Corporate Tax Rate	20%	
Debt:Equity Split	Debt 40%	Equity 60%
Cost of Debt	4.00%	
Cost of Equity	12.90%	
WACC	9.34%	

Sensitivities

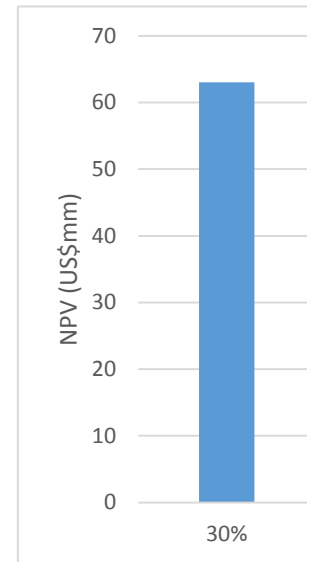
Oil Price

	NPV
30%	58
15%	46
0%	34
-15%	22
-30%	10



Production

	NPV
30%	63
15%	48
0%	34
-15%	20
-30%	5



Capex

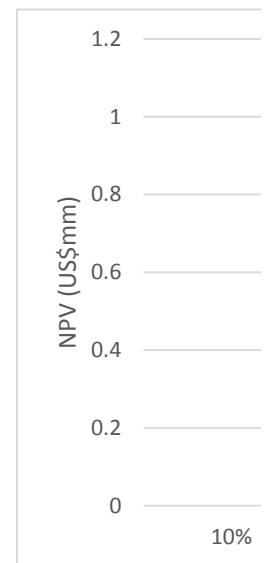
	NPV
30%	32
15%	33
0%	34
-15%	35
-30%	36

Opex

	NPV
30%	21
15%	27
0%	34
-15%	41
-30%	47

Corporate Tax Rate

	NPV
10%	
15%	
20%	
25%	
30%	

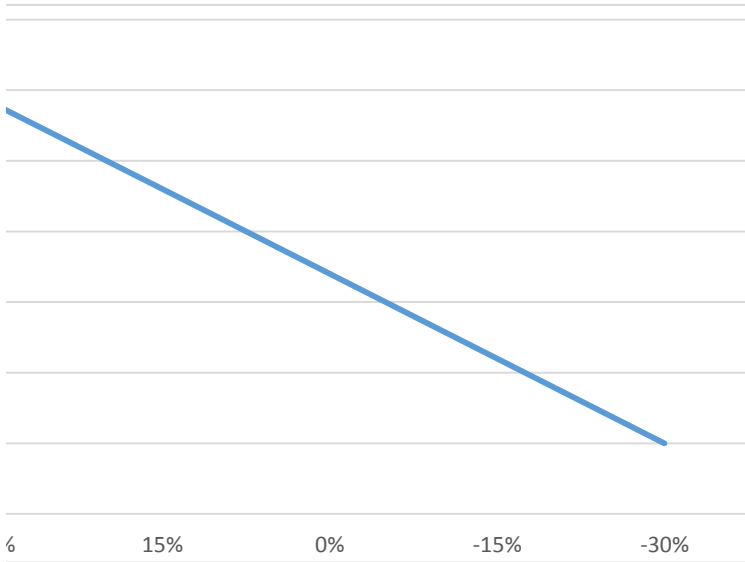


Discount Rate

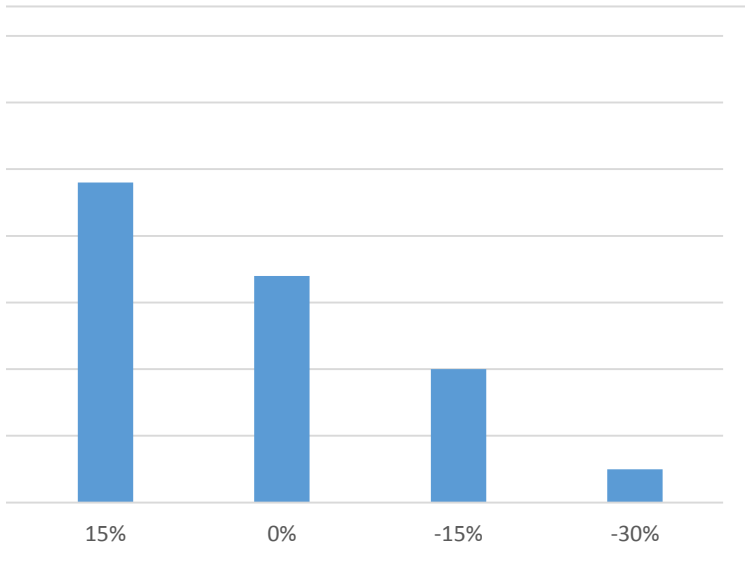
	NPV
5.0%	
7.5%	
10.0%	
12.5%	
15.0%	

Summary

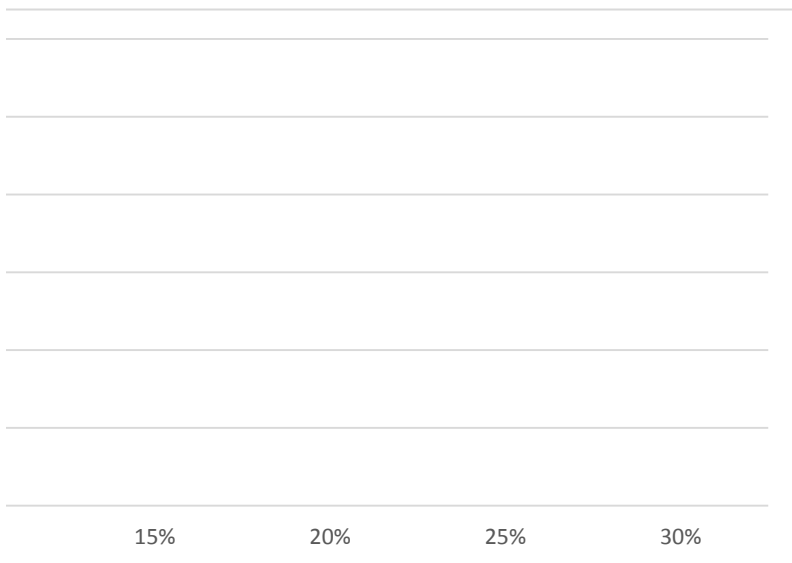
	Oil Price	Production Capex	Opex	Corp Tax	Disc. Rate	
Downside	10	5	32	21	0	0
Low	22	20	33	27	0	0
Base	34	34	34	34	0	0
High	46	48	35	41	0	0
Upside	58	63	36	47	0	0



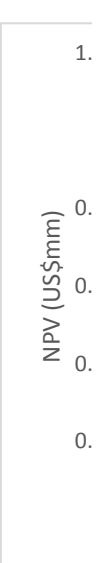
Oil Price

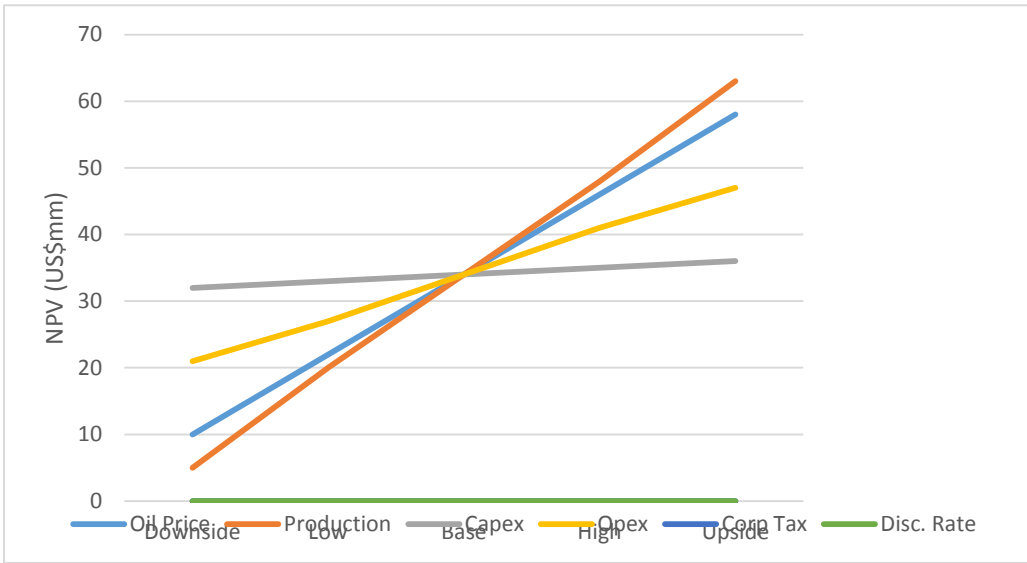


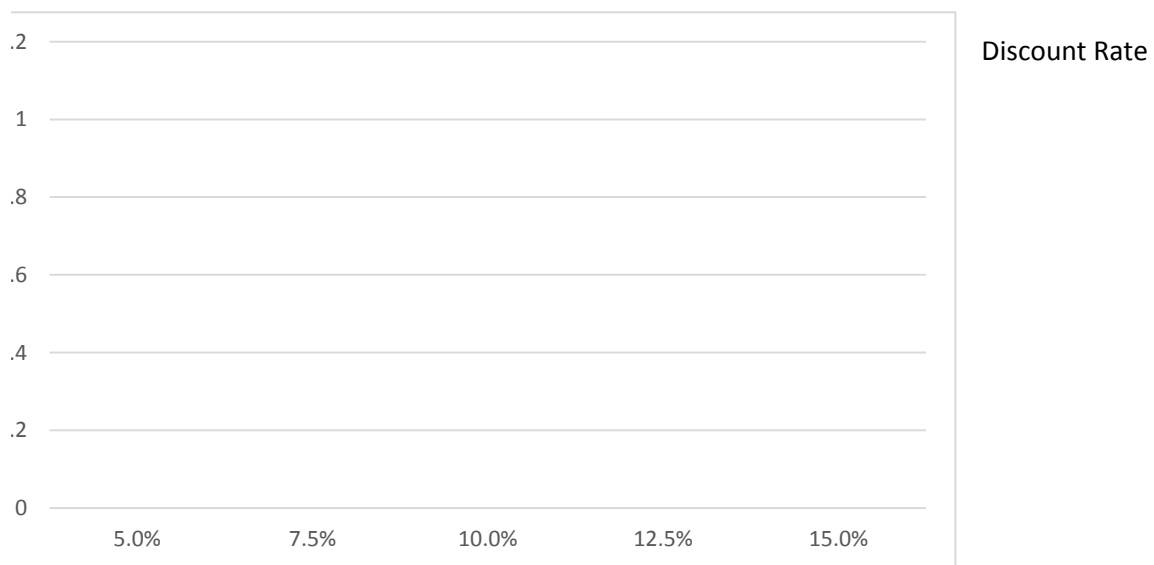
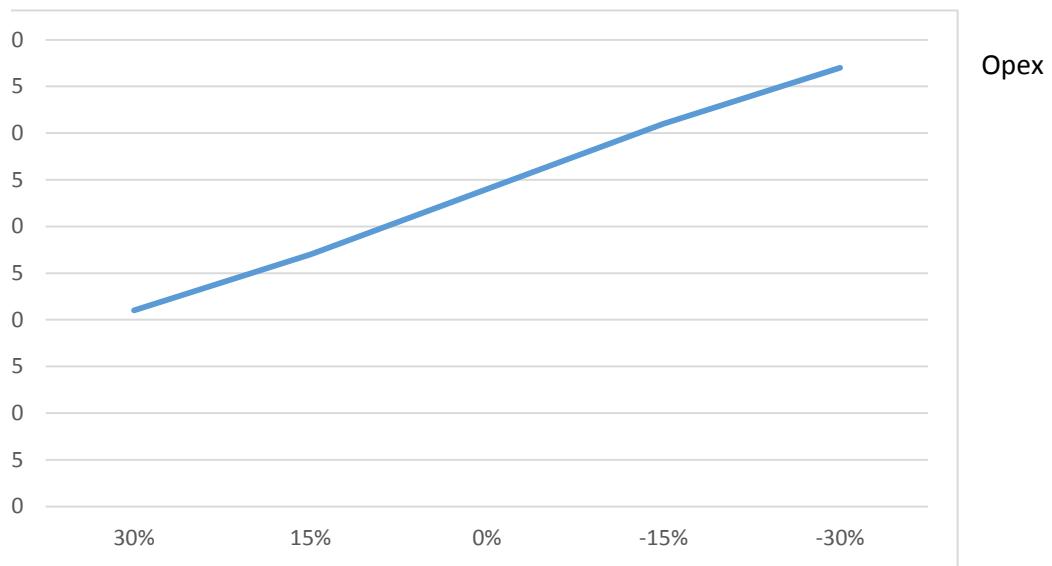
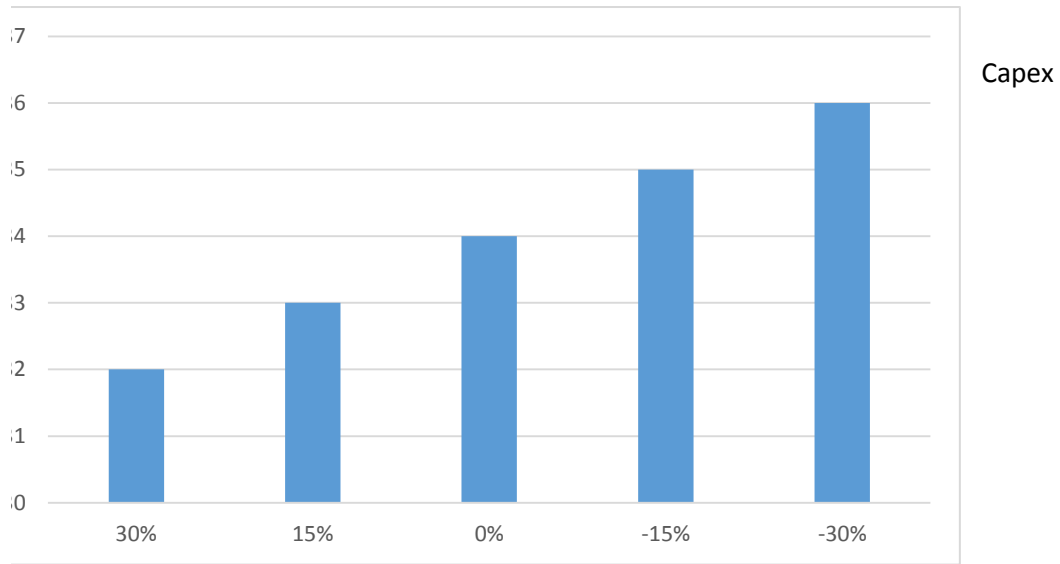
Production



Tax Rate







PSA Regime

	2017	2018	2019	2020	2021	2022	2023
Company Revenues	0	0	39	14	8	6	5
Operating Costs	0	0	-11	-4	-2	-2	-1
Transport Costs	0	0	-5	-2	-1	-1	-1
Operating Taxes	0	0	0	0	0	0	0
EBITDA	0	0	23	8	5	4	3
Depreciation	0	0	-15.4494	-5.40728	-3.24437	-2.43328	-2
EBIT	0	0	8	3	2	1	1
Tax on EBIT <i>Corporate Tax Rate</i>	0 20%	0	-1.55037	-0.54263	-0.32558	-0.24418	0
Post tax cashflow	0	0	22	8	5	3	3
CAPEX	0	-40	-2.5	-2.5	-2.5	-2.5	0
Free Cashflow (FCF)	0	-40	19	5	2	1	3
Cumulative FCF	0	-40	-21	-16	-14	-13	-10
Discount Rate	10%						
Discount Factor	1.10	1.21	1.33	1.46	1.61	1.77	1.95
Discounted Cashflow (DCF)	0	-33	14	3	1	1	1
NPV (\$mm)	-4						
IRR (%)	7%						

Revenue Calculation

	Company	Govt					
Cost Oil	80%						
Profit Oil	50%	50%					
	2017	2018	2019	2020	2021	2022	2023
Total Revenues	0	0	79	28	17	12	9
Govt Royalty	0	0	1	0	0	0	0
Taxable Revenues	0	0	78	27	16	12	9

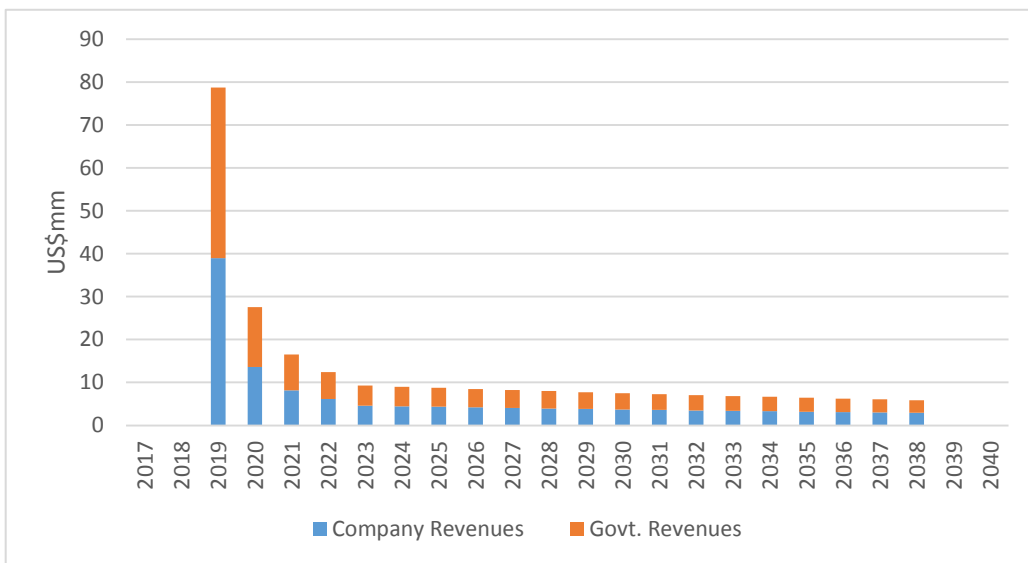
Cost Oil

80% of Revenues	0	0	62	22	13	10	7
Accumulated Cost Oil		0	62	84	97	107	114
Annual Costs		-40	-18	-8	-6	-5	-2
Accumulated Costs		-40	-58	-66	-72	-77	-79
Payback		0	4	18	25	30	36
		0	1	1	1	1	1
Cost Oil to Company	0	0	0	0	0	0	0
Profit Oil	0	0	78	27	16	12	9
Profit Oil							
Company	0	0	39	14	8	6	5
Govt	0	0	39	14	8	6	5
Total Company Revenues	0	0	39	14	8	6	5
	2017	2018	2019	2020	2021	2022	2023
Company Revenues	0	0	39	14	8	6	5
Govt. Revenues	0	0	40	14	8	6	5

2024	2025	2026	2027	2028	2029	2030	2031	2032
4	4	4	4	4	4	4	4	4
-1	-1	-1	-1	-1	-1	-1	-1	-1
-1	-1	-1	-1	-1	-1	-1	0	0
0	0	0	0	0	0	0	0	0
3	3	3	2	2	2	2	2	2
-2	-2	-2	-2	-2	-2	-1	-1	-1
1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0
2	2	2	2	2	2	2	2	2
0	0	0	0	0	0	0	0	0
2	2	2	2	2	2	2	2	2
-8	-5	-3	-1	1	4	6	8	10
2.14	2.36	2.59	2.85	3.14	3.45	3.80	4.18	4.59
1	1	1	1	1	1	1	0	0

2024	2025	2026	2027	2028	2029	2030	2031	2032
9	9	8	8	8	8	8	7	7
0	0	0	0	0	0	0	0	0
9	9	8	8	8	8	7	7	7

7	7	7	7	6	6	6	6	6
122	129	135	142	148	154	160	166	172
-2	-2	-2	-2	-2	-2	-2	-1	-1
-81	-83	-84	-86	-87	-89	-91	-92	-93
41	46	51	56	61	65	70	74	78
1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0
9	9	8	8	8	8	7	7	7
4	4	4	4	4	4	4	4	4
4	4	4	4	4	4	4	4	4
4	4	4	4	4	4	4	4	4
2024	2025	2026	2027	2028	2029	2030	2031	2032
4	4	4	4	4	4	4	4	4
5	4	4	4	4	4	4	4	4



2033	2034	2035	2036	2037	2038	2039	2040
3	3	3	3	3	3	0	0
-1	-1	-1	-1	-1	-1	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
2	2	2	2	2	2	0	0
-1	-1	-1	-1	-1	-1	0	0
1	1	1	1	1	1	0	0
0	0	0	0	0	0	0	0
2	2	2	2	2	2	0	0
0	0	0	0	0	0	0	0
2	2	2	2	2	2	0	0
11	13	15	17	18	20	20	20
5.05	5.56	6.12	6.73	7.40	8.14	8.95	9.85
0	0	0	0	0	0	0	0

2033	2034	2035	2036	2037	2038	2039	2040
7	7	6	6	6	6	0	0
0	0	0	0	0	0	0	0
7	7	6	6	6	6	0	0

5	5	5	5	5	5	0	0
177	182	187	192	197	202	202	202
-1	-1	-1	-1	-1	-1	0	0
-95	-96	-97	-99	-100	-101	-101	-101
82	86	90	94	97	101	101	101
1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0
7	7	6	6	6	6	0	0
3	3	3	3	3	3	0	0
3	3	3	3	3	3	0	0
3	3	3	3	3	3	0	0
2033	2034	2035	2036	2037	2038	2039	2040
3	3	3	3	3	3	0	0
3	3	3	3	3	3	0	0

Exploration Well Analysis

Chance of Success	33%
Cost of Well	5 US\$mm
NPV of Success	34
Dry Hole	-3.4
Successful Well	11
EMV	8

Questions

Real and Nominal

	2018	2019	2020	2021	2022	2023
Q1	100	102.5	105.1	107.7	110.4	113.1

Q2

	2018	2019	2020	2021	2022	2023
Real	60	60	60	60	60	60
Nominal	60	61.20	62.42	63.67	64.95	66.24

Inflation 2%

Real +1%	60	60.60	61.21	61.82	62.44	63.06
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NPV and DCF

Q1

	2018	2019	2020	2021	2022	2023	2024	2025
US\$m	100	100	100	100	100	100	100	100
Discount factor	1.10	1.21	1.33	1.46	1.61	1.77	1.95	2.14
Discount Rate	10%							
DCF	91	83	75	68	62	56	51	47
NPV	614							
NPV Excel	614							

Q2

	2018	2019	2020	2021	2022	2023	2024	2025
Capex	-187.5	-187.5	-187.5	-187.5	-187.5			
Cashflow						100	150	200
Net Cashflow	-188	-188	-188	-188	-188	100	150	200
Discount Factor	1.1	1.21	1.33	1.46	1.61	1.77	1.95	2.14
Discount Rate	10%							
DCF	-170	-155	-141	-128	-116	56	77	93
NPV	381							
NPV Excel	381							
IRR	16%							
Cost Inflation	1.25							

2026	2027
100	100
2.36	2.59
42	39

2026	2027	2028	2029	2030	2031	2032	2033	2034
250	300	300	300	300	300	300	270	243
250	300	300	300	300	300	300	270	243
2.36	2.59	2.85	3.14	3.45	3.80	4.18	4.59	5.05
106	116	105	96	87	79	72	59	48

2035	2036	2037
219	197	177
219	197	177
5.56	6.12	6.73
39	32	26

Time Value of Money

	At Jan 1						
	2018	2019	2020	2021	2022	2023	2024
US\$	100						
US\$						100	
US\$							
Interest Rate	3%	3%	3%	3%	3%	3%	3%
Multiplier	1.03	1.06	1.09	1.13	1.16	1.19	1.23

Real versus Nominal

Costs	At Dec 31						
	2018	2019	2020	2021	2022	2023	2024
US\$ Nominal	1	1	1.00	1.00	1.00	1.00	1.00
Inflation Rate	0%	0%	0%	0%	0%	0%	0%
Multiplier		1	1.00	1.00	1.00	1.00	1.00

Money available

100

Chocolate Bars

Money Invested

100.0

Chocolate Bars	100.0	0.0	0.0	0.0	0.0	0.0	0.0
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US\$ Real (2018)

Money Available
Cost of Choc Bar

2025	2026	2027	2028
------	------	------	------

			100
--	--	--	-----

3%	3%	3%	
1.27	1.30	1.34	

2025	2026	2027	2028
1.00	1.00	1.00	1.00

0%	0%	0%	0%
1.00	1.00	1.00	1.00

0.0

0.0

0.0

0.0

Example Discounted Cashflow

Example 1

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	
Cashflow	0	0	0	0	0	0	0	0
Discount Factor								
Discounted Cashflow								
NPV	0.0							
Discount Rate	0%							
Excel Calculation	0.0							

Example 2

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	
Capital Cost	-100	-100	-100					
Revenue				30	60	120	150	
Operating Cost				-5	-5	-5	-5	
Net Cashflow	-100	-100	-100	25	55	115	145	
Discount Factor	1.08	1.17	1.26	1.36	1.47	1.59	1.71	
Discounted Cashflow	-92.6	-85.7	-79.4	18.4	37.4	72.5	84.6	
NPV	173.2							
Discount Rate	8%							
IRR	18.66%							
Excel Calculation	173.2							

Year 8	Year 9	Year 10
0	0	0

Year 8	Year 9	Year 10
150	150	150
-5	-5	-5
145	145	145
1.85	2.00	2.16
78.3	72.5	67.2