

The VoLo Foundation Climate Risk Rankings



Oil and Gas Industry 2018

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INTRODUCTION

Climate change poses one of the most substantial but least analyzed long-term investment risks.

Goldman Sachs Research

With the costs of climate change now visible and rising, investors now are becoming increasingly active and engaged on the issue of climate-related financial risk.

To date, little has been done to provide clear, consistent and comparable information that would allow market participants to appropriately model potential climate-related financial risk.

In an effort to "promote more informed decisions related to climate risk," the Task Force on Climaterelated Financial Disclosure (TCFD), chaired by Michael Bloomberg, has developed a series of recommendations designed to help investors, lenders, and insurance underwriters better understand how climate change is likely to impact a company's future financial position.

One of the principal recommendations made by the TCFD is to encourage companies to include a so-called **"2°C scenario analysis"** in their financial disclosures.

The 2°C scenario would lay out a pathway and an emissions trajectory for each sector that is consistent with holding the increase in the average temperatures to 2 degrees Celsius.

To assess the implications of the TCFD's recommendations, the VoLo Foundation has developed a unique approach for assessing the relative potential impact of a 2°C scenario on large oil and gas companies, based on company-specific production curves.

The VoLo Foundation approach ranks the 50 largest oil and gas companies based on the impacts to a company's asset values from declining oil and natural gas demand curves consistent with achieving internationally agreed objectives on climate change, air quality, and universal access to modern energy under the IEA's Sustainable Development Scenario.



OVERVIEW

Under the VoLo Foundation approach, a company's exposure to climate-related financial risk is measured by looking at potential changes to a company's asset values under oil and gas demand curves consistent with the International Energy Agency (IEA)'s Sustainable Development Scenario (SDS) where demand for oil is expected to decline by 31.5% and natural gas declines by 20.5% relative to business as usual (BAU) assumptions by 2040.



Source: International Energy Agency, WEO 2017

The Sustainable Development Scenario is used by Chevron in their climate change resilience framework as the reference 2°C case scenario and is also referred to in this study as the reference 2°C case.

In order to create climate risk profiles and rankings for the 50 largest private oil and gas companies, the VoLo Foundation combines the production data from the IEA with granular field-level data from the Wood Mackenzie Upstream Data Tool using the following three step approach:

Step 1	Create a business as usual (BAU) profile
Step 2	Create a Sustainable Development Scenario (2°C) profile
Step 3	Compare asset values under the BAU and 2°C Scenarios

EXAMPLE 2°C PROFILE – EXXON MOBIL

Step 1 Create a Business as Usual (BAU) Company Profile

The Business as Usual (BAU) company profile includes estimates for oil and gas production, spending, cash flows and the net present value (NPV) of all upstream projects under the IEA's New Policy Scenario (NPS) case.

As an example, under the IEA's NPS business as usual scenario, Exxon Mobil is forecast to produce 41.6trln BOE of liquids and gas through 2064, generating total net cash flows of \$619.28bln with a net present value of \$162.37bln.



Source: Wood Mackenzie Upstream Data Tool Q4 2017

Step 2 Create a 2°C scenario Company Profile

The VoLo Foundation 2°C company profile includes estimates for oil and gas production, spending, cash flows and the net present value (NPV) of all projects based on the relative changes in oil and gas demand under the IEA's Sustainable Development Scenario (SDS) case where temperatures rise less than 2°C in accord with the global climate change agreement.



Under the 2°C Low Risk scenario, Exxon Mobil would be estimated to produce 36.6trln BOE of oil and gas (which uses the same oil and gas price curves used in the BAU profile), generating \$521bln in net cash flows with a net present value of \$147bln. Under the 2°C High Risk Case, which uses a Low Price oil and gas assumptions) production would also be 36.6bln BOE and net cash flows would decline to \$189bln with a net present value of \$52bln as shown in Fig. 7 and Fig. 8¹.



Source: IEA WEO 2017, Wood Mackenzie Upstream Data Tool Q4 2017, VoLo Foundation estimates

Step 3 Lastly, the net present value of assets (NPV) under the BAU profile and the net present value of assets under the 2°C profile are compared using a new metric

called the Climate Risk Ratio. The Climate Risk Ratio is used to estimate the percentage of a company's assets that could be exposed to reduced oil and gas production under a 2°C scenario. For example, Exxon Mobil's Climate Risk Ratio of 9.35% is calculated as follows:

Figure 9: Climate Risk Ratio Calculation – Exxon Mobil						
Climate Risk Ratio				NPV of Assets under 2°C Scenario		NPV of Assets under BAU Scenario
9.35%	=	100%	-	\$147.21bln	/	\$162.37bln

A 9.35% Climate Risk Ratio implies that around 9% of Exxon Mobil's assets could be exposed to under a 2°C scenario Low Risk Case where demand declines relative to current BAU projections.

The VoLo Foundation also uses this Climate Risk Ratio to compare companies against their peers from lowest to highest exposure to climate-related financial risk. Under this framework, Exxon Mobil ranks 25 out of the 50 companies reviewed.

¹ Assumes all net production and net cash flows beyond 2040 are reduced at the same percentages as for the year 2040

Box 1: What about the decline rate argument?

Exxon Mobil and Chevron have both recently issued updated 2°C climate risk reports.

According to Exxon Mobil, the company's reserves face "little risk" of being left in the ground even under aggressive climate policies as "the decline rate for oil fields is forecasted to greatly exceed the decline in global oil demand even under the average 2°C case scenario."

While Chevron's analysis was far more detailed in its assessment of the company's climaterelated financial risks, the report also concluded that while "lower demand under the SDS 2°C case implies that less supply is required," the fact that natural decline rates even under the SDS will create a supply gap to 15mpbd in 2040 means that "investments in the most competitive assets would still be needed."

Under the VoLo Foundation approach, where all companies are assumed to reduce production equally, companies like Exxon Mobil and Chevron would be exposed to impacts on their upstream assets of between 8-9.5% under a 2°C Low Risk Case.

However, under a scenario where national oil companies like Saudi Aramco are given priority to produce from their existing reserve base, the VoLo Foundation estimate would likely be considered a conservative outcome for companies like Exxon Mobil and Chevron.

As can be seen from the graph below, which shows production curves for the five largest state-owned oil and gas companies, adjusted for the shared declines under the VoLo Foundation 2°C framework, these companies are left with a 13.6 million barrel per day supply gap relative to their peak.

A 13.6 million barrel per day supply gap for these five companies alone would be enough to cover 90% of the existing 15 million barrel per day supply gap and would likely create significant headwinds for additional private sector production going forward.



Source: IEA WEO 2017, Wood Mackenzie Upstream Data Tool Q4 2017, Chevron Climate Change Resilience, VoLo Foundation estimates

2°C SCENARIO – MACRO RESULTS

The VoLo Foundation framework for the oil and gas industry highlights several potential climate-related financial risks associated with production, net cash flows, asset values, and debt coverage ratios.

Production

Under the 2°C scenario, global production plans would be 14.5% lower for liquids and 7.2% lower for gas relative to what is consumed under the BAU assumptions until 2040.



Source: IEA WEO 2017, Wood Mackenzie Upstream Data Tool Q4 2017, VoLo Foundation estimates

Net Cash Flows*

Net cash flows from reduced production assumptions under the 2°C risk scenario for the 50 largest private oil and gas companies would decline by 15% under the 2°C Low Risk Case and by 62.5% under the 2°C High Risk Case as shown in Fig. 13.



Source: VoLo Foundation estimates, IEA WEO 2017, Wood Mackenzie Upstream Data Tool Q4 2017

* Net Cash Flows = Net Revenues - Opex - Capex - Government Royalties - Government Take

Net Asset Values

Using a 10% discount rate, the net asset value of all currently commercial projects through 2064 stands at around \$2.06 trillion using BAU assumptions. Under the 2°C Low Risk Case scenario the NPV would be expected to decline by around 9% to \$1.87trln and by around 63% to \$762bln under the 2°C scenario High Risk Case scenario as shown in Fig. 14.



Source: VoLo Foundation estimates, IEA WEO, Wood Mackenzie Upstream Data Tool Q4 2017

Debt Coverage Ratios

According to Bloomberg, the oil and gas industry currently has just over \$1 trillion in debt with nearly \$28 billion longer than 50 years. As these debt obligations are largely backed by future cash flows from oil and gas projects, a reduction in cash flows under a 2°C scenario would be expected to raise debt coverage ratios and in some cases impede a given company's ability to pay back its debts.



KEY MACRO TAKEAWAYS

- 1. According to IEA's 2°C (SDS) case, oil demand would need to decline by 30.5% and natural gas demand would need to fall by 20.5% relative to business as usual in 2040 to keep temperatures safe. A reduction in demand that could have a material impact on the production plans of oil and gas companies over time.
- 2. The VoLo Foundation estimates that asset values for the 50 largest private oil and gas companies could decline from around \$2.06trln under a BAU case to around \$1.87trln under a 2°C Low Risk Case and \$762bln under a 2°C High Risk Case.
- 3. Under the VoLo Foundation 2°C scenario approach, which includes detailed company-specific oil and gas production analysis for the world's largest private oil and gas companies, companies with *shorter duration and lower cost basis portfolios* are likely to have lower climate-related financial risk than companies with longer duration and higher cost basis portfolios.
- 4. Company risk assessments assume that natural decline rates for oil and gas production will allow them to continue to develop the overwhelming majority of their reserve base; however, this may underestimate how national oil companies will respond to an estimated 27 million barrel per day narrowing of the oil supply gap.
- 5. While most of the oil and gas industry's \$1trln of debt is short-dated and manageable, companies with debt obligations that extend beyond 2040 are more likely to have higher climate-related financial risk under a 2°C risk case.

2C SCENARIO METHODOLOGY

The following section outlines the methodology used by the VoLo Foundation to rank companies exposure to climate-related financial risk under a 2°C Scenario.

As part of the analysis, granular field level data from Wood Mackenzie's Upstream Data Tool is used to compare net revenues, net cash flows, and the net present value of assets under two scenarios; 1) the IEA's business as usual New Policy Scenario (NPS) and 2) the IEA's 2°C Sustainable Development Scenario (SDS).

Under the IEA's NPS Scenario, the IEA outlines a pathway for global energy production until 2040 consistent with current business as usual consumption trends. Under the IEA's SDS Scenario, the IEA outlines a pathway for global energy production until 2040 consistent with a limiting concentrations of CO2 in the atmosphere to 450 parts per million by the end of the century. According to the IPCC, this level of emissions is expected to provide a **50% chance of keeping temperatures from rising more than 2 degrees Celsius above pre-industrial levels by the end of the century.**

Both the New Policy (business as usual) Scenario and the Sustainable Development (2°C) Scenario cases model total energy production, including oil and gas production until 2040 consistent with their respective climate pathways as shown below in Fig. 16 and Fig. 17:







Source: International Energy Agency, WEO 2017

As can be seen below in Fig.18, the production curve for oil under the IEA's 2°C scenario needs to slow sooner than the production curve for natural gas. This is primarily due to the **need to increase natural gas production over the short-term** as the global economy looks to transition away from using coal as a primary energy source.



Source: IEA WEO 2017, Wood Mackenzie Upstream Data Tool Q4 2017, VoLo Foundation estimates

BAU Scenario Analysis

Under the NPS or BAU Scenario, all commercial oil and gas projects are fully developed and net production, net revenues, net cash flows, and the net present value of assets are consistent with the oil and gas price assumptions used by the Wood Mackenzie Upstream Data Tool Base Case through the year 2064.

2°C Scenario Analysis

Under 2°C Scenario, two climate-related risk cases were generated using the Wood Mackenzie Upstream Data Tool: a **Low Risk Case** and a **High Risk Case**. Both cases use the changes in oil and natural gas demand under IEA's SDS relative to the IEA's NPS until 2040 and then all years beyond 2040 use reductions for the year 2040.

The **2°C Low Risk Case** models climate risk impacts assuming production, spending, and net cash flows decline in line with the IEA's Sustainable Development Scenario (SDS) oil and gas demand curves relative to the business as usual case using oil and gas prices consistent with the Wood Mackenzie Base Case price curves.

The **2°C High Risk Case** also models climate risk assuming that production, spending, and net cash flows declines in line with the IEA's 2°C oil and gas production curves but also assumes oil and gas prices fall relative to the Base Case using the Wood Mackenzie Low Price Case scenario as shown in Fig. 19 and Fig. 20:



Source: Wood Mackenzie Upstream Data Took Base Case and Low Case Oil and Gas Price Forecasts Q4 2017

The Climate Risk Ratio

After calculating the net production, net revenue, net cash flow, and net present value of assets under BAU and 2°C Scenarios, the Climate Risk Ratio for each company is then calculated by dividing the net present value (NPV) of assets under the 2°C Low Risk Climate Case by the NPV of assets under the BAU Case and then subtracting this percentage of project value preserved under the 2°C from 100% of project value as shown below:

NPV of Assets under IEA's 2°C Low Risk Case Climate Risk Ratio = 100% -

NPV of Assets under IEA's BAU Scenario

The Climate Risk Ratio is then used in order to compare companies within the oil and gas industry based on the value of assets expected to be at risk.

Note that only the 2C Low Risk Case Scenario is used for determining the Climate Risk Ratio used in the rankings while both Climate Risk Ratios are provided in the detailed company analysis in the final section of this report. THE CLIMATE RISK RANKINGS

THE VOLO FOUNDATION CLIMATE RISK RANKINGS

Climate Risk	Component	Climate Risk
Ranking	Company	Ratio
1	Origin Energy	3.15%
2	Ecopetrol	3.56%
3	Santos	3.66%
4	INPEX Corporation	5.39%
5	KOGAS	5.44%
6	Eni	6.65%
7	Woodside Petroleum Investo	6.70%
8	Repsol	6.92%
9	OMV	7.03%
10	Private Investors	7.14%
11	Encana Corporation	7.18%
12	Total	7.28%
13	Cabot Oil & Gas	7.46%
14	Shell	7.68%
15	Murphy Oil	7.74%
16	BHP Billiton	7.91%
17	BP	8.20%
18	Chevron	8.21%
19	Statoil	8.44%
20	Range Resources Corp	8.70%
21	Kosmos Energy	8.72%
22	Southwestern Energy	8.87%
23	LUKOIL	8.94%
24	Conoco Phillips	9.06%
25	Exxon Mobil	9.35%

* Climate Risk Ratio represents an estimate of possible "at risk" asset values under a 2°C scenario

THE VOLO FOUNDATION CLIMATE RISK RANKINGS

Climate Risk	Company	Climate Risk Ratio
26	Gazorom	9 41%
20	Petrobras	9 92%
28	Apache	10.03%
29	IAPEX	10.15%
30	Oil India	10.56%
31	Noble Energy	10.59%
32	Hess Corporation	10.59%
33	Marathon Oil	10.69%
34	Glencore	10.70%
35	Rosneftegaz	10.83%
36	Husky Energy	10.84%
37	Anadarko	11.07%
38	Tullow Oil	11.09%
39	EOG Resources	11.22%
40	Devon Energy	11.27%
41	Chesapeake Energy	11.31%
42	Occidental Petroleum	11.62%
43	Suncor Energy	12.08%
44	Newfield Exploration	12.50%
45	Canadian Natural Resources	12.57%
46	Cenovus Energy	13.41%
47	Continental Resources	14.09%
48	California Resources	14.22%
49	Pioneer Natural Resources	14.45%
50	Denbury Resources	15.86%

* Climate Risk Ratio represents an estimate of possible "at risk" asset values under a 2°C scenario

DETAILED COMPANY ANALYSIS

Anadarko

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	2,821,972	2,573,941	2,573,941
Liquids	4,297,313	3,726,729	3,726,729
Total	7,119,285	6,300,670	6,300,670
Cash Flow (bln)			
Total Net Cashflow ⁴	\$116.99	\$98.47	\$47.88
Net Present Value (NPV) ⁵	\$34.36	\$30.55	\$11.02
Climate Risk Ratio = 1 - (NP)	V 2℃ / NPV BAU)	11.07%	67.93%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve 3. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve 4. Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

Net Production

5. Calculated using a 10% discount rate

6. Ranking is from lowest to highest exposure



Net Cash Flow

Apache

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	1,080,068	1,016,702	1,016,702
Liquids	2,037,631	1,793,070	1,793,070
Total	3,117,699	2,809,772	2,809,772
Cash Flow (bln)			
Total Net Cashflow ⁴	\$32.28	\$27.36	\$8.94
Net Present Value (NPV) ⁵	\$10.08	\$9.07	\$0.58
Climate Risk Ratio = 1 - (NPV 2	$^{ m C}$ / NPV BAU)	10.03%	94.25%

Climate Risk Ranking⁶

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5. Calculated using a 10% discount rate

kboe/day

6. Ranking is from lowest to highest exposure



Gas 2C

Liquid 2C

BAU



Net Cash Flow

BHP Billiton

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	3,156,662	2,924,103	2,924,103
Liquids	2,190,168	1,895,433	1,895,433
Total	5,346,830	4,819,536	4,819,536
Cash Flow (bln)			
Total Net Cashflow ⁴	\$69.84	\$61.43	\$33.14
Net Present Value (NPV) ⁵	\$23.42	\$21.57	\$10.52
Climate Risk Ratio = 1 - (NP)	V 2℃ / NPV BAU)	7.91%	55.11%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

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5. Calculated using a 10% discount rate

6. Ranking is from lowest to highest exposure



Net Cash Flow

BP

	Business as Usual (BAU) Assessment ¹	2°C Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	14,111,177	13,041,580	13,041,580
Liquids	18,456,185	15,883,543	15,883,543
Total	32,567,362	28,925,123	28,925,123
Cash Flow (bln)			
Total Net Cashflow ⁴	\$358.63	\$310.08	\$148.12
Net Present Value $(NPV)^5$	\$117.50	\$107.86	\$53.30
Climate Risk Ratio = 1 - (NP	V 2° C / NPV BAU)	8.20%	54.64%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve 3. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve 4. Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

5. Calculated using a 10% discount rate

6. Ranking is from lowest to highest exposure

kboe/d





Net Cash Flow

Cabot Oil & Gas

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	4,985,378	4,553,281	4,553,281
Liquids	270,575	232,295	232,295
Total	5,255,953	4,785,576	4,785,576
Cash Flow (bln)			
Total Net Cashflow ⁴	\$29.42	\$25.76	\$16.57
Net Present Value (NPV) ⁵	\$7.41	\$6.86	\$3.78
Climate Risk Ratio = 1 - (NPV	2℃ / NPV BAU)	7.46%	49.07%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve 3. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve 4. Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

13/50

5. Calculated using a 10% discount rate



California Resources

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	272,761	253,835	253,835
Liquids	1,077,454	901,139	901,139
Total	1,350,215	1,154,974	1,154,974
Cash Flow (bln)			
Total Net Cashflow ⁴	\$21.29	\$16.87	\$5.48
Net Present Value (NPV) ⁵	\$5.13	\$4.40	\$0.67
Climate Risk Ratio = 1 - (NP	V 2°C / NPV BAU)	14.22%	86.95%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve
 Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

5. Calculated using a 10% discount rate

6. Ranking is from lowest to highest exposure



Net Cash Flow

Canadian Natural Resources

	Business as	2℃ Climate	2℃ Climate
	Usual (BAU)	Agreement Low	Agreement High
	Assessment ¹	Risk Case ²	Risk Case ³
Production (kboe)			
Gas	2,009,117	1,899,811	1,899,811
Liquids	8,728,106	7,192,647	7,192,647
Total	10,737,223	9,092,458	9,092,458
Cash Flow (bln)			
Total Net Cashflow ⁴	\$153.07	\$120.57	\$14.13
Net Present Value (NPV) ⁵	\$35.89	\$31.38	\$1.56
Climate Risk Ratio = 1 - (NP)	/ 2℃ / NPV BAU)	12.57%	95.65%

Climate Risk Ranking⁶

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5. Calculated using a 10% discount rate

6. Ranking is from lowest to highest exposure

Net Production



Net Cash Flow



Cenovus Energy

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	746,940	717,497	717,497
Liquids	4,935,818	4,182,874	4,182,874
Total	5,682,758	4,900,371	4,900,371
Cash Flow (bln)			
Total Net Cashflow ⁴	\$74.78	\$60.68	\$3.07
Net Present Value $(NPV)^5$	\$19.96	\$17.29	-\$0.72
Climate Risk Ratio = 1 - (NP	V 2℃ / NPV BAU)	13.41%	103.63%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

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Net Production

5. Calculated using a 10% discount rate

6. Ranking is from lowest to highest exposure



Net Cash Flow

Chesapeake Energy

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	8,716,959	7,865,055	7,865,055
Liquids	1,725,158	1,484,613	1,484,613
Total	10,442,117	9,349,669	9,349,669
Cash Flow (bln)			
Total Net Cashflow ⁴	\$64.05	\$53.66	\$27.05
Net Present Value (NPV) ⁵	\$13.59	\$12.05	\$2.75
Climate Risk Ratio = 1 - (NPV	/ 2℃ / NPV BAU)	11.31%	79.79%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve 3. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve 4. Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

41/50

5. Calculated using a 10% discount rate



Chevron

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	12,376,464	11,230,446	11,230,446
Liquids	15,649,324	13,431,879	13,431,879
Total	28,025,788	24,662,325	24,662,325
Cash Flow (bln)			
Total Net Cashflow ⁴	\$583.20	\$497.00	\$276.10
Net Present Value $(NPV)^5$	\$166.76	\$153.08	\$80.96
Climate Risk Ratio = 1 - (NPV 2°C / NPV BAU)		8 21%	51 45%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve
 Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

5. Calculated using a 10% discount rate

6. Ranking is from lowest to highest exposure



Net Production

2048

2051 2054 2057

BAU Case

2C High Risk Case

000 063

2045

2042

Net Cash Flow

Conoco Phillips

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	5,192,344	4,691,430	4,691,430
Liquids	8,034,059	6,919,011	6,919,011
Total	13,226,403	11,610,441	11,610,441
Cash Flow (bln)			
Total Net Cashflow ⁴	\$220.10	\$188.27	\$56.41
Net Present Value (NPV) ⁵	\$66.84	\$60.78	\$21.16
Climate Risk Ratio = 1 - (NPV 2℃ / NPV BAU)		9.06%	68.34%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve
 Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

5. Calculated using a 10% discount rate

6. Ranking is from lowest to highest exposure



Net Cash Flow

Continental Resources

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	2,283,480	2,059,568	2,059,568
Liquids	4,388,337	3,630,907	3,630,907
Total	6,671,817	5,690,476	5,690,476
Cash Flow (bln)			
Total Net Cashflow ⁴	\$93.82	\$75.05	\$34.24
Net Present Value (NPV) ⁵	\$18.37	\$15.78	\$2.93
Climate Risk Ratio = 1 - (NP)	V 2℃ / NPV BAU)	14.09%	84.08%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve
 Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve
 Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Opex – Government Take)

47/50

5. Calculated using a 10% discount rate



Denbury Resources

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	11,176	10,737	10,737
Liquids	775,202	655,789	655,789
Total	786,378	666,526	666,526
Cash Flow (bln)			
Total Net Cashflow ⁴	\$10.44	\$8.42	-\$0.26
Net Present Value (NPV) ⁵	\$2.75	\$2.32	-\$0.66
Climate Risk Ratio = 1 - (NPV 2° / NPV BAU)		15.86%	124.11%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve 3. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve 4. Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

5. Calculated using a 10% discount rate

6. Ranking is from lowest to highest exposure



Net Cash Flow

2048

2051

BAU Case

2C High Risk Case

054

057

2060 2063

Devon Energy

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	1,986,772	1,837,280	1,837,280
Liquids	3,697,205	3,184,847	3,184,847
Total	5,683,977	5,022,127	5,022,127
Cash Flow (bln)			
Total Net Cashflow ⁴	\$61.86	\$51.15	\$15.94
Net Present Value (NPV) ⁵	\$16.13	\$14.32	\$0.83
Climate Risk Ratio = 1 - (NPV 2℃ / NPV BAU)		11.27%	94.84%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve 3. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve

40/50

4. Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

5. Calculated using a 10% discount rate



Ecopetrol

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	412,158	404,568	404,568
Liquids	1,885,254	1,775,591	1,775,591
Total	2,297,412	2,180,159	2,180,159
Cash Flow (bln)			
Total Net Cashflow ⁴	\$16.95	\$16.68	-\$3.53
Net Present Value (NPV) ⁵	\$11.23	\$10.83	-\$0.72
Climate Risk Ratio = 1 - (NPV 2°C / NPV BAU)		3.56%	106.37%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve 3. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve 4. Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

-BAU

Liquid 2C

Gas 2C

 kboe/d

Calculated using a 10% discount rate
 Ranking is from lowest to highest exposure

Net Production



Net Cash Flow

Encana Corporation

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	2,316,542	2,168,130	2,168,130
Liquids	1,963,645	1,715,260	1,715,260
Total	4,280,187	3,883,389	3,883,389
Cash Flow (bln)			
Total Net Cashflow ⁴	\$52.64	\$46.46	\$24.59
Net Present Value (NPV) ⁵	\$16.93	\$15.71	\$6.95
Climate Risk Ratio = 1 - (NPV 2°C / NPV BAU)		7.18%	58.95%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve 3. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve 4. Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

11/50

5. Calculated using a 10% discount rate



Eni

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	6,981,034	6,507,319	6,507,319
Liquids	6,523,543	5,809,941	5,809,941
Total	13,504,577	12,317,259	12,317,259
Cash Flow (bln)			
Total Net Cashflow ⁴	\$170.63	\$152.45	\$93.17
Net Present Value $(NPV)^5$	\$62.71	\$58.55	\$33.09
Climate Risk Ratio = 1 - (NP	V 2℃ / NPV BAU)	6.65%	47.24%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve
 Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

5. Calculated using a 10% discount rate

6. Ranking is from lowest to highest exposure



Net Cash Flow



EOG Resources

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	2,913,514	2,662,119	2,662,119
Liquids	8,451,279	7,196,093	7,196,093
Total	11,364,793	9,858,212	9,858,212
Cash Flow (bln)			
Total Net Cashflow ⁴	\$178.31	\$147.23	\$74.63
Net Present Value (NPV) ⁵	\$48.42	\$42.99	\$17.38
Climate Risk Ratio = 1 - (NPV 2° / NPV BAU)		11.22%	64.09%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve
 Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve
 Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Opex – Government Take)

39/50

5. Calculated using a 10% discount rate



Exxon Mobil

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	20,417,556	18,443,819	18,443,819
Liquids	21,247,573	18,154,171	18,154,171
Total	41,665,130	36,597,990	36,597,990
Cash Flow (bln)			
Total Net Cashflow ⁴	\$619.28	\$521.34	\$189.13
Net Present Value $(NPV)^5$	\$162.37	\$147.20	\$52.69
Climate Risk Ratio = 1 - (NPV 2°C / NPV BAU)		9.35%	67.55%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve 3. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve 4. Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

6,000

5,000

4,000

3,000

2,000

1,000

0

kboe/d

5. Calculated using a 10% discount rate
 6. Ranking is from lowest to highest exposure

Net Production



Net Cash Flow

Gazprom

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	92,141,644	82,002,594	82,002,594
Liquids	19,445,236	15,987,660	15,987,660
Total	111,586,880	97,990,254	97,990,254
Cash Flow (bln)			
Total Net Cashflow ⁴	\$779.09	\$653.48	\$144.52
Net Present Value $(NPV)^5$	\$158.98	\$144.02	\$21.95
Climate Risk Ratio = 1 - (NPV	2℃ / NPV BAU)	9.41%	86.19%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve 3. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve 4. Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

26/50

5. Calculated using a 10% discount rate



Glencore

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	751,524	685,250	685,250
Liquids	2,148,423	1,795,643	1,795,643
Total	2,899,947	2,480,892	2,480,892
Cash Flow (bln)			
Total Net Cashflow ⁴	\$30.71	\$24.85	\$14.13
Net Present Value (NPV) ⁵	\$8.03	\$7.17	\$4.02
Climate Risk Ratio = 1 - (NPV 2	℃ / NPV BAU)	10.70%	49.90%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve
 Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

Net Production

5. Calculated using a 10% discount rate

6. Ranking is from lowest to highest exposure



Net Cash Flow



Hess Corporation

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	984,675	929,318	929,318
Liquids	2,740,603	2,088,410	2,088,410
Total	3,725,278	3,017,728	3,017,728
Cash Flow (bln)			
Total Net Cashflow ⁴	\$54.74	\$46.08	\$19.75
Net Present Value (NPV) ⁵	\$17.54	\$15.68	\$4.13
Climate Risk Ratio = 1 - (NP)	V 2℃ / NPV BAU)	10.59%	76.44%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve
 Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

32/50

5. Calculated using a 10% discount rate



Husky Energy

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	651,273	615,171	615,171
Liquids	1,845,345	1,581,912	1,581,912
Total	2,496,618	2,197,083	2,197,083
Cash Flow (bln)			
Total Net Cashflow ⁴	\$32.44	\$27.18	\$2.62
Net Present Value $(NPV)^5$	\$10.26	\$9.15	-\$0.12
Climate Risk Ratio = 1 - (NP		10 84%	101 19%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve
 Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve
 Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

Net Production

5. Calculated using a 10% discount rate

6. Ranking is from lowest to highest exposure



Net Cash Flow

INPEX Corporation

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	1,886,765	1,741,093	1,741,093
Liquids	2,630,015	2,235,942	2,235,942
Total	4,516,780	3,977,035	3,977,035
Cash Flow (bln)			
Total Net Cashflow ⁴	\$103.41	\$93.10	\$63.45
Net Present Value $(NPV)^5$	\$34.69	\$32.82	\$21.46
Climate Risk Ratio = 1 - (NP	V 2℃ / NPV BAU)	5.39%	38.13%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve 3. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve 4. Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

5. Calculated using a 10% discount rate

6. Ranking is from lowest to highest exposure



Net Cash Flow

JAPEX

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	169,229	156,151	156,151
Liquids	305,516	264,098	264,098
Total	474,745	420,250	420,250
Cash Flow (bln)			
Total Net Cashflow ⁴	\$4.57	\$3.84	\$0.90
Net Present Value (NPV) ⁵	\$1.46	\$1.31	\$0.27
Climate Risk Ratio = 1 - (NPV 2°C / NPV BAU)		10.15%	81.66%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve 3. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve 4. Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

29/50

5. Calculated using a 10% discount rate



	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	1,531,522	1,391,629	1,391,629
Liquids	799,259	709,831	709,831
Total	2,330,781	2,101,460	2,101,460
Cash Flow (bln)			
Total Net Cashflow ⁴	\$17.61	\$16.04	\$9.28
Net Present Value $(NPV)^5$	\$5.34	\$5.05	\$2.41
Climate Risk Ratio = 1 - (NP	V 2℃ / NPV BAU)	5.44%	54.93%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve 3. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve 4. Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

5/50

5. Calculated using a 10% discount rate



Kosmos Energy

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	357,591	316,636	316,636
Liquids	160,118	147,043	147,043
Total	517,709	463,679	463,679
Cash Flow (bln)			
Total Net Cashflow ⁴	\$8.09	\$7.23	\$3.61
Net Present Value (NPV) ⁵	\$2.83	\$2.59	\$1.06
Climate Risk Ratio = 1 - (NPV	/ 2℃ / NPV BAU)	8.72%	62.53%

Climate Risk Ranking⁶

Net Production

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve
 Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve
 Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

Calculated using a 10% discount rate
 Ranking is from lowest to highest exposure



Net Cash Flow

Lukoil

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	5,296,654	4,909,722	4,909,722
Liquids	14,208,472	12,273,101	12,273,101
Total	19,505,126	17,182,823	17,182,823
Cash Flow (bln)			
Total Net Cashflow ⁴	\$204.90	\$172.76	\$100.63
Net Present Value (NPV) ⁵	\$67.59	\$61.54	\$35.26
Climate Risk Ratio = 1 - (NPV	/ 2℃ / NPV BAU)	8.94%	47.83%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve 3. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve 4. Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

5. Calculated using a 10% discount rate

6. Ranking is from lowest to highest exposure



Net Cash Flow

Marathon Oil

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	1,663,688	1,526,160	1,526,160
Liquids	3,947,325	3,339,969	3,339,969
Total	5,611,014	4,866,129	4,866,129
Cash Flow (bln)			
Total Net Cashflow ⁴	\$73.25	\$60.85	\$27.23
Net Present Value (NPV) ⁵	\$17.86	\$15.95	\$4.26
Climate Risk Ratio = 1 - (NPV 2°C / NPV BAU)		10.69%	76.13%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve 3. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve 4. Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

5. Calculated using a 10% discount rate

800

700

600

500

300

200

100

0

2018

2021 2024 2027 2030

Gas 2C

2036

2033

kboe/d 400

6. Ranking is from lowest to highest exposure

Net Production



Net Cash Flow

Murphy Oil

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	893,352	827,684	827,684
Liquids	988,329	862,451	862,451
Total	1,881,681	1,690,135	1,690,135
Cash Flow (bln)			
Total Net Cashflow ⁴	\$22.40	\$19.91	\$8.04
Net Present Value (NPV) ⁵	\$7.04	\$6.49	\$1.68
Climate Risk Ratio = 1 - (NP	V 2°C / NPV BAU)	7.74%	76.20%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve 3. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve 4. Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

15/50

5. Calculated using a 10% discount rate



Newfield Exploration

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	647,196	593,589	593,589
Liquids	1,619,093	1,369,242	1,369,242
Total	2,266,289	1,962,831	1,962,831
Cash Flow (bln)			
Total Net Cashflow ⁴	\$29.29	\$23.81	\$10.26
Net Present Value (NPV) ⁵	\$6.99	\$6.12	\$1.20
Climate Risk Ratio = 1 - (NP)	∕ 2℃ / NPV BAU)	12.50%	82.76%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve 3. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve

44/50

4. Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

5. Calculated using a 10% discount rate



Noble Energy

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	3,362,384	3,032,471	3,032,471
Liquids	2,823,041	2,450,336	2,450,336
Total	6,185,425	5,482,807	5,482,807
Cash Flow (bln)			
Total Net Cashflow ⁴	\$72.78	\$61.57	\$31.46
Net Present Value $(NPV)^5$	\$18.85	\$16.85	\$4.74
Climate Risk Ratio = 1 - (NPV 2° / NPV BAU)		10.59%	74.85%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve
 Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's DAU price curve

4. Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

5. Calculated using a 10% discount rate

6. Ranking is from lowest to highest exposure



Net Cash Flow

Oil India

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	283 <i>,</i> 448	260,855	260,855
Liquids	667,187	570,842	570,842
Total	950,635	831,697	831,697
Cash Flow (bln)			
Total Net Cashflow ⁴	\$10.19	\$8.61	\$4.80
Net Present Value (NPV) ⁵	\$2.97	\$2.66	\$1.47
Climate Risk Ratio = 1 - (NPV 2°C / NPV BAU)		10.56%	50.62%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve 3. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve 4. Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

5. Calculated using a 10% discount rate

6. Ranking is from lowest to highest exposure



OMV

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	582,474	560,160	560,160
Liquids	1,027,139	917,721	917,721
Total	1,609,614	1,477,882	1,477,882
Cash Flow (bln)			
Total Net Cashflow ⁴	\$23.56	\$21.14	\$13.13
Net Present Value $(NPV)^5$	\$9.76	\$9.08	\$5.23
Climate Risk Ratio = 1 - (NPV 2°C / NPV BAU)		7.03%	46.39%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve
 Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

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5. Calculated using a 10% discount rate



Origin Energy

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	926,545	873,150	873,150
Liquids	20,925	19,829	19,829
Total	947,471	892,979	892,979
Cash Flow (bln)			
Total Net Cashflow ⁴	\$20.56	\$19.54	\$12.74
Net Present Value (NPV) ⁵	\$8.87	\$8.59	\$5.87
Climate Risk Ratio = 1 - (NPV 2°C / NPV BAU)		3.15%	33.76%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve 3. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve 4. Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

5. Calculated using a 10% discount rate

6. Ranking is from lowest to highest exposure



Net Production





Petrobras

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	2,250,262	2,134,423	2,134,423
Liquids	22,340,044	19,458,563	19,458,563
Total	24,590,306	21,592,987	21,592,987
Cash Flow (bln)			
Total Net Cashflow ⁴	\$381.89	\$331.63	\$138.70
Net Present Value (NPV) ⁵	\$146.48	\$131.96	\$52.34
Climate Risk Ratio = 1 - (NPV	2℃ / NPV BAU)	9.92%	64.27%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve
 Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve
 Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

5. Calculated using a 10% discount rate

6. Ranking is from lowest to highest exposure



27/50

Net Cash Flow

Pioneer Natural Resources

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	1,501,997	1,354,799	1,354,799
Liquids	5,491,184	4,592,633	4,592,633
Total	6,993,181	5,947,432	5,947,432
Cash Flow (bln)			
Total Net Cashflow ⁴	\$149.16	\$118.42	\$64.42
Net Present Value (NPV) ⁵	\$34.82	\$29.79	\$12.69
Climate Risk Ratio = 1 - (NPV 2°C / NPV BAU)		14.45%	63.57%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve
 Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve
 Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

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5. Calculated using a 10% discount rate



Private Investors

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	3,936,985	3,696,727	3,696,727
Liquids	7,764,079	6,787,026	6,787,026
Total	11,701,064	10,483,753	10,483,753
Cash Flow (bln)			
Total Net Cashflow ⁴	\$204.20	\$181.98	\$85.91
Net Present Value $(NPV)^5$	\$81.52	\$75.69	\$35.23
Climate Risk Ratio = 1 - (NPV 2° / NPV BAU)		7.14%	56.79%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve 3. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve 4. Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

5. Calculated using a 10% discount rate

6. Ranking is from lowest to highest exposure



Net Cash Flow

Range Resources Corp

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	6,241,464	5,637,823	5,637,823
Liquids	2,068,543	1,745,301	1,745,301
Total	8,310,006	7,383,124	7,383,124
Cash Flow (bln)			
Total Net Cashflow ⁴	\$42.26	\$36.47	\$17.95
Net Present Value $(NPV)^5$	\$8.25	\$7.53	\$1.25
Climate Risk Ratio = 1 - (NPV 2° / NPV BAU)		8.70%	84.86%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve
 Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve
 Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

20/50

5. Calculated using a 10% discount rate



Repsol

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	2,737,212	2,589,863	2,589,863
Liquids	2,046,610	1,794,084	1,794,084
Total	4,783,821	4,383,946	4,383,946
Cash Flow (bln)			
Total Net Cashflow ⁴	\$43.95	\$39.29	\$20.19
Net Present Value (NPV) ⁵	\$17.18	\$15.99	\$7.92
Climate Risk Ratio = 1 - (NPV 2°C / NPV BAU)		6.92%	53.87%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve 3. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve 4. Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

8/50

Calculated using a 10% discount rate
 Ranking is from lowest to highest exposure



Rosneftegaz

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	6,263,674	5,711,921	5,711,921
Liquids	18,518,757	15,427,728	15,427,728
Total	24,782,431	21,139,649	21,139,649
Cash Flow (bln)			
Total Net Cashflow ⁴	\$251.08	\$202.74	\$106.14
Net Present Value (NPV) ⁵	\$64.45	\$57.47	\$29.51
Climate Risk Ratio = 1 - (NPV	2℃ / NPV BAU)	10.83%	54.21%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve 3. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve 4. Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

5. Calculated using a 10% discount rate

6. Ranking is from lowest to highest exposure



Net Cash Flow

Santos

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	717,342	684,607	684,607
Liquids	125,016	115,150	115,150
Total	842,358	799,757	799,757
Cash Flow (bln)			
Total Net Cashflow ⁴	\$19.31	\$18.30	\$10.62
Net Present Value (NPV) ⁵	\$7.93	\$7.64	\$4.07
Climate Risk Ratio = 1 - (NPV 2°C / NPV BAU)		3.66%	48.65%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve 3. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve 4. Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

5. Calculated using a 10% discount rate

kboe/d

6. Ranking is from lowest to highest exposure





Net Cash Flow

Shell

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	21,024,394	19,172,771	19,172,771
Liquids	16,614,654	14,632,181	14,632,181
Total	37,639,048	33,804,952	33,804,952
Cash Flow (bln)			
Total Net Cashflow ⁴	\$600.49	\$524.30	\$273.68
Net Present Value (NPV) ⁵	\$190.52	\$175.90	\$85.26
Climate Risk Ratio = 1 - (NP	V 2℃ / NPV BAU)	7.68%	55.25%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve
 Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve
 Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

5. Calculated using a 10% discount rate

6. Ranking is from lowest to highest exposure





Net Cash Flow

Southwestern Energy

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	8,457,035	7,487,758	7,487,758
Liquids	1,454,094	1,160,997	1,160,997
Total	9,911,130	8,648,756	8,648,756
Cash Flow (bln)			
Total Net Cashflow ⁴	\$55.68	\$47.15	\$27.26
Net Present Value (NPV) ⁵	\$9.22	\$8.40	\$3.27
Climate Risk Ratio = 1 - (NPV 2°C / NPV BAU)		8.87%	64.50%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve 3. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve 4. Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

5. Calculated using a 10% discount rate

6. Ranking is from lowest to highest exposure





Net Cash Flow

Statoil

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	7,876,397	7,187,510	7,187,510
Liquids	6,643,391	5,919,326	5,919,326
Total	14,519,788	13,106,835	13,106,835
Cash Flow (bln)			
Total Net Cashflow ⁴	\$197.45	\$172.44	\$90.28
Net Present Value $(NPV)^5$	\$69.95	\$64.04	\$31.22
Climate Risk Ratio = 1 - (NPV 2°C / NPV BAU)		8.44%	55.37%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve 3. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve 4. Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

5. Calculated using a 10% discount rate

6. Ranking is from lowest to highest exposure





Net Cash Flow

Suncor Energy

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	14,626	13,933	13,933
Liquids	9,145,608	7,602,947	7,602,947
Total	9,160,233	7,616,880	7,616,880
Cash Flow (bln)			
Total Net Cashflow ⁴	\$93.77	\$76.00	-\$17.38
Net Present Value (NPV) ⁵	\$25.65	\$22.55	-\$5.47
Climate Risk Ratio = 1 - (NPV 2°C / NPV BAU)		12.08%	121.32%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve 3. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve 4. Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

Calculated using a 10% discount rate 5.

6. Ranking is from lowest to highest exposure



Net Cash Flow

Total

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	11,127,656	10,288,640	10,288,640
Liquids	12,357,108	10,584,118	10,584,118
Total	23,484,764	20,872,757	20,872,757
Cash Flow (bln)			
Total Net Cashflow ⁴	\$338.38	\$296.30	\$148.52
Net Present Value (NPV) ⁵	\$109.55	\$101.58	\$52.39
Climate Risk Ratio = 1 - (NP)	/ 2℃ / NPV BAU)	7.28%	52.17%
	2		

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve 3. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve 4. Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

5. Calculated using a 10% discount rate

6. Ranking is from lowest to highest exposure



Net Cash Flow

Tullow Oil

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	78,084	75,253	75,253
Liquids	847,829	726,219	726,219
Total	925,914	801,472	801,472
Cash Flow (bln)			
Total Net Cashflow ⁴	\$17.76	\$15.13	\$5.07
Net Present Value (NPV) ⁵	\$6.14	\$5.46	\$1.59
Climate Risk Ratio = 1 - (NPV 2°C / NPV BAU)		11.09%	74.12%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve 3. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve 4. Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

5. Calculated using a 10% discount rate

6. Ranking is from lowest to highest exposure





Net Cash Flow

Woodside Petroleum Investors

	Business as Usual (BAU) Assessment ¹	2℃ Climate Agreement Low Risk Case ²	2℃ Climate Agreement High Risk Case ³
Production (kboe)			
Gas	931,969	898,431	898,431
Liquids	324,897	288,918	288,918
Total	1,256,867	1,187,350	1,187,350
Cash Flow (bln)			
Total Net Cashflow ⁴	\$59.80	\$53.49	\$29.77
Net Present Value $(NPV)^5$	\$16.93	\$15.80	\$7.57
Climate Risk Ratio = 1 - (NPV 2°C / NPV BAU)		6.70%	55.26%

Climate Risk Ranking⁶

1. Estimates based on Wood Mackenzie estimates for currently commercial projects over the period from 2018 to 2064

2. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie's BAU price curve 3. Assumes oil and gas output is reduced over time in line with the IEA's 2C Scenario (2C production/BAU production) using Wood Mackenzie Low Price Curve

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4. Net Cash Flow = (Net Revenue – Royalty Payments – Capex – Opex – Government Take)

5. Calculated using a 10% discount rate



About VoLo Foundation



VoLo Foundation is a 503(c) Private Non-operating Foundation located in Jupiter Florida with a mission to support environmental initiatives, enhance education, and improve global health.

Our Mission

To accelerate change and global impact by supporting science-based climate solutions, enhancing education, and improving health.

Guiding Principles

We believe that developing and sharing knowledge through fact and data accelerates positive global change. Through original research and analysis, and in collaboration with philanthropic and academic partners, we aim to enrich the lives of individuals, strengthen communities and educate future generations. We track our progress using a variety of qualitative and quantitative approaches and we support programs that generate measurable, meaningful and sustainable results.

About the Author

Andrew Stevenson is the Managing Director and Senior Research Analyst at JUST Capital, a company that ranks the largest publicly traded U.S. corporations on worker pay and treatment, customer respect, product quality and environmental impact. Prior to JUST Capital, he was a Macro Portfolio Manager at Citadel Asset Management's Global Fixed Income Fund. Additionally he has over twenty years of experience working for investment banks in London and Tokyo. Before that he gained significant experience as Portfolio Manager for Brevan Howard AM and JWP Partners, U.S. His experience also includes eight years as an advisor to and employee of the National Resources Defense Council, a nonprofit focused on energy, health and climate-related policy and governance issues. He has served as an advisor to ClimateWorks on the topic of impact investing and speaks at Columbia Law School and Congressional Briefings on issues related to climate finance. As VoLo's Advisor, he is responsible for helping the team execute it'smission, specifically as it relates to climate change. Andrew has a Bachelor degree from the University of Michigan.