

Deep Dive

# Oil & Gas

An investor's guide to the oil & gas sector in an era of energy transition



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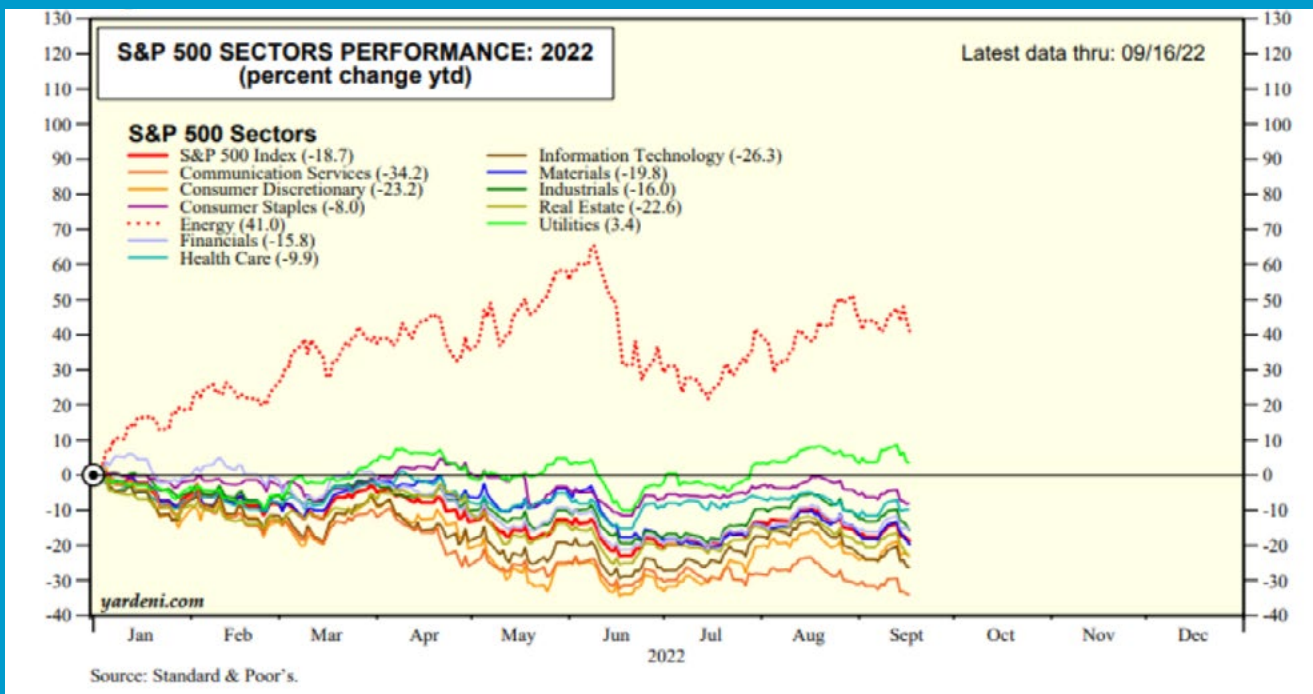
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# Introduction

Energy has been the best performing sector this year (below chart, as of September 16th). In fact, it is the only sector that has given investors a positive absolute return (aside from Utilities). What is interesting is that, even after the rally, many oil and gas companies are trading at very high free cash flow yields!



Source: Yardeni Research, S&P

However, investors remain skeptical. They are perhaps uncertain that these oil prices and the resulting free cash flow yields will last. They are not to blame as the energy sector has a history of cyclical behavior. In the most recent cycle, the energy sector thoroughly disappointed investors when excess oil and gas supply kept oil prices down for a prolonged period of time. Or possibly, they are bound by ESG constraints which call for divesting these carbon producing assets. Many investors may

worry about the terminal value of their investments in the sector as new technologies and renewable energy can mean the demise of the sector. Still others may determine that they have no edge in forecasting oil and gas prices due to which the sector remains uninvestable for them.

Due to these factors, the energy sector is currently just 4.2% of the S&P 500 index. It had sunk below 2% in October 2020, an all-time low, before Covid vaccines were announced. The current macroeconomic environment is often compared to the inflationary 1970's. **In 1972, energy was just 7% of the S&P 500, but it would peak at 28% at the end of 1980. Notably, only gold and oil produced positive inflation adjusted returns over the entire decade** (and with tech as the worst performing). It is important to keep in mind that if indeed the energy bulls are right this time—and even if you think that's a big “if”—**most investors with no energy exposure today could be severely mispositioned** over the coming years. Hence we believe energy is relevant and deserving of being given some thought by investors—and this is the case regardless of whether one is a generalist, tech, or consumer focused.

# The Heavyweight in the Corner

Warren Buffett's Berkshire Hathaway started investing heavily in the oil and gas sector in February of this year. He did not bottom tick the sector, but has bought with conviction even as oil prices have risen. He most recently filed to acquire up to 50% of Occidental Petroleum (OXY) and has a big stake in Chevron (CVX). OXY has a market capitalization of \$65 bn and an enterprise value of \$100 bn so Buffett is making a sizable bet here. Given his conviction, it behooves us to understand this sector and determine if it deserves an allocation in our portfolios.

While many investors understand Buffett as a quality-value investor, he, in fact, has a long history of investing in the oil and gas sector. In a 1957 article, 'Security I like best', he recommended investing in an oil and gas company called Oil and Gas Property Management Inc as a hedge to inflation. But in the 1970's he did not own oil and gas (or gold) related securities and was acutely aware that the gains in book value per share in Berkshire was merely keeping up with the price of oil and gold. Buffett's asset-light intangible asset strategy did wonders in the 1980's and 1990's when these assets could be had for cheap and declining inflation and reduced taxes acted like a tailwind. Buffett went back to oil and gas again in 2002, when he invested in Petro-China and exited that investment in 2007 for a 52% annual return. He then invested in Conoco-Philips (COP) and Exxon (XOM), but these investments were not profitable and he exited the last of his Exxon stake in 2014. He has come back to the sector with a bang with his Occidental purchase.

"I would think if you owned Occidental, you'd be bullish on oil over the years—and you're probably bullish on the Permian Basin because they have such a significant portion of their assets there. It's a bet on oil prices over the long-term more than anything else. It's also a bet the Permian

Basin is what it's cracked up to be... If oil goes way up, you make a lot of money...**You have to have a view on oil over time.** Charlie and I have some views on that..."

—Warren Buffett

Ok, so Buffett has a positive view of oil prices. His investing style—as seen by his previous investments—is to invest in income-producing assets with long reserve life that have optionality to higher prices run by competent management.

In this report, our goal is to provide some key insights and frameworks for investors to have an informed starting point in thinking about this important sector. Energy is a complex topic, and we have taken the liberty to simplify some of the topics at times to present clearer arguments. Importantly, we also wish to showcase how excerpts from Stream by Alphasense expert call transcripts can be a useful tool for obtaining a more nuanced and deeper understanding in sector research.

This report is by no means an exhaustive treatment of the topic, and interested readers will find plenty of opportunities to engage deeper on this topic at both the industry and company levels.

We encourage you to explore [Stream's transcript library where there is an abundant collection of transcripts from the energy industry.](#)

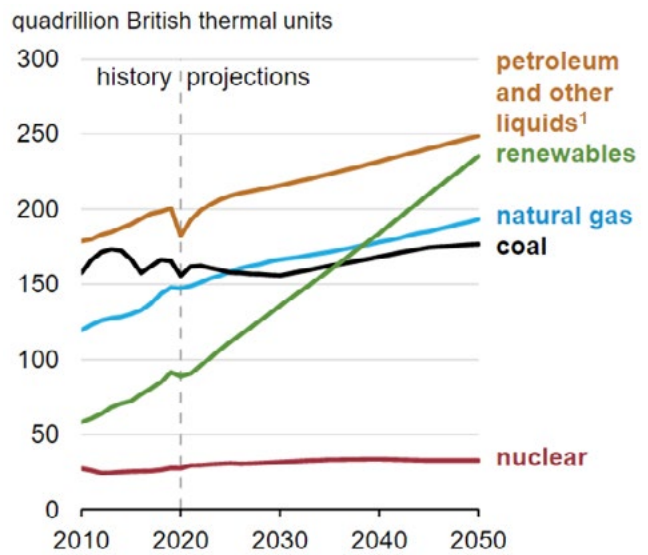
*Finally, please note that this report is provided for informational purposes only and not to be taken as investment advice or recommendation in any way, shape, or form. forward.*

# Demand

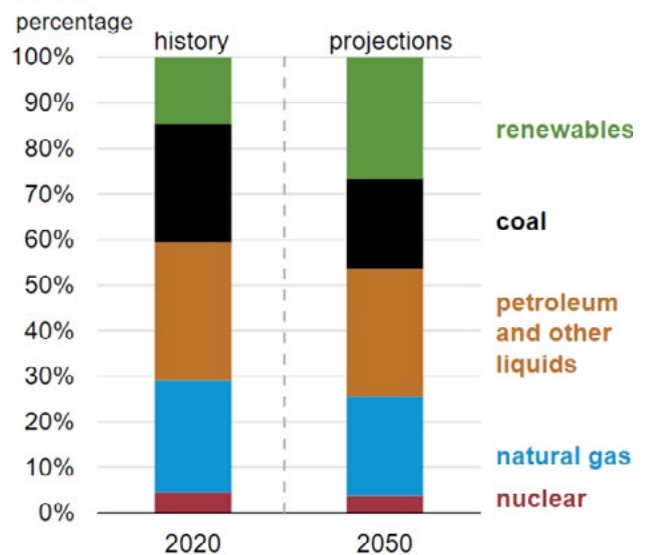
We preface by saying that demand forecasting for oil and gas is difficult. Recently, economists at BP and Shell called for peak oil demand in 2020, and that oil demand may never recover from the impact of Covid. We now know this is not true as demand has already reached its pre-pandemic levels in 2022 and is expected to exceed those levels in 2023. Investors often worry about the terminal value of their oil and gas investments. But it's also worth noting that historically oil and gas demand has been much more resilient than narratives of its purported decline.

When thinking about demand for oil and gas, first it is important to distinguish between relative and absolute terms. Consider the projections by EIA and S&P Platts. **Even as the share of renewable energy increases, absolute oil and gas demand is expected to rise over the next few decades.** As per the EIA, petroleum and other liquids as well as natural gas consumption will rise at low single digits due to population growth and as emerging countries industrialize (even as the relative share of renewables continue to grow).

Primary Energy Consumption By Energy Source, World



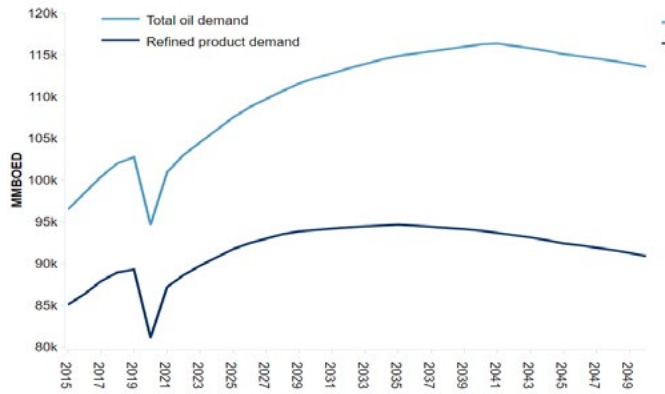
Share of Primary Energy Consumption By Source, World



Source: EIA

Perhaps you think the EIA is biased. But S&P Platts also does not expect oil demand to peak until the late 2030's and into 2040.

### We Expect Demand for Refined Products To Plateau in the Mid-2030s



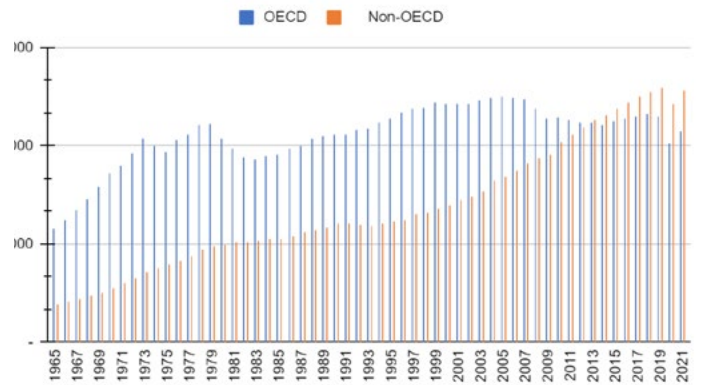
Source: S&P Platts

A report by Columbia University finds that the world's oil intensity—the volume of oil needed to produce a fixed economic output, has been constantly declining in a linear trend as humans have become more efficient in making use of it. The main driver has been technology as well as the globalization of markets, which enables faster diffusion of technical innovation. This is likely to be the case going forward but this does not mean that less absolute oil is needed. With increasing industrialisation and innovation, human beings have demanded more oil.

Let's look at the history.

The growth in demand has been remarkably consistent, as shown below. **Oil demand is a function of population growth and industrialisation.** While climate activism has been intensifying in OECD countries, politicians in emerging markets have their priority razor focused on alleviating poverty, growing their middle class, and industrializing. This path still involves substantial consumption of fossil fuel in which there is little alternative. India's oil consumption is 51.4 gallons per capita compared to 138 gallons for China and 984 gallons for the USA. **Even if OECD countries curtail their usage of oil, non-OECD countries (orange bar below chart) are still on the path to increasing usage.**

### World Oil Demand



Source:EIA

Consider the cases of Norway and China. Norway is the most advanced in terms of EV penetration and has tilted incentives heavily in EV's favor. According to recent estimates EVs account for 65% of all new vehicles sold and EV stock share of the car fleet has increased to about 15% over the last five years. Due to this, gasoline and diesel sales in the country have declined by about 9% over the same period. In contrast, China, despite being the largest EV market in the world by volume where more than 1 mn EVs were sold last year (accounting for about 5% of total car sales) gasoline demand continues to grow due primarily to the growth in overall personal mobility demand.

When looking at oil demand by end-use, estimates vary but generally it falls into the range between 55-65% for "moving things" (45-50% for road transportation and 10-15% for air and marine), 25-30% for "making things" (e.g. plastic, cement, paint, tires, all kinds of consumer goods from cosmetics to shampoo), and 10-15% for electricity generation, agricultural, heating and cooling, and other uses. While passenger vehicles represents the biggest source of demand decline due to shift to EVs, **it's important to keep in mind that at least half of aggregate oil demand—if not likely more—comes from use cases that will continue to grow at GDP rates and/or where replacements for fossil fuel simply do not exist for the foreseeable future** (e.g. "making things", air and marine transportation).

And while alternatives such as electric vehicles are on the rise, it is important to keep in mind that the speed of demand substitution is gated by physical constraints including supply of key materials for electrification. For example, lithium prices have shot up five to ten fold since 2020 levels. The supply for these materials in many cases face supply constraints that are just as structural and serious as oil and gas, including environmental and political factors. Another under-discussed constraint on EV penetration is the electrical grid, which will have to undergo substantial investments if it were to accommodate for the ambitious projection of EV penetration in the coming decades.

But to be clear this is certainly not an argument against EVs, nor a bet against human innovation and ingenuity. Rather, it is an important realization that many things around us come from fossil fuels. **It is a recognition that even as other sources of energy ramp up their supply, it will not satisfy the world's vast energy needs.** From

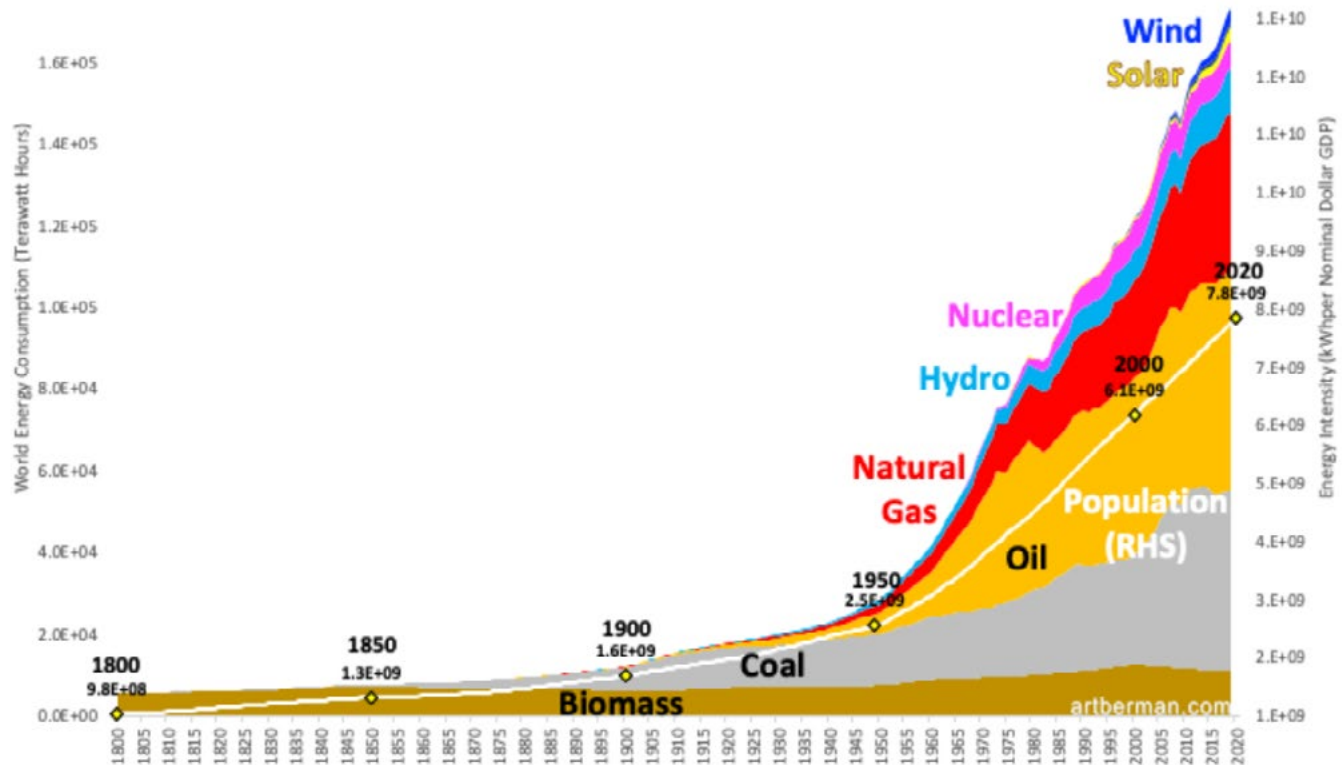
an investor's point of view we don't really think the argument is about oil versus renewables, even though the narrative is always constructed to be this way. Energy transition will take place over decades and will likely be an incredibly daunting and disruptive process. During this journey, we do see a way for both oil and renewables investments to do well. This point will become even more clear once we start to incorporate the supply picture, which we discuss in the next section.

*"We drive everywhere. We fly everywhere. We expect to be able to do that. We heat our houses. We buy cell phones, want everything to-go etc. We are consuming a lot of resources. I think people don't really have an appreciation of what it actually takes to give them the life that they have today."*

*—Former Division Head, Saudi Aramco, August 2022 (Stream Transcript)*

### World Population Has More Than Tripled Since 1950 (3.1x); Energy Consumption Has Increased at More Than Twice That Rate (6.4x)

This fact is absent from discussions of climate change and continued economic growth.



Source: Artberman.com



If we extend this conversation to gas then we find a few interesting nuances. Gas is very different from oil in that it is less cyclical than oil and is mainly used for producing electricity, producing fertilizers as well as for some industrial uses. Unlike oil which can be easily transported, gas requires specialized infrastructure in order to process, store and transport. For the last 10 years, the gas produced in the US has been trapped domestically which kept prices low in the US. Increasingly, with the build-out of LNG (liquification) terminals, gas is becoming an international commodity—just like oil.

With Europe's efforts to wean itself off Russian natural gas, US LNG will become increasingly important. With Venture Global's Plaquemines LNG and Cheniere's Corpus Christi Stage III getting a green light, total export capacity in the U.S. will be at least 17.3 billion cubic feet per day (Bcf/d) by mid-decade. Other proposed projects can add 11.4 Bcf/d of export capacity to the U.S., pushing the total toward 30 Bcf/d by the end of the decade. Total US gas production is roughly 91 Bcf/d so this is about 30% of US production and is sure to change the supply demand dynamics on the continent.



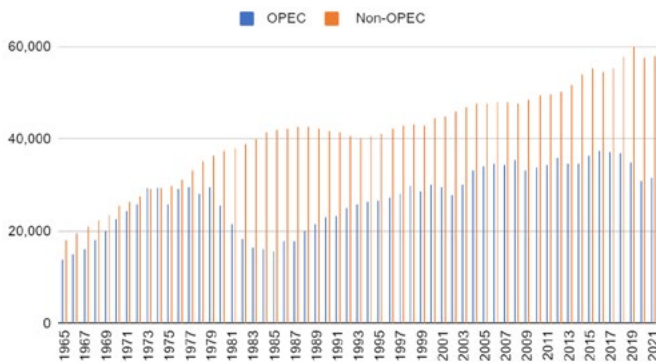
# Supply

Now this is where things get really interesting. Edward Chancellor wrote a wonderful book called *'Capital Returns: Investing Through the Capital Cycle'* in which he shows a way to profitably invest in cyclical sectors. One of the key takeaways from the book is to look at the flow of capital. **Sectors which see excessive capital inflows will produce mediocre returns, and sectors with deficient capital will eventually produce excessive returns.** Think technology in 2000 and 2020, or housing in 2006 for the former, and oil & gas and metals and mining in 2002 or 2020 for the latter.

Another important insight offered by the author is that the primary driver of corporate profitability is a favorable supply side, and not necessarily strong demand growth. Yet, most investors devote more time to thinking about demand rather than supply (arguably demand forecasting is the more difficult one). **It is the shifts in the supply side that stock prices often fail to anticipate. This is precisely the lesson that's applicable to the oil and gas industry today.**

First, let's talk about how we got here. Then, we will examine the current key factors that influence supply.

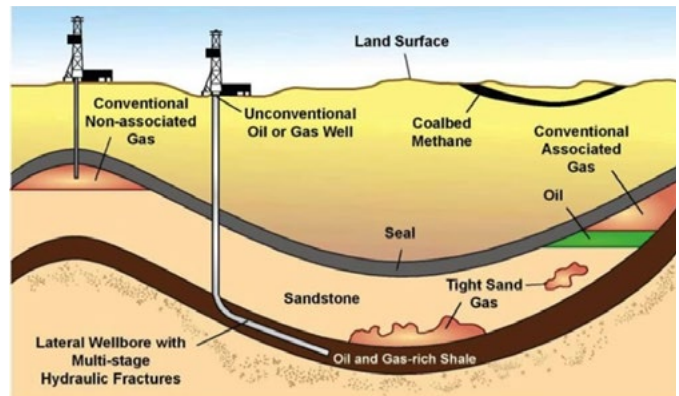
## World Production



Source: EIA

Oil and gas are produced through conventional and unconventional means. Unconventional oil refers to oil reserves that cannot be feasibly accessed using conventional drilling techniques. These reserves—notably tight oil, oil shale, and bitumen—must be extracted using novel methods (although it should be noted that in reality, there is some overlap as unconventional technology has permeated across all facets of oil extraction).

## The Geology of Conventional and Unconventional Oil and Gas



Source: EIA

Back in 1956, geologist M. King Hubbert was worried. Then, the rate of US oil discovery was in steep decline. This fact led Hubbert to make a startling prediction: US oil production would soon peak. That is exactly what happened and the peak came, as Hubbert predicted, around 1970. U.S. oil production had seemingly peaked in 1970 at 9.6 million b/d and by 2005 declined to 5.2 million b/d (and crude oil imports had reached 10.1 million b/d).

Hubbert also predicted that the global production of oil would peak around the year 2000. Looking only at conventional crude oil, it turns out that Hubbert was roughly right. The global oil production from conventional sources peaked at around 70 mn b/d in 2006.

Then in 2008, something changed. U.S. oil production started to rise and the next seven years marked the fastest oil production increase in U.S. history. Production of U.S. crude oil and natural gas liquids reached a peak of 15 mn b/d in 2015. All of these increases were caused by the revolution of shale oil. Hydraulic fracturing, or “fracking” had been around since the late 1940s and had been used extensively to promote higher production rates from conventional oil and gas wells.

Fracking involves pumping water, chemicals and a proppant (like sand) down an oil or gas well under high pressure to break open channels (fractures) in the reservoir rock trapping the deposit. Oil and gas do not travel easily through certain reservoir types, which is why they need to be fractured. The proppant is designed to hold those channels open, allowing the oil or natural gas to flow to the well bore.

### Lower 48 States Shale Plays



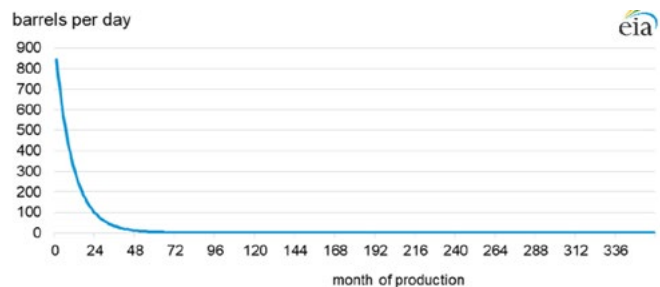
Source: EIA

Below, a reservoir engineer explains the key difference between the business economics of a shale (unconventional) play versus the conventional type:

“The breakeven price for oil produced from the unconventional is much higher. A lot of times it’s around \$50 a barrel. The reason for this high number is because you have to drill a lot of wells and these wells don’t produce at very high rates. They produce 5,000 barrels per day and then they decline very fast and they produce over a very long period of time. However, on the flip side, if you look at the conventional space, you have reservoirs with much fewer wells and the rates are much, much higher, 20,000, 30,000, etc. The breakeven price of oil produced in Saudi is so low, it’s in the single digits, \$10 per barrel. Oil from offshore Guyana, which is the next direct oil province is \$25-\$35 a barrel.”

—Former Chief Reservoir Engineer, Hess Corporation, August 2022 (Stream Transcript)

### Monthly Production Profile, Hyperbolic Decline Curve



Source: EIA

Let’s peel the onion here. Every company producing unconventional oil faces a decline rate. Each of their wells are declining and then just to stay even, they have to drill more wells. If they want to grow, they have to drill even more wells. With oil prices hovering around \$50-60 per barrel, these companies were producing a lot of growth but not a lot of free cash flow as a result of this constant capital requirement.

“We did quickly realize, my gosh, the spend to not only increase production but also just to maintain production is significant in the unconventional space because the production depletes so quickly and you have to keep on reinvesting, drilling more wells, fracking more wells to not only increase your production but just even to maintain it flat. We called it the hamster wheel. The

free cash flow curve is always pushed a little bit out to the right because you need to reinvest your cash capital to drill more wells...I think that was pretty much how everyone was, clearly not delivering enough cash”

—Former VP Global Wells and Seismic Delivery, BHP, March 2022 (Stream Transcript)

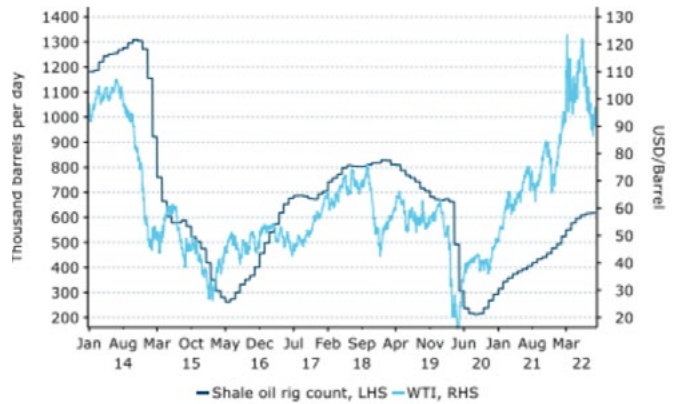
Seeing the emergence of new competition which were more financially dependent and weaker, OPEC tried to drive North American frackers out of business starting in 2014 by flooding the market with crude, provoking the biggest price crash in a generation. But what OPEC did not anticipate was that frackers were able to realize significant productivity gains during this period, as productivity had doubled from 2012 to 2018 thanks to better technology and extraction methods. This allowed shale players to cut breakeven costs down to \$50 per barrel— almost half from previous levels of \$80-90 per barrel. Although some frackers went bust, overall the industry proved nimble, relying on innovating and frugality to reduce production costs and stay alive.

But this competition came to head in 2020, when in addition to the Covid demand shock, Saudi Arabia further flooded the market with crude. The industry had been in a downtrodden state for many years and this was the final nail in the coffin for unconventional players resulting in over 100 North American oil and gas bankruptcies in 2020. The resulting negative print on crude prices affected investor, management, as well as employee sentiment and caused some dramatic changes in the industry that continues to affect supply today.

This explains how we got here. Since bottoming out in April of 2020, crude prices have recovered. In the industry, it is often said that “the cure to high prices is high prices”. Yet, even though crude prices now sit at a comfortably high level for players in the industry by historical standards, supply response continues to be restrained.

One way to see this is the number of rig counts (below chart). The last time WTI was at \$90-100/bbl, there were more than 1,300 horizontal rigs operating in the US. Today, in a similar oil price environment, rig count is only around half of that level.

### Oil Rig Count ss. WTI Crude Oil

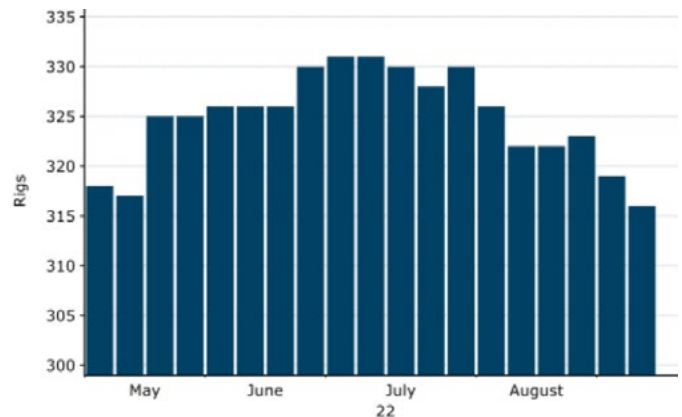


Source: CME Group, Bloomberg, Macrobond, ANZ Research

Source: ANZ Research

But rig counts should be coming back up right? The near term trend in fact shows the opposite picture. As shown below, rig count in the Permian Basin (the most resource rich region accounting for 40% of US production) has been falling since July. With this, the US shale industry’s position as a swing producer is coming under question.

### The Number of Rigs in America’s Permian Basin Has Fallen



Source: Bloombera. Macrobond. ANZ Research

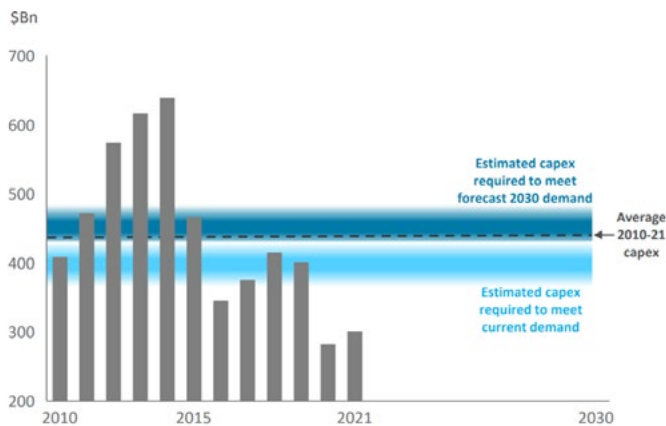
Source: ANZ Research

What is happening? We examine six key supply issues below.

## 1. ESG headwind

ESG (Environmental, Social, Governance) has gained significant momentum in recent years, having been adopted by some of the world's largest investment organizations. The movement has arguably had the most impact on the Western oil "majors", such as BP and Shell, contributing to their clean energy rhetoric of recent years as their largest institutional investors increasingly demand to see progress on the ESG front. Private non-listed players also face more challenges accessing capital, as banks (which are themselves big proponents of ESG) become more reluctant to lend to the sector. **All this had the direct effect of reducing capital expenditure in the sector.**

### Global Oil Capital Spending



Source: Saudi Aramco

## 2. Management's reluctance to invest

Every company is producing a lot of free cash flow at current crude prices, but their focus is not on increasing production but returning this capital to shareholders. The companies which have debt are also prioritizing debt repayment.

"If you look at the rig count in the shale space, we had \$90 oil last week and the rig count only went up by a dozen or so across the U.S. There's a lot more pressure on companies to return money to those investors and see some increase either in stock price or dividends.

[—Former Director, Marathon Energy, December 2021 \(Stream Transcript\)](#)

Management teams have been through a lot in recent years. The crashes of 2015 and 2020 have made a mockery out of the most optimistic management teams. It's likely to take more than just a few quarters of high crude prices for management to revisit their investment plans; perhaps even a generational change is required for the mindset to change. On the other hand, investors have become reluctant to play the long game too. Why invest long-term in a business that's popularly seen as being on the "losing side" of energy transition? Investors have figured the best way is to milk existing assets as much as they can, pressuring management to focus on returning cash.

In addition, the uncertain environment around government policy has also contributed to management's reluctance to invest. Populist policies like the windfall profit taxes remain counterproductive to solving the supply problem. No management team would be eager to invest when the government is on the lookout for the first signs to tax any excess profit out of the industry.

## 3. Labor and equipment market tightness

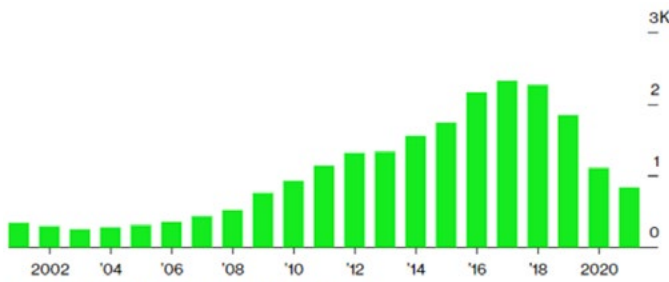
During Covid, employees with decades of experience have left the industry—some permanently—amid demand declines and oil and gas bankruptcies.

"There's been a huge retirement wave that's been happening for quite a while and it was accelerated during the pandemic. I speak from experience. I retired from Hess just because they didn't have the work. Most of my work, I was involved in deepwater and they weren't drilling. They had to just stop in the U.S. Our entire completion team was retired. **We had people with 30+ years experience and no one's coming back**"

[—Former Senior EHS Manager, Hess Corporation, February 2022 \(Stream Transcript\)](#)

At the same time, young petroleum engineers are becoming increasingly scarce too! According to Bloomberg, this year, the number of new petroleum engineering graduates is expected to total just 400 in the United States, down more than 80% from 2017 when there were 2,300 graduates. The retirement waves and the decline in young talent going into the industry likely means the industry labor market will remain tight in the near term.

## Pool of New Petroleum-Engineering Graduates Has Been Shrinking Since 2017



Source: Professor Lloyd Heinze at Texas Tech University

Source: Bloomberg

But longer term, this needs to be squared with the fact that the industry should see continued gains in automation and technological advancements. One expert is optimistic on technology:

“I think you’re going to see the pace of technology adoption go a lot faster, because the world still needs a lot of oil...Most of oil and gas operations can be automated. It’s just a matter of putting the right sensors in place and computers in place. You can have people sitting in office and manage production. You don’t need as many people in the future. The future is digital, **I have no doubt that the oil fields of the future will be almost completely, perhaps 70% automated.** It’s happening.”

—Former Senior Engineering Advisor, Hess Corporation, May 2022 (Stream Transcript)

Equipment has been another area of challenge. During Covid many companies were idling their equipment and using parts from the idled equipment for the active equipment as they struggled to obtain parts. With supply chain disruptions, they have had difficulty getting equipment back to the patch in order to increase production. Currently, service companies are still operating at full capacity, resulting in smaller operators not getting the equipment they need in order to grow.

“Because of supply chain issues and people issues, will you be able to get your project on line in a given timeframe? Even though it’s profitable, you don’t have the equipment to go ahead and actually get it on line. That is an issue that we have to come to

grips with. That’s a new thing which has come out of the COVID stuff. **Nobody anticipated the supply chain business, nobody.**”

—Former Chief Reservoir Engineer, Hess Corporation, May 2022 (Stream Transcript)

## 4. Inflation

High inflation is a big problem for the industry because it derails investment plans. Based on our own discussion with management teams (WhiteCap Resources and NuVista Energy), inflation in capex and opex has been running at about 15–20% a year. In this kind of environment, **capital budgeting becomes all but an impossible task.** As a result, management teams have been sitting on the sidelines waiting for inflation to subside (while raking in all time high profits).

And while capital budgets are up in 2022 by an average of 23% over 2021, keep in mind that about two-thirds (15%) results from oilfield service inflation. Net absolute capital budgets have not increased by any substantial amount.

“Chevron’s CEO, its previous CEO, I remember him standing up, at that time oil was \$100+ a barrel, and he said that “\$100 a barrel is the new \$30.” What he meant by that was basically, we don’t make any more money at \$100 than we did at \$30. It’s just everything shifted because things cost a lot more. A lot of these performance gains will stay and hopefully will continue.”

—Former VP Global Wells and Seismic Delivery, BHP, March 2022 (Stream Transcript)

## 5. OPEC

No discussion on supply will be complete without a mention of OPEC. This organization seeks to actively manage oil production in its member countries by setting production targets. Historically, crude oil prices have seen increases in times when OPEC production targets are reduced. OPEC is often referred to as a “call” on oil supply. This is because while producers outside of OPEC seek to operate at full capacity, OPEC maintains spare capacity that can be adjusted quickly in response to meet demand changes.

The problem is that OPEC is highly opaque. There is a big debate currently that argues that **OPEC does not have the spare capacity that they state they do, limiting its ability to increase production.** According to EIA estimates, OPEC currently has 2.5 mn b/d of spare capacity but in practical terms they have been producing below their quotas. Some analysts interpret this as a sign that OPEC has difficulty in meeting higher production levels.

We have not been able to find conclusive evidence either way, but this is certainly an area for motivated readers to do more research. What we do believe however is that OPEC seems to prefer oil prices in the current range, as it results in attractive levels of profit while not being so high that it threatens to significantly accelerate energy transition away from fossil fuels.

## 6. Strategic Petroleum Reserve

The Strategic Petroleum Reserve (SPR) is an emergency reserve of petroleum maintained by the United States Department of Energy in response to supply disruptions.

Since being established in 1975, the US government has tapped into the reserve on only three occasions prior to the current crisis—during Gulf War in 1991, Hurricane Katrina in 2005, and war in Libya in 2011.

Most recently, on March 31 President Biden announced the release of 1 mn barrels per day from the reserve over the next 180 days (for comparison, the United States consumes roughly 20 mn b/d and globally 100 mn b/d). An additional 20 mn barrels of release was announced in July. The SPR stockpile has fallen to below 450 mn barrels and could approach the 400 mn soon, compared to a historical steady level of about 600–700 mn before major drawdowns starting last year. At some point the **SPR will turn from being a seller of oil to a buyer as it must replenish the stockpile.**

We have laid out several key points when it comes to understanding the evolving demand and supply picture. While this is not about offering price predictions, one of the key jobs as an investor is to recognize when the industry fundamentals have been structurally altered.



# Industry Map

The oil and gas industry is often divided into three segments:

**Upstream**, which is also known as exploration and production (E&P), deals with finding and extracting oil and gas resources. When most investors refer to oil and gas companies, they are typically referring to the upstream part of the industry (although large state-owned players and majors like Exxon can be integrated from upstream all the way downstream so sometimes it's not so clearcut).

This is the sexiest part of the industry and where the bulk of value creation typically lies. It also happens to be the segment most influenced by fluctuations in oil price, yet it's also the segment where companies can be truly differentiated from one another based on where they are on the cost curve and technological capabilities. In other words **the gap between the bottom and top quartile players in upstream can be enormous.**

Companies in this space truly run the gamut:

- North American independents: the largest publicly listed US-based players include EOG Resources (EOG), Pioneer Natural Resources (PXD), Devon Energy (DVN), Occidental Petroleum (OXY), Diamondback Energy (FANG), Hess Corporation (HES), Continental Resources (CLR), Antero Resources (AR), APA Corp (APA), Chesapeake (CHK), and a long tail of small to midsize players. Major Canadian tar sands producers include Suncor (SU), Canadian Natural Resources (CNQ), Cenovus (CVE), and Meg Energy (MEG).
- International Oil Companies (IOCs) often referred to as the majors or supermajors: ExxonMobil (XOM), Chevron (CVX), ConocoPhillips (COP), Shell (SHEL), BP (BP), and Total (TTE).
- National Oil Companies (NOCs): Saudi Aramco, Rosneft, China National Offshore Oil Corporation, Petróleos de Venezuela, Qatar Petroleum, Statoil, Pemex, Petronas, National Iranian Oil Company

When it comes to share of production, the rough mental image to have is that National Oil Companies account for about 50% of global production, compared to independents and majors which accounts for about 25% each.

**Midstream** includes transportation (pipeline) and storage of oil and gas. This segment doesn't have the risk profile or asset complexity of the other segments. Companies are usually regulated utilities earning stable cash flows based on long-term service contracts, and often with minimum volume commitments. Key players include Energy Transfer (ET), Enterprise Product Partners (EPD), Kinder Morgan (KMI), Targa Resources (TRGP), and DCP Midstream (DCP).

**Downstream** includes refining and marketing/retail. Refining turns crude oil into useful petroleum products, such as gasoline, diesel, and jet fuel. Facilities require a lot of upfront capital investment. The refining business is really all about the refining margin (also called crack spread), which is the difference between the purchase price of crude oil and the price of the petroleum product produced from it. With better technology, refiners are able to effectively make use of lower quality and cheaper crude (such as the Canadian heavy crude), increasing the refining margin (typically, light and sweet crude are easier to distill and refine and trade at a premium to heavy and sour).



Refiners don't make money the same way as upstream companies, because they make money on the spread instead of sales of crude. This means that refiners tend to experience higher margins when crude prices decline, as the cost of input declines. While their refined products will also see price declines eventually, there is typically a lag effect. The reverse is true when crude goes up. If refiners are not able to immediately pass on the higher cost, their margins will be pressured.

Major pureplay downstream players include Marathon Oil (MRO), HF Sinclair (DINO), Phillips66 (PSX), and Valero (VLO). But keep in mind the largest refining companies in the world by capacity are the giant NOCs (Sinopec, CNPC, Aramco).

In addition, there are also **oilfield services** companies, which are a key part of the industry. They provide the technology that enables the full range of exploration activities (seismic, drilling, well operations, rig construction) as well as engineering and construction

(for discovered oil and gas). Service companies focused on exploration are typically dominated by US companies, whereas more European and Asian companies can be found in the engineering and construction space. The performance of oilfield services companies are inextricably linked to those of its clients, with the capex budgets of E&Ps as the leading indicator for the performance of service players.

Notable oil services firms include Schlumberger (SLB), Baker Hughes (BKR), Halliburton (HAL), Loews (L), and National Oilwell Varco (NOV).

If you are still skeptical about the sector but want a hedge to oil prices, an **oil and gas royalty company** such as Texas Pacific Land (TPL) or Prairie Sky (PSK. TO) may be worth looking into. These companies have vast land holdings and get a royalty whenever an E&P company drills on their property. There is very little operating or capital costs due to which these companies are profitable across the cycle.

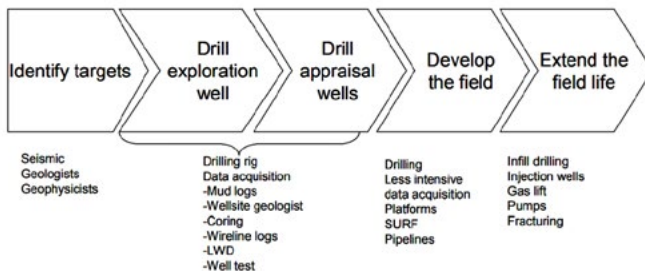


# The Business of E&Ps

In this report, we dive deeper into upstream, E&Ps.

First, E&Ps have to compete for access to mineral rights granted by governments by either entering a concession agreement, or a production-sharing agreement, where the government retains ownership and participation rights.

Once acreage is obtained, companies commission drilling to further delineate the reserves. The key for high-quality reservoir formation is the combination of porosity and permeability of the basin, which determines the ‘effort’ and costs required to extract the oil and gas in the reservoir. The following illustrates the typical steps required in the development process:



Source: Deutsche Bank

Within upstream, the two main sources of resources are onshore and offshore.

**Onshore** extraction requires drilling into underground deposits. In onshore drilling facilities, the wells are grouped together in a field. The key point is that onshore production companies can turn on and off rigs more easily than offshore rigs to respond to changing market conditions. Also, the process is more mechanical—the technology has been proven and additions to production are just a matter of drilling more wells.

An industry expert describes the fast-paced, competitive nature of on-shore development. Organizational responsiveness and agile culture are key success factors:

“I do think that in Lower 48, it’s okay if a major wants to put some money on it, but I don’t think it can compete in terms of agility, nimbleness and the barrels are not as profitable as other basins where they can compete a lot better. The Lower 48 is great, but again, because it’s easy access there are many players. I don’t think that is the right environment for one of the majors. **I would leave it to smaller independents for them to fight for that production. It’s very fast-paced, again, very competitive, and I don’t think these big companies have the learning and agile culture to be able to adapt to that environment”**

—Former Director for Strategic Relationships, BP, May 2022 (Stream Transcript)

**Offshore** drilling uses a single platform that is either fixed (bottom supported) or mobile (floating secured with anchors). Offshore drilling has a longer lead time, is more complex and is more expensive than onshore drilling. Operating conditions on the sea can be extremely rough. Every case is unique and has different seismic conditions and companies need advanced technology as well as large budgets in order to tackle these projects. These projects are often very capital intensive and can involve building infrastructure such as platforms, pipelines, processing plants and possibly export terminals. While onshore projects can produce oil in as little as 8-12 months, offshore projects typically take much longer (8-10 years). But once the wells are producing oil they typically have low marginal costs and low decline rates.

Currently, one of the world's largest offshore investments is Exxon's project off the coast of Guyana (Yellowtail). The \$10 billion project will add 250k barrels per day of production starting 2025 and total estimated resources of 900 million barrels (Exxon has been engaged in development in Guyana since 2015 and this is the company's fourth and the largest project in the region).

Offshore is the territory of the majors which can bring in unmatched budget, knowhow, and technology to tackle the hardest engineering problems:

"I do believe that where the big majors can really thrive is tackling these big, big basins where you have significant capital requirements, very high barriers of entry due to the capital requirements. Again, you need incredible technology and an amazing capacity to integrate to make these projects viable. If you look at what Exxon is doing in Guyana, what Chevron is doing in Australia, what BP has done in Azerbaijan, those are amazing things that there's no way smaller independents can do."

[—Former Director for Strategic Relationships, BP, May 2022 \(Stream Transcript\)](#)



# Reserves

Once drilling has taken place, an E&P company determines its reserves and resources estimates. This is an extremely important topic. Note that reserves does not refer to how much hydrocarbons exist under the surface in an absolute sense. Instead, it is an inexact estimate of how much can be commercially extracted. Hence, it is an economic concept. This of course depends on the extraction technology that is available. The better the technology, the more that can be extracted economically. It is also a function of crude price—higher prices can absorb more cost, which will help “unlock” more resources that can be extracted.

Here, we will not get down to the nitty-gritties of reserve classifications and accounting—this is an area for motivated readers to dig deeper. But importantly, it is worth a reminder that reserves are always an estimate. While there are industry guidelines and definitions in place to protect investors (definitions by SEC and SPE—Society of Petroleum Engineers), it is still subjective and, just like accounting in general, happens to allow for “flexible” interpretations by management. Even if

management has the best of intentions, **it is best to look at reserve figures with an understanding that it is an inexact number derived on the basis of countless complex assumptions, which is subject to revision as production progresses and operating conditions change.**

Oil and gas companies publish a reserves statement which is key to providing a view of the as yet un-depleted assets of the company, and as such the potential for a company’s future growth. Here, it’s also worth noting that once production starts, companies amortize production assets on a unit of depletion basis. If you’re wondering why management may try to overstate their reserves, this is one reason. The higher the reserves, the lower the calculated depreciation and thus higher the accounting profitability. In this way, reserves directly impact the income statement.

Below is a reserve statement from Petrobras. The reserve shown in the first chart is prepared on the basis of SEC standards, while the second chart is based on SPE—note the differences this creates. Care must be taken when comparing reserves across different companies.

Net Prove Reserves – SEC	2021	2020	2019	2018	2017
<b>Crude Oil and NGL (MMbbl)</b>					
Brazil	8,416.7	7,533.9	8,090.5	8,173.5	8,255.40
International	18.7	18.4	65.6	87.9	179.2
Africa	0	0	41.6	59.8	63.4
South America	1.9	0.3	1.4	1.6	1.2
North America	16.8	18.1	22.7	26.6	114.6
<b>Total Crude Oil and NGL (MMbbl)</b>	<b>8,435.4</b>	<b>7,552.3</b>	<b>8156.1</b>	<b>8,261.5</b>	<b>8,434.60</b>

Source: Petrobras

Net Prove Reserves – SPE	2021	2020	2019	2018	2017
<b>Crude Oil and NGL (MMbbl)</b>					
Total Brazil	8,624.8	7,889.8	9,412.1	10,085.4	10,352.40
International	18.8	19.5	65.2	88.1	181.1
Africa	0	0	41	59.9	65.2
South America	1.9	1.4	1.5	1.6	1.2
North America	16.8	18.1	22.7	26.6	114.6
<b>Total Crude Oil and NGL (MMbbl)</b>	<b>8,643.6</b>	<b>7,909.3</b>	<b>9,477.2</b>	<b>10,173.4</b>	<b>10,533.50</b>

Source: Petrobras

The reader may have figured it out by now, but this is often a feature that gets ignored in common valuation methods such as EV/EBITDA or P/E. While many companies may have good current earnings, a good investment often consists of an asset with decades of low cost inventory. It is very important to take into account the reserves. **Reserves inform us of the growth potential and sustainability.**

- **Growth:** Reserves replacement ratio = reserve additions / production. If the company consistently books reserve additions higher than production levels (replacement ratio > 100%), it is an indication that production could grow in the future as those additional reserves undergo development.
- **Sustainability:** total reserves / annual production tells us how many years a company can sustain production at current levels.



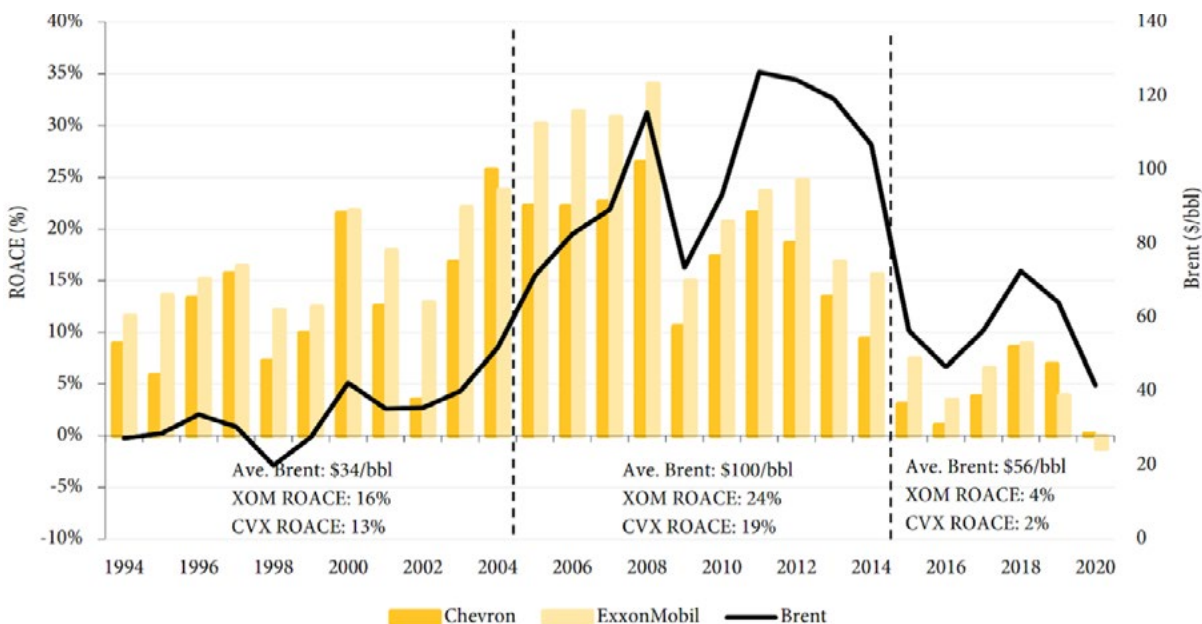
# Investing in E&Ps

Valuation metrics for oil & gas producers are a little different than other industries and can include:

- Enterprise Value per Flowing Barrel (EV/boe/d): Determines the value of the company per barrel of production. Helps investors compare the price of the company with the production volumes of the company
- Field Netback: Shows the margin created from a barrel of oil after subtracting standard costs. It indicates the profitability of the asset without taking into account taxes and interest.
- Enterprise Value to Reserves (EV/boe): Similar to EV per flowing barrel, but compares the price of a company with barrels still in the ground. It helps determine the future potential of a company's assets.
- Finding, Development & Acquisition (FD&A) costs: Shows the cost of finding a barrel reserve and producing it. These costs provide valuable insight into cost efficiency and management's operating capabilities.
- Recycle Ratio: Indicates the level of profitability of an oil or gas asset.
- Price/NAV (P/NAV): Calculates how much an investor is paying for the underlying net assets of the company

For someone who wants to pick stocks, this sector offers a little bit of everything so it really depends on one's investment philosophy as well as risk appetite. The options in front of all investors are (a) North American independents focused on unconventional oil, (b) majors that are focused on both conventional and unconventional, and (c) national (state-owned) oil companies. Each of them offer a different risk reward to investors.

## Us Majors ROACE vs. Brent (Real)



Source: Redburn Research

As shown above, historically the majors have been good investments based on ROACE (Return on Average Capital Employed). However, returns have come down significantly since 2014. We believe these are the key reasons:

- The pursuit of overly complex projects especially in deep-water and frontier economies.
- Ambitious M&A with optimistic assumptions that necessitated increase in supplies in order to show a good result
- Technological advances which resulted in an increase in industry-wide supply trends and the consequent impact on service costs and eventual market balance.

The key understanding that one needs of the sector is that in addition to the 'hard' differentiating factors such as scale, reserve assets, cost, and technology, **management and culture** are also key factors for evaluating a company's moat. We believe Warren Buffett owns Chevron and not Exxon this cycle because Chevron has shown an ability to be superior at M&A. Exxon's purchase of XTO Energy for \$41 bn (out of which it wrote down \$18.4 bn) is still in the history books as one of the largest and worst capital allocation decisions in the industry, and a reminder that capital allocation can never be neglected. It is when prices are high and profits are flowing (management is overconfident) that the risk of capital misallocation is at the highest.

"As an industry, we do learn from each other pretty quickly. A lot of companies are partners with other companies. You get to see each other's performance. The good companies actually work together in the partnership and feed off each other and share ideas and stuff. A lot of this stuff very quickly goes from somewhat not really proprietary but being what one company did. It gets spread across everyone very quickly. **I do think the culture is a piece that does differentiate itself or is different across companies, and different companies have different cultures and ways of working**"

[—Former Director, Marathon Energy, December 2021 \(Stream Transcript\)](#)

Today, many large and small energy companies support single digit P/E's even as they run lucrative capital return programs. They are awash in free cash flow but a large part of this cash is being returned to shareholders in the form of dividends or share buybacks. Many companies in the Canadian E&P space are trading at less than 5x EV/FCF.

Below, we include a list of select North American listed players (sorted by market capitalization) and their current valuation metrics.

Name	Ticker	Last Price	Market Cap (USD, mn)	Net Debt	Div Yield % (NTM)	FCF Mkt Cap Yld % (LTM)	P/E (LTM)	P/E (NTM)	EV/EBITD A (LTM)	EV/EBITD A (NTM)
Exxon Mobil Corporation	XOM	\$93.2	\$388,465	\$46,227	3.9	12.7	10.2	7.7	5.1	4.2
Chevron Corporation	CVX	\$156.5	\$306,241	\$29,197	3.7	9.9	10.4	8.4	5.8	4.9
Shell plc	SHELL	\$26.2	\$189,748	\$52,116	4.0	18.9	5.6	4.7	3.3	2.5
ConocoPhillips	COP	\$113.1	\$144,018	\$14,010	1.7	10.9	9.4	7.5	5.0	4.1
BP p.l.c.	BP	\$31.0	\$96,080	\$39,063	0.8	21.3		4.3	3.2	2.4
Enbridge Inc.	ENB	\$54.4	\$83,024	\$60,271	4.9	3.4	21.9	18.0	13.9	12.5
EOG Resources Inc.	EOG	\$121.5	\$71,175	\$698	4.5	5.5	12.5	7.1	6.1	4.2
Canadian Natural Resources Limited	CNQ	\$53.9	\$60,423	\$12,040	5.3	16.0	7.2	5.7	4.3	3.9
Occidental Petroleum Corporation	OXY	\$64.4	\$59,835	\$28,375	0.9	19.0	6.3	6.3	4.6	4.1
Devon Energy Corporation	DVN	\$66.8	\$43,754	\$4,661	1.1	12.6	8.5	6.9	5.3	4.3
Suncor Energy Inc.	SU	\$30.7	\$41,943	\$12,771	4.7	18.3	6.1	4.2	3.5	3.5
Hess Corporation	HES	\$121.6	\$37,465	\$6,428	1.4	1.7	25.8	11.7	9.2	6.0
Imperial Oil Limited	IMO	\$60.9	\$29,191	\$2,588	1.7	18.2	7.6	4.5	4.5	3.3
Continental Resources Inc.	CLR	\$69.8	\$24,975	\$6,824	1.6		8.7	5.6	5.1	3.8
Tourmaline Oil Corp.	TOU	\$78.9	\$19,968	\$697	3.7	8.6	10.6	8.0	6.8	5.1
Texas Pacific Land Corporation	TPL	\$1,773.1	\$13,693	(\$427)	0.7	2.5	36.2	25.1	25.5	18.8
Ovintiv Inc.	OVV	\$49.6	\$12,606	\$5,514	2.0	14.3	5.4	3.6	4.3	3.0
Whitecap Resources Inc.	WCP	\$9.2	\$4,253	\$851	3.6	21.7	2.0	3.7	0.9	2.4
MEG Energy Corp.	MEG	\$18.0	\$4,134	\$2,098	0.5	19.6	6.7	5.3	3.9	3.8
Vermilion Energy Inc.	VET	\$23.1	\$3,790	\$1,361	1.0	6.1	5.9	3.5	4.3	2.5
PrairieSky Royalty Ltd.	PSK	\$18.8	\$3,376	\$510	1.9		16.8	13.2	10.1	8.7
NuVista Energy Ltd.	NVA	\$11.1	\$1,887	\$428	0.0	9.3	5.0	6.4	3.8	3.1
Peyto Exploration & Development Corp.	PEY	\$11.4	\$1,469	\$892	5.9	11.0	6.6	4.6	4.3	3.6
<b>Average</b>					<b>2.6</b>	<b>12.4</b>	<b>10.7</b>	<b>7.6</b>	<b>6.2</b>	<b>5.0</b>

Source: Koyfin (September 16, 2022)



# Environmental, Social, Governance (ESG)

No analysis on the oil and gas sector will be complete without a discussion of ESG. We start this with a little bit of a story. It is said that England started burning coal at around 1000 AD. During the 13th century restrictions were put in place to curb air pollution caused by coal burning, and eventually King Edward I (1272-1307) banned its use altogether. His successor, King Edward II (1307-1327) went a step further, demanding anyone caught burning coal to be sentenced to torture. However, in the subsequent decades the monarchy would eventually relent, lifting the ban, and instead governed the coal industry through taxation and import controls, opening the road for England's eventual industrialization.

The concept of ESG itself isn't something new. Our ancestors were not entirely clueless about the environmental consequences of burning hydrocarbons, even though they may not have had the trove of scientific evidence that we have today. They did so because it was necessary to sustain and improve their livelihood. Today, folks in suits and ties can preach ESG until the sun sets, but the truth is that it will not change the law of atoms governing our world. To quote the renowned energy researcher Vaclav Smil, who has been a vocal critic of the achievability of climate pacts such as the COP26 (Glasgow),

*"To set goals that correspond to available technical capabilities while taking into account reasonable advances in the production and adoption of noncarbon energy sources, we must start with gradeschool algebra. What are the chances of that?"*

Many institutional investors have divested their oil and gas investments due to ESG concerns, and this trend has accelerated in recent years. It seemed like policymakers and investors have abandoned the sector, perhaps assuming that the energy transition is just a few years away. The narratives got ahead of reality. After Russia's invasion of Ukraine and the resulting energy crisis in Europe, many are re-evaluating their previous assumptions. It is more likely than not that this energy transition takes place over decades. Until then, we will have to learn to live with oil and gas. 2022 has perhaps made this clear for most people.

It is important to note that, within fossil fuels, natural gas is somewhat less exposed to environmental risk. This is because, when burnt for power generation, gas is significantly less polluting than coal. Hence, gas is seen as a vital bridge fuel in the energy transition to systemic decarbonization. Look at the chart below—United States emissions (per capita) have come down significantly over the last two decades (coinciding with the shale boom). Much of this was enabled not by renewables but by the switch to natural gas. Per capita emissions of the United States is now on par with levels last seen in the 1950 to 60's.

In Europe, natural gas was cheaper than coal. But due to supply disruptions from the war, gas prices have shot up and has now become cheaper to use coal. This drives up emissions and makes it expensive for companies to purchase carbon emissions through the EU Emissions Trading System. As a result, policymakers have become more flexible on carbon emission prices

to help industries, and could perhaps introduce a wartime subsidy of the energy industry ahead of what is expected to be a very costly winter. It goes to show how susceptible climate policies can be in times of crisis in the short-term.

### Per Capita CO<sub>2</sub> Emissions



Source: Ourworldindata.org

Playing offense, most oil and gas companies have established ESG policies and programs and have begun efforts to focus on their environmental impact. Here are some notable ones from the largest players:

- In November of 2020, Occidental Petroleum Corp. became the first large U.S. petroleum producer to set a net zero emissions target associated with their own emissions by 2040, and a commitment to reduce greenhouse gas associated with their products by 2050.
- Shell Oil held a shareholder vote this past year to approve their sustainability strategy which was met with 89% approval. The premise of that strategy was their goal to reduce by 100% their carbon intensity by 2050.
- ExxonMobil has announced a four-prong sustainability framework that includes the investment of \$3 billion in carbon capture and storage project

- British Petroleum invested and continues to invest significantly in wind, solar, and hydrogen and is one of the largest contributors to renewable organizations globally.

'E' issues remain, but for more entrepreneurial companies such as Oxy, this can also be a substantial source of revenues in future years. For example, Oxy is working on carbon capture and is advancing a project with advanced sales from the likes of Airbus, Shopify and Thermo Fisher. The oil sands producers in Canada are also working on a large scale carbon capture and sequestration project.

Given energy security concerns and the efforts of energy companies to become net zero, **it could be the case that these companies will find favor with the investing community again.** But, one needs to be at the forefront of this narrative change to find the real bargains.

# In Closing

This year has taught us all many things. One key realization that has been brought to the fore for many is just how much of the modern world still (and will continue to) rely on oil and gas. The starting point is to recognize the world's vast energy needs. Working backwards, think about how this will be achieved. One could start to see areas, given underlying trends, where the world might collectively risk falling short on. In this report, we have provided a view on the issues that may possibly contribute to the long-term undersupply in the oil and gas industry.

In closing, our message is this—don't be an energy bull or bear, but rather, an **energy realist**. And it seems there is one person who has recently revealed himself as one...

"In order for civilization to continue to function, we do need oil & gas and especially these days with Russia sanctions, we do need to provide oil & gas to keep civilization running...I think some additional (E&P) exploration is also warranted at this time..."

—Elon Musk

*This report was written in collaboration with our partner analysts at Value Punks. If you enjoyed this piece, you can follow their work at:*



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