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In a sense, the concept of “Net Zero” for an O&G company is an oxymoron. The truth is that oil companies are in the business of finding, refining and selling carbon-based fuels. True “Net Zero” for an oil company would mean shutting down their operations.

There is mounting pressure on the industry to transition out of the fossil fuel business from consumers, investors, government regulators and even their own shareholders.

“We are at an inflection point,” said Daniel Farber, a law professor at the University of California, Berkeley and director of the Center for Law, Energy, and the Environment.

“Things have to get worse for the oil companies,” he added. “Even if they’ve got a pretty good chance of winning the litigation in places, the discovery of pretty clear-cut wrong doing – that they knew their product was bad and they were lying to the public – really weakens the industry’s ability to resist legislation and settlements.”

<https://www.theguardian.com/environment/2021/jun/30/climate-crimes-oil-and-gas-environment>

In March, the SEC, then led by interim Chair Allison Herren Lee, signalled that companies may soon have to start disclosing more to shareholders about how climate change affects their business.

<https://www.bloomberg.com/news/articles/2021-06-30/big-oil-attacks-the-sec-as-new-esg-rules-loom-green-insight>

A Dutch court has ruled that Royal Dutch Shell must dramatically reduce its carbon emissions in a landmark climate decision that could have far reaching consequences for oil companies.

This is the first time that a court has ruled a company needs to reduce its emissions in line with global climate goals, according to Friends of the Earth Netherlands, an environmental campaigning group that brought the case against Shell (RDSA).

"This is a turning point in history," said Roger Cox, lawyer for Friends of the Earth Netherlands.

<https://www.cnn.com/2021/05/26/business/shell-court-case-climate-change/index.html>

Oil companies have responded by making a lot of noise in the media about their strategies and efforts related to emissions reductions in scope 1 (emissions associated with a company's internal operations) and scope 2 (emissions related to the products and services acquired by a company). Their aim appears to be to reassure the capital markets and shareholders.

But the real issue is the scope 3 emissions: emissions associated with the downstream use of the company's products, i.e., hydrocarbon fuels. This is the truly existential issue for the industry.

We are indeed at an inflection point, where consumers, Investors and government regulators are all aligning with the transition away from fossil fuels. The result is a very uncertain long-term demand for oil products. Most analysts have forecast maximum demand for oil in the early to mid 2030's. Consumer-driven demand collapse looks very likely. The big issue is in predicting the timing of this collapse, not its probability.

The challenge for the major oil companies is not to follow the historical examples where industries have failed to face existential threats, such as the tobacco industry, or the removal of lead from gasoline. In both cases some companies aggressively denied the science and spent heavily to disprove the threat. All ultimately failed.

Market Disruptors

It's important to recognise the big disruptors for the O&G Industry and how these act individually and in combination to shape the market and industry, giving momentum for the transition:

Short Term

COVID short-term demand collapse, and specifically the short-term industry reaction to acutely reduced demand

- Many producers and refiners had to scale back operations and stopped investment to manage cash flow. This was not restricted to smaller companies. The “Big” majors shed, divested, or closed capacity to manage costs and maintain solvency.

Medium and Long Term

Consumer driven demand for EV's and other alternative energy sources to replace hydrocarbon fuels.

- The longer-term shift to “decarbonise” the end use of energy, EV's, H2, electrification of heavy transport and heavy industry.
- Growing consumer demand for EV's in the light vehicle market supported by national level regulation and incentives.

Activist investor pressure for “Net Zero” action.

- There have been some high-profile activist investor wins in recent months, with Exxon, Shell, and Chevron all experiencing events that would have been considered impossible just a few years ago.
- The recognition of this pressure and the way these companies respond will shape the industry in the coming decade.

Shifting institutional investor and capital market priorities

- There has been an accelerating shift in the way the capital markets and institutional investors view the O&G industry. For decades it has been a growth driven investment. Now it is a “cash cow” investment at best, possibly even perceived as zero return with the risk of stranded assets in the long term.

Regulatory Pressure for “Net Zero” and “climate action”

- The regulatory pressure around climate issues is increasing, with the EU leading and many following.
- Pressures are resulting in carbon taxes and emissions trading regulations, import penalties and investment incentives across the globe. These vary widely by region.

Short Term Market Impacts

The industry's reaction to the COVID-related demand collapse caused a rapid and uncoordinated reduction in capacity to supply, initially in products, but rapidly followed by a reduction in upstream activity and production capacity. This latter supply capacity reduction was hastened by the negative spot price of oil in the US in April last year.

Predictably prices have been rising as demand recovers in the post COVID vaccination world. Sadly, supply capacity has been slow to recover, the result has been a steady rise in oil price this year from around \$40/BBL to the mid \$70's/BBL (ref: Fig 1). This is expected when there is a misalignment of demand and supply at the margin.

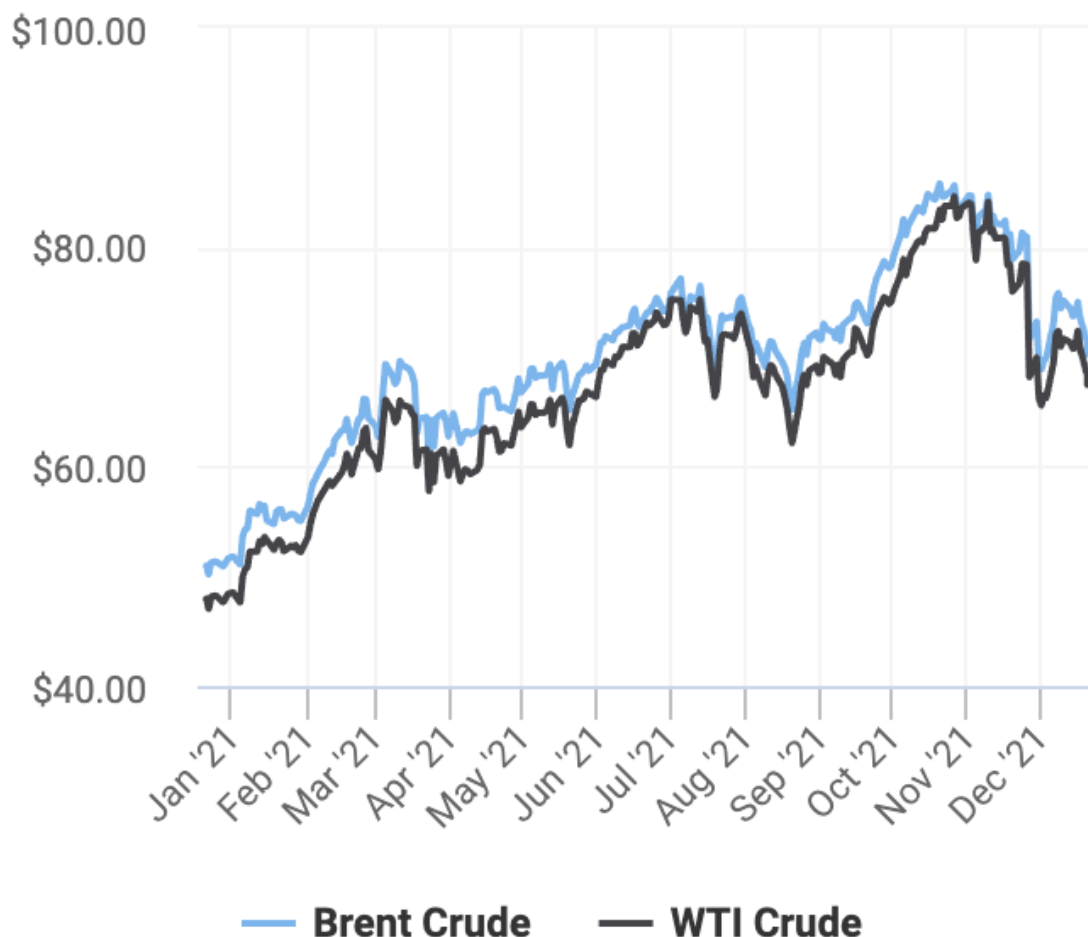


Figure 1: <https://oilprice.com/oil-price-charts/>

There has been a sharp ~29% reduction in E&P investment in 2020 and this is predicted to continue through 2021. This will result in continued short supply as demand continues to recover.

Medium Term Market Impacts

It is expected that demand will stabilise as the world economies recover from the economic shock of COVID. This will not be globally uniform, but overall demand recovery will stabilise, most likely below pre-COVID levels.

Steep reductions seen in general upstream CAPEX (-29%) and Exploration CAPEX (-46%) (Ref: Fig 2) will have lasting effects on medium term production levels. Supply can be expected to lag demand growth, thus supporting higher oil prices in the medium term.

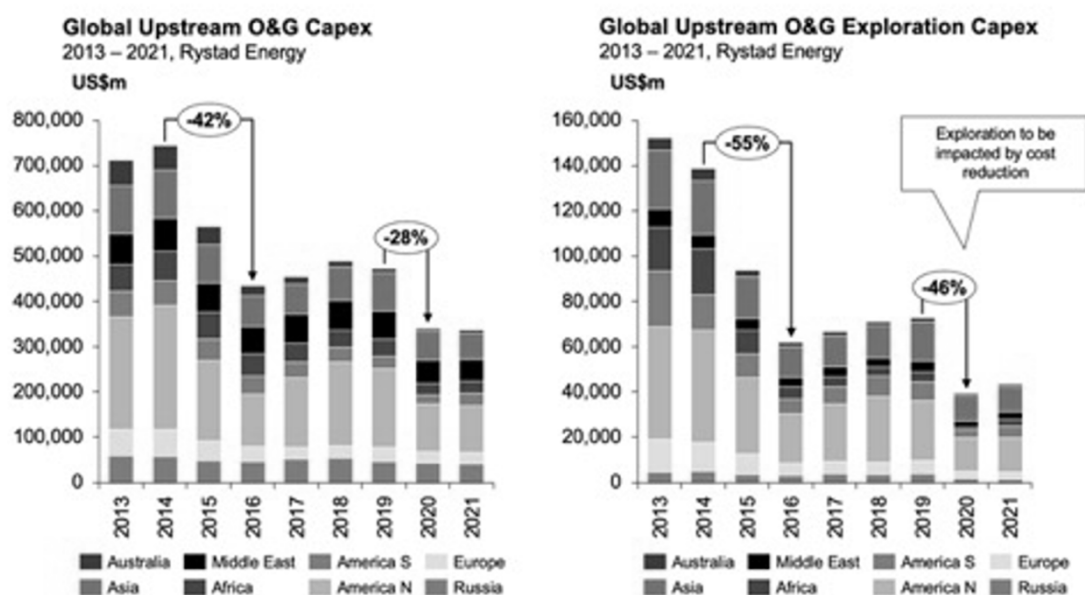


Figure 2 (Source: [Rystad Energy](#); PwC Strategy& research)

The observed downstream divestment and closure of refining assets by some majors and smaller regional refiners will impact product supply at the margin in some markets. As a result refining margins can be expected to increase.

It is unlikely that supply building CAPEX levels will recover in the medium term due to investor sentiment and the public pressures for "net zero" and "decarbonisation" creating uncertainty for the long term viability of these investments.

The traditional O&G industry model of growth driven capital returns will no longer apply, marking external capital harder to find. Internal cash flow will be the primary source of funds for major capital projects, and this funding will be under pressure because of the need to fund the "net zero" transition from the same operating cash flow.

There will be short term price volatility due to the actions of large producers, e.g., Saudi Arabia, whose economies are dependent on oil exports. There will be times

when the position will be taken that oil sold at any price is better than oil left in the ground unsold.

Long Term Market Impacts

There are three major forces that will determine the future oil price:

1. Regulations from governments on the use of Electric Vehicles, perhaps the banning of petroleum burning vehicles or tax and other incentives to substitute EV's for gasoline and diesel light vehicles. Several countries currently have incentives in place and some have announced such bans taking effect between 2030 to 2040.
2. The consumer market preference for "green" transport solutions pushing up EV sales. There has been a strong shift in consumer preferences toward EV's of various types and the trend is likely to continue. This is helped by the government incentives above, but it is also a genuine shift in buying preferences based on climate concerns and the "green" & "net zero" movement.
3. Investor/capital market activism, as seen in recent months, is starting to be a real factor affecting the board rooms of the big oil companies and can be expected to grow and mature. Today we have seen what would have been unthinkable only 5 or 10 years ago: Exxon and Chevron having climate activist sponsored directors elected to their boards, and Shell losing a court case that has mandated a net zero migration, with a 45% reduction in CO2 emission by 2030. This will force the big, listed companies to dramatically change their investment strategies and look for new markets to replace the sale of hydrocarbons.

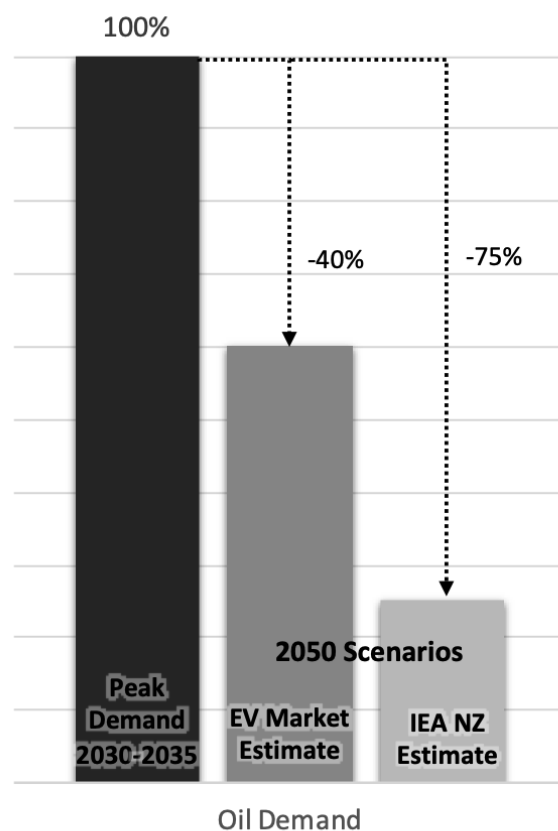


Figure 3.

Long term, there will be a peak in demand (early to mid 2030's) followed by a steady decline. The issue is not if, but rather when and how steep/rapid the decline will be.

This will not be uniform in all markets. There will be some uncomfortable product barrel shapes emerge, creating problems for existing refining assets in meeting product demand at feasible cost as some products are affected more quickly than others. For example, gasoline and diesel for light vehicles will be impacted first. Demand for jet fuel will be affected much more slowly, due to the more difficult fuel substitution issues.

As a result of all this uncertainty it is necessary to look at multiple scenarios and their likely market impact.

The IEA Net Zero simulations show a very aggressive and unlikely demand fall, -75% by 2050 in order to meet the Net Zero commitments, this is unlikely to happen. More conservative simulations based on EV demand and related ICE substitution still show demand falling by around 40% by 2050 with barrel shape misalignment to the market starting in the early 2030's. A fall by as little as 40% would be hugely impactful on markets.

It is unlikely that the reduced upstream CAPEX, discussed earlier, will result in a sufficiently reduced production to balance the low demand. Consequently, it is expected that oil prices will decline, driven by surplus production.

The behaviour of major producing countries will have a significant impact as demand starts to decline (post peak demand in early 2030's). The realization that oil reserves will become stranded assets in the long term will encourage increased production and sales discounting, similar to what was seen in April 2020. However, this will be more sustained and possibly more aggressive.

Also, the social implications will be large in some of these countries that are highly dependent on the oil revenue and have low cash reserves, e.g., Central Asian, or African countries like Congo, Kazakhstan, and Azerbaijan. There is likely to be social and political instability as well as economic instability.

In the Middle East, significant demand collapse will have very large impacts on many countries. Only those who have diversified in a meaningful way will avoid economic and social/political problems. Today we see some recognition of this from Saudi Arabia, but less so by the others. However, it is not clear that Saudi reaction is serious, and their actions today appear to be more marginal, and PR focused.

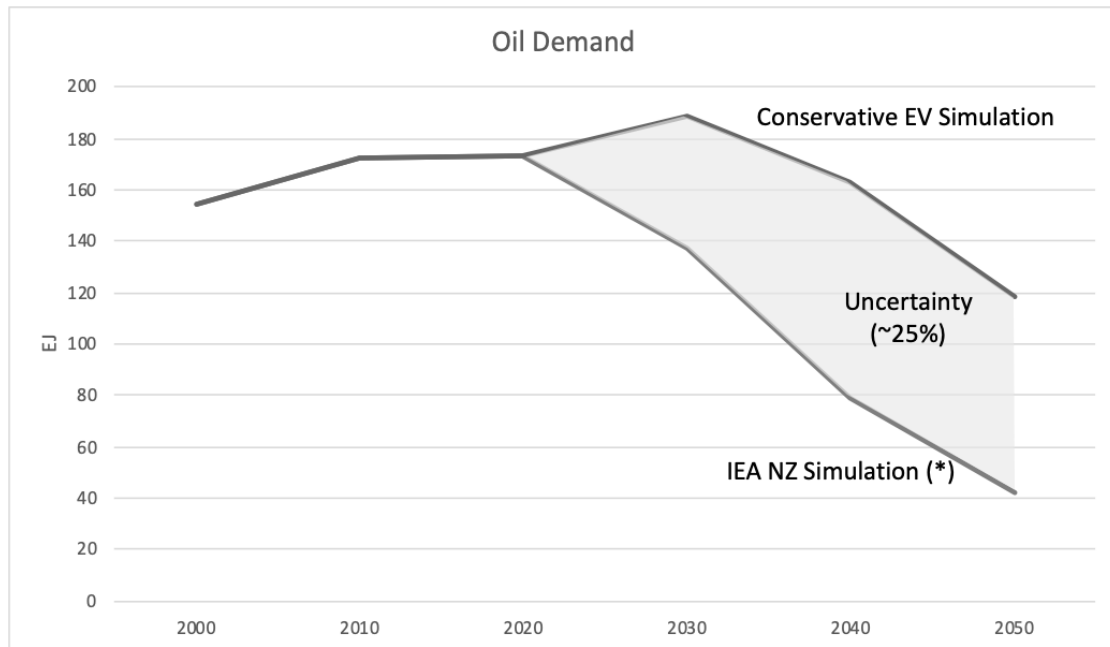


Figure 4

(*)Data from: International Energy Agency (2021), Net Zero by 2050, IEA, Paris

Finally, the projections have wide uncertainty. The IEA projection is unlikely to come true as it requires immediate aggressive action. The more conservative projects have higher probability and will be driven by consumer and investor sentiment.

The market outcomes will be analogous to what was seen with lead in gasoline or tobacco. In both these cases there were elements in the industry who fought hard to deny the science and delay the transition of their businesses. In the case of lead in gasoline, it was Exxon leading this denial tactic. We could be forgiven for thinking that Exxon is doing the same now. In both these examples the science won, and the market shifted. We can expect the same in this case.

*IEA's net zero roadmap report and data may be found via the following links;
[iea.li/nzeromap](https://www.iea.org/net-zero) [iea.li/nzedata](https://www.iea.org/net-zero)*

The Issues Relating to the Transition Away from Oil and Gas

The long term impact on the market of an industry in transition away from its traditional operations of finding, producing, refining, distributing and selling oil and gas to a “green” or “net zero” future will be profound.

The major impacts will result from decisions about the direction of that transition, how to fund it, how to transform the workforce, how to build competence for that new and unfamiliar business operations, and how to maintain investor and shareholder confidence.

The long-term options for most oil and gas companies are stark.

- Follow the demand decline, with a planned downscaling of operations to match demand. In this case they will either end up with a small niche operation producing the remaining non-fuel hydrocarbon products, lubricants, solvents, polymers etc. Their scale would be around 10% of current operations. Or they could transform into an energy, emissions, carbon, and commodity trading company, if the company culture and competence supports such a transition. This process would start with an aggressive portfolio restructuring, particularly oil and gas reserves, immediately divesting the high risk, high cost, low recovery assets. BP is doing this now.
- Divest ahead of the decline to maximise the recovered value of the assets, and re-invest in other energy or related industries, such as, green hydrogen or EV infrastructure. It is expected that oil demand will continue to rise modestly through into the mid 2030's, giving time to execute a well-planned exit strategy and recover reasonable asset value. Shell seems, at least initially, to be following this path.
- Do nothing, decline into bankruptcy, and leave stranded assets for the creditors. This is the denier's path, the followers of the idea that they can manage the market and keep the status quo for the long term. Sadly, today it looks like Exxon and a number of smaller NOC's are in this group. Cynically, this is the option some senior executives will pursue to capture short term compensation benefits at the expense of long term viability, knowing that they will be long gone from the industry before the demand issues bite hard.

The likely outcome for individual companies will depend on their adaptability and how the market pressures develop. It's likely that hydrogen will gain in importance as an energy source replacing oil, gas and coal for heavy vehicles, trains, ships, and industrial applications. Industries such as steel making, and cement are the obvious targets for green hydrogen at scale.

There is also a viable intermediate step in the transition path, using natural gas as a coal replacement and as the source for producing “blue H₂” which would fill the gap until the development of high efficiency and cheaper photovoltaics and electrolyzers. This will enable some exploitation of current natural reserves and assets (e.g. pipelines and distribution infrastructure). It is also a business model that oil companies understand and have expertise in. There must be a clear strategy to phase out the traditional business while leveraging it as much as possible to generate the cash to fund the transition.

Transition Strategies & Practical Considerations

It starts with the issues related to a viable transition strategy:

- What will your company be after transition? (The transition target)
- How to get there?
- Where will the funding come from?

The practical issues of “How to Get There” and “Funding” have been well summarised by the following Forbes article:

“There are three primary challenges facing the oil and gas industry today. The first is to produce more energy at lower cost with less emissions..... Oil and gas companies need to continue their good work at lowering costs. Investors are demanding better returns on their investment in oil and gas companies.

The second challenge is for the oil and gas industry to collectively invest approximately \$500 billion each year just to keep up with demand. Since 2015 the oil and gas industry has underinvested, especially in the upstream portion of the business..... Once the global spare capacity is depleted there will be a need to reinvest in not only maintaining, but actually growing oil and gas production to satisfy the needs of customers..... This challenge will be difficult to achieve and if it is not handled effectively to develop or re-develop supply to stay in-step with demand, we will see a period of higher oil and gas prices.....

The third challenge is for oil and gas companies to demonstrate differential and durable cash flows. There’s been a large number of investors fleeing the oil and gas sector. In the past, many oil and gas companies outspent their cash flows in the name of growth. That is no longer the case for the vast majority of companies. Still, investor confidence has not yet returned. Energy companies need to show that they have capital discipline and will consistently return money to their shareholders....”

Forbes Mar 10, 2021, William “Bill” Maloney is currently on the Board of Directors of Trident Energy and ATX Energy.

Bill serves as an energy advisor to Warburg Pincus and an executive advisor for Balex Technologies.

<https://www.forbes.com/sites/uhenergy/2021/03/10/challenges-and-trends-for-the-oil-and-gas-industry/?sh=114eca90167f>

Considerations

A transition to “net zero” for a large oil company is a difficult and complicated undertaking. There are a lot of risks to the core business and to stakeholders. The transition strategy developed by any company must be a balance between competing forces:

Time - Meaningful and impactful transition strategy that achieves the “net zero” goals within the target time frame.

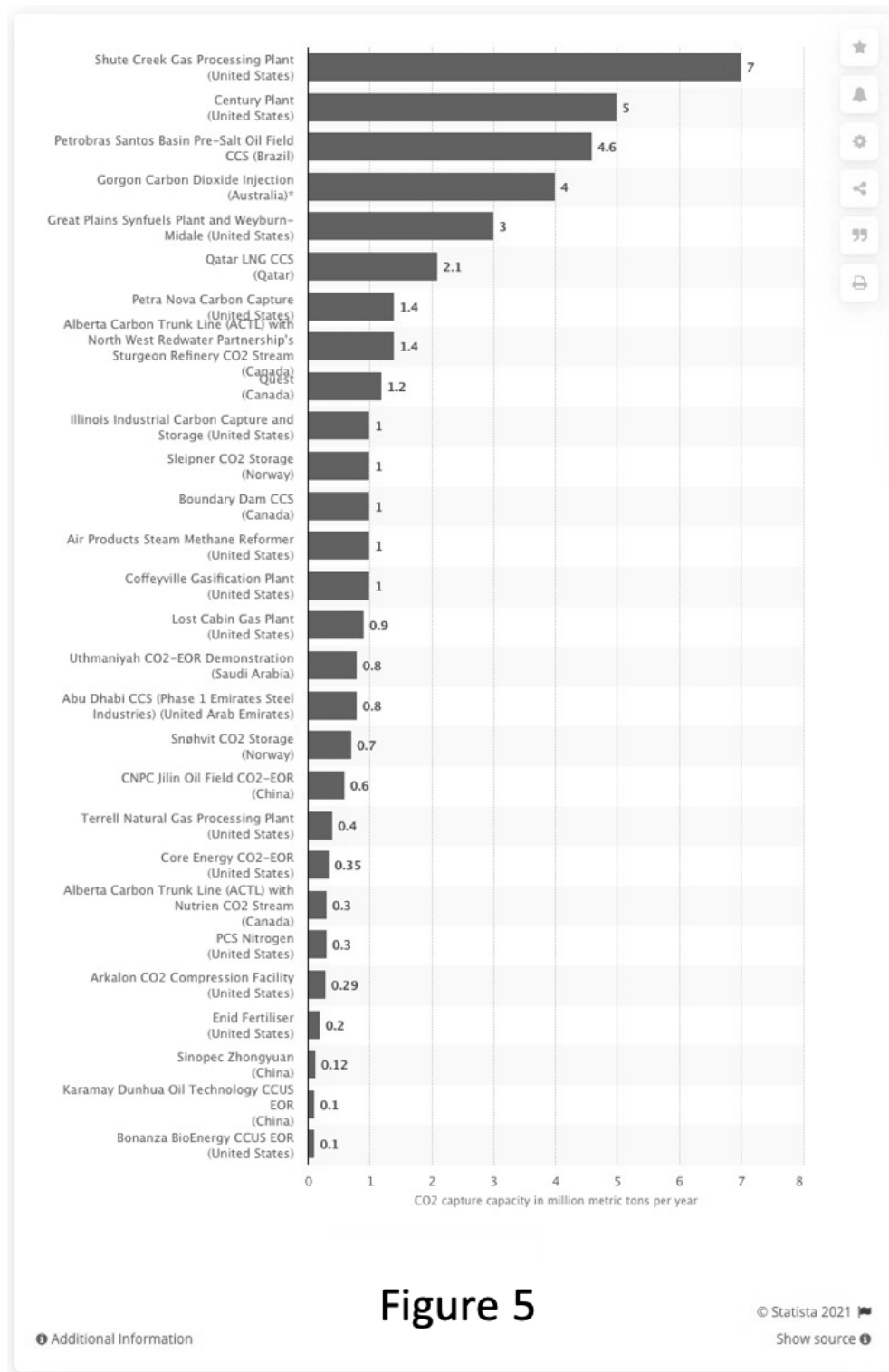
Funding - A transition that does not bankrupt the company, leaving investors with stranded assets and large liabilities. This is both a funding issue and a strategic planning issue.

Social Impact - The social impact, at both the large scale of countries and small scale of local towns and communities, must be managed so as not to create political and social instability.

Scale - The transition strategy must recognise huge scale of the industry and the massive infrastructure it has created over the last 100 years or so. The entire economic system of the planet is dependent on the energy industry. Consequently, transition strategies must address how to replace this large-scale infrastructure without damage to the economies of many countries.

Industry Dynamics - No single strategy by one company or government will be the solution, it will take many transitions adding together to affect change. The very large multinational oil companies have an important role to play because of the scope of their operations. Consequently, an effective transition strategy should take into account the actions of the other players in the market and seek complement their activities, not simply compete.

The Practical Issues – Scale



The huge scale of the industry and the dependence of modern economies on the energy industry, are important features that must be considered in any transition strategy.

There are two scale issues;

The first is the obvious one, the reason for the “Net Zero” initiative and the Paris Accord. That is the approximately 34 billion tonnes of CO₂ emitted into the atmosphere every year from the burning of fossil fuels (Oil, Gas and Coal). Another way to look at it, the O&G industry burning of around 100 million barrels per day of oil.

Any meaningful transition strategy should be expected to produce a visible impact on these numbers. For example, today the global total CO₂ capture capacity is only approximately 35million tonnes per year (0.001%) (ref Figure 5).

The second is the scale of the oil and gas industry infrastructure. While the production numbers of 100 million barrels per day of oil production and the 62 million barrels a day oil equivalent of natural gas are large numbers, the infrastructure is even more massive. The exploration, production, refining and distribution infrastructure built by the industry is very, very large. Over the last 120 years of operation the oil and gas industry has spent something like \$20 Trillion of capital on building that infrastructure. To put it in context, this is more than the 2020 GDP of China, which was \$14.3T.

Given this scale, transitioning away from Oil & Gas will be a slow and expensive process, much slower and more expensive than is generally expected. This will be a process of countless small initiatives by numerous companies and countries.

For corporations, the process will be driven by the combined forces of investor sentiment, consumer preferences and government regulation. The speed of transition will be limited by the availability of capital to invest, the speed at which the engineering of the infrastructure can be achieved (i.e., how fast the money can be spent) and of course the level of corporate will to do it. This latter point is illustrated by the actions of the majors described in previous sections.

Practical Issues – Funding

Funding such a massive transition is a major issue for most oil companies. The options for oil companies are relatively few and all have their consequential effects.

- Divert existing capital expenditure away from traditional oil and gas development to new “net zero” projects. Over time, this will cause depletion of available oil and gas reserves, as reserve replacement activities are discontinued in favour of transitional spending. This diversion is likely to include huge pressure on enhanced recovery and field/well maintenance spend, which will accelerate the decline of some fields. The medium/long term impact of this was discussed previously.
- Raise additional capital from the market (bonds or equity). This will be limited by investor sentiment, as the entire oil & gas industry deals with the

legacy public perceptions of being a polluting industry. Consequently, these capital sources will be limited and increasingly expensive. Issuing additional equity is even less attractive and will be unpopular with existing investors who would oppose the dilution of their holdings. It will also increase pressure on dividends, further increasing cash pressures. As an example, refer to Aramco's dividend policy.

- Portfolio optimisation, divesting assets to raise capital. BP is an example of this strategy. Shareholder sentiment is an issue as the impacts on the balance sheet and debt must be managed.
- Operational efficiency improvements. All companies have inefficiencies that can be removed to improve cash flow and profits. The scale of the average oil company usually means the improvements in cash terms can be very large. Each company and the market within which it operates is different, so the opportunities will be specific to their circumstances. These programs need to be extremely detailed and focus on small improvements in many parts of the businesses. Typically, an operational efficiency program will be driven centrally and work through improvement categories around CRM, SRM, Supply Chain Optimisation, Maintenance, warehouse inventories, ETRM, cash and treasury optimisation, FOREX optimisation, etc. generally speaking, biggest gains are found in the areas of big expenditures: oil trading (margin management and hedging), upstream maintenance/procurement, and downstream turn-around maintenance. An important feature of an operational excellence program is that the portfolio of projects must be managed to prioritise the largest cash flow improvements across all businesses and subsidiaries. This requires central high-level planning, coordination, and governance.
- For state-owned enterprises, requesting public funding is an option. This is essentially raising shareholder capital or increasing debt levels, and may have undesirable effects on the other shareholders if the state-owned enterprise is a listed company.

Practical Issues – Social Impact

As mentioned previously, one of the consequences of a falloff in oil demand will be the impact on the economies of oil export dependent countries. This is a larger-scale impact if the declining economies of these countries could result in political and social instabilities.

Some countries, such as the smaller Middle Eastern countries like UAE, Qatar, Kuwait, have strong reserves and comparatively low debt levels with small populations. These countries could theoretically find a safe transition path.

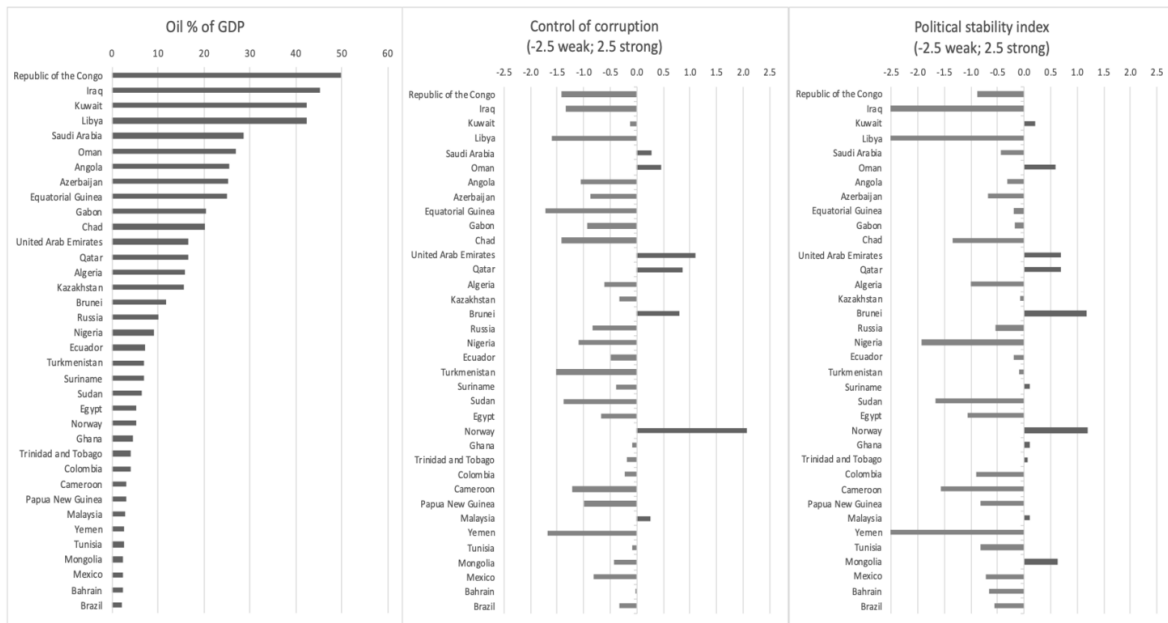


Figure 6

The countries most at risk are those with a large part of the GDP dependent on Oil & Gas exports (>10%), with high external debt levels, weak governance, and without strong financial reserves.

Examples of countries at risk include Turkmenistan, Kazakhstan, Azerbaijan, Republic of Congo and Nigeria, where the already complicated political systems will be strained by economic difficulties.

Finally, there are a few countries where the outcome could be very bad: Russia, Saudi Arabia, and Iraq. Each has its own issues, but most have a huge dependence on export revenue from Oil and Gas with very little in the way of back up. Russia has immense reserves of minerals and could mitigate the impact if timely action is taken.

There is another social impact that will be felt by countries with large state-owned oil and gas companies. In most of these countries the companies provide services to cities and provinces that employ large numbers of people and support critical infrastructure and services. The loss of the oil company operations would have a dramatic impact on these cities. This is particularly true in countries like Russia, Kazakhstan, Azerbaijan, and most of the Middle East, where their economies are heavily dependent on oil and gas export revenue.

It is reasonable to expect significant economic and social instability in these countries if no mitigating steps are taken. These will look like the instabilities and social unrest seen in the UK in the 1980's when the deep coal mining industry closed down and many small towns dependent on the coal mining were left with high unemployment and no other sources of income.

China is a special case. While large numbers of cities (and people) are heavily dependent on the state-owned oil and gas companies, China has the good fortune of not being Oil & Gas export dependent. China can balance its large imports against its own production to match declining local demand and thus insulate the local communities from the immediate impact. Also, this dominant position in the oil import market means that China will have increasing trade power to support some countries' economies and not others, for its own political benefit.

Sadly, Russia is not in this situation and may see significant issues as exports to Europe and China decline.