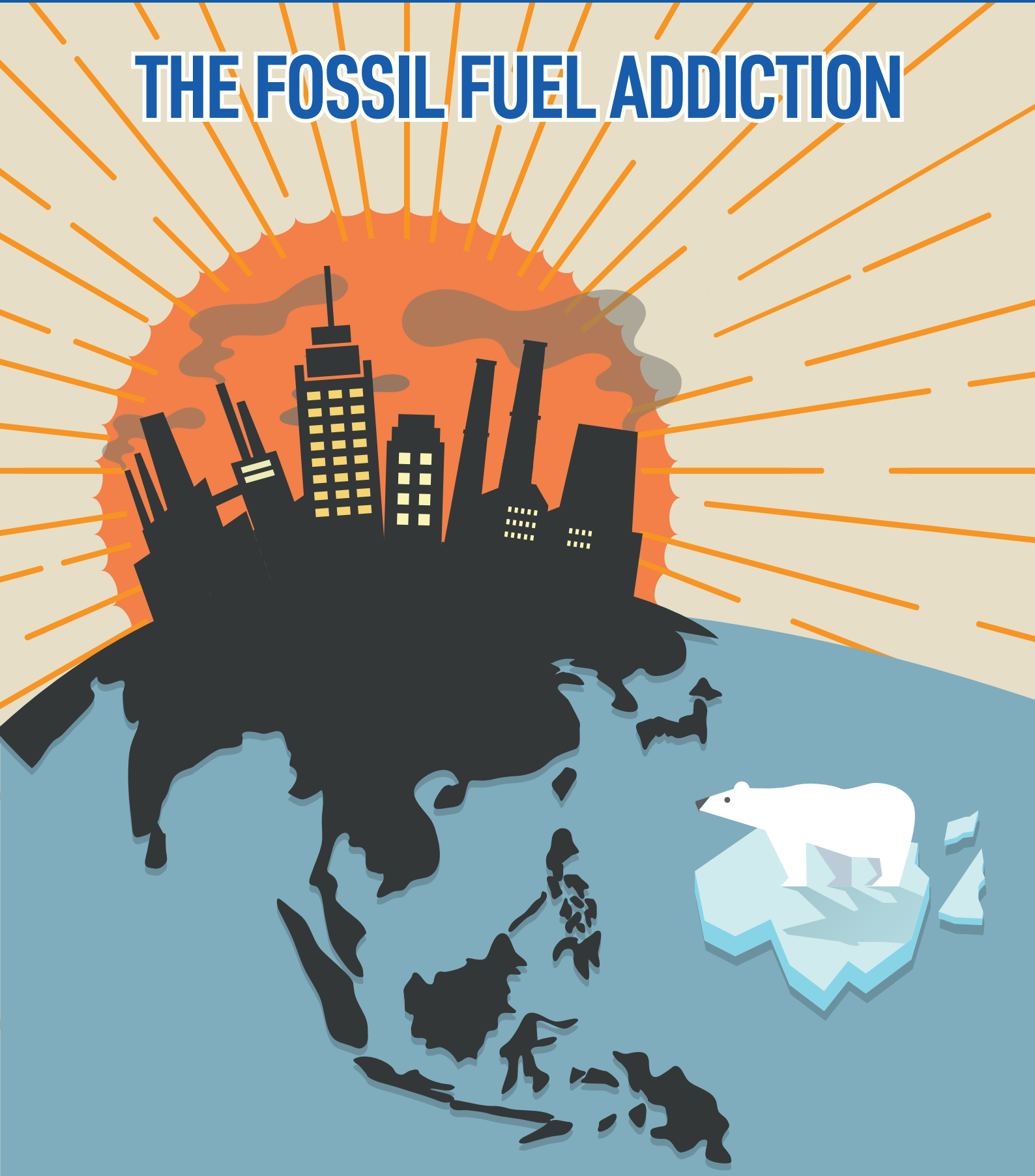


THE FOSSIL FUEL ADDICTION



27 November 2019

Energy | Regional Oil & Gas

Regional Oil & Gas

Overweight (Maintained)

The Fossil Fuel Addiction

Stocks Covered 21
 Ratings (Buy/Neutral/Sell): 14 / 5 / 2
 Last 12m Earnings Revision Trend: Negative

- **OVERWEIGHT, some Top Picks: Yinson, Thai Oil (TOP), Keppel Corp.** The world needs to cleanse itself from its fossil fuel addiction and move towards a greener, lower-carbon world. A balance between providing fossil fuels to meet global demand while minimising the impact on the environment is required. With consumption at 100mbpd and rising, oil will remain an important fuel source well into the foreseeable future. We are not bullish on the oil market, but believe further uplift in share prices on select companies is possible.
- **Global warming is melting Earth's ice sheets and glaciers, causing sea levels to rise.** Floods, droughts, and hurricanes will get more severe and frequent if we do not change the way we behave. Global warming is getting worse as a result of ever more greenhouse gas emissions in the atmosphere. Almost half of the world's extra man-made carbon dioxide emissions occurred after the turn of the 1990s. The burning of the fossil fuels has been named as the number culprit of greenhouse gas emissions.
- **The world needs to cleanse itself from its fossil fuel addiction and move towards a greener, lower-carbon world.** However, we remain highly dependent on fossil fuels, which account for as much as 79% of primary energy demand today. Although renewables are promising, solar and wind still face limitations in terms of intermittence and storage. A technological breakthrough is required to accelerate the proliferation of renewables.
- **Weaning the world off fossil fuels has started,** with the push by climate activists/shareholders, support of various governments, and corporate action. Some oil majors have investments in renewables and the electric value chain, while others have focused their efforts on making oil & gas as competitive as possible with other future substitutes.
- **Oil & gas companies need to find the balance** between providing fossil fuels to the world while minimising the impact on the environment. With consumption at 100mbpd and rising, we believe oil will remain the one of the most important fuels well into the foreseeable future.
- **OPEC and its alliance (OPEC+)** – along with the US crude oil producers – remain an essential part of global supply. Shale oil's estimated faltering growth in 2020 could possibly alleviate OPEC+'s need to provide the markets with a deeper cut amidst weaker demand. In the bigger picture, we believe Russia remains a committed partner to OPEC, and the objectives of OPEC+ remains firm – to keep the market balanced and stable.
- **OVERWEIGHT maintained.** We believe the oil & gas industry is now in a late cycle, as oil demand starts to falter. This past year has been a roller coaster ride for the crude oil markets, with high volatility in crude oil price with the ebb and flow of the news cycle. One key factor that will determine the direction of the oil and equity markets now and next year is the US-China trade war, where the outcome, or lack thereof, will determine the magnitude of the global economic slowdown. With our forecasts of USD64.00/bbl for 2020F and USD60.00/bbl for longer term, we are not overly bullish. However, we believe share prices have been overly bearish and may not be reflecting the improved outlook of each individual company. We believe there is the possibility of further uplift in share prices on our selected companies. Our Top Picks overall: PTT Exploration & Production (PTTEP), PTT Global Chemical (PTTGC), Thai Oil (TOP), Star Petroleum Refining (SPRC), Yinson, Serba Dinamik, and Keppel.

Top Picks

Yinson (YNS MK) – BUY
 Thai Oil (TOP TB) – BUY
 Keppel Corp (KEP SP) – BUY

Target Price

MYR8.22
 THB84.00
 SGD7.80

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Climate change: Are we at the point of no return?



Source: Science, HowStuffWorks, The Crimson Monkey, Getty Images

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Company	Rating	TP	% Upside (Downside)	P/E (x) Dec-20F	P/BV (x) Dec-20F	Yield (%) Dec-20F
PTTEP	BUY	THB150	25.52	11.02	1.07	3.63
PTTGC	BUY	THB63	16.67	11.74	0.77	4.07
Thai Oil	BUY	THB84	20.86	12.30	1.07	3.60
SPRC	BUY	THB12.7	24.51	8.50	0.96	5.78
Yinson	BUY	MYR8.22	23.61	18.73	1.89	0.60
Serba Dinamik	BUY	MYR5.42	26.05	11.88	2.26	2.56
Keppel	BUY	SGD7.80	15.21	11.34	1.01	4.41

Source: Company data, RHB

Are We At The Point Of No Return?

“Climate change is no longer some far-off problem, it is happening here, it is happening now.” – Former US President Barak Obama on Climate Change

“The Earth is a fine place and worth fighting for.” – Ernst Hemingway



Catastrophe in the making

Ice is melting worldwide, especially at the Earth’s poles. By the end of this century, with temperatures rising by 1.5 degrees Celsius, sea levels are expected to rise by 26-82cm or higher. In extreme cases, if all of the Earth’s glaciers and ice sheets melt, it would raise sea levels by 65m. This could cause entire states and even some countries to disappear under the waves. Some parts of the world are at risk of decades-long mega droughts by 2100. While this is an unlikely scenario, and may take centuries, it could happen if the world keeps burning fossil fuels. Until then, we will likely see hurricanes and other storms become stronger, while floods and droughts become more common and intense. There will be less fresh water, as glaciers store about three-quarters of the world’s fresh water. The ecosystem will continue to change – some species will move to cooler climates while others, such as polar bears, could one day become extinct. *(National Geographic)*

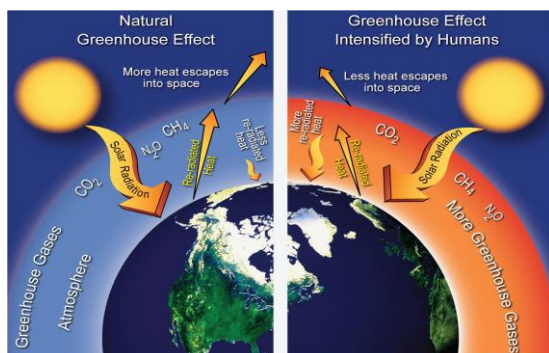
Global warming

What is greenhouse gas/global warming/climate change?

The greenhouse effect is a process that occurs when gases in the Earth’s atmosphere trap the Sun’s heat. The process makes Earth much warmer than it would be otherwise. Without an atmosphere, the Earth’s surface would be c.-18 degrees Celsius. The primary greenhouse gases (GHGs) are water vapour, carbon dioxide, methane, and nitrous oxide. Human activities are changing the greenhouse effect. The burning of fossil fuels has put more carbon dioxide into the atmosphere, and too much GHG could cause the Earth’s atmosphere to trap more and more heat, causing the world to warm up – global warming.

Global warming is the long-term heating of Earth’s climate system – observed since the pre-industrial period (1850-1900) – due to human activities, accelerating the greenhouse effect. The term global warming is frequently used interchangeably with climate change, although the latter refers to both human and naturally produced warming and the effects it has on our planet. The most common measure of global warming is the average increase in the Earth’s global surface temperature. *(National Aeronautics and Space Administration or NASA)*

Figure 1: The GHG effect



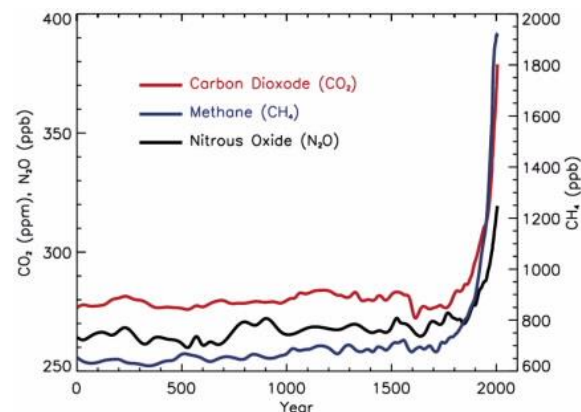
Source: Socratic.org

The causes and impact of climate change

Carbon dioxide occurs naturally in the atmosphere, accounting for less than 1% of atmospheric gases, and is essential for photosynthesis. However, the level of carbon dioxide (and other GHGs) in the atmosphere has increased since the industrial revolution. The concern is the significant increase in carbon dioxide (and other GHGs) over a relatively short period of time. The cause has been attributed to deforestation, burning of fossil fuels, intensive farming, waste disposal, mining, and overconsumption.

Scientists use observations from the ground, air, and space – along with theoretical models – to monitor and study past, present, and future climate changes. Climate data collected provide evidence of climate change: Global land and ocean temperature increases, rising sea levels, ice loss at the Earth’s poles and in mountain glaciers, frequency and severity of changes in extreme weather (eg hurricanes, heatwaves, wildfires, droughts, floods, and precipitation), to name a few.

Figure 2: GHG emissions



Source: Intergovernmental Panel on Climate Change (IPCC)

The Solutions

Solving global warming will not be easy. The good news is that we know the problem, know the cause and effects, and know how to avert a catastrophe. What we need is a global collective plan of action, as well as the political will to make the hard decisions and take appropriate actions. With the Paris Agreement signed in 2016, we have a global collective plan. We now need to take action.

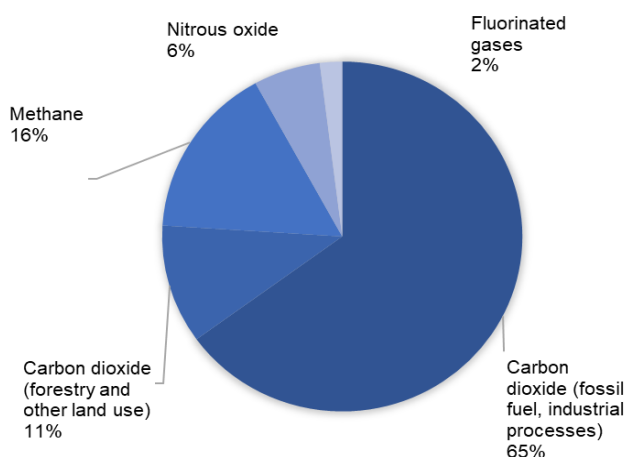
The Paris Agreement came into force on 4 Nov 2016. This agreement brings all nations to a common cause – the aim: strengthening the world’s response to the threat of climate change by keeping the rise in global temperature this century to well below 2 degrees Celsius above pre-industrial levels and pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius. In total, 196 countries have committed to the Paris Agreement. Each country will submit its own plan, targets for emissions reduction, and action plans to reach those targets. However, despite this agreement, global carbon emissions have been on the rise, and the last five years have been the hottest on record.

The solutions to global warming hinges on us, and how we behave and shift the way we make and consume energy. There is no one magic pill, but a myriad of things that we, as individuals, a country, and globally can do to combat climate change:

- i. **Renewable energy (RE), moving away from fossil fuels:** Solar, wind, biomass and geothermal energy;
- ii. **Energy and water efficiency:** Reducing/increasing efficiency of our energy consumption;
- iii. **Sustainable transportation:** Promote public transportation, carpooling, electric/hydrogen vehicles;
- iv. **Sustainable infrastructure:** Building new low-energy buildings and renovate existing buildings;
- v. **Sustainable agriculture and forest management:** Better use of natural resources, stop deforestation, and make agriculture greener and more efficient;
- vi. **Responsible consumption:** Reduce, reuse and recycle food, clothing, and cosmetics, and recycle wherever possible.

Source: NASA, United Nations Framework Convention on Climate Change (UNFCCC), Solar Impulse

Figure 3: Global gas emissions breakdown



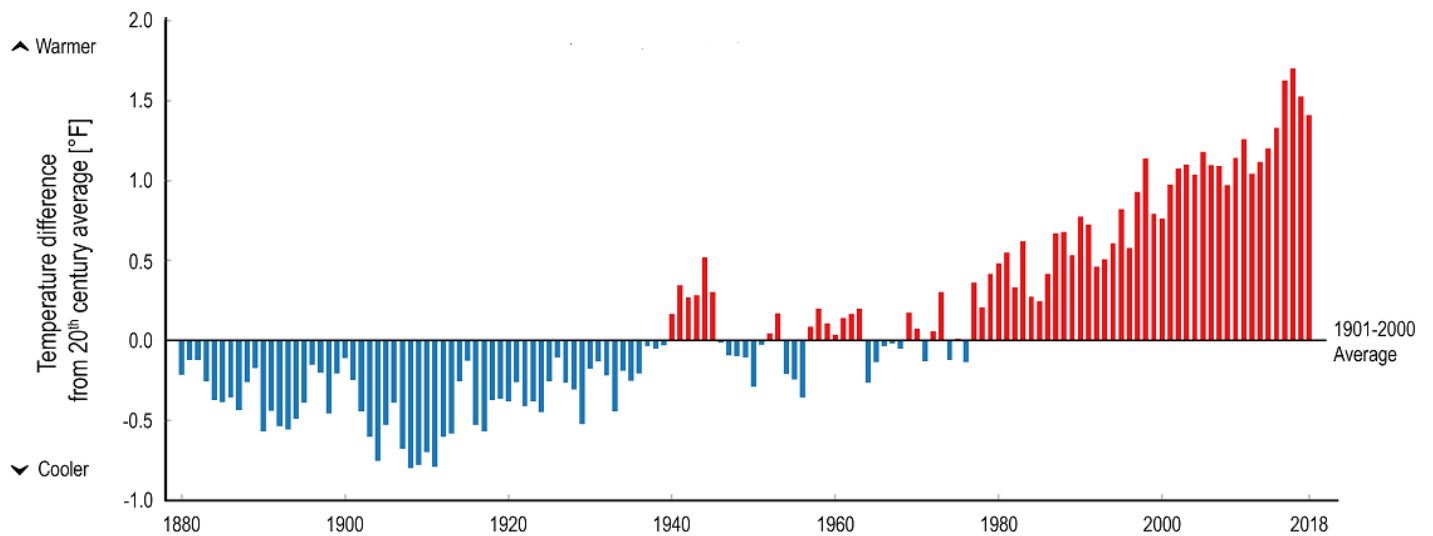
Source: US Environmental Protection Agency (EPA), RHB

Figure 4: Key GHG emissions from human activities

Greenhouse gas	Activities
Carbon dioxide (CO ₂)	The burning of fossil fuel is the primary source of CO ₂ , but it can also be emitted by human activities directly impacting forestry and other land systems (deforestation, land clearing for agriculture, etc). Conversely, CO ₂ can be removed from the atmosphere through reforestation, soil improvements and other activities.
Methane (CH ₄)	Agricultural activities, waste management, energy use and biomass all contribute to CH ₄ emissions.
Nitrous oxide (N ₂ O)	Agricultural activities such as fertiliser use as well as fossil fuel combustion generate N ₂ O.
Fluorinated gases (F-gases)	Industrial processes, refrigeration and the use of a variety of consumer products contribute to emissions of F-gases.

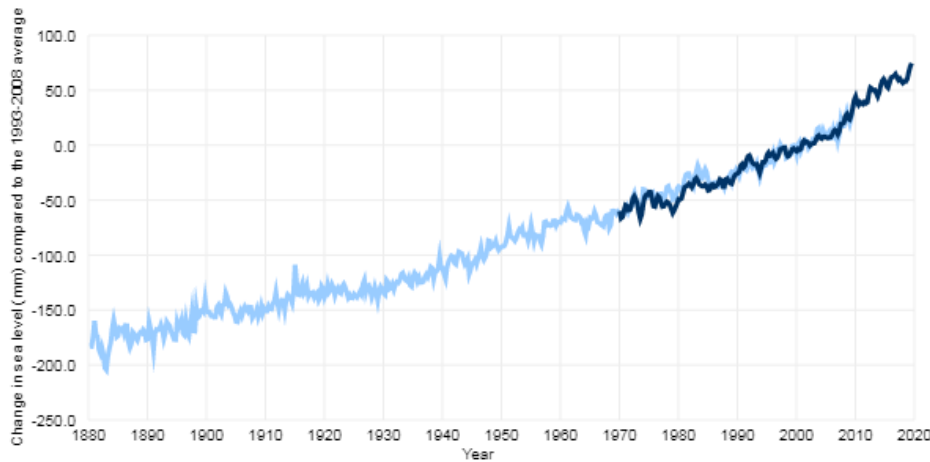
Source: EPA, RHB

Figure 5: Land and ocean surface temperatures are increasing



Note: Since the 1880s, the average global temperature has increased by more than 1.5 degrees Fahrenheit. Since the 1980s, average temperatures have exceeded the previous century's average every year.
 Source: US Global Change Research Programme

Figure 6: Global sea level rising



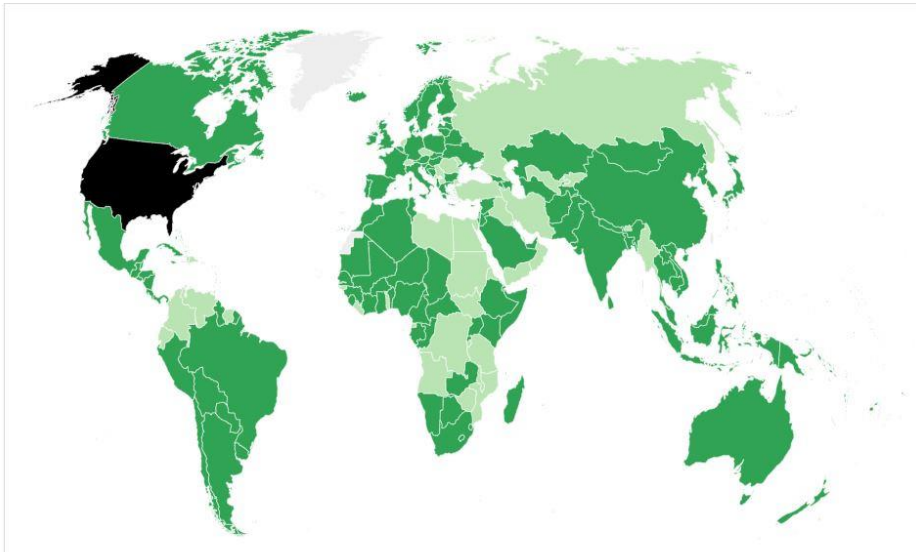
Note: The global sea level has risen 21-24cm since 1880 – a third of this has come in the last two and a half decades. The rising water level is mostly due to a combination of meltwater from the glaciers and ice sheets, and thermal expansion of seawater as it warms. In 2018, the global mean sea level was 8.1cm above 1993 average, the highest annual average on satellite record (1993-present)
 Source: National Oceanic & Atmospheric Administration Climate.gov

Figure 7: Countries that joined the Paris Agreement in 2016

Paris Agreement Participation

After countries sign the Paris Agreement, they formally join the pact by ratifying, accepting, or approving it—thereby expressing the country's agreement to abide by the accord.

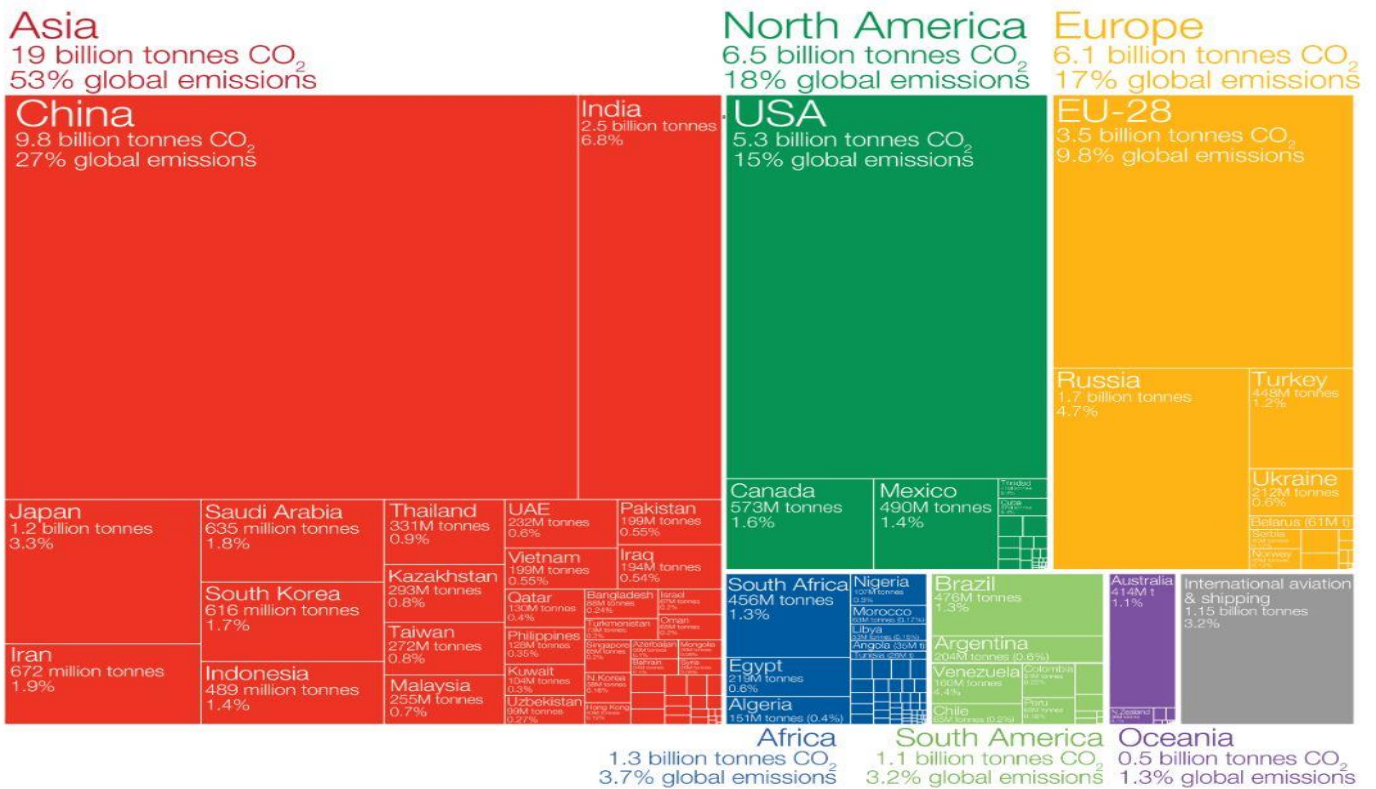
■ Withdrawing from Paris Agreement ■ Signed ■ Joined ■ No data



Source: National Geographic, RHB

Article 28 of the Paris Agreement, states that after joining the agreement, a country cannot leave for three years, after which there is a one-year waiting period for the leave to be fully effective. The US has begun the process to withdraw from the Paris Agreement as at 4 Nov 2019. As such, the earliest possible date to withdraw would be 4 Nov 2020.

Figure 8: Countries that emit the most CO₂



Note: National production-based emissions data is based on 2017. It is a production-based emissions measure of CO₂, produced domestically from fossil fuel combustion and cement, and does not adjust for emissions embedded in trade (consumption-based)
 Source: Our World In Data

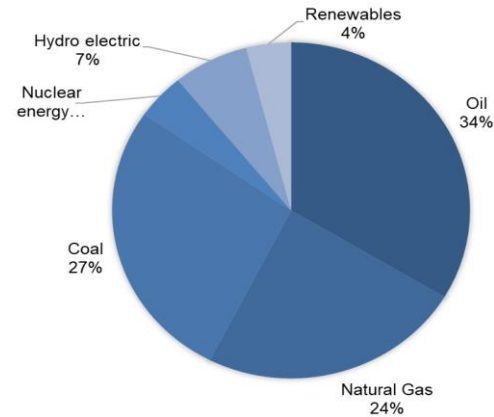
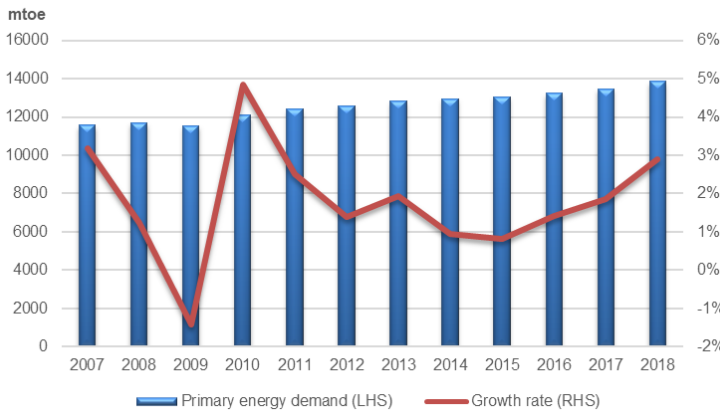
The Fossil Fuel Addiction

Putting things into perspective

The world's primary energy demand grew at an average of 1.7% pa over the past decade, with 2018 growing at a strong 2.9%. Primary energy comprises oil, natural gas, coal, nuclear energy, hydro-electric, and renewables. Fossil fuels currently account for 85% of total energy demand in 2018, according to BP Statistics, with oil and gas accounting for 34% and 24% of the total primary energy demand.

Figure 9: Primary energy demand sees continued strong growth

Figure 10: 85% of total primary demand is from fossil fuels



Source: BP Statistics, RHB

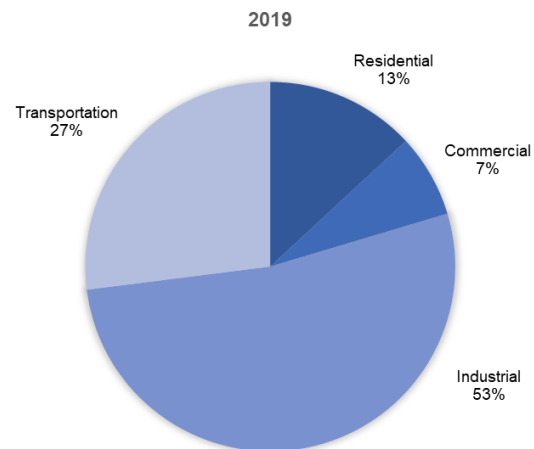
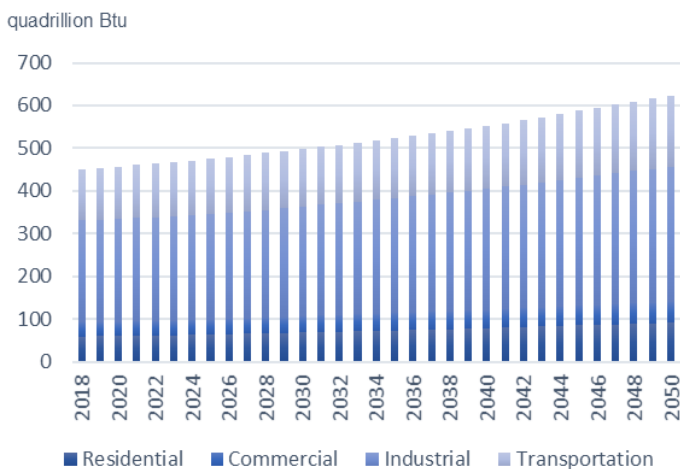
Source: BP Statistics, RHB

Primary energy demand is expected to see continued and sustained growth of 1% pa through 2050, according to the US Energy Information Administration (EIA). Total additional primary energy demand will increase by 169qdn Btu by 2050. To understand the magnitude of such a demand size, China's consumption currently stands at 117qdn Btu.

In terms of sector breakdown, industrial (refining, mining, manufacturing, agriculture, and construction) and transportation account for 80% of total primary energy demand. The total increase in the industrial sector is expected to increase by more than 30% to reach 316qdn Btu by 2050. The transportation sector is set to increase by more than 36% of by 2050 to reach 167qdn Btu by 2050.

Figure 11: Primary energy demand to see sustained growth through 2050

Figure 12: Industrial and transportation sector accounts for 80% of total primary energy demand



Source: US Energy Information Administration (EIA), RHB

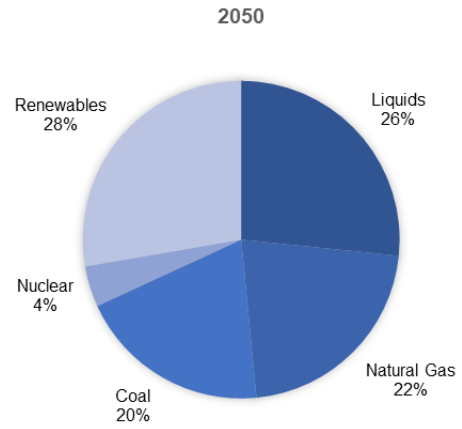
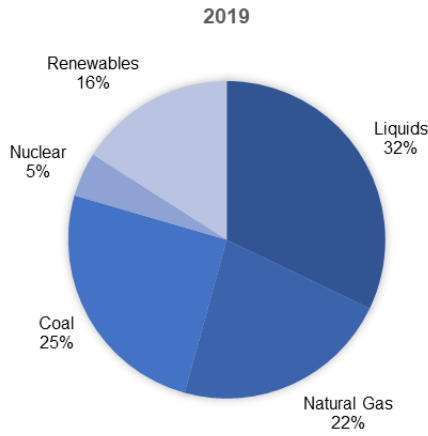
Source: BP Statistics, RHB

Fuelling the world's thirst for energy

The main source of fuel in 2019 is currently fossil fuels, at 79%. By 2050, the total fossil fuel component will fall to 68%, where the declines will come from oil/liquids – to 26% from 32% currently – and coal, which will be 20% of the total energy mix. This is down from 25% currently, according to the EIA.

Figure 13: Fossil fuels the main source of fuel at 79% in 2019

Figure 14: Fossil fuel component to fall to 68% by 2050



Source: EIA, RHB

Source: EIA, RHB

Combating Climate Change: Oil & Gas Solution

A difficult path ahead

It is well recognised that we need to move away from fossil fuels towards a carbon-neutral world. However, with fossil fuels accounting for as much as 79% of the primary source of global fuel demand in 2019 – and declining to 68% by 2050 – the world remains highly dependent on such fuels. In our view, we will remain this way until we have a major change in government policies, globally, as well as technology breakthroughs.

We need a clean energy technology breakthrough that is affordable, efficient, and reliable. There is no single or simple solution to combat global warming. There is a myriad of promising alternatives to fossil fuels – renewables, nuclear power, carbon capture, battery storage, and hydrogen fuel cells, to name a few. However, all of these alternative energy sources still require further development to compete with and replace fossil fuels.

Energy policies are adjusting to the new pressures, but the overall response still seems far from adequate to meet the energy security and environmental threats we now face:

- i. The oil & gas landscape is being profoundly reshaped by the US shale revolution. With pressure to combat climate change from investors, the oil companies have to rethink of business models & strategies (see our [Disruptive Fear](#) report for more details);
- ii. Solar, wind, and storage & digital technologies are transforming the electricity sector. However, renewables still require the technological breakthrough that will allow them to be more reliable, efficient, and affordable. The transition to renewables also requires the tackling of legacy issues from the existing infrastructure.

We believe the world can change, with the right incentives and under the right environment. The shale oil revolution in the US has shown us that, with the right incentives and technological breakthroughs and capital incentives, a change in the global oil landscape can happen. The solution to global warming requires governments to take the lead. While the Paris Agreement is a promising commitment, the world requires technology breakthroughs and the political will to change our behaviour and direction in which we are heading towards. The path forward is far from easy, but it will be worth it in the end.

Oil Majors In Transition

The oil industry is confronted by the prospect of slowing oil demand. Eventually, peak oil demand maybe somewhere on the horizon as well, as the players are pressured by shareholders and climate activists to reduce carbon emissions from their hydrocarbon businesses to limit global warming. Note that the details of the oil majors' responses to peak oil were addressed in our [Disruptive Fear](#) regional thematic, as well as in our piece on the [Dawn of E-Mobility](#).

Total (FP FP, NR) is the front runner amongst the oil majors to transform itself into a full energy company. It is active across the energy value chain from oil & gas exploration, refining, chemicals, trading, shipping, and marketing to power generation and renewables. Its strategy is to diversify from businesses that are subject to oil price volatility and towards establishing a robust position in the future of energy growth markets.

Royal Dutch Shell (RDSA NA, NR). The company will no longer be an oil & gas company, but will be an energy transition firm instead. It formed a new energies division in May 2016, combining low carbon and renewables interests – ie hydrogen, electric vehicle charging, biofuels, and renewables – to focus on long-term energy transition as part of its diversification strategy.

BP (BP LN, NR) is taking a more cautious approach to renewables, as it has lost several billion dollars in premature investments in the 2000s. However, the company is scanning and screening renewable opportunities for life beyond oil. BP is looking to invest c.USD500m pa (organically and inorganically) to enable growth in a low carbon world. The company has also invested over USD300m in more than 40 entities that are emerging or have potentially disruptive technologies across the upstream, downstream, and green energy industries.

Eni (ENI IM, NR) has a vision to grow its RE business in the long term, to ensure that the company will be able to adapt to a low-carbon future. Its three pillar corporate strategy includes RE as an integral part and targets to deliver 1GW of installed capacity in 2018-2021 by investing EUR1.2bn. It targets projected IRRs of 8-12% after financing and synergy with upstream operations. Long-term goal is to have 5GW of installed renewables by 2025.

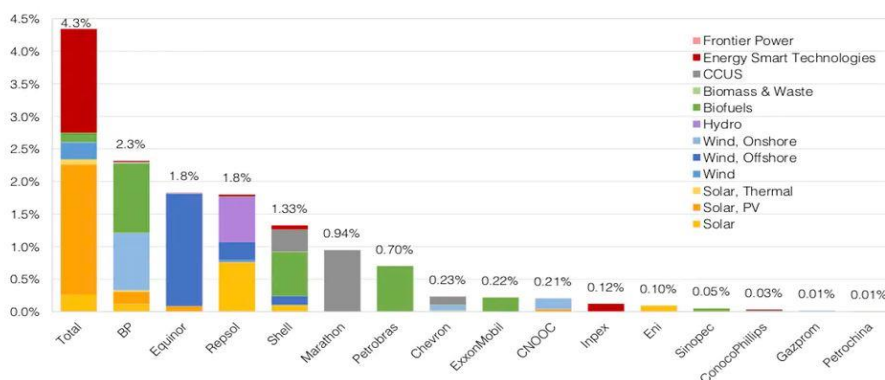
Equinor's (EQNR NO, NR) future investments into low carbon energies and renewables will increase from the current 3-5% of annual capex to 15-20% of total capex by 2030.

The US oil majors have avoided following their European peers:

ExxonMobil (XOM US, NR) – For its strategy to lower GHG emissions, the company is investing in biofuels, and carbon capture & storage (CCS) technologies. ExxonMobil holds stakes in approximately a third of the world's CCS capacity and has announced plans to develop carbon capture fuel cell technologies, which could potentially reduce costs. For biofuels, ExxonMobil funds broad-based research into algae, non-food biomass feedstock, and agricultural waste.

Chevron (CVX US, NR)– Although the company has invested in solar, wind, and geothermal projects in 2000, 2014, and 2016, it has exited these businesses, as returns were not as attractive as the oil & gas business. Its strategy for lowering GHG emissions is through improving energy efficiency, reducing flare, and fixing methane leaks. Chevron is also investing in two of the world's largest CCS projects – Quest CCS at Canada's oil sands and the Gorgon Project in Australia. It launched the Future Energy Fund with an initial commitment of USD100m to invest in potential breakthrough technologies that will enable the energy transition.

Figure 15: Oil company's capex (%) invested in low-carbon energy (2010-1Q18)

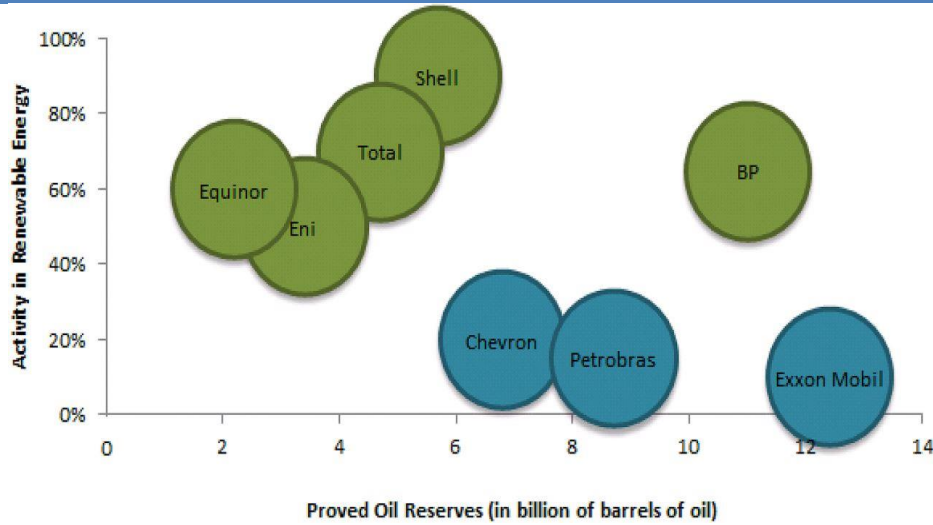


Source: The Conversation

See important disclosures at the end of this report

Interestingly, oil majors that have smaller levels of proved reserves seem to invest more in renewables than companies with higher levels of proved reserves. BP has high reserves, but has also entered – and is active – in renewables/low carbon investments. The European oil & gas companies remain under pressure from shareholders and climate activists – this has resulted, on their part, to a push towards a lower carbon world.

Figure 16: Activity in RE vs proved reserves



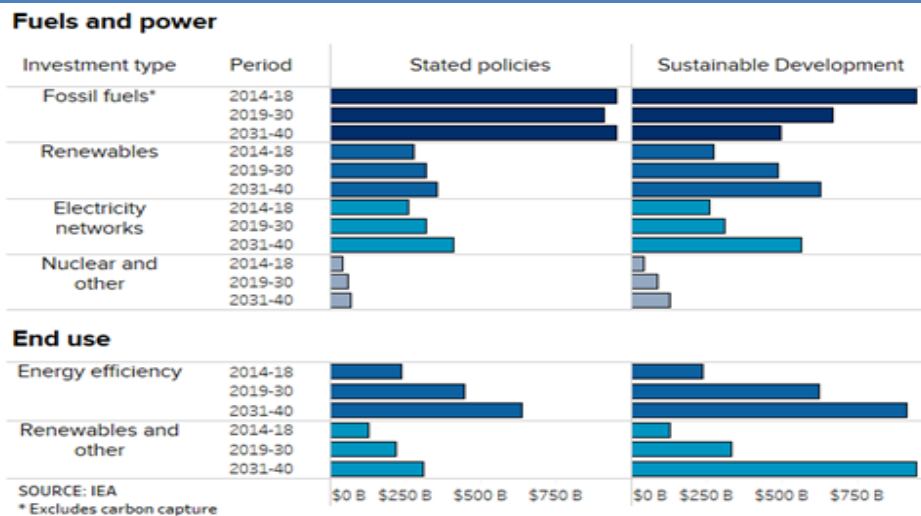
Source: ScienceDirect

Investments In New Technologies

Significant investments will be required to develop battery storage, carbon capture, and increase overall energy efficiency to reduce global emission levels. The International Energy Agency (IEA) estimates that the world will require USD16.7trn worth of investments to reach an entirely sustainable energy goal. This is a difference of USD5trn from stated policies announced, with total investments of USD11.7trn:

- i. Under IEAs sustainable development scenario – a framework for how to reach sustainable energy goals entirely – spending on energy efficiency will reach USD16.7trn by 2040, or USD625bn pa over the next decade, and increase to USD920bn pa for 2030-2040. Investments in renewables will need to reach USD650bn pa for the next 10 years in order to meet such energy goals;
- ii. As things stand now, the state policies scenario – based on energy-related policy decisions announced with regards to energy efficiency spending – is expected to total USD11.7trn by 2040, with renewables to reach USD440bn per pa.

Figure 17: The IEA’s investment outlook



Source: IEA, CNBC

Malaysia's Transition

Part of the 11th Malaysia Plan 2016-2020. The country signed and ratified the Paris Agreement to the United Nations Framework Convention on Climate Change (UNFCCC) in 2016 with a commitment to reduce 45% of GHG emissions intensity to GDP by 2030 – relative to the level in 2005. This consist of 35% on an unconditional basis and a further 10% conditional upon receipt of climate finance, technology transfers, and capacity building from developed countries. The emissions intensity of GDP in 2005 was 0.531 tons of CO₂ equivalent per MYR1,000.

The projected outcome of the 11th Malaysia Plan, coupled with many other key policies and plans, are meant to form the basis of Malaysia's Intended Nationally-Determined Contribution. Consequently, one of the six key pillars of the 11th Malaysia Plan is to enhance environmental sustainability through green growth, which encapsulates three priorities and nine strategies. The Government has stipulated several key focus areas – with mitigation measures being implemented – to reduce GHG emissions in the major sectors, eg energy, transport, waste, industrial processes, etc. Stepping into the last year of the plan, we have seen the Government levelling up its game, especially in RE over the past two years.

Figure 18: Key priorities of Pillar V for the 11th Malaysia Plan



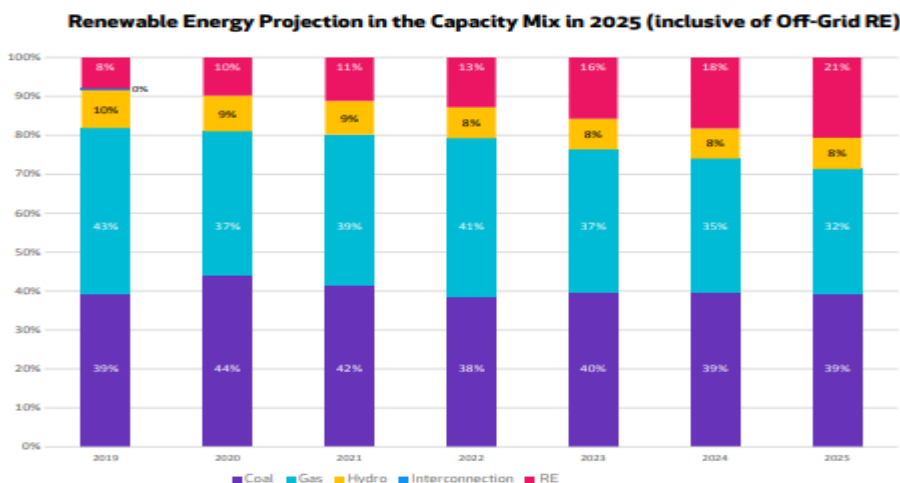
Source: Mid-term Review of the 11th Malaysia Plan

Increasing contribution of RE. Malaysia's current energy mix is still dominated by coal and gas. The Government has targeted to increase the country's power generation mix for RE to 20% – from the current 2% – by 2025. While it may seem ambitious to achieve this aim at this juncture, we believe RE development, especially solar power generation, will be expedited on the continuous efforts from Ministry of Energy, Science, Technology, Environment & Climate Change (MESTECC). The implementation of large scale solar (LSS) and net energy metering programmes are the key initiatives to drive RE contributions into the grid system.

LSS3 award coming soon. The third cycle of the LSS project, or LSS3, offers 500MW capacity with a development value of USD2bn. This is expected to be awarded by the end of this year. It was reported that over 700 companies had participated in the LSS3 tender. The lowest bid received was 17.8 sen per kWh, which is lower than current gas generation cost of 23.22 sen per kWh. Among the 700 were Tenaga Nasional (TNB MK, NEUTRAL, TP: MYR14.51), Malakoff (MLK MK, BUY, TP: MYR1.00), and Uzma (UZMA MK, NR).

MESTECC has indicated that generation costs could possibly be below 24 sen per kWh, which is much lower than the reference price of 32 sen per kWh in LSS2. This is also not significantly higher than the generation cost of coal and gas, which were at 16 sen and 22 sen per kWh in 2Q19. Moving forward, we believe the Government will have to roll out few more cycles of LSS projects.

Figure 19: RE projection in the capacity mix by 2025 (inclusive of off-grid REs)

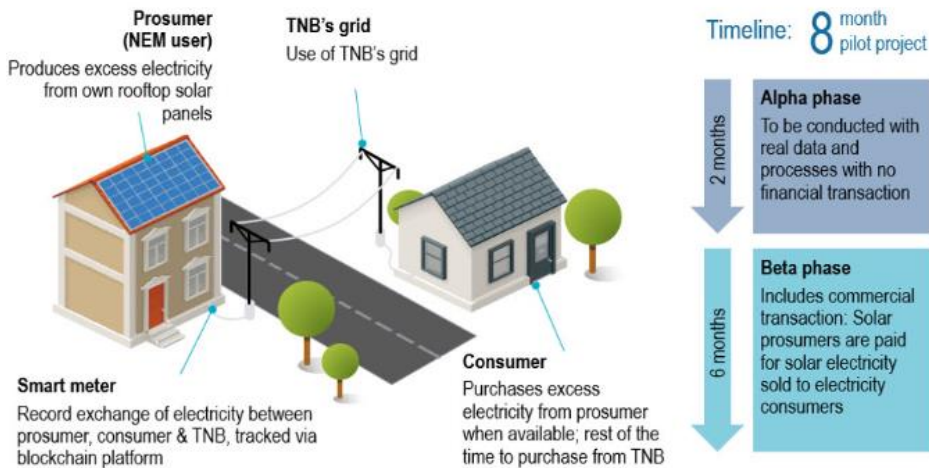


Source: Energy Commission

Peer-to-peer (P2P) trading pilot project. MESTECC is also developing the Renewable Energy Transition Roadmap 2035 (RETR 2035) – its details are expected to be firmed up by the end of this year.

Under RETR 2035, a P2P energy trading platform pilot project was introduced in early October, whereby a solar photovoltaic (PV) producer sells excess electricity on an energy trading platform to another consumer. The technology provider is Australia’s Power Ledger, and the project will run in two phases – technical operability and commercialisation testing stages – for about eight months.

Figure 20: Concept of P2P pilot project in Malaysia



Source: Sustainable Energy Development Authority

Encouraging low carbon mobility. Continuous improvement in the country’s public transport system – such as completion of the Mass Rapid Transit Line 1 (MRT1) and Light Rail Transit Line 2 (LRT2) projects – are essential for reducing air pollution, GHG emissions, and traffic congestion. Malaysia is also implementing RON95 Euro 4M by 1 Jan 2020 and – progressively – RON97 Euro 4 and Euro 5 Diesel by Sep 2020 and Sep 2025.

Such adoption of higher fuel standards will reduce the sulphur content in the environment and improve air quality.

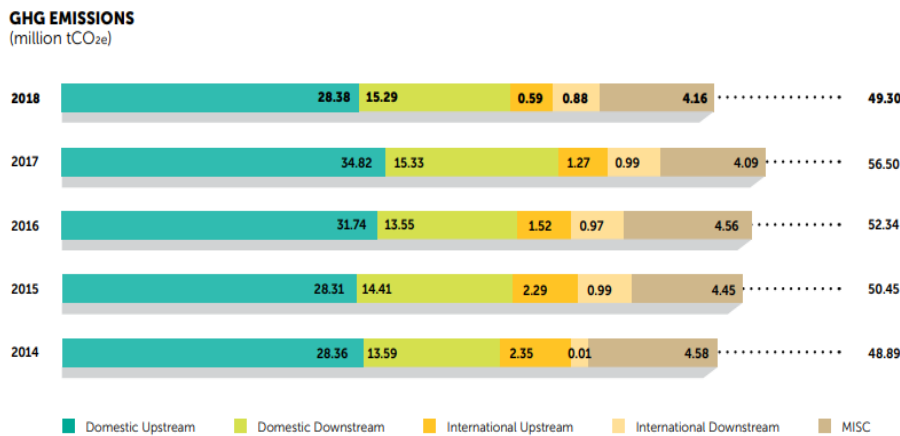
The **Low Carbon Cities Framework** is another initiative launched in 2011 by MESTECC via Malaysian Green Technology Corp to guide and assess the development of low carbon cities. According to *The Edge Weekly*, 19 of the 154 local authorities in Malaysia have measured their emissions baseline and developed low-carbon action plans. Among them, five local authorities – the Shah Alam City Council, Klang Municipal Council, City Council of Seberang Prai, Hang Tuah Jaya Municipal Council, and Subang Jaya Municipal Council – have successfully reduced CO₂ emissions.

Petronas’ carbon footprint

Petronas Carbon Commitments (PCC) started back in 2012, when the national oil & gas company started introducing carbon commitment targets that year. Petronas set a GHG emissions reduction target of 8m tonnes of CO₂ to be achieved by 2017 via the reduction of flaring and venting, as well as better energy efficiency. This PCC is applicable to all businesses and petroleum agreement contractors, both domestically and internationally.

Additionally, Petronas has targeted to achieve zero continuous venting and flaring by 2024 and 2030. In 2018, the company managed to reduce its monitored carbon footprint 13% from 2017’s numbers. It has also been able to achieve a cumulative 12m tonnes of GHG emissions reduction since 2012. This is largely due to both its domestic upstream and international businesses, which have successfully reduced 0.82m and 0.72m tonnes of CO₂.

Figure 21: Petronas carbon footprint



Source: Petronas Annual Report 2018

Prioritising cleaner natural gas. Petronas promotes the use of natural gas and LNG as a low carbon fuel. Being a major player in the LNG business, it has been advocating LNG as the preferred and cleaner marine fuel of choice. The first commercial LNG bunkering is likely to kick-start by 1Q20 from Regasification Terminal 1 (RGT1) in Sungai Udang, Melaka, and RGT2 in Pengerang, Johor. This is followed by Kemaman Supply Base in Kemaman, Terengganu, and Asian Supply Base, Labuan.

Minor steps taken. Petronas’ solar venture started with a 10MW solar farm in Gebeng, Pahang, followed by a solar rooftops pilot project at Suria KLCC and petrol stations in 2013. Meanwhile, the Solar Installation & Application On Petronas Rooftops & Assets Nationwide (SINARAN) project was initiated, whereby solar panels were installed at its upstream and downstream assets to complement electricity usage.

Petronas current SINARAN solar PV panels are capable of generating electricity at 24.1MW peak (MWp) and reducing GHG emissions of 26,072 tonnes of CO₂ annually.

New energy division to anchor RE push. In 2018, Petronas set up its new energy division to develop sustainable income streams – apart from oil and gas – with an initial focus on solar and wind. This unit is eyeing to contribute at least 25%, or 1.5GW, of Malaysia's RE target of 6GW by 2025.

As a start, this division signed a Letter of Intent with UiTM Energy & Facilities, a subsidiary of UiTM Holdings, to jointly develop LSS PV power plants and on-campus energy optimisation and solar rooftop projects.

Petronas – still driven by oil & gas. Overall, we believe oil & gas will still be Petronas' key core businesses – with a bias towards natural gas – in the foreseeable future. RE contributions should be insignificant in the medium term, with all the potential investments mostly focused on technology and experimental projects – this is to catch up on the learning curve.

However, we expect the budget allocation for the new energy division to increase over the medium to long term. Putting things into perspective, Petronas will only require c.USD1.5bn (MYR6.3bn) in capex to contribute 1.5GW RE capacity, assuming USD1m per MW by 2025. This will translate into MYR1.1bn pa, which is about 2% of Petronas' total targeted capex of MYR50bn this year. The Pengerang Integrated Complex is close to completion and commercial operations are expected to kick off in 4Q19. With that, more priority can be given to the RE space.

Others to follow. Similar to Petronas, no significant transition is expected from the local listed oil & gas companies in pursuing RE in a big way in the near term. While Tenaga Nasional will take the lead in assisting the Government in the energy mix transition, other listed companies – such as Uzma and Serba Dinamik – have participated in the bidding for LSS3, while Cypark Resources will be one of the contractors that should be executing the EPCC of these projects.

We expect the local services players to follow Petronas' footsteps, as the oil major gradually deploys more resources into RE in future.

Thailand's Transition

Thailand is one of the parties that signed on to the Paris Agreement. It is committed towards putting forward its best efforts through the Nationally Determined Contribution (NDC) commitment. The country will work towards sustainable development and achieve low-carbon emission, as well as a climate resilient society, consistent with the strategies of the 12th National Economic & Social Development Plan (NESDP) 2017-2021.

As one of the Top 10 countries in the world facing climate risk, Thailand is taking a proactive and urgent step towards addressing climate change. The kingdom prioritises adaptation in key sectors such as agriculture and water management. Thailand will work to reduce emissions a further 20-25% in 2030 vis-à-vis the Business As Usual level. Its primary target sector for mitigation is energy, which – together with transportation sector – accounts for more than 70% of GHG emissions. The proposed mitigation actions include feed-in tariffs, tax incentives, and access to investment grants/venture capital to promote RE.

In 2017, the Cabinet endorsed an NDC Roadmap (2021-2030) to deliver the country's NDC target. The mitigation actions will involve sectors in energy, transport, waste management, and industrial processes. The roadmap constitutes a tangible action plan to achieve ambitious goals.

Energy security has long been an issue of concern over the course of Thailand's development. In the past, power generation in the kingdom relied heavily on crude oil imports. To remedy this, the Government initiated a shift to natural gas in the power generation sector as early as the 1980s. Natural gas-fired power plants currently account for 61% of total fuel source used for power generation.

The Energy Ministry is taking steps to balance security, economy and ecology to address climate change. These targets are defined in the Power Development Plan (PDP), the Alternative Energy Development Plan, and the Energy Efficiency Plan.

We recently completed a utilities sector report, highlighting Thailand's ambitious renewables push: [Thailand's Green Transition](#). In this report, we saw that:

- i. **Thailand is moving towards a low-carbon society** under the new PDP2018. Over the next 20 years, the utilities sector is expected to change significantly from where it is today. As a portion of installed capacity, power sourced from fossil fuels will decline and make up 48% vs 73% now, while renewables will increase to 32% from 13% currently. Such a transition is not without risks, as power generation from renewables remains unreliable under current technologies and cost structures – this can pose a risk to the stability of the electricity system;
- ii. **The Government has embraced disruptive technology** by allowing private participation in energy trading through P2P energy trading systems that use blockchain technology. This transforms the traditional power distribution system from a single buyer into a more decentralised/prosumer variant. It encourages the Electricity Generating Authority of Thailand/Provincial Electricity Authority (EGAT/PEA) to develop a smart grid system to integrate RE systems and better facilitate consumer needs. The Government has also put in place a small power producer (SPP) replacement programme that will see EGAT lower its committed offtake capacity from SPPs, allowing the latter to market the bulk of available capacities directly to private consumers. The Government is also encouraging the development and future use of energy storage systems.

The Environmentally Sustainable Transport System Plan proposes ambitious actions to promote road-to-rail modal shift for both freight and passenger transport, which include extensions of mass rapid transit lines, construction of double-track railways, and improvement of bus transit networks in the Bangkok Metro area. A vehicle tax scheme based on CO₂ emissions has also been approved.

Finally, the Government adopted the Waste Management Roadmap, which is aimed at more efficient and sustainable waste management, as well as the promotion of power generation from waste-to-energy technologies. The roadmap can contribute tremendous environmental benefits in terms of GHG emissions and pollution reduction.

Currently, the Ministry of Natural Resources & Environment is also studying the potential of reducing carbon emissions in the forestry sector.

Figure 22: Thailand's GHG emissions reduction plans

(Unit: tonnes CO ₂)	2020	2025	2030	Total reduction
Business as usual greenhouse gas emissions			555	
Greenhouse gas emissions target			439.4	
Total reduction			115.6	
Electricity generation	14.6	20.7	24.0	4%
Energy efficiency improvement	2.9	5.8	6.0	
Implementation renewable energy	11.8	14.9	18.0	
Residential sector	1.6	2.8	4.0	1%
Energy efficiency improvement (it. Lighting, cooling)	1.2	2.1	2.8	
Renewable energy and alternative energy deployment	0.4	0.8	1.2	
Commercial sector	0.2	0.6	1.0	0%
Energy efficiency improvement (i.e. heating and cooling system)	0.2	0.6	1.0	
Manufacturing industrial sector	13.8	27.9	43.0	8%
Energy efficiency improvement (i.e. heating and cooling system)	2.4	8.3	11.0	
Renewable energy and alternative energy deployment (solar rooftop)	11.5	19.7	32.0	
Transport sector	9.4	23.8	41.0	7%
Energy efficiency improvement (engine efficiency improvement)	7.1	18.0	31.0	
Biofuels used in vehicles	2.3	5.8	10.0	
Municipal solid waste (MSW) - reduction	0.4	0.8	1.3	0%
Waste water management	0.2	0.4	0.7	0%
Industrial processes and product use	0.1	0.2	0.3	0%
Total GHG reduction	40.3	77.2	115.3	21%

Source: NRC Roadmap 2030

PTT's "Clean & Green" strategy

PTT has adopted a "Clean & Green" strategy, which aims to encompass the circular economy into its value chain. This will be through a higher proportion of RE and natural gas in its portfolio. PTT will also look to develop environmentally friendly products and services, as well as reduce GHG emissions from all aspects of its operations.

For 2019, PTT's target is 39.40 tons of CO₂ equivalent.

Figure 23: PTT's "Clean & Green" strategy

Strategic Direction	2019	2020	2025	2030	Target Measurement
GHG EMISSION FROM NEW BUSINESS PRODUCT (SCOPE 3)		Increase revenue from New Clean & Green business			GHG EMISSION FROM NEW BUSINESS PRODUCT (SCOPE 3)
Design Now Define New Clean & Green Business o Strategic Investment in Clean & Green o Electrification Value Chain o Circular Economy in Value Chain					GHG EMISSION FROM PRODUCT (SCOPE 3) 1. % of Revenues from *Low Carbon & **Avoided Emission Product 2. Investment Decision Criteria Study & Implemented by 2020
GHG EMISSION FROM PRODUCT (SCOPE 3)	Increase Renewables, LNG Value Chain/ Limit Coal				
Decide Now Increase Clean & Green Product Portfolio o Increase Renewables, LNG Value Chain/ Limit Coal o More Clean & Green Products o Induce Carbon Price in Investment Decision Criteria					3. Setting up Greenhouse Gas Reduction Target from Operation (Proposed 20% vs BAU by 2030) 4. GHG Intensity Target for Each BU/ Company ✓ Verified by 3 rd party
	Increase revenue from Low Carbon & Avoided Emission Product				
	Carbon Price • Set carbon price • Develop Process & Tools	Carbon Price • Integrate into SIMC, SSHE & GHG reporting system • Drive investment in Energy efficiency	Carbon Price • Use as Tool to assess and manage carbon related risks	Carbon Price • Use as Tool to identify carbon related opportunities	
GHG EMISSION FROM OPERATION (SCOPE 1+2)		Reduce GHG from operation			
Do Now Reduce Operational Carbon Footprint o GHG Reduction in Operations o Circular Economy in Operations	 15 % vs BAU	 16 % vs BAU	 18 % vs BAU	 20 % vs BAU	
GREEN LIFE STYLE					

Source: PTT

See important disclosures at the end of this report

Singapore's Transition

Over the years, Singapore has maintained a balance between development and conserving the environment. Successive environmental blueprints – such as the Singapore Green Plan 2012 and Sustainable Singapore Blueprint 2015 – have set forth the strategies and initiatives to achieve economic growth and a good living environment.

The island republic has managed the growth of the vehicle population and made the switch from fuel oil to natural gas – the cleanest form of fossil fuels – to generate electricity. Over 95% of Singapore's electricity is now generated via natural gas. These initiatives have helped to moderate carbon emissions growth significantly. However, given the small size of the nation, and its dense urban landscape, there are challenges to using alternative energy options – like solar and wind power – on an island-wide scale.

The Singapore Government's National Climate Change Secretariat (NCCS) estimates that the country contributes 0.11% of global emissions.

Power generation

Environmentally friendly method to power Singapore. Power generation is one of the major sources of carbon emissions. Since 2000, this island nation has increased the percentage of natural gas used in electricity generation to 95% today from 19%. Among all fossil fuels, natural gas produces the least amount of carbon emissions per unit of electricity. Singapore's fuel mix is much less carbon intensive than many other nations, which still use coal as an important part of their power generation mix.

Decreasing fuel oil usage. Singapore's electricity is produced by the combustion of natural gas that is piped from Malaysia and Indonesia. There is diversification in the supply of natural gas with the development of an LNG terminal on Jurong Island. There are further plans to build a second LNG terminal to support new industrial sites and power plants. This will not only provide critical mass for enhanced energy security, but it will also enable Singapore to be a hub for LNG-related businesses.

Singapore's approach to alternative energy

As a small, resource-constrained country, Singapore imports almost all its energy needs, and has limited renewable energy options:

- i. Commercial wind turbines operate at wind speeds of above 4.5m per second (m/s), but the average wind speed in Singapore is only about 2m/s;
- ii. The country's relatively narrow tidal range and calm seas limit opportunities for commercial tidal power generation. Much of Singapore's sea space is also used for ports, anchorage, and shipping lanes, which limit the application of ocean energy technologies;
- iii. Hydroelectric power cannot be harnessed, as Singapore does not have a river system with fast-flowing water throughout the year;
- iv. The island does not have geothermal energy sources;
- v. Singapore's small physical size (715.8sq km), high population density, and land scarcity limits the potential for sustainably-grown domestic biomass. It also constraints the safe deployment of nuclear power within the island republic.

Solar energy

Finding ways to increase solar power generation. Among the alternative energy options available, solar energy offers the most promising opportunity for Singapore. With the fall in solar PV panel prices, solar energy is currently economically comparable to electricity derived from fossil fuels.

To accelerate solar deployment in Singapore, the SolarNova programme has been launched to promote and aggregate solar demand across government agencies. In Nov 2015, the first SolarNova tender was awarded for solar PV systems to be deployed on the facilities of government agencies, including the Housing & Development Board (HDB), the Ministry of Home Affairs, and the Public Utilities Board – the national water agency.

Singapore's high average annual solar irradiation of about 1,500 kWh per sq m makes solar PV a potential renewable energy option for the country. However, there are challenges. There is limited available land on the island for the large-scale deployment of solar panels. In addition, the presence of high cloud cover across Singapore and urban shading poses challenges, such as intermittency.

With the limited RE options available and current technological capabilities, the country is not able to generate sufficient baseload electricity from renewable sources reliably. Nevertheless, Singapore is aiming to increase solar deployment from the current 47MWp to provide around 350MWp of electricity by 2020. By 2030, it is estimated that RE could potentially contribute up to 8% of the country's peak electricity demand.

Notable solar installations. The total installed solar PV capacity in Singapore is currently about 47MWp for both residential and non-residential areas. This includes installations at:

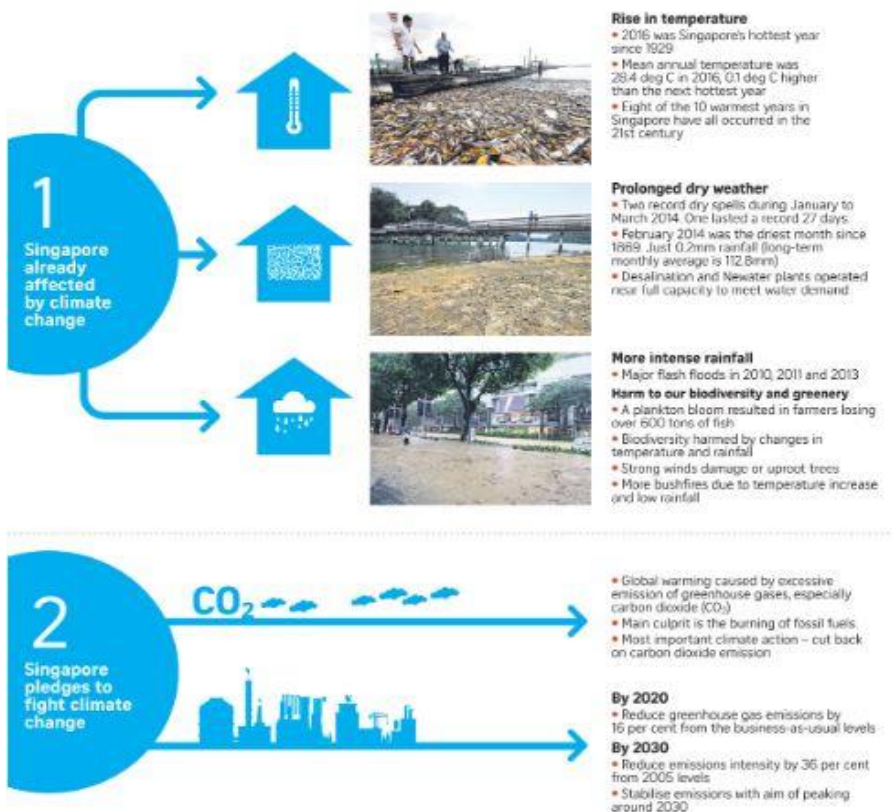
- i. HDB rooftops;
- ii. Keppel Seghers Ulu Pandan NEWater Plant;
- iii. Resorts World Sentosa;
- iv. GreenPac;
- v. Applied Materials Singapore Operational Centre;
- vi. Sheng Siong Supermarkets;
- vii. Singapore Sports Hub;

Additionally, several companies have plans to lower carbon emissions. These include:

- i. CapitaLand (CAPL SP, BUY, TP: SGD4.20);
- ii. City Developments (CIT SP, NEUTRAL, TP: SGD10.50);
- iii. ComfortDelGro (CD SP, NEUTRAL, TP: SGD2.38);
- iv. Sembcorp Industries (SCI SP, BUY, TP: SGD2.68).

Figure 24: Singapore – fighting climate change on all fronts

Singapore has launched its Year of Climate Action, and will be moving on all fronts to help people and companies realise the impact of climate change on the Republic. The Straits Times looks at what people can do to reduce their carbon footprint.



Source: The Straits Times

Looking Back: Forecasts' Slips And Slides

Crude oil prices traded in a wide range of USD52.82 per bbl to USD73.89 per bbl over the past year. We started the year with pessimism and fear of a global recession. Optimism of tighter crude oil markets in April through May carried crude oil prices to peak at over USD70.00 per bbl. 2H19 was marred by the global economy recession fears, as global manufacturing and trade started to falter. Forecasts for global economy, oil demand, and price and forecasts slipped as the year progressed.

We started the year with crude oil prices at a low of USD52.82 per bbl (average Brent, Jan 2019). This was on concerns of crude oil oversupply, pessimism of OPEC+ production cut compliance and the fear of global economic recession. We believed at the time that the US-China trade war would be resolved some way or another. We also expected Russia to start to comply by end of 1Q19 and that US waivers on Iranian exports would end in May.

Russia started to comply by April, while the US waivers on Iranian exports ended in May and production cut compliance by OPEC+ remained high (with Saudi Arabia doing most of the heavy lifting). As a result, crude oil prices trended toward USD70.00 per bbl in April through May. These events and the rise in crude oil prices were within our expectations.

From June onwards, we saw crude oil prices started to slip and slide to below USD60.00 per bbl. This is due to ongoing concerns of oil demand due to slower global economic growth, exacerbated by the US-China trade war. We note here that the US and China are the two largest oil consuming nations in the world, with oil consumption of c.20mbpd and c.13mbpd. Despite millions of barrels of crude oil supply being wiped off from major producers – Venezuela and Iran, along with geopolitical tensions in the Persian Gulf and September's attacks on critical oil facilities in Saudi Arabia – rather than spiking (although it did do so on the first trading day after the attacks), crude oil prices have continued to remain subdued for the most part of 2H19.

Not in our assumptions. The fear of a global recession and, as of writing, the unresolved US-China trade war and its impact on global trade and manufacturing, are factors that were not in our assumptions when we started this year.

Forecasts slips and slides. The International Monetary Fund (IMF) and IEA have revised down their respective global GDP and oil demand forecasts as the year progressed and outlook for the global economy deteriorated.

At the time of the Dec 2018 report, according to IMF and IEA data, the outlook for 2019 saw global GDP growth at 3.7% and additional oil demand of 1.4mbpd. However, as at it Oct 2019 report, the IMF expects global GDP growth for 2019F-2020F to be 3% and 3.4%. The IEA expects additional oil demand for 2019F and 2020F to be at 1mbpd and 1.2mbpd.

Our crude oil prices were revised down from USD76.00 per bbl at the beginning of the year to USD64.00 per bbl currently for 2019F-2020F.

Figure 25: Forecasts' slips and slides as global economy falters

	As of Dec 2018	As of Oct 2019
	2019F	2019F
IMF Global GDP growth forecast	3.7%	3.0%
IEA additional oil demand forecast (mbpd)	1.4	1.0
RHB crude oil price forecast (USD/bbl)	76	64

Source: IMF, IEA, RHB

Figure 26: Crude oil prices remained under pressure



Source: Bloomberg, RHB

See important disclosures at the end of this report

OPEC+ Remains Committed

OPEC+, along with US crude oil producers, remain an essential part of global supply. The US shale oil producers currently supply c.8mbpd. Should their production fade – with possible laws to restrict or ban fracking – the world will face much higher crude oil prices than what we see today. Their faltering growth, as we enter into 2020, could possibly alleviate the need by OPEC+ to provide the markets with deeper cuts.

In the bigger picture, we believe that Russia remains a committed partner to OPEC and the objectives of OPEC+ remains, ie to keep the market balanced.

OPEC+

OPEC+ has provided the world with the security of supply and have done a remarkable job in putting a floor to crude oil prices and, as a result, there has been a boost in investments in the upstream sector.

Saudi Arabia, through Saudi Aramco, has taken the leadership role and shown the world its ability and willingness to cut more than obligated and during times of adversity (ie the September attacks on its facilities), it was able rebound faster than industry experts had expected. We believe that the commitment from both Russia and Saudi Arabia to OPEC's objective to keep crude oil markets balanced will remain in the foreseeable future.

5-6 Dec meeting: Will it extend or deepen the cuts as well? Among the myriad of factors to consider at these meetings, we believe the most important factors that will be taken under consideration will be:

- i. What is the health of the global economy as we enter 2020?
- ii. Additional crude oil demand: This depends on global economic outlook and the US-China trade war negotiations. Any possible deals, or lack thereof, will have material impact on crude oil demand expectations;
- iii. The possible slowdown in US shale oil production. At the moment, the additional production growth estimates range from 400kbpd to 1mbpd;
- iv. Can the non-complying participants to the production cut start to comply? These are Russia, Nigeria, Iraq, and other participating OPEC members. If they start to comply, then an additional 335-400kbpd of supply will be taken off the global market.

5-6 Dec meeting expectations

The market expectations have shifted from expecting deeper OPEC+ production cuts to an extension of production cuts. Saudi Arabia has indicated that it would like to currently focus on higher compliance to the production cut agreement rather deeper cuts. Russia has expressed that it is not looking for deeper cuts, but will try to be fully compliant to the product cut agreements.

We note also that Russia will be discussing with OPEC partners to exclude natural gas condensate – also called natural gas liquids and ultra-light oils – from its production cut agreement. Condensate produced in Russia is not exported but included in its production statistics – many other producers do not. Production of gas condensate in winter months are high and is set to increase with the start-up of new gas fields.

We expect OPEC+ to factor in the slowdown of US oil output growth in its market assessment. Industry experts and major agencies expectations vary widely for 2020F US production growth, with estimates of 400kbpd to 1mbpd.

As we approach the meeting, Russian President Vladimir Putin has provided some support to OPEC+, saying that his country and OPEC have a “common goal” to keep the oil market balanced, and that Russia will continue to cooperate with the cartel to keep the market stable.

We believe OPEC and its alliance will remain together to monitor and stabilise the oil markets well into the future. We believe that more likely outcome for the OPEC+ meeting, in our opinion, is to extend the production cut/cooperation agreement to year-end 2020, as the market situation remains highly uncertain.

Supply And Demand Outlook For 2020F

The major agencies' demand and supply expectations are similar. As such, we use the OPEC Nov 2019 report as our basis of analysis of the oil market situation as we enter 2020F.

World economy. Global economic growth for 2019F-2020F is expected at 3%. Organisation for Economic Co-operation & Development (OECD) growth for 2019F-2020F is expected at 1.6% and 1.4%. US GDP growth is 2.3% for 2019F, with the ongoing slowdown that was confirmed by recent 3Q19 activities leading to an expected lower US GDP of 1.8% for 2020F.

Eurozone growth is expected at 1.2% and 1% for 2019F-2020F, with a slowdown in 2H19 expected to carry into 2020F. For emerging economies, China's growth is 6.2% and 5.9% for 2019F-2020F, while India's growth is forecasted at 6.1% and 6.7% during this same period.

World demand. 2019F global oil demand is expected to increase 0.98mbpd to average 99.8mbpd. 2020F global demand is expected to average 100.88mbpd (+1.08mbpd YoY). Non-OECD demand will be the largest contributor to this growth – expected to be 1.01mbpd – while OECD demand is expected at 0.07mbpd.

World supply. 2019F non-OPEC supply growth is expected at 1.82mbpd and average 64.3mbpd. Of note, there was an upward revision from the previous report to production from Canada, the UK, and Kazakhstan, which was offset by lower production from the US, Indonesia, Denmark, India, Malaysia, Brazil, and China.

2020F non-OPEC supply growth is expected at 2.17mbpd YoY to average 66.46mbpd. This was a result of a downward revision from the US and minor adjustment to India's supply. The US, Brazil, Norway, and Russia remain the main drivers of growth in 2020F, while declines are expected from Mexico, Indonesia, and Egypt.

Overall supply remains subject to uncertainties, including oil price levels, capital spending, infrastructure constraints, and drilling and completion activities, especially in the US.

Stock movement: Preliminary data for Sep 2019 showed total OECD commercial oil stocks falling 23.5mmbbls MoM to stand at 2,945mmbbls (+88mmbbls YoY, 28mmbbls above the 5-year average).

Our analysis

Under the current assumptions of demand and supply, set forth by OPEC, and assuming OPEC produces at the 3Q19 average of 29.4mbpd through 4Q19-2020F, we believe:

- i. 4Q19F should see a shortfall of 1.3mbpd and, for 2019F, there will be an overall shortfall in crude oil supply of 1.3mbpd;
- ii. For 2020F, there will be a slight oversupply of 0.3mbpd and 0.5mbpd for 1Q20F-2Q20F. However, as we move towards 3Q20F-4Q20F, we should see a shortfall of 1.1mbpd and 0.4mbpd. At the current OPEC production rate of 29.4mbpd, for the full year 2020F, the market should see an overall shortfall of 0.2mbpd;
- iii. For OPEC+, with some minor tweaking in production levels by its participating members, we believe its current production levels should be sufficient for a more or less balanced market for 2020, when taken as a whole;
- iv. Assuming its participating members fully comply – and with Venezuela and Iran not ramping up crude oil production over the course of the year – total production could be lowered by another 335-400kbpd from current levels. This should be sufficient to provide a balanced market in 1H20F.

From these numbers, we believe that current OPEC production levels of 29.4-29.9mbpd should be sufficient to balance the markets in 2020F. This is with the assumption that Venezuela, Iran, and Libya do not increase production. Should the non-complying participants start to comply fully, supply will lower by an additional 335-400kbpd.

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Energy | Regional Oil & Gas

Figure 27: OPEC's demand and supply balance, where the 2020F call on OPEC expected at 29.6mbpd (-1.1mbpd YoY)

(mbpd)	2017	2018	1Q19	2Q19	3Q19	4Q19F	2019F	1Q20F	2Q20F	3Q20F	4Q20F	2020F
World demand												
OECD	47.5	47.9	47.7	47.3	48.4	48.4	48.0	47.7	47.3	48.5	48.5	48.0
Americas	25.1	25.5	25.2	25.4	26.0	26.0	25.7	25.4	25.6	26.2	26.2	25.8
Europe	14.3	14.3	14.0	14.2	14.7	14.3	14.3	13.9	14.2	14.7	14.3	14.3
Asia Pacific	8.1	8.1	8.5	7.6	7.7	8.1	8.0	8.4	7.6	7.7	8.1	7.9
DCs	32.1	32.6	33.0	32.9	33.5	33.1	33.1	33.5	33.4	34.1	33.8	33.7
FSU	4.7	4.8	4.8	4.7	5.0	5.1	4.9	4.8	4.8	5.1	5.2	5.0
Other Europe	0.7	0.7	0.8	0.7	0.7	0.8	0.8	0.8	0.7	0.8	0.9	0.8
China	12.3	12.7	12.6	13.2	13.0	13.4	13.1	12.9	13.5	13.3	13.8	13.4
(a) Total world demand	97.4	98.8	98.8	98.8	100.7	101.0	99.8	99.8	99.8	101.8	102.1	100.9
Non-OPEC supply												
OECD	25.7	28.3	29.3	29.7	29.7	30.8	29.9	31.1	31.3	31.7	32.3	31.6
Americas	21.5	24.1	25.1	25.6	25.6	26.3	25.7	26.6	26.9	27.3	27.6	27.1
Europe	3.8	3.8	3.8	3.6	3.6	3.9	3.8	4.0	3.8	3.8	4.1	3.9
Asia Pacific	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6
DCs	13.4	13.5	13.4	13.4	13.6	13.8	13.6	13.8	13.8	13.8	14.0	13.8
FSU	14.1	14.3	14.6	14.2	14.3	14.3	14.3	14.3	14.4	14.4	14.6	14.4
Other Europe	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
China	4.0	4.0	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
Processing gains	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Total non-OPEC supply+NGLs	59.5	62.5	63.8	63.8	64.2	65.4	64.3	65.8	66.1	66.5	67.5	66.5
OPEC NGLs	4.6	4.8	4.8	4.8	4.7	4.9	4.8	4.8	4.8	4.8	4.8	4.8
(b) Total non-OPEC supply+NGLs	64.1	67.2	68.6	68.6	68.9	70.2	69.1	70.6	70.9	71.3	72.3	71.3
OPEC crude oil production	32.0	31.9	30.5	30.0	29.4							
Total supply	96.1	99.1	99.1	98.6	98.3							
Balance	-1.28	0.27	0.32	-0.16	-2.41							
OECD closing stock levels, mbbls												
Commercial	2,855	2,865	2,871	2,931	2,945							
SPR	1,568	1,550	1,556	1,547	1,545							
Total	4,422	4,416	4,427	4,478	4,490							
Oil-on-water	1,025	1,058	1,013	995	1,012							
Days of forward consumption in OECD, days												
Commercial on-land stocks	60	60	61	60	61							
SPR	33	32	33	32	32							
Total	92	92	94	92	93							
Market balance												
Call on OPEC (a) - (b)	33.3	31.6	30.2	30.1	31.8	30.7	30.7	29.1	28.9	30.5	29.8	29.6
OPEC production	32.0	31.9	30.5	30.0	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4
Oversupply/shortfall	-1.3	0.3	0.3	-0.2	-2.4	-1.3	-1.3	0.3	0.5	-1.1	-0.4	-0.2
Call on OPEC (YoY change)	0.9	-1.7					-0.9					-1.1
OPEC production (YoY change)	-0.19	-0.15					-2.48					0.00

Note: Total non-OPEC supply includes OPEC NGLs

Note 2: OPEC production is from secondary sources

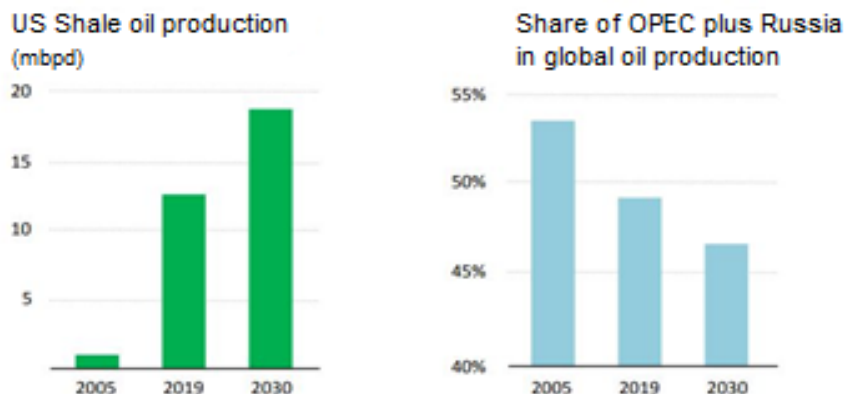
Note 3: Totals may not add up due to independent rounding.

Source: OPEC (Nov 2019), RHB

US Crude Oil Production: Faltering Growth

Although US shale oil production is set to slow in 2020, the reserves are there – shale oil production is still expected to increase over the longer term. US shale oil production is expected to increase to 19mbpd over the next decade. This will lower OPEC and Russia's market share from 55% in the mid-2000s to 47% by 2030.

Figure 28: Shale can stay higher for longer



Note: IEA Stated Policy Scenario
Source: Reuters, RHB

In the shorter-term horizon, US shale oil production is expected to decelerate quite significantly next year, as shareholders and creditors are now unwilling to spend more money on unprofitable growth. American producers expect US shale growth to be as low as 400kbpd in 2020F. IHS Markit forecasts US production growth to fall to 440kbpd in 2020 and flatten by 2021F, down from a global record growth of 2mbpd in 2018. This is compared with additional growth expectations of c.0.7mbpd to 1mbpd by brokers and the EIA.

Fundamentals of shale oil & gas formations are catching up, as many producers have drilled in the more prolific locations already – they are now drilling at lower-quality sites. The parent-child well problems are starting to result in loss of the overall performance of the wells.

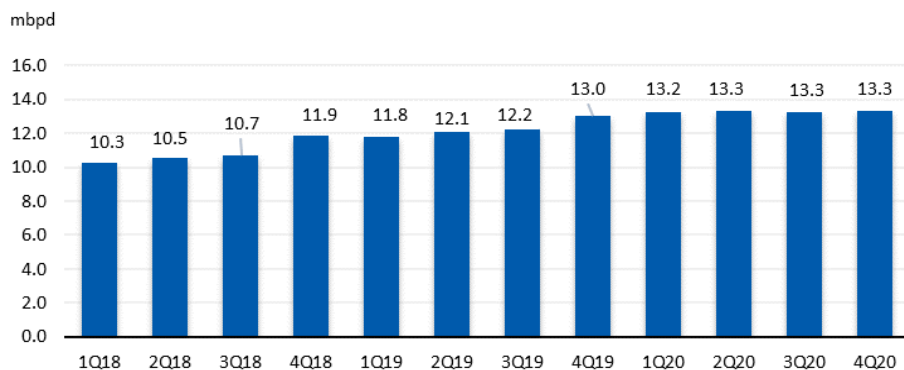
Although the precise number of additional growth may differ, we are more or less certain that there will be a slowdown, not a collapse, in US shale oil production in 2020F.

Figure 29: US annual growth rate slows

(mbpd)	2015	2016	2017	2018	2019	2020
US crude oil production	9.44	8.84	9.35	10.99	12.29	13.29
US crude oil production growth	(3.91)	(0.60)	0.51	1.64	1.30	1.00

Source: EIA, RHB

Figure 30: US crude oil production growing at a decelerating rate



Source: EIA, RHB

Pioneers of the US shale boom have started to warn of a slowdown in oil production growth, according to Bloomberg:

- i. **Pioneer Natural Resources (PXD US, NR)** CEO Scott Sheffield said that investors' call for shale producers to shutdown rigs and stop burning through cash are being heeded. Across the US shale industry, output growth will slow in 2020F, which should provide a boost to crude oil price. "I don't think OPEC has to worry that much more about US shale growth long-term...", Sheffield said, adding that he was "definitely becoming more optimistic that we are probably at the bottom end of the cycle regarding oil prices". Sheffield sees about 700kbbpd shale oil growth next year;
- ii. **Centennial Resource Development (CDEV US, NR)** CEO Mark Papa expects shale oil growth to be 400kbbpd in 2020. "I believe US shale production on YoY basis will be considerably less powerful in 2020 and in the later years," Papa said;
- iii. **Brokers see shale oil production** at 600-700kbbpd, while the EIA expects US shale oil production to grow 910kbbpd-1mbpd;
- iv. **Occidental Petroleum Corp (OXY US, NR)**, Apache Corp (APA US, NR), Cimarex Energy (XEC US, NR), and Pioneer are all signalling plans to trim budgets. Capex spending by the US shale producers are expected to fall 17% YoY.

ExxonMobil expects to ramp-up shale oil production from current 300kbbpd to 1mbpd by 2024. However, we note that the company has recently redefined its US shale strategy from a "short-cycle cash generation" play to one that is of "long-term value creation".

The results of such success may "take time, but we're confident they will bear fruit," said Staale Gjervik, President of XTO Energy, a subsidiary of ExxonMobil. We believe such change in its shale play definition may be a result of the thin margins that the shale oil patch is providing, relative to the company's more conventional oil plays.

Crude Oil Price Forecast

The demand and supply should remain quite uncertain for 2020F, as a result of the ongoing US-China trade war, global economic slowdown, as well as possibilities of much sharper slowdown in US shale oil production than the major agencies currently expect:

- i. Global oil demand outlook from major agencies should remain healthy as we enter 2020F, in the range of 1mbpd to 1.37mbpd. The US-China trade war still weighs heavily on the global markets, and the outcome of any deal, or lack thereof, will have material impact on the crude oil demand outlook;
- ii. Global non-OPEC supply is expected to accelerate to be in the range of 2.2-2.37mbpd. However, this could be lower as US shale oil production forecasts could vary quite widely amongst the experts;
- iii. We believe that current OPEC production levels of 29.4-29.9mbpd should be sufficient to balance the markets in 2020F. This is with the assumption that Venezuela, Iran, and Libya do not increase production. Should the non-complying participants start to comply fully, supply will lower by an additional 335-400kbpd.

Our crude oil price forecast is USD64.00 per bbl for 2019F-2020F. Our long-term crude oil price at USD60.00 per bbl.

The current crude oil price forecasts reflect:

- i. Middle East tensions and OPEC+'s continued efforts to balance oil markets, which will support oil prices;
- ii. We also note that a lower crude oil price band can entice more oil demand.

Upside for crude oil prices above and beyond our forecasts should be from:

- i. Heightened Middle East tensions;
- ii. Global oil demand being higher than expected;
- iii. Shale oil production could be much lower than what the major agencies are forecasting at the moment;
- iv. The US-China trade war being resolved.

Further downside to our crude oil prices are likely to stem from:

- i. OPEC+ being disbanded and all countries producing oil at will;
- ii. Global economy going into a recession.






Figure 31: Our crude oil price forecasts

(mbpd)	1Q19	2Q19	3Q19F	4Q19F	2019F	1Q20F	2Q20F	3Q20F	4Q20F	2020F
RHB average crude oil price (Brent, USD/bbl, new)	63.1	68.8	61.9	62.5	64.0	62.0	65.0	63.0	66.0	64.0
Demand	99.1	99.4	101.3	101.5	100.3	100.1	101.0	102.7	102.8	101.7
YoY change	0.5	0.5	1.3	2.00	1.03	1.00	1.60	1.40	1.30	1.325
Supply										
Non-OPEC	63.9	64.4	65.1	65.7	64.8	66.2	67.1	67.4	67.5	67
YoY change	2.6	2.2	1.5	1.2	1.9	2.3	2.7	2.3	1.8	2.2
NGLs	5.6	5.6	5.5	5.5	5.6	5.6	5.6	5.6	5.6	5.6
Call on OPEC	29.6	29.4	30.7	30.3	29.9	28.3	28.3	29.7	29.7	29.1
YoY change	(2.1)	(2.2)	(1.3)	(1.9)	(2.0)	(1.3)	(1.1)	(1.0)	(0.6)	(0.9)
Total supply	99.1	99.4	101.3	101.5	100.33	100.1	101	102.7	102.8	101.65
YoY change	0.6	0.1	0.2	(0.7)	0.0	1.0	1.6	1.4	1.3	1.3
Supply from OPEC	30.7	30	28.49	-	-	-	-	-	-	-
Oversupply/shortfall	1.1	0.6	(2.21)	-	-	-	-	-	-	-

Source: RHB

Where To Invest In 2020F?

Figure 32: South-East Asia's oil & gas listed companies

Major players in the region	Shipyard related	Offshore Engineering & Construction	Storage and tankers
<p>NOC: Pertamina (Indonesia) Petronas (Malaysia) Petrovietnam (Vietnam) PTT (Thailand) PTTEP (Thailand)</p>	<p><u>Singapore</u> Cosco Dyna-mac Keppel Offshore & Marines Sembcorp Marine Triyards Yangzijiang Shipbuilding</p>	<p><u>Singapore</u> Ezra</p> <p><u>Malaysia</u> Alam Maritim Daya Materials Sapura Energy Barakah Offshore Petroleum Serba Dinamik</p>	<p><u>Malaysia</u> MISC Dialog</p> <p><u>Thailand</u> Prima Marine</p> 
<p>Independent E&P</p> <p><u>Malaysia</u> Cliq Energy Hibiscus Petroleum Sona Petroleum Sapura Energy Dialog Petra Energy</p> <p><u>Singapore</u> Kris Energy RH Petrogas</p> 	<p>Vessels operators/management</p> <p><u>Singapore</u> KS Energy Mermaid Maritime</p> <p><u>Malaysia</u> Coastal contracts Perisai Petroleum Sapura Energy UMV Oil and Gas</p>	<p>Subsea</p> <p><u>Singapore</u> Marmaid Maritime MTQ Neptune Mencast (Marine) EMAS AMC</p> <p><u>Malaysia</u> Kruetz Holdings</p>	<p>Downstream</p> <p>Refineries and petrochemicals</p> <p><u>Malaysia</u> Petronas Chemicals</p> <p><u>Thailand</u> Bangchak Corporation Esso (Thailand) IRPC Indorama Ventures PTT Global Chemicals Thai Oil Star Petroleum Refining</p> 
	<p>Offshore support services</p> <p><u>Singapore</u> CH Offshore Ezion Ezra Marco Polo Marine Pacific Radiance</p> <p><u>Malaysia</u> Alam Maritim Bumi Armada Perdana Petroleum Sapura Energy Swissco</p> <p><u>Indonesia</u> Logindo Wintermar</p>	<p>Equipments</p> <p><u>Singapore</u> Baker Tech XMH</p> <p><u>Malaysia</u> Favelle Favco Handal Resources KNM Group Technics Oil & Gas Wah Seong</p>	<p>Oil and gas distribution</p> <p><u>Indonesia</u> Perusahaan Gas Negara</p> <p><u>Malaysia</u> Petronas Gas Petronas Dagangan</p> <p><u>Thailand</u> PTT PTG Energy Bangchak Corporation</p> 
	<p>Floating production units</p> <p><u>Malaysia</u> Bumi Armada Perisai Yinson</p> <p><u>Singapore</u> Ezra</p>	<p>Equipment servicing/maintenance</p> <p><u>Singapore</u> MTQ</p> <p><u>Malaysia</u> Deleum Dayang Enterprise Petra Energy</p> 	
	<p>OSV shipbuilding/ship repair</p> <p><u>Singapore</u> ASL Marine Holdings Jaya Holdings Marco Polo Marine Pacific Radiance Nam Cheong Otto Marine Triyards Vard Holdings</p> <p><u>Malaysia</u> Coastal Contracts</p>		

Source: RHB

Figure 33: Where are we in the oil & gas cycle?

Leading indicators		Upstream E&P	Upstream services	Midstream	Downstream
Global economy	Robust	Negative: Producers cannot breakeven at depressed oil price. Cash flows are squeezed. Investments are put on hold. Producers need to cut costs/increase efficiency. For highly leveraged companies, negotiations with banks to defer payments etc may be necessary.	Negative: Service contracts are pushed out/delayed/payments from customers are late or negotiated. This puts a strain on the services companies' cash flows. Highly leverage companies will be hard pressed to negotiate with bankers to extend loan payments/take haircut. Some may need to utilise their asset by finding other customers in other industries to keep assets utilised. Industry asset are in oversupply.	Positive: Oversupply in crude oil results in need for short-term transportation of crude oil and need for storage on land/floating storage for the traders. Long-term contracts for storage and tankers remain in place and should not be a problem.	Positive: Strong economy leads to strong demand for every day consumption of non-durables, durables as well as transportation.
Oil demand	Strong				
Oil supply	Oversupply				
Oil price	Depressed Break-even point of oil production is higher than oil prices. 2014-present, break-even is around USD30.00-50.00/bbl depending on the type of crude oil plays				
Global economy	Robust	More positive: more cash flows improve, opening up more prospects for longer-term planning. As producers have more confidence of the longer-term stability of crude oil price, at reasonable higher than breakeven costs - investments in both short-term and long-term projects can start	Less negative: Service companies are able to negotiate with their bankers/extend their debt obligations/take haircut. Customers start to make steady payments/contracts that have been put on hold starts to flow again. Cash flows improve. Industry assets are starting to be utilised, oversupply should slowly run down.	Positive: Balancing of crude oil markets will results less need for shorter-term contracts from the traders. Long-term contracts remain in place. Tankers and storage players should not see much problem.	Positive: Strong economy leads to strong demand for every day consumption of non-durables, durables as well as transportation.
Oil demand	Strong				
Oil supply	Balancing of supply and demand begins				
Oil price	Above breakeven point for most oil plays				
Global economy	Robust global economy	Positive: Cash flows are positive. Investments for both short and long-term moves forward.	Positive: Industry assets are now in demand and more orders and contracts are moving forward. Cash flows are no longer a problem.	Positive: Long-term contracts remain in place for both tankers and storage players. Note: tankers can be in oversupply/deficit, depending on the product	Positive: Strong economy leads to strong demand for both every day consumption of durables as well as transportation
Oil demand	Strong				
Oil supply	Balanced				
Oil price	Prices are comfortably high for a prolonged period of time, with less volatility				
Global economy	Global economy slows	Positive: Investments for both short and long-term are still ongoing. Cash flow starts to see a squeeze.	Positive: Industry assets are now in demand and more orders and contracts are moving forward. Cash flows are no longer a problem. Demand for industry assets reaches peak.	Positive: Long-term contracts remain in place for both tankers and storage players. Utilisation rates start to soften for then non-contracts, as more supply enters the markets and are not being utilised. Spot rates start to soften	Less Positive: Slowing economic growth affects the growth in overall consumption of non-durables, durables and transportation fuels. Refined products and petrochemicals spreads start to soften
Oil demand	Softens				
Oil supply	Oversupply begins				
Oil price	Prices soften				
Global economy	Global economy enters into recession	Negative: Producers cannot breakeven at depressed oil price. Cash flows are squeezed. Investments are put on hold. Producers need to cut costs/increase efficiency. For highly leveraged companies, negotiations with banks to defer payments, etc, may be necessary	Negative: Service contracts are pushed out/delayed/payments from customers are late or negotiated. This puts a strain on the services companies' cash flows. Highly leverage companies will be hard pressed to negotiate with bankers to extend loan payments/take haircut. Some may need to utilise their asset by finding other customers in other industries to keep assets utilised. Industry asset are in oversupply	Negative: Long-term contracts remain in place for both tankers and storage players. Utilisation rates for spare capacity or non-contracted capacity slumps as more assets are in oversupply. Spot rates crash	Negative: Economic recession results in slump in growth rates of overall consumption. Although base consumption of non-durables and transportation remains. Refined products and petrochemicals spreads becomes depressed
Oil demand	Slumps				
Oil supply	Oversupply (assuming producers do not adjust)				
Oil price	Depressed, at below breakeven price point				

Note: For the crude oil, industry assets (OSV, tugboats, rigs etc), storage, tankers, petrochemical products all have their own demand and supply and these will vary depending on the investment cycle for each product. Especially for each refined products and petrochemicals products, there will be seasonality as well as oversupply/deficit as such, seasonal and cyclical volatility are normal for the industry
Source: RHB

27 November 2019

Energy | Regional Oil & Gas

Figure 34: RHB regional oil & gas coverage

Company name	Rating	TP	Upside (Downside) %	P/E (x) Dec-20F	P/BV (x) Dec-20F	Yield (%) Dec-20F
Malaysia (MYR)						
Upstream FPSO						
Bumi Armada	BUY	0.61	24.49	8.45	0.72	0.00
Yinson	BUY	8.22	23.61	18.73	1.89	0.60
Upstream Services						
MMHE	SELL	0.76	(14.61)	89.00	0.58	0.00
Muhibbah Engineering	BUY	4.26	79.75	7.65	0.81	3.38
Sapura Energy	NEUTRAL	0.30	5.26	142.50	0.39	0.00
Serba Dinamik	BUY	5.42	26.05	11.88	2.26	2.56
Midstream						
MISC	BUY	9.21	10.83	18.55	1.02	3.61
Downstream						
Petron Malaysia	BUY	5.93	16.73	7.71	0.70	2.60
Petronas Chemicals	NEUTRAL	6.97	(1.55)	16.09	1.67	3.11
Petronas Dagangan	NEUTRAL	25.09	4.98	23.97	3.71	3.10
Integrated Oil & Gas						
Dialog	BUY	4.00	17.65	33.33	4.59	1.35
Thailand (THB)						
Upstream Exploration & Production						
PTTEP	BUY	150.00	25.52	11.02	1.07	3.63
Refineries and petrochemicals						
Bangchak Corp	NEUTRAL	30.00	23.46	6.73	0.57	5.93
IRPC	SELL	2.90	(18.08)	13.11	0.80	2.82
PTTGC	BUY	63.00	16.67	11.74	0.77	4.07
TOP	BUY	84.00	20.86	12.30	1.07	3.60
SPRC	BUY	12.70	24.51	8.50	0.96	5.78
Integrated Oil & Gas						
PTT	NEUTRAL	46.00	5.75	9.67	0.88	4.14
Singapore (SGD)						
Keppel Corp	BUY	7.80	15.21	11.34	1.01	4.41
Sembcorp Industries	BUY	2.68	20.18	8.58	0.54	2.38
Sembcorp Marine	BUY	1.60	24.03	58.80	1.18	-

Source: RHB

Where are we in the oil & gas cycle now?

We believe the oil & gas industry is now in a late cycle, after a strong performance in 2018. This past year has been a roller coaster ride for the crude oil markets, with crude oil price seeing high volatility with the ebbs and flows of the news cycle. The global economy is teetering on a slowdown, but this remains highly dependent on the outcome of the US-China trade war.

In general, as global economy slows, and demand for commodities may not be as strong as previously expected. Consequently, prices and spreads will soften, as various products in the value chain will turn into oversupply mode.

This will affect more on the upstream E&P (lower crude oil price). However, E&P activities and projects for conventional oil & gas plays will move forward – with more expected exploration and development activities. This is possible as a result of the more stable crude oil price environment, made possible – in our opinion – by OPEC and its alliance, which has, more or less, put a floor on oil prices.

For the upstream services sector, we see most of these companies starting to emerge from their corporate restructurings, while some are at the tail-end of their negotiations. Demand for their assets have started to pick up, as E&P companies' capital spending begin to flow more consistently. This will result in improved asset utilisation rates, while chartered rates may remain much below peaks, as service assets there remain in surplus.

For the midstream segment, long-term contracts remain in place for both tankers and storage players. As more tankers and storage facilities enter the market – while demand may not keep pace – spot prices should start to soften. Short-term or roll-over contracts may see a softening of rates, as spot prices start to weaken.

Downstream petrochemicals companies will see softening in prices and spreads as more supply enter the market, with demand not keeping pace. Refineries, on the other hand, will have the International Maritime Organisation (IMO) regulations that will be implemented on Jan 2020, which should provide some uplift in spreads for refineries that do not have high sulphur fuel oil content in their refinery yields.

Regional Oil & Gas: OVERWEIGHT

We have upgraded our regional oil & gas sector to OVERWEIGHT after the 3Q19 reporting season. With expectations of crude oil price expected to trade in the range of USD60.00-70.00 per bbl in 2020, we are not overly bullish.

However, we believe share prices have been overly bearish, and may not be reflecting the improved outlook of each individual company. We believe further uplift in share prices are possible over the next 12 months on our selected companies.

Malaysia: OVERWEIGHT

Upgrade to OVERWEIGHT from Neutral. This is after we upgraded MISC and resumed coverage on Serba Dinamik (SDH MK, BUY, TP: MYR5.42) and Petron Malaysia (PETRONM, BUY, TP: MYR5.93). We expect to see further growth in local upstream capex growth in 2020, assuming a portion of work orders being pushed forward to 2020.

As such, this will leave lesser room for Petronas to suppress service rates amidst higher asset utilisation. Globally, we are still positive on the FPSO segment, as job tenders are at their highest in the past three years, with 9-12 prospective FPSO contracts in the next two years.

Our Top BUYS in the sector are Yinson and Serba Dinamik.

Thailand: OVERWEIGHT

We are not bullish on crude oil price, with expectations of crude oil price to average USD64.00 per bbl for 2020F. Our OVERWEIGHT on the Thai oil & gas sector is a result of our upgrades of SPRC and PTTGC to BUYs over the 3Q19 reporting season. We believe share price of these two companies have bottomed out in 3Q19.

While we expect earnings of both companies to bottom out in 4Q19F, as the refineries undergo major maintenance of 45 and 54 days for SPRC and PTTGC, we expect earnings rebound for both companies in 2020F. Our Top Picks are: PTTEP, Thai Oil, SPRC, and PTTGC.

Singapore: OVERWEIGHT

We are OVERWEIGHT on the Singapore oil & gas sector. We have BUYs on all three oil & gas related large-cap stocks listed on the SGX. Our Top Pick is Keppel Corp (KEP SP, TP: SGD7.80), with a catalyst being Temasek's partial share offer – being a precursor to future restructuring, particularly of its offshore & marine (O&M) business.

Whilst waiting for the earnings recovery of the O&M segment, Keppel can depend on its property business for earnings. Our second preference is for Sembcorp Industries (SCI SP, TP: SGD2.68), which has relatively stable energy earnings to cushion the drag on current earnings by the O&M space.

Thailand: OVERWEIGHT

Upstream: PTTEP

We are not bullish on crude oil prices, with our expectations for 2020 in the range of USD60.00-70.00/bbl, averaging USD64.00 per bbl for the year. That said, PTTEP's share price is highly correlated with crude oil prices (0.84x), as its products are both directly and indirectly linked to these prices. We valued PTTEP on a DCF valuation basis, taking into account our in-house crude oil price forecasts. As such, we take a longer-term view on our valuation of this company.

We like this company as it has a strong balance sheet, robust cash flow and attractive dividend yields. We believe the company strategy is sound, as it pursues a smooth transition of its recently acquired assets, and increases exploration activities in its focus areas. Its objective for its exploration projects will be to bring these projects to market as soon as possible. M&A should not be a key focus area in the near term.

PTTEP will be looking to ensure that there is a smooth transition in the transfer of assets from Chevron to PTTEP in the Erawan field. With regard to the decommissioning costs (on which Chevron is disputing its obligations), PTTEP believes this is of national interest. The project will impact the country's energy security and therefore it has to be settled. As such, the Government should not allow any deadlock to happen.

The Murphy acquisition has provided additional reserves/resources but more than that, it has also provided PTTEP with a team that has experience in deepwater projects. This will be valuable, as the company is looking to expand into deepwater projects in the Andaman Sea in Myanmar.

There will be more exploration activities in 2020. PTTEP believes that it is a good time to increase exploration activities as costs are not too high at the moment. It plans to accelerate exploration projects in Myanmar (The Zawtika and MD-7 projects, as well as deep-sea projects in the Andaman Sea) and in Malaysia (Peninsular Malaysia, Sarawak and Sabah). For Malaysia, the company plans to explore with the objective of bringing projects to the market as soon as possible. The SK410B project remains one of its top priorities to bring to the market as soon as possible;

Leng Lebah (SK410B) currently has total resources estimated at 2tcf. PTTEP expects to drill another 300m in the nearby area by 2Q20. It is possible that another 2-3tcf can be found with additional drilling. This project could potentially be commercialised by 1Q25, as it could use shared existing facilities within the area. Assuming 30-100% of the 2tcf is proved reserves, this project could add c.THB3.50-11.50 per share to PTTEP. This is assuming valuation of c.USD4.00 per boe to its reserves.

Finally, we should point out that its product mix is 70% natural gas and 30% liquids. As such, the scenario of peak oil demand, should it eventually happen, will not severely affect its sales. We expect natural gas to remain a crucial part of the primary energy mix over the longer term.

Refineries and petrochemicals

Our Top BUYs for the refineries and petrochemicals are: TOP, SPRC and PTTGC.

2020F commodity spreads outlook: Crude oil prices (Brent) are expected to average at USD62.50 per bbl in 4Q19F and USD64.00 per bbl for 2019F-2020F. The refined product spreads outlook remains positive, with the implementation of the IMO's regulations. Refined product spreads should see a further uplift in 2020. Finally, petrochemical prices and spreads remain weak for most of the products over the forecasted period. The new capacities entering across the board as well as global economic slowdown are likely to pressure prices and spreads. However, we believe that downward pressure has already bottomed out in 2H19 and will level off in 2020.

Integrated oil & gas: PTT

This company has a strong balance sheet and robust cash flow, and provides attractive dividends. However, we believe that there are few major catalysts for PTT's share price at the moment, given the subdued outlook for the global economy and oil demand, and the expected higher crude oil supply entering in 2020.

Figure 35: Refined product spreads outlook remains positive with the implementation of IMO regulations

	1Q19	2Q19	3Q19	4Q19F	2019F	2020F	Comments
Crude oil price outlook							
RHB crude oil price (USD/bbl, Brent)	63.1	68.8	61.9	62.5	64	64	- Global economy and oil demand expectations have softened since beginning of year. The IMF cut 2019 global GDP growth to 3% as of October from its initial expectations of 3.5% in January. Likewise, the IEA cut oil demand to 1mbpd as of October from 1.4mbpd at the beginning of the year.
Crude oil price (USD/bbl, Dubai)	63.5	67.4	61.2	59.5	63	58-65	- US crude oil production hits record high of 12.6mbpd in October, while 4Q US pipeline expansion will increase US exports + We note here that US crude oil annual growth looks set to be more sluggish next year, as shale oil producers face a myriad of obstacles (financial, technical) + OPEC+ production cuts remain in place until Mar 2020. The meeting on 5-6 Dec will assess the oil markets. OPEC+ has mentioned that it will now look to take into consideration the sluggish growth from shale oil producers. It will also look for higher compliance from its participating members + Escalation of Middle East tensions with possible loss of supply remains a constant risk
Refined product spreads (USD/bbl)							
Diesel	12.8	12.4	15.4	17.1	14.4	19-20	+ New IMO regulation to support diesel demand in 2020 - Weak demand from economic slowdown and new supply from Malaysia and China
Very low sulphur fuel oil (VLSFO)	6.8	9.9	13	17.5	12	17-18	+ IMO regulation supportive of VLSFO + Delays in scrubber installation on vessel due to high freight rates help support VLSFO demand
Gasoline	3.7	7.5	11.7	12.7	8.9	9-13	- Weak demand from economic slowdown, pressure from lighter crudes as US production rises
High sulphur fuel oil (HSFO)	0.6	-2.3	0.9	-12.7	-3.4	-14 to -13	- IMO regulation to pressure HSFO demand - Economic slowdown leads to lower trading activity and thus lower demand for bunker fuel

Source: Company data, RHB

Figure 36: Aromatics and polymers spreads under pressure with new capacities and global economic slowdown

	1Q19	2Q19	3Q19	4Q19F	2019F	2020F	Comments
Paraxylene value chain (USD/ton)							
Polyethylene terephthalate (PET) resin margin	137	138	118	100-110	120-130	120-130	- US-China trade war provides uncertainty, pressuring overall demand
Purified terephthalic acid (PTA) margin	132	195	157	110-120	140-150	130-140	- New capacities from in China: 2019F 2.3mtpa, and 2020F 9.1mtpa
PX-naphtha margin	561	369	319	290-300	385-390	320-330	- New PX capacity for 2019F 7.1mtpa already entered, while 2020F will see another 8.4mtpa entering global supplies
Benzene value chain (USD/ton)							
Phenol product to feed	447	293	209	250-270	300-305	275-305	- Softer downstream margin due to economic slowdown and weak auto sector
BZ-naphtha margin	70	47	185	135-150	115-119	150-180	+ New downstream capacity from China of c.1.3mtpa - New capacity of 1.9mtpa in 2019 already entered. For 2020F expect 2.3mtpa to enter
Ethylene and derivatives (USD/ton)							
HDPE price	1093	1080	951	870-890	970-1030	910-1030	- Lower prices from US pressure SEA market sentiment
HDPE-Mean of Platts Japan (MOPJ)	573	539	457	350-400	480-510	440-550	- New capacities entering SEA (800ktpa) in 4Q19F to limit PE price upside - Falling polyethylene (PE) prices squeeze margins in naphtha-based integrated PE producers in Asia + US-China trade war may ease toward US general election in Nov 2020
Monoethylene glycol (MEG) price	624	562	551	545-565	560-600	580-620	- New MEG capacity of 1.6mtpa entering Asia and US to pressure price in 4Q19 + MEG supply lower as non-competitive producers cut production + Price should be stronger in 2020F as 3.8mtpa of new additional polyester capacity enters
Propylene and derivatives (USD/ton)							
PP Price	1127	1143	1085	1050-1070	1090-1120	1000-1100	- Additional PP of 7.4mtpa in 2020 to outstrip demand growth of 3.2mtpa leading to a downtrend in PP market
PP-MOPJ	608	602	591	530-560	570-600	540-570	- PP market also is challenged as a result of US-China trade war
Propylene price	839	796	862	835-855	820-850	780-810	- Additional capacity in Asia c. 1.3mtpa to start in 4Q19 to further pressure markets - 2H20F additional capacity of 3.6mtpa in North-East Asia and South-East Asia to further dampen price

Source: Company data, RHB

Malaysia: Overweight (From Neutral)

Upgrade to OVERWEIGHT on the sector from Neutral following our upgrade on MISC as well as resuming coverage on Serba Dinamik and Petron Malaysia. We expect to see further growth in local upstream capex growth in 2020 assuming a portion of work orders being pushed forward to 2020. As such, this will leave less room for Petronas to suppress services rates amidst higher asset utilisation. Globally, we are still positive on the FPSO segment, as job tenders are at their highest in the past three years, with 9-12 prospective FPSO contracts in the next two years.

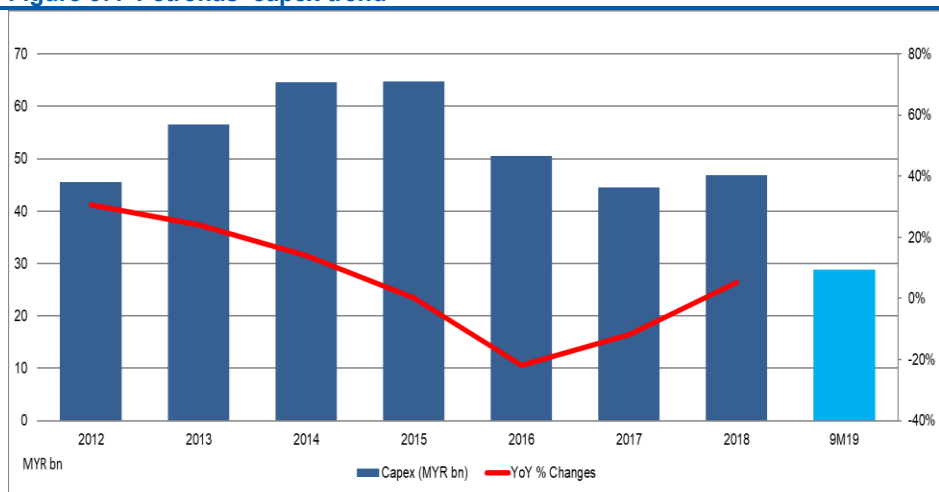
Top BUYs

Yinson (YNS MK, BUY, TP: MYR8.22) is well-positioned to capture the robust FPSO upcycle, leveraging on its excellent delivery track record. The recent FPSO Marlim 2 win from Petrobras marks its maiden venture into the Brazilian FPSO market. Significant cost savings could be attained if Yinson is able to seal the PDB project in Brazil, while the potential award of the Pecan project in Ghana could serve as another near-term catalyst. Note that our SOP-derived TP has factored only the Marlim 2 win and an additional new project win with capex size of USD1bn.

Serba Dinamik's (SDH MK, BUY, TP: MYR5.42) orderbook remains solid at MYR10bn (potentially MYR11bn, including estimated work orders from master service agreements). It is targeting to hit MYR15bn by end-2020, backed by a robust tenderbook of MYR16bn. Our FY19F-21F earnings growth of 10% is still relatively conservative vs management's target of 15-20%. Overall, consistent earnings growth, backed by robust orderbook, coupled with contract flow remain key share price catalysts.

Reading through Petronas report card, 9M19 core earnings fell 3% to MYR38.7bn on lower averaged realised prices for major products offsetting strengthening of the USD vs MYR. Its balance sheet remained healthy amidst a deteriorated net cash position from the special dividend payment. Capex spending picked up in 3Q19 at MYR12bn (+40% QoQ; +80% YoY). This capex ramp up is mainly attributable to its international division (+91% QoQ; +235% YoY) while Malaysia capex has grown at a relatively slower pace (+5% QoQ; +14% YoY). Overall, 9M19 capex of MYR28.9bn (+9% YoY) accounted only 58% of Petronas' targeted full-year capex estimate of RM50bn (+7% YoY).

Figure 37: Petronas' capex trend

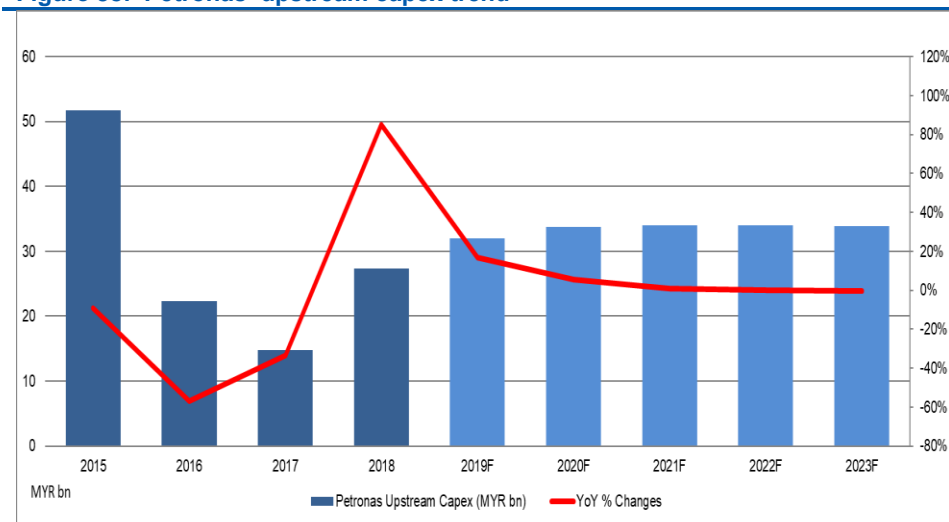


Source: Petronas, RHB

Should we see higher local upstream capex in 2020? Note that Petronas has not come out with the latest capex guidance for 2020. With 9M19 capex only accounting 58% of its full year budget, Petronas' capex should still ramp up strongly in 4Q19, if management wishes to maintain its capex target. Additionally, total upstream capex of MYR19.1bn (including MYR5.8bn spent on gas & new energy segment) is also lagging behind the initial target of MYR32bn. Meanwhile, according to the 2018 Annual Report, Petronas has projected the total upstream capex to range from MYR33.7-34bn in 2020-2023. This suggests that local upstream capex growth is likely to moderate in the next few years, given that Petronas has indicated it will increase overseas capex in the medium term.

Our view: Petronas, in our view, would probably spend only up to MYR40-45bn this year (implying MYR11-16bn in 4Q19), with the rest being pushed to 2020. If this is the case, local upstream capex spending is likely to land at MYR10-12bn in 2019 (vs planned target of MYR14-15bn). Regardless of Petronas' final capex spending, we believe that 2019 will most likely be the inflection point for local upstream capex given its low base of MYR7.5-8.3bn pa in 2017-2018. All in, we should continue to see growth in local upstream capex spending in 2020-2021.

Figure 38: Petronas' upstream capex trend



Source: Petronas, RHB

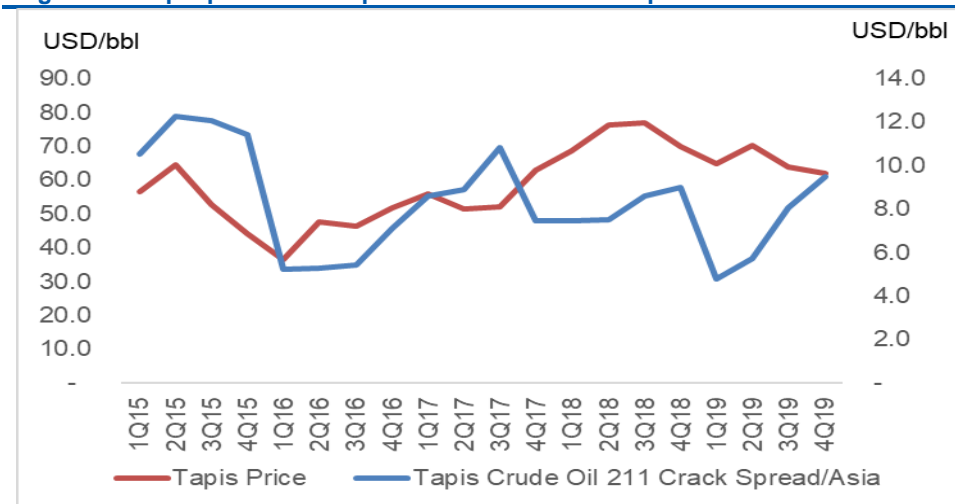
Selective growth in sub-segments. Petronas has yet to release the latest Activity Outlook report. As such, Activity Outlook 2019-2021 should be the reference to gauge the activity level of each sub-segment in 2020. Assuming Petronas has ramped up its work as guided in the report in 2019, we should see overall upstream activities stay elevated in 2020. Sub-segments with higher activities in 2020 are jack-up rigs, offshore fabrications, line pipes, pipelay installation and selective offshore support vessels, while hydraulic workover units (HWU), heavy lift structural installation, hook-up & commissioning (HUC) may experience a marginal slowdown. Overall, we reckon that the upcoming Activity Outlook report will not change significantly as the YTD average Brent price of USD64.00/bbl and our in-house 2020 average oil price forecast of USD64.00 per bbl are still within Petronas' oil prices expectation of USD60.00-70.00 per bbl. However, if Petronas does not utilise all its budget in 2019, we may still see upside in terms of potential work orders being awarded to services players.

Less room to suppress rates. Petronas has implemented cost optimisation measures since the industry downturn in 2014. The national oil company achieved MYR800m cost savings in 2018 and is targeting to reduce opex by MYR1.2bn to MYR30.4bn from MYR31.6bn in 2018. We are unclear on Petronas' current progress on this given limited disclosure. Nonetheless, based on our channel check as well as recent contract awards announced by local services players, charter rates for jack-up rigs and OSVs are on the rise. This indicates that bargaining power is slowly shifting towards the services players, with a higher number of idle assets being utilised.

FPSO segment remains the bright spot. We are still positive on the FPSO segment, as job tenders are at their highest in the past three years. 9-12 prospective FPSO contracts are likely to be awarded in the next two years, the bulk of which are from Brazil. As there are limited existing players with established track records, we expect more new entrants to penetrate this premium-lease FPSO market, competing for key resources such as human capital, yard capacity and financing. Overall, these new FPSO projects still fetch attractive IRRs, but excellent project execution and strong financing capacities remain the key success factors.

Downstream – mixed outlook. The global refining margin has staged a recovery in 2H19. The Tapis Crude 211 crack spread – with product prices that include a mix of gasoline and diesel – has recovered to an average USD8.00 per bbl in 3Q19 (2Q19: USD5.70 per bbl). With the implementation of IMO2020, refining spreads could sustain at an average USD7.00-8.00 per bbl in 2020 (vs 2019 YTD average of USD7.00 per bbl). On the other hand, we expect petrochemical prices to stay unexciting, due to flattish oil prices and unfavourable supply dynamics amidst lingering concerns over the global economic slowdown.

Figure 39: Tapis prices and Tapis Crude Oil 211 crack spread



Source: Bloomberg, RHB

Tank terminal segment underpinned by Pengerang development. The Pengerang Integrated Complex is expected to gradually ramp up in 2020, and this would benefit midstream (tank terminal owners) and plant maintenance players. The development of Pengerang Integrated Petroleum Complex Phase 2 and Pengerang Energy Complex, which will potentially involve foreign international petrochemical players, could kick start by 2020. Thus, we are positive in the long term on Pengerang paving its way to be a regional downstream hub due to its strategic location and availability of vacant land.

Singapore: Overweight (Maintained)

We are OVERWEIGHT the Singapore oil & gas sector. We have BUY recommendations on all three oil & gas related large-cap stocks listed on the SGX. Our Top Pick is Keppel, with the catalyst being the Temasek partial share offer being a precursor to future restructuring, particularly of its O&M business. While waiting for the earnings recovery of the O&M segment, Keppel can depend on its property business for earnings. Our second preference is for Sembcorp Industries, which has relatively stable energy earnings to cushion the drag on current earnings by the O&M space.

3Q19 earnings were generally weaker than expected. Keppel, Sembcorp Industries, and Sembcorp Marine (SMM) all recorded 3Q19 net earnings which were below market expectations. The YoY weaker 3Q19 net profit for Keppel can be attributed to softer earnings from the property division, due to absence of divestment gains. For SMM, additional costs for rigs and floaters projects led to a wider YoY 3Q19 operating loss. As Sembcorp Industries owns 61% of SMM, the latter's larger 3Q19 losses contributed to the former recording a 13% YoY fall in net profit.

O&M segments showing strength in orderbook

O&M orderbooks are expanding. New contracts secured by Keppel O&M (KOM) between January and mid-October amounted to SGD1.9bn (ahead of 12M18's SGD1.7bn), with close to 60% for LNG and renewables-related projects. KOM's net orderbook of SGD5.1bn is higher than Dec 2018's SGD4.3bn. Similarly, SMM recorded YTD new contracts of SGD845m, up 16% YoY – including offshore wind contract, FPSO conversion job and FPU orders. We believe the increase in new orderbook could persist (also factoring in expected stability in crude oil prices) and have assumed a higher new orderbook for 2020 – which augurs well for future O&M earnings for the listcos.

Settlement agreements with Sete Brasil paves the way for completion of rigs/drillship construction. KOM and SMM's settlement agreements with Sete Brasil paves the path for completion of construction of some (or all) of the rigs, which should help drive revenue and earnings going forward.

Keppel will take over ownership of four uncompleted semisubmersible rigs (which are 40%, 21% and the balance two are below 10% completed), and these contracts with Sete Brasil will be deemed terminated, and both parties will waive all rights to claims. Two other rigs (92% and 70% completed) will be sold to Magni Partners, and Keppel is in talks with Magni Partners to complete the construction works.

SMM will retain the title to five of the seven drill ships, while the titles to the remaining two (which are in the most advanced stage of construction) will be shared between SMM and Sete Brasil in proportion to payments received by SMM from Sete Brasil. SMM is in negotiations with Magni Partners for new contracts to complete these two drill ships.

Selective non-O&M businesses also showing potential

Keppel experiencing growth from non-O&M segments. The property division remains the largest contributor to 9M19 net profit at 66%. We see the property segment continuing to be a major earnings contributor for Keppel, while KOM's earnings may take a while to pick up steam. Its infrastructure division saw 3Q19 datacentre fair value gains, helping PBT expand 53% to SGD92m.

Sembcorp Industries renewable energy has strong growth potential. The energy business remains the largest contributor to its net profit, contributing SGD81m to 3Q19 net profit. Due to losses from the marine business, Sembcorp's overall 3Q19 net profit was a lower SGD71m. Within the energy segment, Singapore contributed SGD39m (or 55% of overall SCI net profit) while China contributed SGD26m (or 37%). The shutdown of some Singapore power generation assets in 4Q19 could weaken contributions, but the China FY19 portion should be stable vs FY18. Total renewables capacity has risen at a 10% CAGR between Nov 2017 and Nov 2019 to 2,621MW, and is forecast to rise to 4,000MW by 2022 – pointing to growing profit contribution.

Shareholding changes and financial flexibility

In late Oct 2019, Keppel announced that Temasek is offering SGD7.35 per share in cash to acquire an additional 30.55% stake in the company. Upon completion, Temasek will own a 51% stake Keppel. The intention is for the latter to remain listed on the SGX. The partial offer can only be made after the pre-conditions (including domestic and foreign regulatory approvals) have been fulfilled or waived, and this may take several months. After the successful close of the partial offer, Temasek intends to work with Keppel's board to undertake a comprehensive strategic review of the company's businesses, with the objective of creating sustainable value for all shareholders.

Better financial flexibility for SMM. SMM secured a 5-year subordinated loan facility of SGD2bn from Sembcorp Industries, a major shareholder with a 61% stake in the firm. SGD1.5bn of this was deployed to retire short-term borrowings. SMM has since obtained the consent of its bondholders to revise the definition of its debt covenant to exclude the SGD2bn from its net debt to improve its financial flexibility.

Valuation

Keppel's valuation – diversified asset structure with huge value unlocking potential. The company has multiple businesses in different industries. We use SOP methodology for valuation to arrive at a TP of SGD7.80, based on O&M division valued at 1.4x FY20F P/BV, a discount to the 5-year average mean 1.6x P/BV of SMM. Its infrastructure division is valued conservatively at 10x FY20F P/E, and the property wing is valued at a 40% discount to RNAV – close to the average discount to RNAV applied for China listed property developers.

SMM's valuation. Our TP of SGD1.60 is pegged to 1.47x FY20F BV (0.3SD below 1.6x 5-year mean). We are bullish on the YTD contract wins leading to more contract wins in 2020 and beyond. Trading at c.1.2x FY20F BV, we see limited share price downside. Maintain BUY.

Sembcorp Industries' TP is SGD2.68, based on SOP valuation. The bulk of the value is derived from the energy business (60% contribution), with subsidiary SMM accounting for another significant 34% share. A 20% conglomerate discount is also factored in. The TP of SGD2.68 implies a FY20F P/E of c.10x – this is c.1SD below the 5-year historical average of 13.4x.

Appendix I

Shale Oil Producers – Where Are We Now?

Crude oil production from the US remains on the rise, but at a decreasing rate. Shale oil and gas producers are under pressure – from both shareholders and creditors – to exercise financial discipline. The Wall Street Journal reported that smaller drillers, which account for a sizable part of US oil production, are struggling to pay off hefty debt burdens. Bankruptcies are rising, with 26 US oil and gas companies already filing for bankruptcy this year – this was according to an August report by law firm Haynes & Boone.

We take a look at the raw data from the shale oil producers vs those of the oil majors that are the most active in shale oil play in the US – namely Chevron and ExxonMobil. We conclude the following:

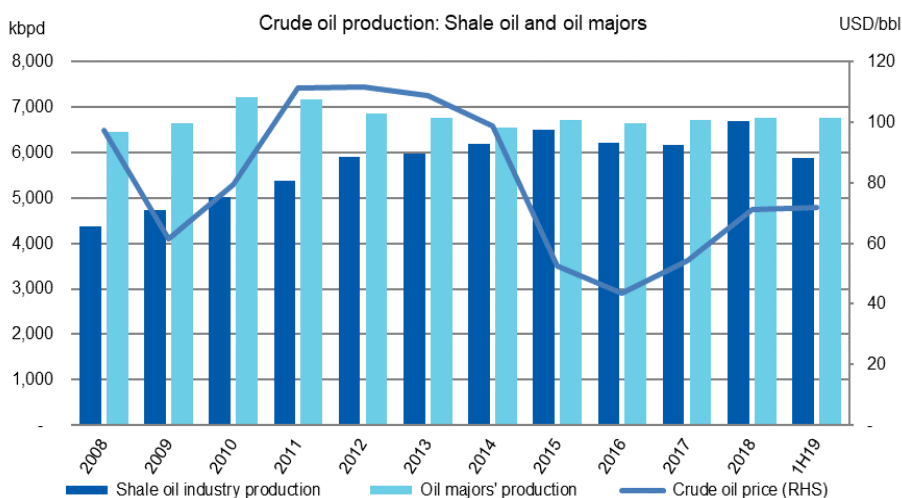
- i. **Shale oil production is more sensitive to crude oil prices** relative to the oil majors' production. However, crude oil production is not too volatile – moving 5-8% up and down to crude oil prices, with some lag time;
- ii. **Shale producers' earnings are more volatile and pronounced** when compared to the major oil producers. Rising oil prices have more pronounced upward swings in shale oil producers' profitability when compared to that of the oil majors and vice versa. However, the oil majors' profitability is more resilient;
- iii. **Cash flows for shale oil producers are not optimal.** Shale oil producers' cash flows from operations are hardly sufficient for their investment requirements, and they have consistently required either equity or debt financing. Oil majors' cash flows are superior, with strong cash flows from operations that exceed their investing requirements. Oil majors' free cash flows are used to repay debt or pay dividends to shareholders;
- iv. **Shale oil producers' balance sheets are relatively weaker** than that of the oil majors, with higher gearing and lower cash on hand.

Our analysis

In this analysis, we took readily available data from Bloomberg. There are 28 listed US shale oil & gas companies in total in this sample group, and we used Chevron and ExxonMobil as our oil major comparisons. We used the 2008 to present day period to see the performance trend of the shale oil industry vs the oil majors.

We believe that our sample group may represent the strongest of the shale oil producers, as the weaker or smaller shale oil & gas producers may not be listed. Crude oil prices quoted here are the average spot Brent price for each period.

Figure 40: Shale oil industry profits remain quite volatile with oil prices

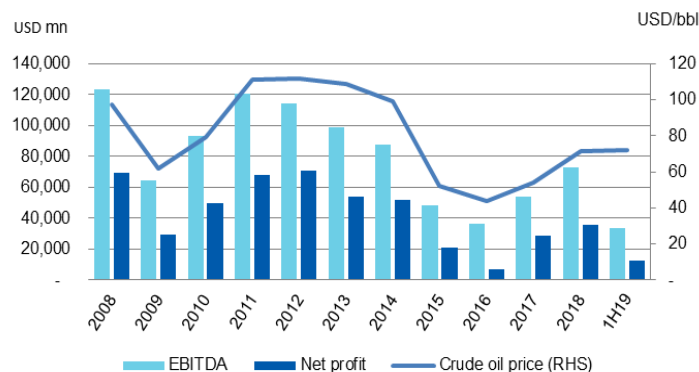
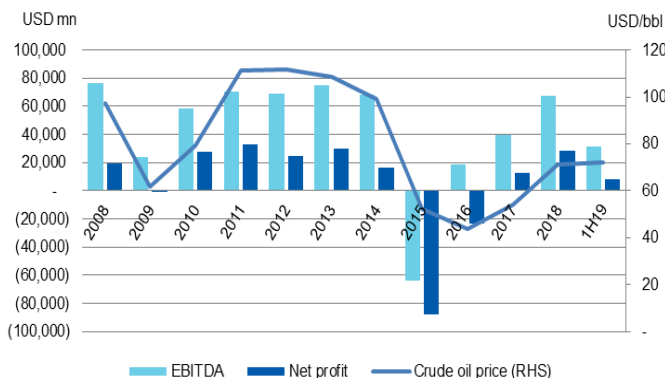


Source: Bloomberg, RHB

- ◆ Shale oil production seemed to be more sensitive to crude oil prices relative to that of the oil majors
- ◆ Crude oil price fell from an average USD99.00/bbl in 2014 to USD52.00/bbl in 2015. In 2015, both shale oil and oil majors increased production by 5% and 3%
- ◆ Declines in crude oil production only occurred in 2016, when the crude oil price was USD44.00/bbl. Shale oil production fell 4%, while oil majors' production fell 1%
- ◆ 2018 saw a large boost in both crude oil price – averaging USD71.00/bbl – as well as an 8% boost in shale oil production compared to a 1% growth in oil majors' production

Figure 41: The shale oil industry's profitability is relatively volatile...

Figure 42: ...while oil majors' profitability showed resilience



Source: Bloomberg, RHB

Source: Bloomberg, RHB

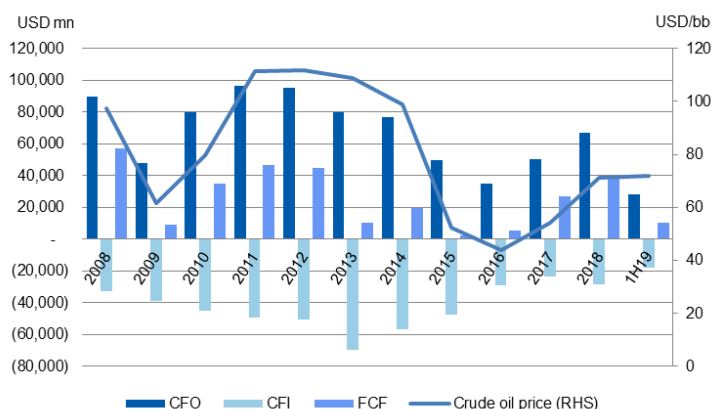
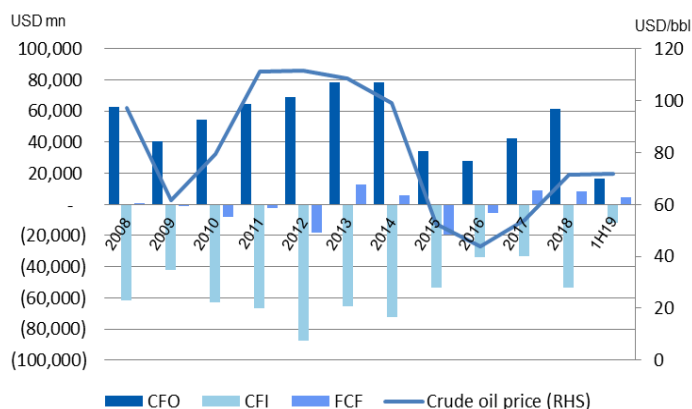
Oil majors' earnings are more resilient. In their worst years, the 28 shale oil companies saw their EBITDAs turn negative: 53% in 2015 and 28% in 2016. The oil majors were able to see positive EBITDAs throughout the entire 10 years under observation. For the 2015 and 2016 period, the oil majors saw EBITDA falling by 45% and 24%. We believe the oil majors' earnings are more resilient than the shale oil companies, as they are integrated oil & gas companies with diversified portfolios.

Revenues of both shale oil and oil majors correlate well with crude oil prices, and therefore are not shown in the charts. That is to say that a 37% decline in crude oil prices will lead to a 32-37% decline in revenue. A 20% increase in crude oil prices will lead to a 20-29% increase in topline.

Shale oil & gas companies' profitability sensitivity to crude oil prices is more pronounced than the oil majors. For shale oil firms, a 37% decline in crude oil prices in 2009 led to a 69% drop in EBITDA vs a 48% decline for the oil majors during this period. In 2015, when crude oil prices fell 47%, EBITDA for the shale oil & gas firms fell 194%, while oil majors saw a 45% drop. In 2018, when crude oil prices increased 32%, the shale oil companies' EBITDA increased 70% YoY vs 35% YoY rise for the oil majors.

Figure 43: The shale oil industry's FCF has been meek

Figure 44: Oil majors' FCF is much stronger



Source: Bloomberg, RHB

Source: Bloomberg, RHB

Shale oil companies' cash flows are not optimal... For the 10 years under observation, cash flows from operations hardly met the cash flows for investments – only four years of FCF were positive. This means that shale companies need constant debt/equity injections to finance their operations.

...while the oil majors' cash flows are strong. In contrast, the oil majors' cash flows from operations exceeded the cash flows from investments. These oil majors were also able to repay debt or pay out dividends to shareholders every year during our 10-year observation period.

Figure 45: Shale oil companies' cash flows are not optimal

	2008-2018 cumulative	
	Shale oil companies	Oil majors
Cash flows from operations	551,527	766,633
Cash flows from investing	(570,787)	(473,092)
FCF	(19,260)	293,541
Cash flows from financing	25,725	(322,787)
Changes in cash	6,464	(29,246)
Beginning cash	10,788	41,639
Change in cash	6,464	(29,246)
Ending cash	17,253	12,393

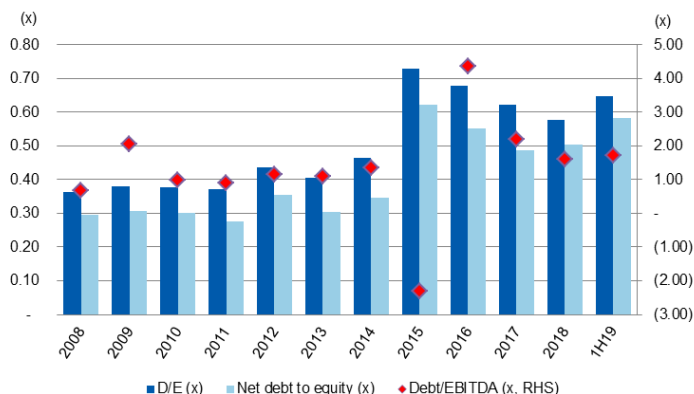
Source: Bloomberg, RHB

Finally, looking at the balance sheets, the oil majors are superior to the shale oil producers.

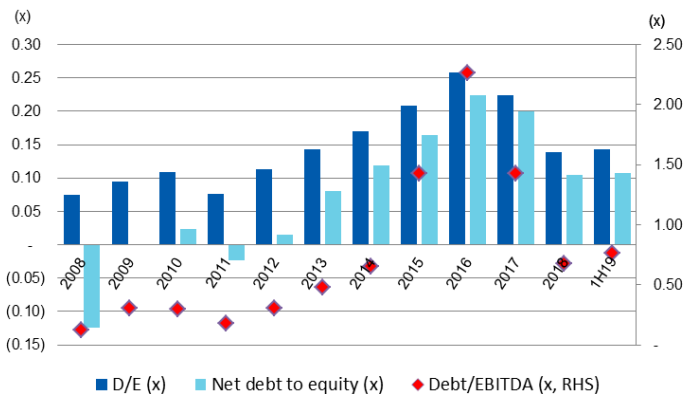
- i. Shale oil companies' D/E ratios ranged from 0.36x in 2008 and peaked at around 0.73x in 2015. Debt to EBITDA ranged from 0.67x in 2008 and peaked in 2016 at 4.3x;
- ii. Oil majors' D/E was much lower at 0.08x in 2008 and peaked at 0.26x in 2016. Debt to EBITDA was 0.12x in 2008 and peaked at 2.2x in 2016.

Figure 46: The shale oil industry's balance sheet was relatively weaker...

Figure 47: ...while the oil majors' balance sheets remained robust



Source: Bloomberg, RHB



Source: Bloomberg, RHB

The shale oil segment looks set for a sluggish year ahead. With shareholders and creditors calling for capital discipline, shale oil production seems to be growing at a more sluggish pace and bankruptcies of US energy producers seem to be rising. With this in mind, we are not expecting a collapse in shale oil production, but believe that production growth will be sluggish in the coming year.

The shale oil boom and its resilience may have started to turn this year. As shale oil wells have rapid decline rates (70% in the first year, with a well life averaging three years), funding remains critical for shale oil producers. Investors and creditors have started to demand that shale oil companies spend less and pay more dividends. Once funding dries up, declines in total production may eventually follow.

Production growth has started to decelerate, to average c.15% in 2019, or 8.6mbpd, vs 27% growth in 2018, or an average of 7.5mbpd. Pioneer Natural Resources, a shale oil & gas producer, believes that there will be a significant fall in Permian Basin production growth, and for most producers, there will be no growth.

Figure 48: Shale oil production growth is set to tone down

	2016	2017	2018	YTD19
Shale oil production (average, kbpd)	5,406	5,910	7,506	8,663
Production growth	-8%	9%	27%	15%
Production growth (kbpd)	(455)	504	1,596	1,157

Source: Bloomberg, RHB

2020 shale oil production growth forecasts vary among the major agencies, but all agree that shale oil production growth will be sluggish. The EIA expects growth of c.1mbpd, while Pioneer said output will grow by about 600-700kbpd over the next few years. S&P Platts expects 2020 production to grow by 1.1mbpd, while Wood Mackenzie expects growth to be c.550kbpd.

Parent-child well problems

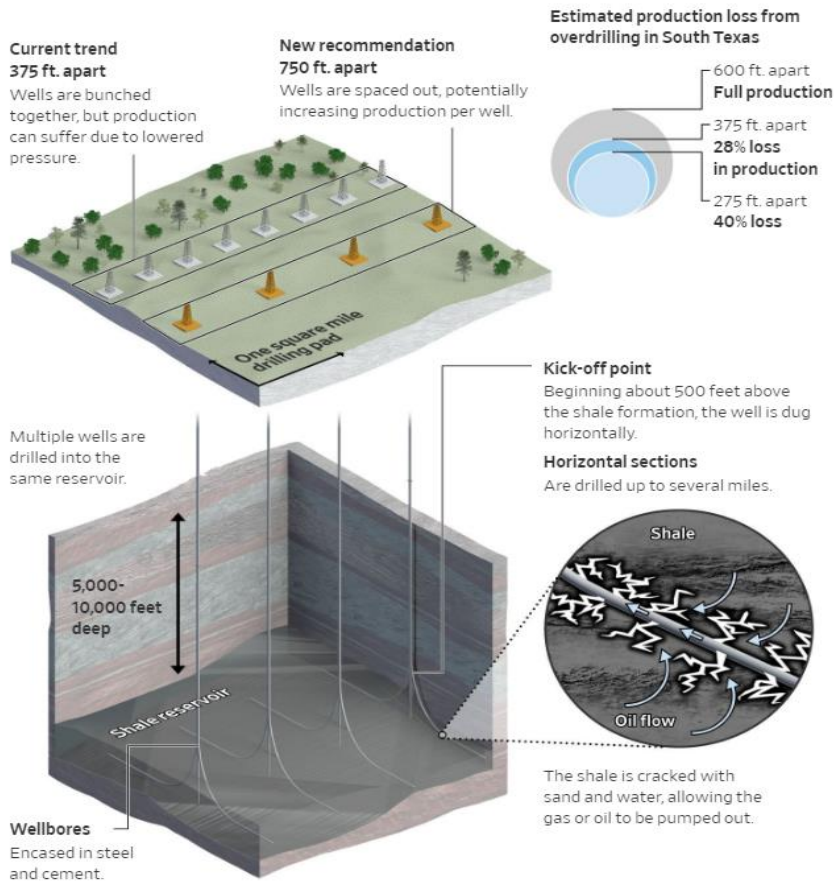
There are many problems that shale oil producers have encountered. However, from a more technical aspect, shale oil producers have encountered parent-child well problems.

In recent years, shale oil producers have started to drill “child wells” in close proximity to the “parent wells” to increase production of oil and gas. The problem with this is that close proximity between wells will interfere with the older wells. Blasting too many holes in dense rock formations can damage nearby wells and lower the overall pressure – making it harder for oil to seep out. This could cause permanent damage and lower the overall amount of oil recovered from the reservoir, according to the Wall Street Journal.

Wells drilled 350ft apart could result in a 28% loss in production over the well’s life. If the wells are spaced 275ft apart, the loss could be as high as 40%. In some cases, water and chemicals used to frack a child well could flood the parent well through connected fractures, and significantly impact the oil production of the older wells.

Shale oil companies could face the equivalent of an industry-wide write-down if they are forced to downsize the estimates of drill sites they have announced. As such, companies continue to test the balance between making a single well as productive as possible, and maximising returns from a cluster of wells.

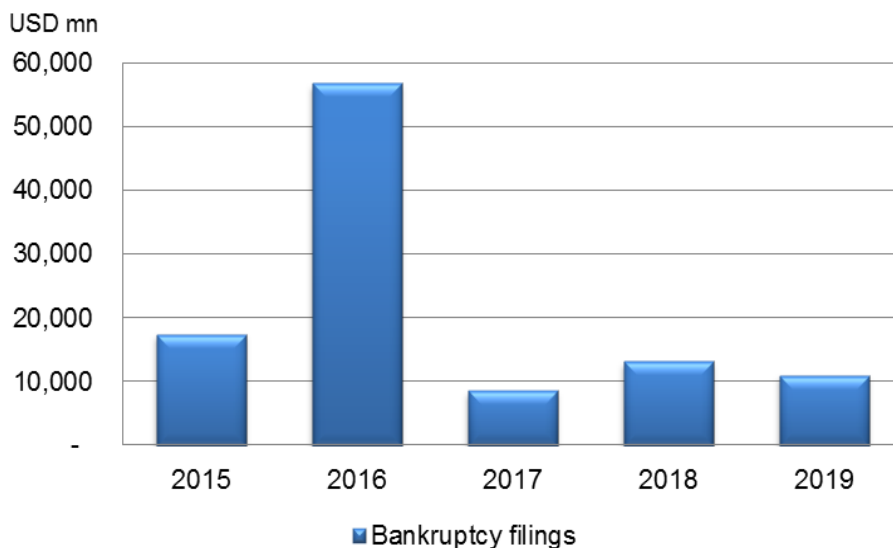
Figure 49: Parent-child well problems



Note: schematic drawing
Source: WSJ, Statoil (production loss), Energy Department (drilling); American Petroleum Institute (fracking)

Bankruptcies of US energy producers seem to be on the rise again this year. Putting things in perspective, US energy firms filing for bankruptcy protection peaked in 2016, with a total of USD56.8bn worth of bankruptcies filed. In 2017, shale oil companies worth USD8.5bn filed for bankruptcy. The trend is now on the rise again, with YTD-August total bankruptcy protection filed amounting to USD10.9bn, according to Reuters.

Figure 50: Bankruptcies are on the rise in 2019



Source: Reuters, RHB

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