



*All Fired Up:  
Powering the Emerging Markets*

SMU Emerging Markets  
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MARKETS

# An Introduction to Emerging Markets:

*“Good information, thoughtful analysis, quick but not impulsive reactions, and knowledge of the historic interaction between companies, sectors, countries, and asset classes under similar circumstances in the past are all important ingredients in getting the legendary ‘it’ right that we all strive so desperately for”*

**Barton Biggs- Traxis Partners Founder**

The term emerging markets has been in the vernacular for decades. They are playing an even more important role today as regions such as China, India, Russia and the Middle East jostle their way onto the world stage, becoming prominent forces to be reckoned with. As debt and capital markets in emerging markets swell to euphoric valuations, they’ve attracted the eyes of many; from institutional investors seeking havens for their assets to retail investors searching for high yields. However, research on these regions is still lacking.

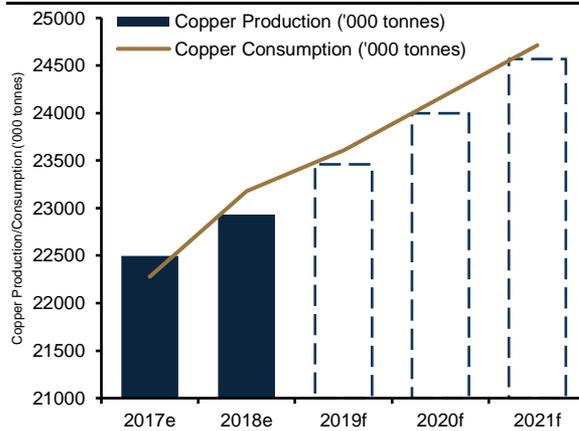
The main focus of research is to reduce the pervasive problem of information asymmetry between the researcher and the topic at hand. At SMU Emerging Markets club, we seek to reduce this asymmetry and provide all our analysts (current and incoming) with the necessary tools and insights to understand these prevalent forces.

This year’s annual publication is a taste of what we do as a club. We have compiled a series of research pieces that our talented analysts have written on the state of energy in emerging market regions.

We hope you’ll enjoy reading it as much as we enjoyed writing it.

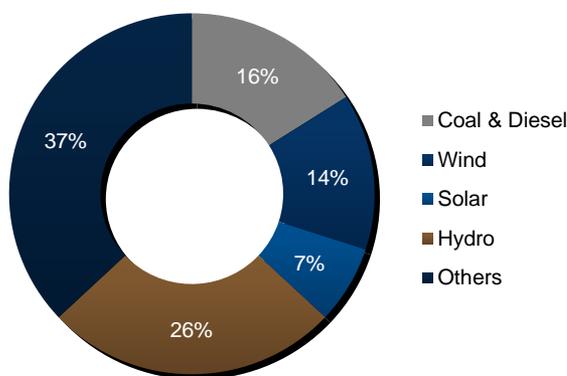
Written by  
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Figure 1: Global Copper Production and Consumption



Source: Trading Economics, 2019

Figure 2: Estimated Electricity Matrix by Source, 2021



Source: Ministry of Energy (Government of Chile), 2017

## Headlines

- Chile is one of Latin America's leading economies, displaying robust growth, stability and an open market
- With incumbent President Sebastian Piñera, initiatives to improve the economic growth rate have taken precedence
- Copper, the backbone of Chile's economy, not only makes up 49% of exports, but is key to determining performance by ancillary industries
- Chile's commitment to a green economy has led to introduction of carbon tax and new renewable energy facilities
- GDP growth is forecasted to be 3.5% in 2019, with a focus on present goals of attracting more foreign investment and a future goal of creating sustainable business opportunities

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## Chile's Renewable Energy Industry: A Small yet Successful Story

Chile is one of the emerging economies in Latin America that has been displayed a consistent growth since the 1990s. With a GDP per capita of USD15,346 in 2017 and a GDP growth rate of 1.5%, Chile's economy has shown promise despite the turmoil faced by the rest of the region. Its positive economic growth can be attributed to a low interest rate and consistent trading activities. Copper extracts form the backbone of Chile's economy, accounting for about 49% of total exports and 15% of the GDP.<sup>1</sup> The global demand for copper continues to grow as industrial activities in emerging economies expand, thus bolstering Chile's economy. (Figure 1) The Chilean Peso (CLP) has shown relative stability in the past year, despite exports being affected by the US-China trade war. While 2018 began bleakly for CLP, it gained momentum by mid-year, proving that Chile's economy was equipped to face shocks in a region where inflation, corruption and political uncertainty have become the norm. Chile is also recognised as one of the leaders in renewable energy, with 45% of the country's energy mix coming from natural sources like hydro, solar, wind and geothermal.

### President Piñera: A Pioneer

Since President Sebastian Piñera took office in early 2018, his initiatives have been directed at bringing growth rates of the economy back to how they were during his first term that ended in 2014. Being one of Chile's richest businessmen, President Piñera won the confidence of the public by assuring them of his expertise in business, which he would use to change Chile's economic landscape.

Amongst other actions, the government seeks to address mounting debt by bringing a tax reform into effect and by opening Chile to more foreign investors. The former is more internal-facing as it would alter the existing pension system. The latter aims to open Chile to investors in key growth sectors.<sup>2</sup>

On the business front, Chile has been recognised as one of the most open markets in South America. With a well-developed banking and financial system, the country serves as a gateway for companies looking to enter the Latin American markets. There are many foreign players, mainly from the Americas and Europe, who actively participate in various sectors of the economy. Since a new law that cut red tape and set yearly investment targets came into effect in 2017, foreign direct investment (FDI) grew by 655%.<sup>3</sup> The single largest contributor to FDI growth was Southern Power Grid from China when it bought Transelec, Chile's electric transmission system.

Signs of progress in the economy to how it was in earlier years have already become evident. The growing wages in the economy have been contributing to Chile's competitiveness. In the past year, a growth of 2.3% was recorded in real wages. In the first 3 months of 2019, wages grew by 2% y-o-y, only marginally lesser than the 2.2% hike in labour costs. The impact of this increase can be seen in comparatively low consumer confidence over the course of the Q119, as production costs have been on the rise.

### The Power of Copper

The new government took office at an uncertain time as copper prices had been fluctuating through 2018. To finance their ambitious growth plans, the government was hoping for robust copper prices. Halfway into 2018 though, copper prices dropped dramatically, hitting a nine-month low due in July 2018 due to prospects of a potential US-China trade war. Copper exports are central to Chile's economic performance as they support 30% of the global copper demand. While the prices eventually bounced back, a prolonged depression in copper prices could be a serious setback for the Chilean government. However, given China's development plans and ever-rising demand for metal, the government expects that even if trade tensions arise, copper production will not take a big plunge.<sup>4</sup> Chile's advantage lies in selling copper in dollar terms, which cushions any pressure that may arise if there are peso fluctuations. This is perhaps why CLP only lost 5% of its

value compared to a steep 22% decrease for Argentina's currency during the months of the trade war in 2018. Even still, a weak peso impacts the economy by raising inflation and making imports costly.

### Renewing their Chances

The demand for electricity tends to be high for sectors associated with resource extraction and distribution. As mining is one of Chile's key activities, the country has always sought ways to make the resource-processing more efficient since a third of Chile's power is used for mining activities. In March 2019, Chile installed its first ever floating solar panels in the Los Bronces copper mine where renewable energy will be used to sustain mining activities.<sup>5</sup> These panels can produce up to 86 kilowatts of electricity.

Beyond mining activities, Chile is committed to developing renewable energy capacity in the country. (Figure 2) Presently, about 20% of the country's power comes from non-renewable sources, compared to merely 5% in 2013.<sup>6</sup> In the past few years, hydro, wind and solar power have become a priority to reduce the country's dependency on fuel imports.<sup>7</sup> Chile became the second largest renewable energy market in Latin America in 2016.

To incentivise the expansion of non-conventional energy sources, the government has introduced new laws that make it easier to invest in them. For instance, the government emphasises on issuing more technology-neutral tenders to generate electricity such that the negative externalities arising from use of technology are limited. Such tenders not only keep the technology costs lower, but also attract more players to the renewable energy market.

### Commitment to All-Round Green Policies

Chile is known to be the eco-tourism hub of the world. To combat climate change, Chile is always finding ways to introduce green-energy policies. Most notable of Chile's initiatives is its Carbon Tax in 2018. This tax covers about 40% of the national emissions and particularly applies to industries that exhibit large carbon footprints. The rate of tax is at USD 5 per tonne of carbon dioxide generated. The country's association in the Partnership for Market Readiness (PMR) has supported the development of policies for carbon taxation. These are not only an attempt to fulfil its target of cutting emissions, but also give fillip to the consumers to look for cleaner alternatives.

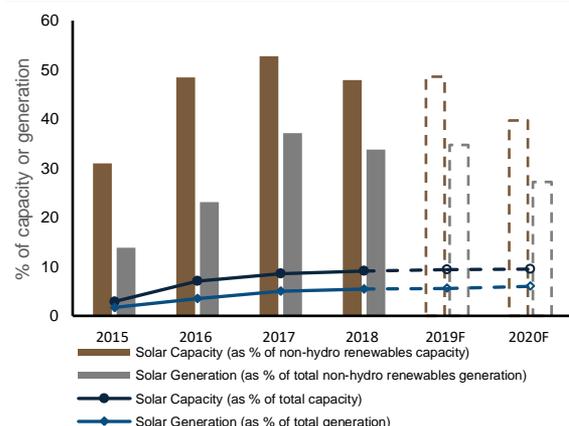
Early 2019 saw the number of electric vehicles double to 525 in the span of one year. The Ministry of Energy regulates the costs and issues tenders for new projects, but the generation and distribution of electricity is privately owned. In late 2017, the power grids of the north and south of the narrow land-mass were connected, successfully providing power to 97% of Chile's population. Investment in energy is set to grow to USD 11.6 billion by 2025.<sup>8</sup> Chile also recently signed an initiative known as New Plastic Economy, a global network of businesses that aim to redefine use and recycle of plastics. Overall, Chile is pursuing an agenda that favours the present and future of the country.

### What the Future Looks Like

GDP growth is forecasted to be 3.5% in 2019 as essential commodities are expected to perform steadily. With the new government motivated to accelerate Chile's growth, the next few years would see more policies that are in favour of openness of the economy and higher investment in Chile's diverse resource economy. One of Piñera's flagship initiatives, 'Chile's Energy Road Map', identifies ten actions to be taken to upgrade renewable energy capacity in the country over the period of his presidency. In May 2019, the hydroelectric plan Los Condores was completed by Enel, one of Chile's leaders in renewable energy. Possessing a business-focus on expanding Chile's economy, Piñera's efforts will also see a higher participation of foreign players.

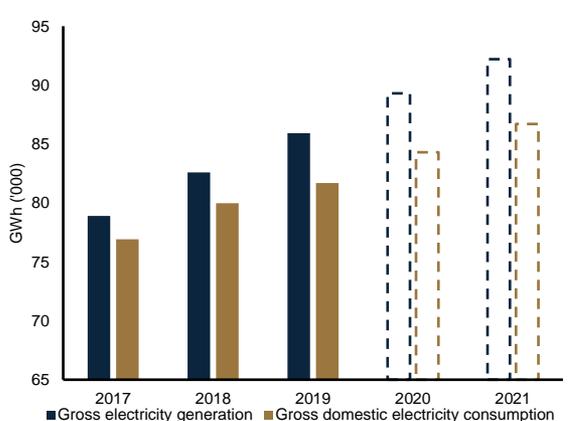
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Figure 1: Increasing Solar Capacity and Generation



Source: EMIS

Figure 2: Electricity demand and production to increase linearly



Source: EIU

### Headlines

- Installed capacity of solar increased from 12 MW in 2013 to 2.38 GW in late 2018, taking over from natural gas as the third most important source of electricity with a 9.4% share in the power mix
- Utility-scale solar PV has decreased 85% from \$350/MWh in 2009 to \$50/MWh in 2017
- Chilean Chamber of Construction forecasted that private investment in the overall energy sector will total to USD 11.6 billion between 2016 and 2025
- Generation companies are required to produce 5% of energy from non-conventional renewable energy sources – a quota set to increase incrementally till 2025

## Chile's Renewable Energy Industry: Perfectly Poised to Prosper

The origins of the strengths of Chile's electricity sector lie in the historical signing of the Electricity Act in the early 1980s - which led to the vertical and horizontal unbundling of the generation, transmission and distribution of electricity. Chile's model of a privatized electricity sector has since served as an example of successful electricity reform for the rest of Latin America, which is notorious for its unstable state-controlled energy. Since then, the Electricity Act has seen several amendments - including one instating a key shift to renewables, following an electricity crisis caused by overdependence on Argentinian gas in the early 2000s. Resultantly, since 2010, generation companies have been required to produce 5% of energy from non-conventional renewable energy sources - a quota set to increase incrementally till 2025. Given these key features of the Chilean electricity sector along with its natural endowments, relative regulatory strengths and government support, the country has been slowly diversifying its power mix to move towards a key resource – solar energy. Although coal and hydropower still dominate with close to 40% and 30% of the power mix respectively, solar is poised to continue to grow as a key renewable. This is especially clear as solar energy is set to replace natural gas as the third most important source of electricity, with a forecasted 9.4% share in Chile's power mix in 2019.<sup>9</sup> (Figure 1)

### Ripe for Investment

Given its relative macro stability in Chile, vast potential for solar energy and increasing electricity demand (Figure 2), Chile is being seen as an attractive investment opportunity for several foreign investors. In particular, the Atacama Desert, the driest desert in the world with some of the highest levels of solar radiation, is finally being tapped into for its solar potential – 3 new solar projects were approved in March 2019, leading to an investment of USD203 million. Healthy competition in the energy sector has also manifested in the form of low prices – recent Chilean energy auctions led to the second lowest bid worldwide for solar power at USD2.14 c/KWh. Additionally, utility-scale solar PV has decreased 85% from \$350/MWh in 2009 to \$50/MWh in 2017 while installed capacity increased simultaneously to reach 2.38 GW in late 2018. In addition to the attractiveness of the macro stability and energy demand, the complementary role solar plays to Chile's key mining industry also makes it attractive. Many mining companies now view the falling prices of solar as incentive to invest in the same, especially since mining constitutes about a third of Chile's power usage and energy costs added up to 11% of total costs for 21 of the largest mines in the country in 2017.<sup>10</sup> Innovations such as Las Tortolas, a floating island of solar panels, are being tested as a means to make mine operations cleaner by reducing water loss and increasing clean energy usage.<sup>11</sup> Forms of investment in solar energy have been varied - some companies invest in their own solar projects, such as state owned Codelco, while others sign power-purchase agreements (PPAs) with existing players in the renewables sector.

### PMGD Presents Promise

Of the growth of installed capacity of solar from 12 MW in 2013 to 2.38 GW in late 2018, the highest number of projects came from the PMGD category i.e. plants that can generate up to 9 MW.<sup>12</sup> Projects in this category present several benefits - firstly, for projects under 3 MW, the Environmental Impact Declaration is not mandatory which significantly reduces the development time, as well as the initial investment cost. Additionally, companies are allowed to choose whether they want to sell their energy to the grid at the spot price or a stabilized price, with the stabilized price guaranteed to be higher than market price. Although this stabilized price mechanism is currently under review by Chilean authorities and may be changed to a timeslot-driven pricing system in the next few years, it remains indisputable that this stabilized price has been lucrative for the growth of PMGDs and will continue to attract such plants in the short term.<sup>13</sup>

### Yet, Long Way to Perfection

Despite inherent strengths, solar faces several challenges, the foremost being the divide between the northern and southern grids. Since the two were initially kept separate and mining companies were quick to sign PPAs for renewables, it made it difficult for the heavily populated southern and central regions to gain easy access to renewables. Although the landmark project to connect the two grids – a USD700 million endeavour to integrate the two systems and ultimately serve 97% of Chileans – was set to be completed in late 2017, there have been significant delays. New forecasts now predict that it will go live only in June 2019.<sup>14</sup> If such infrastructure development projects do not keep pace with innovations in generation, it is possible that transmission and distribution will be bottlenecked and stifle the growth of renewables, including solar.

Additionally, there is little scope for greater citizen participation, which is a necessity for promoting adoption of renewables. In particular, there is a lack of adequate incentives such as feed-in tariffs or net metering systems. Further, ignoring indigenous communities is proving costly; not providing them opportunities to participate in energy sector developments in areas legally owned by them has proven to be deleterious as communities have begun to push back in the form of protests and legal action. Disputes over indigenous issues are estimated to have led to delays in investments worth close to 10% of Chile's GDP.<sup>15</sup>

### Government Gets It Right

Several moves by the government have ensured that the Chilean electricity market remains competitive and transparent. For instance, under the previous government of Michelle Bachelet, the day was divided into thirds and auctions were held accordingly. As a result, the bid to provide solar power in the middle third of the day i.e. during the daylight hours became especially competitive, leading to the previously mentioned low prices. The plethora of companies in each sector of the electricity industry – with generation, transmission and distribution all seeing multiple major players – stands testament to the success of these competition-inducing strategies. Bachelet's government also set the stage for Chile's long-term energy policy with the 2014 'Energy Agenda 2050', which focused on the role of renewables in Chile's energy future.

Further, the current government under President Piñera displayed its commitment to clean energy just 3 months after coming to power with the 'Chile Energy Roadmap' that clearly outlines strategic areas for the energy sector along with 10 core commitments. This was also fortified with the late 2018 call for an investment of more than USD190 million in the development of a 'Technological Institute for Solar Energy, Low Emissions Mining and Advanced Lithium Materials', with the promise of co-financing up to USD12 million of successful projects.<sup>16</sup> This continued display of commitment to renewable energy by successive governments and clarity in expressing this commitment not only highlights the potential of renewables as understood by the government, but also acts as a strong pull factor for large long-term investments in the energy sector. As a result, it is forecasted by the Chilean Chamber of Construction that private investment in the overall energy sector will total to USD11.6 billion between 2016 and 2025, with generation taking the largest share of the pie with a forecasted USD9.1 billion investment.<sup>17</sup>

All in all, despite inevitable teething issues with the renewables expansion, Chile is well positioned to finally take advantage of its solar capabilities, thus creating opportunities for existing energy companies in all 3 segments of the industry to fortify their positions by expanding their solar capabilities and aligning their strategy with Chile's renewables ambitions.

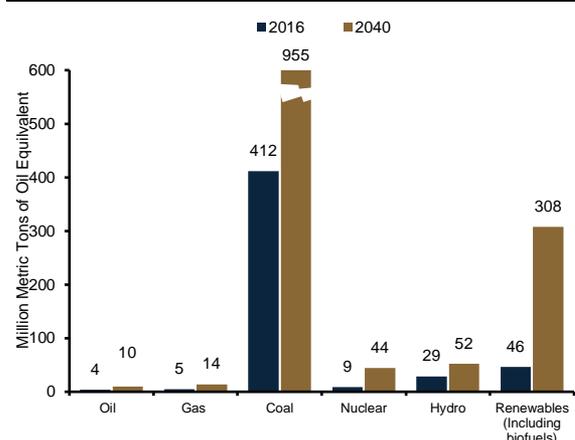
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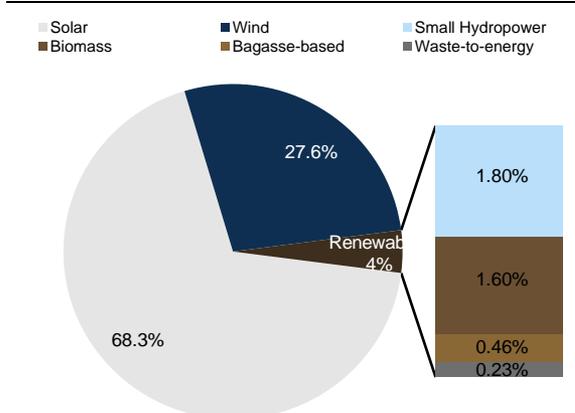
Associate

Figure 1: India's Primary Consumption of Energy, by Source



Source: BP Energy Outlook, 2018

Figure 2: India's Potential of Renewable Power, 2018



Source: MOSPI, 2018

### Headlines

- For the first time in one and a half years, India is losing the title as the 'World's fastest growing major economy' to China
- The Reserve Bank of India is expected to have a third rate cut in June 2019, lowering interest rates to 5.75%
- Prime Minister Modi and the BJP are laying out an ambitious manifesto for more reforms in India, after their landslide victory in the 2019 elections
- India's urbanisation schemes in the northern states are likely to accelerate hydropower projects. However, social and political implications of these schemes are hindering the pace of urbanisation in these regions
- Irreversible environmental impact of hydropower plants is a key concern in future projects in the hydroelectric pipeline

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## India's Renewable Energy Industry: Paving the Way in Realising Potential

In terms of nominal GDP, India is currently the world's sixth-largest economy, with economists forecasting India to overtake the US in terms of GDP by 2030. However, India's recent economic figures cast doubts on the country's ability to realize its growth potential. According to government data, India's year-on-year (y-o-y) GDP growth rate for the year ending Q119 stands at 5.8%, lagging behind China's 6.4%. As consumption makes up 61% of India's GDP, the weakening of domestic consumption is causing India's GDP growth to lag behind China's for the first time in one and a half years. The disappointing economic performance calls into question India's capability to establish itself as a global economic powerhouse.

Despite the below-par economic performance, energy consumption in India has been growing steadily, with demand expected to experience a 156% increase by 2040. This would make India the largest source of energy demand growth, contributing to 11% of the global energy demand by 2040.<sup>18</sup> (Figure 1) India's renewables industry is likely the biggest beneficiary as the industry is projected to expand by a CAGR of 11.9% to 2040, with non-hydro renewables being the key driver of this growth.

### Modi 2.0 – Realizing India's Potential

During Prime Minister Narendra Modi's first term, real GDP growth declined from 7.4% in 2014 to 6.6% in 2018. As such, plans were made to build up India's productive capacity progressively in the hopes that they would propel the nation towards stronger economic growth. These initiatives include India's electrification plan (Saubhagya Scheme), digitalisation plan (BharatNet), streamlining of the country's taxation policy and legislation revision for bankruptcy.<sup>19, 20</sup> Furthermore, with the inflation rate falling to a healthy rate of 2.92% in April 2019, expansionary efforts were also put in place to boost the economy. The Reserve Bank of India has made two repo rate cuts to 6%, with a further reduction of 25 basis points expected in June 2019.<sup>21</sup> The lower cost of borrowing is likely to increase the pipeline of infrastructure projects especially within the energy sector. As the unemployment rate rises to a 7-year high of 3.55%, the newly re-elected Prime Minister Modi will be feeling the pressure to ensure that these initiatives succeed in bringing India's economy back on track after a lackluster economic performance in his first term.<sup>22</sup>

After the Bharatiya Janata Party (BJP) achieved a landslide victory in their 2019 re-election campaign, they provided an ambitious manifesto of the policymakers' goals for India. In line with India's commitment during the 2015 UN Climate Change Conference to reduce India's emission by 30 to 35% by 2030, the manifesto highlighted India's energy plan, which specified the intent to expand the current renewable capacity from 76.87 GW to 175 GW in 2022. (Figure 2)

The main obstacle in realizing that goal is the financial strain it would impose on the government's fiscal expenditure. An estimated total expenditure of 97.4 lakh crores (insert USD rate in brackets too) is required over five years for infrastructure, with the energy and utility infrastructure expected to grow at an annual average of 7.1% between 2019 and 2028. This large disbursement deviates from the Indian central government's fiscal consolidation over the past five years and will expose India to potential default risks. In April, the central government had also announced the borrowing of an unprecedented 4.4 trillion rupees (insert USD rate), reflecting significant current fiscal pressure on the government.<sup>23</sup> As such, it appears that foreign direct investment (FDI) and private debt will be playing an increasingly vital role in alleviating these pressures from the government.<sup>24</sup> Large-scale developers and investors are likely to expect beneficial regulatory reforms as the central government looks to encourage private investment in key areas such as renewables projects and hydropower projects.

### Urbanization Opening Up Hydropower Growth

A key factor driving demand for hydroelectric projects has been urbanization.

Under the government's Smart City initiative, projects related to urban housing and infrastructure have been initiated all over India.<sup>25</sup> Uttar Pradesh, one of India's most populous northern states, is a key beneficiary of India's urbanization scheme due to its political significance. Rapid urbanization in the state has led to an increased need for electricity, paving the way for new demand for hydroelectric projects near the northern regions.<sup>26, 27</sup>

However, the Smart City initiative has been facing several obstacles in the form of backlash from these traditionally spiritual northern states, which might hinder its implementation. The government requires the relocation of citizens from slums to government housing, leading to uproar amongst northern residents as they are forced to leave their centuries-old homes. Moreover, these residents predominantly work in the agricultural industry. As the reduction in water flow from the construction of hydroelectric projects will likely impact the farmers negatively in the short run, this has further compounded their discontent and caused social and political implications for the government. Hence, a more nuanced approach to urbanization is necessary from the Indian government to aid in the growth in renewable projects.

### Environmental Concerns Poses a Tricky Situation

When Prime Minister Modi was elected in 2014, he had proclaimed his commitment to cleaning up India's holy river, River Ganges. A program was launched in 2015 with a budget of approximately 200 billion rupees (USD rate) as Prime Minister Modi ambitiously targeted a cleaner Ganges by October 2020.<sup>28</sup> However, environmental experts have cast doubts on Prime Minister Modi's ambition, citing the size of the budget and the lack of river flow as key stumbling blocks.<sup>29</sup> With hydropower dams being one of the main factors that restrict river flow, the conflict between the maximization of India's hydropower capacity and the obligation to fulfill Modi's campaign promise of cleaning up the river is likely to result in a slowdown in approvals for larger hydropower projects. Experts in environment and water management also highlighted the potentially irreversible negative environmental impact of building hydropower projects.<sup>30</sup> With criticism coming from both domestic and international parties, managing ecological concerns and developing better technologies will be crucial for the sustainability of the hydropower industry.

### Mixed Impact of Regional Hydropower Development

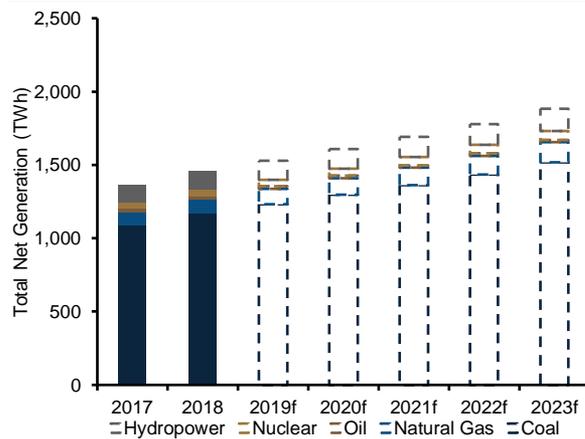
To cope with India's renewables commitment while managing the downsides of various renewables sources, Modi's administration is turning to their neighboring country as a potential solution. Bhutan, a close ally of India, has tapped on India's hydropower expertise to develop their hydropower projects. With signed agreements binding India to purchase power generated from upcoming hydropower projects in Nepal and Bhutan, there is less pressure on India's central government to develop domestic hydropower to meet their renewables target.<sup>31</sup>

In line with India's commitment to regional power trade, an investment of 1000 crores (USD rate) has been planned for India's power grid as Modi's administration looks to improve power capacity and lower power transmission and distribution loss.<sup>32</sup> This investment will directly lower the economic cost for the distribution of energy, which might incentivize more private investors in developing renewables such as hydropower.

Modi's administration has implemented various reforms over the past five years to address many key issues such as productivity, pollution and equality. With the re-election of Prime Minister Modi and the BJP achieving an overwhelming mandate, the challenge for India's central government moving forward would be to leverage on the foundations established in the previous five years to sustainably supply India's energy demand and realize the nation's potential.

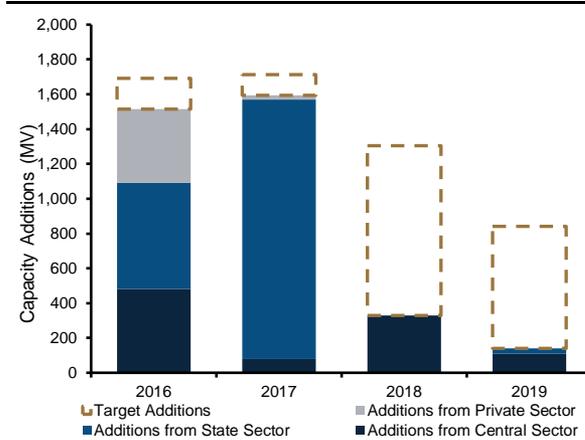
Written by  
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Figure 1: Total Net Energy Generation



Source: Fitch Solutions, 2019

Figure 2: Planned vs Actual Capacity Additions



Source: Central Electricity Authority, 2016 - 2019

## Headlines

- India has enormous untapped potential for hydroelectric power due to its vast geography
- During the lead-up to the Lok Sabha General Elections, India's Cabinet Committee on Economic Affairs approved the proposal to view all hydropower plants under the aegis of renewable energy
- The capital cost of a hydropower plant ranges between 60 - 80 million INR/MW, which is almost twice the cost of a thermal plant
- Inaccurate environment impact assessment often leads to time and cost overruns for hydropower projects
- The government has begun to address implementation hurdles by raising the level of financial support to keep hydropower development viable and attractive to investors

## India's Renewable Energy Industry: Unwavering Support for Hydropower

India's burgeoning population would see an increasing demand for India's current energy capacity. India currently has over 197 hydropower (hydel) plants above 25 MV, which is inclusive of 9 pumped storage stations scattered across the India subcontinent. However, India has slowly staved off its use of hydel since reaching its peak of 51% of electricity generation in 1962, and it accounted for only 8% of electricity generation in 2018. Despite the slowdown in the use of hydropower, India still has a considerable reserve of hydel sources that remain largely untapped by the private and public sector. Moreover, the Modi administration has also indicated its commitment towards diversifying its energy sources to include 40% renewable alternatives to honour its Nationally Determined Contribution for Climate Change<sup>33</sup>, which could serve as potential tailwinds for India's hydel industry. (Figure 1)

### Government Presents Growth Opportunity for Industry

India has enormous untapped potential for hydroelectric power due to its vast geography and is estimated to have around 241 GW hydropower potential, ranking it fifth in the world. Despite this advantage, the total installed capacity of large hydropower projects with a capacity greater than 25 MW stands at a lacklustre 45 GW, representing only 18% of the subcontinent hydropower potential. In contrast, countries like Canada and Brazil had already harnessed around 69% and 48% of their respective hydropower potential a decade ago.<sup>34</sup>

Hydropower projects can be typically categorised into 1) large hydropower projects (LHPs) and 2) small hydropower projects (SHPs). The only difference between the two is the capacity, with the former having a capacity greater than 25 MW. Hydropower plants with dams and reservoirs produce energy at a larger scale and can store water over extended periods to meet peak demand.<sup>35</sup> In 2015, the Indian government had ceased to categorise hydropower projects larger than 25 MW as renewable due to cataclysmic social and environmental impacts from the construction of dams. Such large-scale projects had been known to displace populations of people and wildlife and cause the destruction of the local ecosystem. Therefore, India had been focusing on constructing SHPs instead.<sup>36</sup> However, during the lead-up to the Lok Sabha (lower-house) General Elections this year, India's Cabinet Committee on Economic Affairs approved the proposal to view all hydropower plants under the aegis of renewable energy. The Committee amended their previous statement, citing that the segregation of hydropower based on capacity was an arbitrary one. With all hydropower plants now being recognised as a renewable form of energy, renewable energy will constitute 34.9% of India's installed capacity and it is expected that India will have 225 GW of renewable energy by 2022, which is much ahead of its target of 175 GW as per the Paris Agreement.<sup>37, 38</sup>

Despite the controversy surrounding LHPs, one redeeming factor of this form of renewable energy is the ability to meet peak load requirements, providing stability to the grid. The instantaneous start-stop feature provides users with greater flexibility in the operations of plants which would otherwise require the use of non-renewables like diesel for energy. Increasing hydropower capacity can also help India to bridge its peak power demand and supply such that it can finally reach its target of becoming an electricity-surplus nation.<sup>39</sup> Additionally, hydel projects have long useful lives; for example, projects like Pykara and Mettur Dam in Tamil Nadu have been in existence for more than 70 years. Another factor in favor of the use of hydropower is its ability to provide stable water supply for homes, businesses and farms in India. 70% of rural households in India depend on agriculture for their livelihood, making hydropower projects highly advantageous for them as hydropower projects can provide a sustained and adequate supply of water for irrigation and preserve soil fertility by regulating sediment flow. In fact, the Bhakra-Nangal multi-purpose dam had assisted with agricultural productivity in the area and had claimed some success in the Green Revolution.<sup>40</sup>

### The Lay of the Land Thanks to the Government, Again

Developments in the hydropower sector were primarily the responsibility of the Indian government until it was opened up to the private sector in the early 2000s. Subsequently, the New Hydro Power Policy was introduced by the government in 2008 to encourage private investments in the hydropower sector. Currently, the public sector has a dominant share of the pie, holding 92.5% of market share. One distinct difference between the types of developers is the rate of interest charged on loans being provided to finance hydropower projects: private developers are charged a margin over their Marginal Cost of Funds based Lending Rate (MCLR) rate which is around 10 - 13% p.a., compared to the players in the central and state sectors whose loans cost approximately 8.5% p.a.. Due to the high cost of funding, private developers tend to shy away from the hydropower scene - the share of the private sector in the total installed capacity in the hydropower industry is a mere 7.5%. On the contrary, private developers are the leaders in the thermal power sector, holding 39% of installed capacity.

Undeniably, these hydropower projects require significant investment capital to build and pose immense difficulty to sustain during the long gestation period. Bidding for hydropower projects themselves (particularly upfront premium and free equity) leads to significant cash outflows even before the commissioning stage, impacting project financials. The capital cost of a hydropower plant ranges between 60-80 million INR/MW, which is almost twice the cost of a thermal plant which requires 30-50 million INR/MW.<sup>41</sup> Complexities and challenges in the construction process due to inaccurate environment impact assessment often leads to time and cost overruns which can significantly raise expenses and severely impact the working capital and liquidity of firms. (Figure 2) At present, several projects with a cumulative capacity of 12,178 MW are facing delays in their commission schedule. Since prolonged construction and massive cost escalation are typical in this industry, not many banks are keen to finance these projects.<sup>42</sup> Even if banks do decide to loan, financing charges on hydropower projects require higher risk premiums. Noting that hydroelectric capacity growth needs to be accelerated, the government has begun to address implementation hurdles by raising the level of financial support in this industry. The decisions include imposing some hydropower obligations on states to cover future projects, tariff rationalisation measures and extension of the debt repayment period from 12 to 18 years to keep hydropower development viable and attractive to potential private developers.<sup>43</sup>

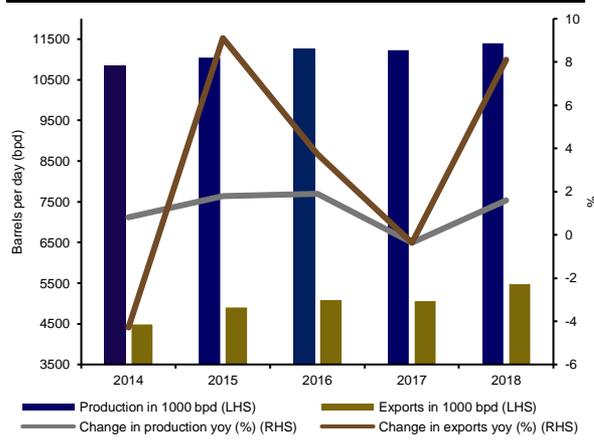
To elaborate further, most of India's untapped potential in the hydropower industry can be generated from projects in the north-eastern Himalayan regions states where 84% of India's potential hydropower is concentrated. However, due to the limited accessibility, developers have to shoulder high costs to install transmission lines passing through mountainous terrains to evacuate the power to the grids, on top of current project costs.<sup>44</sup> To address this, India's government has been tapping into sources such as the Pradhan Mantri Gram Sadak Yojana scheme and the Central Road Fund to prioritise the creation of enabling infrastructure in these remote regions.

A well-constructed electricity infrastructure is necessary for the development of any country and is especially so for India, which is expected to be the world's third-largest economy in another decade. With an energy elasticity of 0.82, India is projected to require around 7% annual growth in electricity supply to sustain 8.5% p.a. GDP growth over the medium term. With capabilities of renewables placed at the forefront of India's agenda, optimising India's hydropower utilisation will play a pivotal role in meeting India's future energy needs. Assuming governmental support continues, it is safe to say that there will be plenty of room for growth in this industry. In return, developers must remain adaptable to capitalise on all opportunities to grow sustainably in the foreseeable future.

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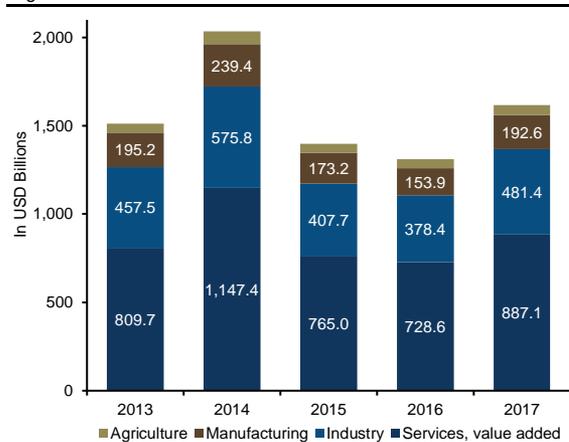
Written by  
Melvin Chua Vice President

Figure 1: Russia's Oil Production and Export



Source: EIU, Ministry of Energy of Russia, 2019

Figure 2: GDP Breakdown of Russia 2013-2017



Source: The World Bank, 2019

### Headlines

- Russia was the second-largest oil producer at 11.4m bpd in 2018
- GDP growth expected to remain modest between 1.5 to 2% from 2019 to 2023
- OPEC+ controls 55% of global oil supplies and 90% of proven reserves
- In 2019, OPEC+ agreed to reduce output by 1.2 million bpd for six months from the start of the year
- Western sanctions on limit its access to financial markets in the US and EU
- Additional US sanctions targeting Russia's energy pipeline projects are underway
- In Russia's US\$ 400 bn six-year development plan, 22% of the budget is allocated to large projects in trade, digital economy and other non-oil sectors

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## Russia's Oil and Gas Industry: Oil Dependence Worrisome in the Long Run

While Russia has largely overcome its 2014 – 2016 currency crisis brought about by the collapse of oil prices and worsening international relations from its annexation of Crimea, its economic recovery remains modest at best. Rallying oil prices and strong exports were largely responsible for Russia's recovery. However, the country continues to be bogged down by Western sanctions and a poor business and investment climate as a result of its strained international relations. Furthermore, its inability to overcome its dependence on hydrocarbons continues to pose a large hindrance in the long term. Russia was the second largest oil producer at 11.4m barrels per day (bpd) in 2018; hydrocarbons constituted 52.9% of total exports in 2018, amounting roughly to US\$237.6 bn, or 12m bpd.<sup>45</sup> (Figure 1)

On the upside, Putin's 2018 decrees seem to recognize the importance of diversifying away from hydrocarbons, with a greater emphasis placed on developing the digital economy, human capital and non-oil exports.<sup>46</sup> Nevertheless, the ambitiousness of these goals without clear execution plans leaves a lot of room for uncertainty. Overall, the BRIC member is still expected to continue inching forward, maintaining a growth rate between 1.5 to 2.0% from 2019 to 2023 according to forecasts by the Economist Intelligence Unit. Russia's future growth prospects largely rest on its ability to shed its reliance on hydrocarbons and develop its non-oil sectors.

### Oil Price Security Still Crucial

Since late 2016, the Organization of Petroleum Exporting Countries (OPEC) have formed an extended coalition with other countries including Russia to form what is often referred to as OPEC+. Collectively, OPEC+ controls 55% of global oil supplies and 90% of proven reserves.<sup>47</sup> In 2019, OPEC+ agreed to reduce output by 1.2 m bpd for six months starting on January 1. As a result, oil prices have since doubled to more than \$60 per barrel.<sup>48</sup> The Kremlin's two-year-long alliance with OPEC has proven useful; the Russian economy benefited from the higher oil prices, buffing up Putin's financial credentials and popularity at home, while oil diplomacy has helped to enable Putin's growing ambitions in the wider Middle East. However, the continuation of Russia's compliance with OPEC+'s strict oil cuts is highly uncertain. On one hand, the collective might of the coalition would enable sustained higher prices which are favorable for the fossil fuel behemoth that relies on oil revenues to fuel its budget. On the other hand, as OPEC+ limits production, the US continues to snatch up market share and poses a threat in the long run. Enabled by the shale discovery, the US has been intensifying oil production and is expected to surpass 13 m bpd in 2020, which would make it the top oil producer globally.<sup>49</sup> Should Saudi Arabia and Russia, the top two oil producers, decide to protect their own interests above the coalition's and contest for market share by boosting production, oil prices could fall as low as US\$ 40 per barrel which would prove detrimental to Russia.<sup>50</sup> Furthermore, with mounting internal pressure from Russian oil companies that no longer want to limit production in order to fully maximize their economies of scale, the decision of whether to fight for market share or to maintain higher prices will be a tough one. The most likely scenario would be that Russia continues to comply with OPEC+ cuts but falls short on its commitment since it can bank on other member states' surpluses in cuts to compensate for Russia's overproduction. Through this, Russia can remain in the coalition while still exerting some force in protecting its market share and placating its domestic oil oligarchs. This is evident from the start of the year, especially in April when OPEC+ as a whole achieved its pledged cut yet Russia only fulfilled 80% of its commitment. In February and March, Russia only fulfilled 35% and 49% of its commitment respectively.<sup>51</sup> Russia risks straining relations with member states should it continue to fall short on its pledged cuts.

### Sanctions Weigh Down on Strong Russia's Shoulders

With escalations early this year in the Russian-Ukrainian conflict in the Avoz sea, Western sanctions are likely to remain. Current sanctions imposed by the US and the EU are on key Russian officials and the Russian financial, energy and defense sectors, which cut off access by Russian

companies to financial markets in the US and EU. Although the initial impact on Russia hit hard with a significant depreciation of the Ruble as well as depressed consumption and investment, the Russian economy has since become well-insulated against these sanctions. Owing to a strict monetary policy as well as recovering oil prices, Moscow has been able to rebuild its foreign currency reserves which stand at a new peak of almost US\$500 tn in 2018, providing the Kremlin with the muscle to remain firm against prolonged sanctions.

Additional US sanctions to prohibit international firms from doing business with Russian companies for the construction, modernisation or repair of energy pipelines are currently under works. Fortunately for Russia, pipeline projects such as the controversial Nordstream 2 pipeline to supply natural gas to the EU have evaded sanctions and their construction continues. The pipeline expansion would add 55 bcm yearly, bringing total capacity to 110 bcm yearly.<sup>50</sup> On the downside, worsening tensions with the West would not play out favourably for Russia. The EU remains divided on such projects, citing a fear of overreliance on Russian supply. New sanction bills targeted at Russian-linked companies might not be able to block the Nordstream 2 project, but they could severely limit the utilisation of its full capacity, dampening future profitability. Strained relations with the West have stifled Russia's export partners especially in Europe's natural gas market. Despite the unfavourable geopolitical arena, Russia has secured partnerships with other nations and indirectly secured its position in the European market. Turkstream, a major gas pipeline project jointly built with Turkey and completed in November 2018, supplies oil to Turkey directly and to southern and south-eastern Europe indirectly. Current capacity stands at 31.5 bcm per year but future expansions of the pipeline project capacity to grow to 64 bcm yearly.<sup>50</sup> Given the EU's rapidly growing demand for gas, these pipelines help to foster a degree of reliance on Russia, thus shielding Russia from the brunt of the sanctions.

### Moving Away from Hydrocarbons: Can it be Done?

Industrials, which includes the oil and gas sector, have taken up a large portion of GDP over the past decade at roughly 30% of GDP per year. (Figure 2) Russia's 2018 US\$400 bn six-year development plan, a reform aimed at diversifying the country away from hydrocarbons, allocated 22% of the budget to large projects in trade, digital economy and other non-oil sectors. These national projects are set to begin in 2020 and 2021 which should provide a boost to economic growth, especially in 2020. However, there are no signs of a broad-based recovery in private investment as of yet. In 2018, the resource and energy (R&E) industry, transport and communications industry and manufacturing industry funded 23.3%, 19.1% and 16.7% of gross fixed investment respectively. Foreign investments continue to play a small role with joint ventures, mostly in the R&E industry, by pure foreign investors contributing only 8.3%. Investments are still largely focused on the R&E sector which makes diversification away from hydrocarbons a tougher transition.

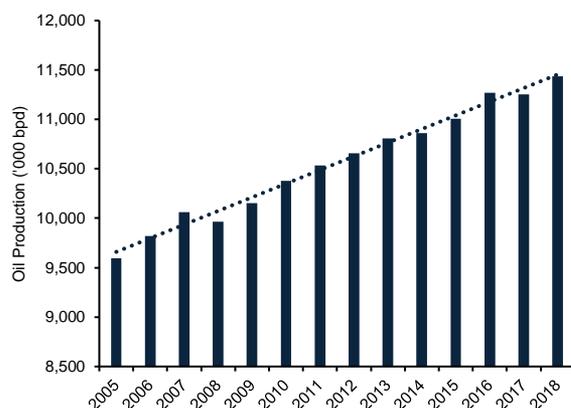
On the brighter side, business confidence is gradually improving. Moody's revision of Russia's credit rating from BA1 to BAA3 in February is consistent with the ratings of both Standard & Poor's and Fitch. Russia's economic resilience and improved ratings have attracted bond traders globally who snapped up the Eurobond offers on US\$3 bn and EUR750 mm in March 2019. Also, with the Fed's decision to halt rate hikes, investors are looking towards the Russian equity market which is up 16% YTD. The rising interest in Russia's markets from foreign investors is a positive sign for Russia's business outlook. Furthermore, measures such as subsidies for domestic non-oil sector production, expansion on domestic-content requirements and guidance for large firms to be involved in the financing of national projects could spur on private investments, albeit their effect might not last long. Over the next few years, it is key that foreign investors' interest in Russia grows especially in non-oil sectors and that Russia's most ambitious development plan will provide the necessary support for these sectors to develop and help the country move away from its oil dependence.

### Written by

Anjalie Thomas

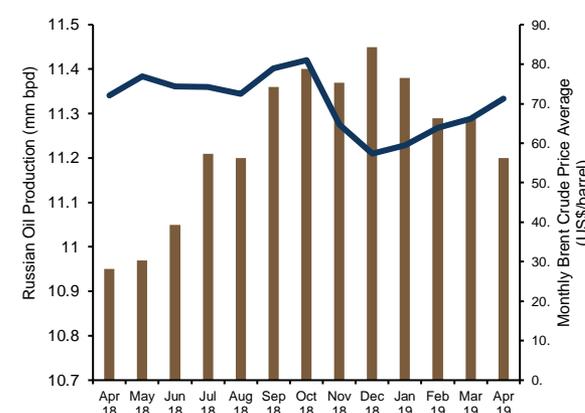
Associate

Figure 1: Oil Production in Russia, in 1,000 barrels per day



Source: Statista, 2019

Figure 2: Russian Oil Production against Average Monthly Brent Crude Oil Price



Source: Statista, 2019

## Headlines

- Russia agrees to cut supply in accordance to the OPEC agreement until June 2019
- US-Iran tensions prop up oil prices in fear of supply crunch
- Transneft is in turmoil as 5 mm tonnes of crude oil to Europe are declared contaminated
- Venezuelan sanctions exacerbate the supply crunch of sour crude; Russia moves in to fill the gap
- Russian oil companies turn to the Arctic and sea beds for ambitious exploration projects

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## Russia's Oil and Gas Industry: Firing the Way Forward

With a record high oil production of 11.16 mm barrels per day (bpd) in 2018, the world's largest oil-producing nation has plans to scale back in the first half of 2019 and pivot to Asia for exports and capital financing.<sup>52</sup> (Figure 1) With oil constituting 52.9% of total exports, worth US\$237.6 bn, crude oil and processed petroleum saw 38.3% and 34.1% increases in volume of exports respectively from 2017 to 2018.<sup>53</sup> These sizeable statistics result in the combined worth of oil and gas resources amounting to 60% of Russia's GDP in 2018, valued at US\$844.58 bn.<sup>54</sup> Even on a global scale, Russia's combined proven reserves of 109.5 bn barrels of oil make it the largest hydrocarbon holder and the third largest refiner after the US and China, with a crude distillation capacity of 5.6 mm bpd. Most of Russia's oil originates from West Siberia (6.3 mm bpd) and the Urals-Volga region (2.9 mm bpd). Additionally, the eastern oil fields of East Siberia, Sakhalin and Russian Arctic hold large untapped hydrocarbon reserves of approximately 1.3 bpd.<sup>55</sup> The industry's landscape is heavily dominated by state-affiliated players, with 80% of the upstream market controlled by six companies. The largest oil producer is state-controlled Rosneft (42%), followed by Lukoil (15%) and Novatek (11%); independent companies occupying second and third place respectively.

### Weathering the Geopolitics of Oil

Russian oil supply is swayed in different directions by varying geopolitical currents. After enjoying a record high production of 11.16 mm bpd in 2018, Russia decided to tone down production as per the decisions reached by an Organization of Petroleum Exporting Countries (OPEC) Summit held in December 2018. The meeting mandated a supply cut of 1.2 mm bpd till June 2019 for the 24 oil-producing attending nations, from which Russia was to cut down by 230,000 bpd.<sup>56</sup> The output cuts were meant to raise oil prices, thus benefitting Russia as well. However, this is a delicate balance to maintain as there remains the danger of losing out fixed-capital investment, postponement of projects and losing market share to USA if production is curbed by too much.<sup>57</sup> Russia fears a situation whereby the US ends up dominating the oil market, with US crude production expected to rise 1.43 mm bpd in 2019 according to the US Energy Information Administration, and an increase in US's crude stockpiles by 2.3 mm barrels in the first week of April.<sup>58</sup> Meanwhile, external forces such as the US-Iranian tensions continue to prop up Brent crude prices (Figure 2), with an increase of \$2.5 per barrel by May 17<sup>th</sup> 2019, after fears of supply disruptions following America's decision to not extend waivers to importers of Iranian oil such as China, India, Turkey and Japan.<sup>59</sup> This development bodes well for Russia as can be seen by the rouble rally in tandem with Brent crude price hike, since Russian oil supply can fill in the supply crunch. Venezuela's sanctions are another factor that bodes well for Russia. This is because Venezuela and Iran produce sour crude (while US's supply is light and sweet, which European refiners have limited capacity to refine). Consequently, European refiners have no alternative but to turn to medium sour Russian Urals, as can be seen from the spike in Ural's differential to Brent, at a premium of 70 cents a barrel since the sanctions kicked in.<sup>60</sup> Thus, there is a possibility that Russia may not adhere to the supply cuts mandated by OPEC and may decide to increase production levels before the stipulated 6-month period to profit off these shifting dynamics.<sup>61</sup>

### Entry of Foreign Players and Navigating Sanctions

Historically, the oil sector has remained in the control of domestic companies due to a series of formal and informal regulations restricting the share of ownership of foreign companies to below 50%. The system of tender allocation on the basis of expertise and capacity tends to favor larger, established players. However, international companies circumvent this by entering joint ventures with domestic companies, with some significant partnerships including ExxonMobil-Rosneft in the Arctic and Novatek and China National Petroleum Company in Eastern Siberia. In 2018,

Rosneft sold 20% of its Taas-Yuryakh field to BP and a 30% stake of Tass Neftegazodobycha, a refining plant, to an Indian oil consortium comprising Indian Oil, Oil India and Bharat Petroresources, with an expected capacity 100,000 bpd by 2021. Chinese investors are also involved in Russian exploration, with Sinopec acquiring a 49% stake in Rosneft's East Siberian Oil and Gas Company with an expected production value of 100,000 bpd at plateau in 2019. The previous priority of developing existing pipelines is receding as the projects enter full capacity. Consequently, the industry has turned its attention to exploration activity through 2019, with key areas for exploration including Yamal Peninsula, Caspian Basin and the Kara Sea. Chinese-built facilities, such as the Scarabeo-9 drilling rig, skirt US sanctions and enable deep-water exploration. BP and Rosneft have commenced exploration of 260,000 sq. m of the Yenisey-Khatanga basin.<sup>56</sup>

Looking forward, a promising source of additional production is non-conventional oil, specifically fracking and shale projects. However, this is dependent on overcoming the US sanctions and obtaining the necessary technology. Currently, the sanctions block access to technology for shale deposits, although the vague definition could potentially include non-shale deposits due to technology overlap between the two activities. Eastern Siberia and the Continental Shelf (including the Arctic) have proven reserves of 10 bn barrels and 160 bn barrels respectively with necessary transport infrastructure already in place, namely the Eastern Siberia Pacific Ocean Pipeline.<sup>55</sup> Although Russian companies could do import substitution for horizontal drilling technology and deep-water rigs, the technology lags behind the sophistication of advanced economies. For instance, US wells exceed 6000 m and have 100 frac stages, while Russia's wells are 1500 m at best and have only 30 frac stages.

### Shifting Oil Export Patterns

Less than 30% of Russia's oil production is consumed domestically and the remainder is exported.<sup>62</sup> Historically, the EU has been Russia's largest oil export market, accounting for over 60% in exports of both crude oil and petroleum product.<sup>61</sup> Slightly more than half of Russia's crude oil is domestically refined and the rest is exported in crude form to European countries including Netherlands, Germany, Poland and Belarus.<sup>62</sup> In turn, Europe is heavily dependent on Russia for oil, with a third of OECD oil imports coming from Russia alone.<sup>63</sup> However, US sanctions in the past few years have resulted in a pivot to Asia, with China financing the construction of the ESPO oil pipeline and entering long-term supply contracts amounting to 1.2 mm bpd as of 2018.<sup>64</sup> A recent development that accelerated the move away from Europe was the scandal surrounding the contamination of the Druzhba pipeline, which delivers oil to Ukraine, Poland and Belarus, in April 2019.<sup>65</sup> Russia's state-owned pipeline system Transneft is responsible for allowing 5 mm tons of contaminated crude oil to spread across Europe, resulting in damage costs amounting to US\$1.5 bn in addition to damaging relations with its European partners. Consequently, Russia had to cut down production from 11.23 to 11.16 mm bpd in May and come up with a means of disposing the contaminated oil such as selling to power generations or decontaminating it.<sup>66,67</sup> Other Asian countries importing oil from Russia include India and Turkey, with total crude oil exports to the Asia-Pacific amounting to 1 mm bpd in 2018. Russia's pivot to Asia is strategic as it reduces dependence on Europe as a buyer, gains allies which can provide finances for developing infrastructure and takes advantage of the growing demand for energy in China.<sup>68</sup>

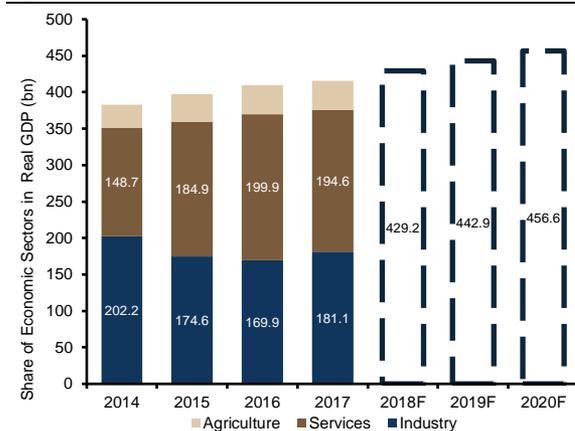
In conclusion, Russia's oil industry has shown resilience in weathering sanctions and geo-political volatilities and has diversified its range of financiers, export destinations, and supply sources. The extensive forward and backward integration by the key industry players results in a highly competitive industry that takes advantage of the country's endowments.

Written by

Dominic Wong

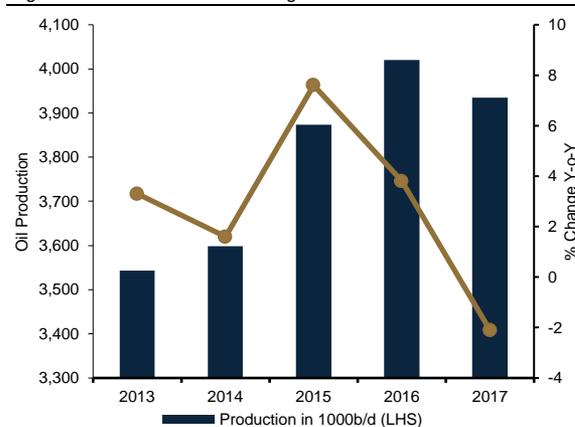
Associate

Figure 1: UAE's GDP by Proportion



Source: Statista, 2017

Figure 2: UAE's Oil Production Figures



Source: Fitch Solutions, 2019

## Headlines

- UAE's real GDP reached USD 352.8bn in FY18 and is forecast to grow 3.3% per annum to FY23
- Around 30% of UAE's GDP is directly supported by the country's oil and gas output
- Though UAE is focusing on economic diversification away from oil, it is still making necessary investments into its oil industry
- Supply uncertainty will influence OPEC's decision to extend production cuts or increase production, but is likely to benefit UAE
- Volatility of the Brent Crude and implementation of VAT likely to negatively impact domestic demand, affecting domestic oil industry

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## United Arab Emirates' Oil Industry: Keeping its Eyes on the Prize

The United Arab Emirates (UAE) is one of the world's ten largest oil producers and is a member of the Organisation of the Petroleum Exporting Countries (OPEC). UAE is a confederation of seven Arab states with specific powers delegated to the UAE Federal Government, but others reserved for each individual Emirate. Amongst the seven Arab states, Abu Dhabi, the largest Emirate, accounts for most of UAE's oil and gas industry.

Historically, UAE, like its MENA peers such as Saudi Arabia, relied on its large oil and natural gas resources to support its economic activity. However, UAE had long realised that their economy was too reliant on hydrocarbons and was one of the first MENA countries to begin their plan to diversify away from black gold. Thus, of recent years, economic policy at both the federal and emirate level has been focused on reducing the UAE's dependence on the hydrocarbons sector and will continue to be the case. UAE aims to draw in foreign and other private-sector financing into the oil sector to release public funds for other sectors. Nevertheless, the economy continues to remain heavily dependent on oil revenue. UAE's total real gross domestic product (GDP) reached USD 352.8 bn in FY18 and is forecast to grow 3.3% per annum to FY23.<sup>69</sup> According to OPEC, 30% of UAE's GDP is directly supported by its oil and gas output.<sup>70</sup> (Figure 1) UAE's oil production is also dependent on OPEC and non-OPEC commitments, the latter of which has been relatively stable and is dependent on OPEC. (Figure 2)

### Diversifying – A Calculated Bet

UAE is the second largest economy in MENA and the main goal of its economic diversification policies is to reduce its dependence on oil exports by 2030. For example, UAE's Vision 2021 is an initiative to remain globally competitive through decreasing reliance on oil components and prioritising their environment, infrastructure, healthcare and education services. Vision 2021 seeks to foster a knowledge-based economy to increase their own competitiveness. As a result, UAE has made significant progress in tourism, trade and manufacturing. Also, as part of Vision 2021, the UAE has also approved Ghadan 21, aimed to boost the competitiveness of UAE's capital, Abu Dhabi. Abu Dhabi has committed AED 535mn (insert USD rate) for a new fund to invest in start-ups to diversify the economy, attract investors and build a tech hub.<sup>71</sup> The continuous government investments in small and medium enterprises will go to spur economic growth within the country.

UAE has put in valiant efforts in trying to diversify its economy away from oil. That being said, it does not mean that UAE has totally ignored its oil and gas industry to favour non-oil industries. UAE has also been making heavy investments into its oil industry. Its state-owned companies such as Abu Dhabi National Oil Company (ADNOC) and its subsidiaries are in the midst of expanding the output of crude oil to 3.5mn barrels per day (bpd) by 2020, which UAE aims to maintain until 2027. It will try to do so by relying on enhanced oil recovery (EOR) practices in its present available fields that will lower operational expenditure and extend the lifespan of producing fields. Additionally, UAE is also expanding its refining capacity. By the end of 2019, an additional 70,000-barrel expansion of UAE's Jebel Ali refinery is set to come onboard.<sup>72</sup>

Thus, although it may appear that the MENA countries are focusing their efforts on diversifying its economy away from hydrocarbons, UAE is not just entirely focusing its attention on non-oil industries. UAE is sustaining its economic growth using a two-pronged approach of making necessary investments into its oil industries, then improving non-oil industries. Also, UAE has made strategic partnerships in its oil and gas industries, bringing in knowledge, expertise and investments along with the partnerships. For example, Zakum Development Company (ZADCO), a joint venture between ADNOC, ExxonMobil and Japan Oil Development Company, owns Upper Zakum, the second largest offshore oilfield and fourth largest oilfield in the world that currently produces 640,000bpd.<sup>73</sup> Thus, it is evident that UAE is also drawing in foreign

investments into its oil sector which will allow UAE to successfully release public funds for its other sectors. This is possibly the main driving force as to why UAE is the most diversified economy amongst its MENA regions. UAE is likely to sustain its economic growth as it continues to work on its economic diversification and improving its oil industries.

### Supply Uncertainty

The Trump administration announced the end of waivers from US sanctions granted to India, China, Japan, South Korea, which are some of Iran's target customers, on 22 April 2019. The United States is now insisting that countries no longer import oil from Iran with effect from May 2019 onwards. Although the White House said that it had worked with Saudi Arabia (KSA) and UAE to ensure that there was sufficient supply, KSA and UAE have been wary in acquiescing to US demands and UAE has stated that it will only raise production if shortages emerge.<sup>74</sup> The effects of Iranian sanctions on supply have yet to surface in the market, with Iran's oil exports expected to drop from May 2019 onwards. Further, heavy contamination of Russia's Druzhba oil pipeline, which delivers Russian crude to Europe has also triggered worries of a shortage.<sup>75</sup> Additionally, US sanctions on Venezuela's oil exports are also expected to create a shortage in the world.<sup>76</sup> The multiple oil supply disruptions mentioned above has created difficulties in OPEC's outlook on global supply for the rest of 2019. It has created uncertainties as to whether OPEC will extend its production cuts or ramp up output to offset an expected decline in oil exports.

Although it is uncertain where affected refiners and countries will find their replacement barrels because of the different requirements that they place on the crude, it is likely that UAE's oil industry will benefit from the shortages. UAE exports the bulk of its crude to Asia, with Japan, South Korea and China among the major buyers. These buyers coincide with Iran's target customers as mentioned above. US sanctions on Iran provides UAE with a window of opportunity to increase its market share in the Asia region. The adjustment from multiple supply shortages and demand will result in a significantly tighter market and is likely to support oil prices for UAE crudes. Thus, UAE's oil industry is likely to benefit from an increase in sales volume and/or increase in oil prices.

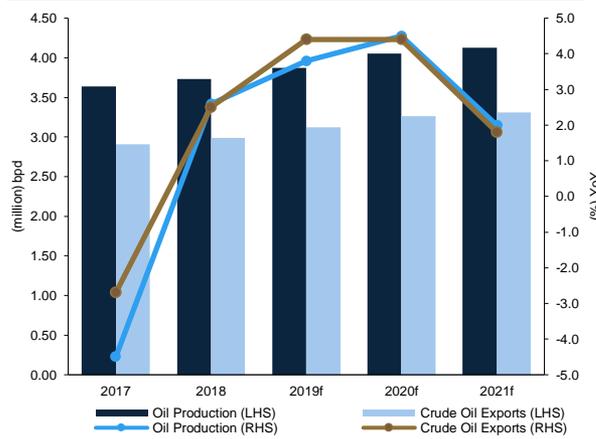
### Domestic Challenges

In 2015, UAE deregulated its monthly fuel price, allowing its retail petrol and diesel prices to track the price of Brent Crude and also allowing the UAE government to cut subsidies for its citizens. Although UAE's fuel remains amongst the cheapest in the world, consumers are likely to feel the pressure from fuel price increases. In April 2019, UAE's Fuel Price Committee announced a more than 10% increase in fuel prices from May 2019 onwards. This was in large part due to high global oil prices.<sup>77</sup> Furthermore, UAE introduced a 5% value-added tax (VAT) in January 2018 that collects VAT on motorists who are refuelling their vehicles. The increased costs through VAT and adjustable fuel prices are likely to negatively impact demand for petrol and diesel domestically, thereby posing headwinds for the UAE's oil industry domestically.

In summary, despite a strong focus on its non-oil industries, UAE remains committed to investments in its oil industry as well. By bringing in foreign expertise through partnerships in its oil industry, UAE has created opportunities to exchange knowledge and to increase foreign investments into its oil sector. The increase in foreign investments has allowed the UAE government to redirect resources into non-oil industries, allowing these non-oil industries to grow and occupy a larger pie of the economy. UAE's two-pronged approach strategy has achieved what it has set out to do and the result is a much more even contribution from oil and non-oil industries to the UAE GDP. There will be much uncertainty to come in UAE's oil industry, but it is likely that UAE will be able to benefit from the global political climate but face small challenges from its domestic headwinds.

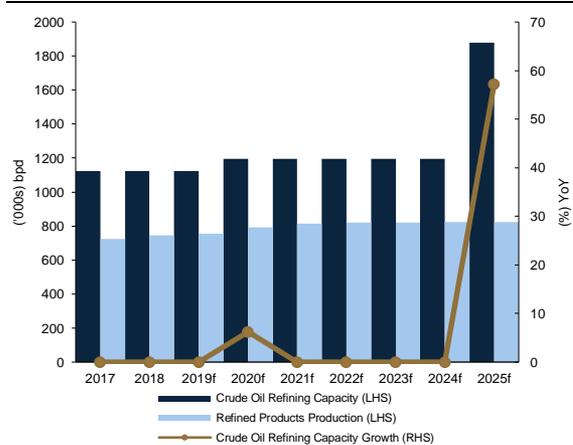
Written by  
Ryan Toh Director

Figure 1: Emirati's Total Oil Production and Crude Oil Exports



Source: Fitch Solutions, 2019

Figure 2: Crude Oil Refining Capacity, Refined Products Production



Source: Fitch Solutions, 2019

## Headlines

- The Emirati oil market stood at 96.6 billion barrels of oil in 2018. The bulk of the oil reserves are located in Abu Dhabi (94%), with the remainder located across Dubai, Sharjah and Ras al- Khaimah
- The upstream segment is driven by field expansion, investment and development of enhanced oil recovery (EOR) techniques
- Demand for crude oil exports are rising due to increasing demand from Asian buyers
- The downstream segment is seeing development and innovation with joint ventures and partnerships with international companies
- Offshore drilling will be the centre of oil production growth
- Very little growth is seen and forecasted in refinery

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## United Arab Emirates' Oil Industry: Greasing Up For A Bright Future

The United Arab Emirates (UAE) is estimated to hold the world's seventh-largest proved oil reserves. As of 2018, the UAE's reserves stood at 96.6 billion barrels of oil. The bulk of the oil reserves are located in Abu Dhabi (94%), while the remainder can be found across Dubai, Sharjah and Ras al-Khaimah.<sup>78</sup> The UAE maintains significant midstream and downstream infrastructure to enhance production and export of oil. In addition, UAE policymakers have ensured that the Emirates, particularly Abu Dhabi, will undertake major strategic investments in midstream and downstream infrastructure to bring domestic producers in line with the UAE's 2021 national development goals. This will provide great grounding for both national and international companies such as Abu Dhabi National Oil Company (ADNOC), Dubai Petroleum Establishment, Mubadala Petroleum, BP Plc and Chevron. The UAE exports 2.5 million barrels per day (bpd) of crude oil of abroad, largely under long-term supply contracts, with 96% destined for Asian markets. Despite a rise in oil production, the collapse in oil prices between 2013 and 2017 resulted in the decline of the Emirati oil market. However, the unwinding of the OPEC+ production-cut deal and a number of upgrade and expansion projects in both upstream and downstream infrastructure is expected to boost supplies over the second half of 2019 and into 2020.

### Upstream Development Leads the Industry

Crude oil and condensates production averaged 1.48 million bpd in 2017, a 2.6% decline on 2016. The decline was largely related to crude oil output, which has declined over recent years especially during 2017 due to OPEC production cuts. However, production is forecasted to increase slightly over the 2019 - 2021 period. Despite the volatility in production, the upstream segment of the Emirati oil market is seeing brighter days due to field expansion and enhanced oil recovery (EOR) techniques, and the UAE is projected to experience a small but sustained growth in oil production.

The UAE also depends on large maturing oilfields for the bulk of its production such as Lower Zakum (1 million bpd) and Upper Zakum (750,000 bpd), which poses a weakness to its oil industry as mature oil fields are close to reaching their economic limit, given that they have depleted most of their primary and secondary recovery.<sup>79</sup> In light of these issues, oil companies in the region have been investing in production capacity and recovery techniques (tertiary recovery) to extract more crude out of the reservoir's oil in comparison with primary and secondary recovery capabilities. For instance, ADNOC is the leader in the application of new and emergent enhanced oil recovery (EOR) techniques. In 2018, ADNOC announced and began its AED1.5 bn (insert USD rate) investment to upgrade and expand the Bu Hasa oil field and increase production capacity from 550,000 bpd to 650,000 bpd, with the project targeted for completion by end 2020. In addition, ADNOC has completed construction of Al Reyadah, a carbon capture, utilization and storage (CCUS) project which will allow a 70% field recovery rate compared to a recovery rate between 35-45% for primary and secondary recovery rate techniques.<sup>80</sup> This method will also allow for a more sustainable and environmentally friendly way of oil extraction in the region.

The Emirates produced 3.64 million bpd in 2017. (Figure 1) Despite the fall in production prior, the number of upgrade and expansion projects underway will be sufficient to significantly lift production capacity into the 2019 and 2020s. Oil production in the UAE is forecasted to reach 3.88 million bpd in 2019 and to cross the 4 million bpd mark in 2020. This is evident in the numerous upstream projects such as the Zakum Development Company (ZADCO) to increase production capacity in Upper Zakum. Younger oilfields such as Umm Lulu fields (129,000 bpd) and Nasr fields (65,000 bpd) have been selected for investment by the Abu Dhabi Marine Operating Company (ADMA-OPCO), showing that there is plenty of room for investment and improvement in the upstream segment of the industry.

### Oil Trade and Downstream Wonders

Despite the rising domestic demand for crude, limited production growth in the UAE will see export volumes remain relatively flat. Bearing this in mind, the Emirates will be increasing its focus on its core Asian crude export markets. Crude oil exports in 2017 were at 2.9 million bpd, and they are forecasted to rise steadily, reaching 3.12 million bpd and 3.26 million bpd in 2019 and 2020 respectively (Figure 1) due to the rising demand for crude oil by their Asian counterparts.

The increasing demand for crude oil stems from the aggressive expansion of refining capacity in the Asia Pacific region which will see the UAE – and, more broadly, the Middle East – increasingly reliant on their Asian buyers. The Emirates exports the bulk of its crude oil to consumers in Asia, with Japan, South Korea, China and Singapore amongst its major buyers. Refining giants such as China, Japan and South Korea also have long-term contracts with the Middle Eastern producers. Moving forward, it is expected that Asia will remain a buyer's market in 2019, with crude oil producers in the UAE and Saudi Arabia set to offer attractive prices and extra volumes to defend their market share in the region.<sup>81</sup>

Much like the upstream activities, the downstream segment of the Emirati oil industry is seeing improvement projects. UAE, being the second-largest Arabian Gulf producer, is earmarking more crude for Asia and boosting exports of refined products as they seek to extract more value from each barrel of oil pumped and to comply with the ongoing global oil output cuts due to the cut backs on crude supply. The ongoing expansion of the Ruwais refining and petrochemicals complex is meant to double refining capacity and triple petrochemicals production by 2025 as part of ADNOC's downstream expansion and part of ADNOC's 2030 Integrated Strategy. Additionally, the Mubadala Petroleum has been leading in downstream innovation and expanding across the region in their partnership with Canada's Nova Chemicals and Austria's Borealis as a joint venture to produce petrochemicals for the production of sustainable and environmentally friendly plastic products.

### Prepping for Growth from Offshore

The recent addition of the Italian oil giant Eni to offshore concession in the UAE indicates that the country is more seriously preparing its oil sector for growth, particularly in the offshore concession sector. Given that the bulk of the oilfields in the Emirates are maturing, oil companies in the region have increasingly looked offshore to replenish their reserves and fulfil their production needs, partly because offshore drilling presents better profitability for oil companies due to the lower transportation cost as compared to onshore drilling. As such, offshore drilling appears to be the centre of oil production growth, given the stabilisation of onshore output. With the 1.6 - 1.8 million bpd onshore and 750,000 bpd Upper Zakum development, the remaining production capacity is up for grabs by offshore concession.

### Refined Products Require More Refinement

The UAE crude oil refining capacity stood at 1.12 million bpd (Figure 2) in 2017 with the expansion of the al-Ruwais (400,000 bpd) and Jebel Ali (140,000 bpd) facilities. The current utilisation rates average around 68%, reflecting that UAE's refinery capacity has ample room to expand in terms of refined products exports. However outside of this, the refinery capacity is forecasted to have little room for growth and will remain relatively stable, with a rise to 1.2 million bpd in 2020 and peaking at 1.88 million bpd in 2025 due to the completion of the further 50% expansion of the Jebel Ali facility in 2020 and the completion of ADNOC's investment plans to add 57% to existing capacity in the downstream segment by 2025. These developments would enhance UAE's ability to capitalize on the growing demands in Asia.

## Sources:

1. The Observatory of Economic Complexity (2019). *Chile*. Retrieved from: <https://atlas.media.mit.edu/en/profile/country/chl/>
2. The Economist (2018). *Sebastián Piñera tries to put Chile back on track*. Retrieved from: <https://www.economist.com/the-americas/2018/12/08/sebastian-piñera-tries-to-put-chile-back-on-track>
3. De la Jara, A. (2018). *Foreign investment in Chile surges due to new law: government*. Reuters. Retrieved from: <https://in.reuters.com/article/us-chile-investment/foreign-investment-in-chile-surges-due-to-new-law-government-idINKBN1K12NO>
4. Guzman, D. & Martin, E. (2018). *Chile's Finance Minister Downplays Copper's Decline, Sees Prices Rebounding*. Bloomberg. Retrieved from: <https://www.bloomberg.com/news/articles/2018-07-24/chile-s-larrain-downplays-copper-decline-sees-prices-rebounding>
5. Cambero, F. (2019). *Floating solar panels to boost efficiency at Chilean copper mine*. Reuters. Retrieved from: <https://www.reuters.com/article/us-chile-mining-solar/floating-solar-panels-to-boost-efficiency-at-chilean-copper-mine-idUSKCN1QV2I2>
6. Global Data (2017). *Chile Renewable Energy Policy Handbook 2017*. Retrieved from: <http://www.arena-international.com/Uploads/2017/11/27/gj/m/Free-Chile-Renewable-Energy-Policy-Handbook-2017.pdf>
7. International Energy Agency (2018). *Chile's renewable energy potential promises multiple benefits for the country, according to latest IEA country review*. Retrieved from: <https://www.iea.org/newsroom/news/2018/january/chiles-renewable-energy-potential-promises-multiple-benefits-for-the-country-ac.html>
8. Chile – Energy (2018). Export.gov. Retrieved from: <https://www.export.gov/article?id=Chile-Energy>
9. RenewablesNow (2019). *Solar to Push Gas out of Chile's Top 3 Power Sources in 2019*. Retrieved from: <https://www.renewablesnow.com/news/solar-to-push-gas-out-of-chiles-top-3-power-sources-in-2019-638831>
10. Bloomberg (2018). *These Massive Renewable Energy Projects Are Powering Chilean Mines*. Retrieved from: <https://www.bloomberg.com/news/features/2018-08-07/these-massive-renewable-energy-projects-are-powering-chilean-mines>
11. Luna, P. (2019). *Chile Tests Floating Solar Panels to Power Mine, Save Water*. Phys.org. Retrieved from: <https://phys.org/news/2019-03-chile-solar-panels-power.html>
12. Libra, M. (2018). *Chile: Land of Opportunity for Renewable Energy*. PV Tech. Retrieved from: <https://www.pv-tech.org/guest-blog/chile-land-of-opportunity-for-renewable-energy>
13. PV Magazine International. (2017). *Chile: Interest in Small Solar Parks Grows*. Retrieved from: <https://www.pv-magazine.com/2017/12/08/chile-interest-in-small-solar-parks-grows/>
14. RenewablesNow. (2018). *ANALYSIS - Chile: Land of opportunities for renewable energies*. Retrieved from: <https://renewablesnow.com/news/analysis-chile-land-of-opportunities-for-renewable-energies-631859/>
15. Agostini, C. A., Nasirov, S., & Silva, C. (2016). *Solar PV Planning Toward Sustainable Development in Chile: Challenges and Recommendations*. *The Journal of Environment & Development*, 25(1), 25–46. Retrieved from: <https://doi.org/10.1177/1070496515606175>
16. Bellini, E. (2018). *Chile Launches Call for \$193.4 Million Solar Energy Research Institute*. PV Magazine International. Retrieved from: <https://www.pv-magazine.com/2018/11/28/chile-launches-call-for-193-4-million-solar-energy-research-institute/>
17. Export.gov (2018). *Chile - Energy* | Export.Gov. Retrieved from: <https://www.export.gov/article?id=Chile-Energy>
18. BP Energy Economics (2018). *BP Energy Outlook - 2019*. Retrieved from: <https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/energy-outlook/bp-energy-outlook-2019-country-insight-india.pdf>
19. Roychoudhury, A. & Dhasmana, I. (2019). *Modi 2.0 – Govt Mulls Steps to Lift Demand, to Focus on Lowering IT Rates*. Business Standard. Retrieved from: [https://www.business-standard.com/article/economy-policy/modi-2-0-finance-ministry-prepares-strategy-for-new-govt-to-lift-demand-119052401739\\_1.html](https://www.business-standard.com/article/economy-policy/modi-2-0-finance-ministry-prepares-strategy-for-new-govt-to-lift-demand-119052401739_1.html)
20. Bharatiya Janata Party (2019). *BJP Election 2019 Manifesto*. Retrieved from: <http://www.documentcloud.org/documents/5798075-Bjp-Election-2019-Manifesto-English.html>
21. Ghosh, I. & Paul, M. (2019). *RBI to cut rates in June, but analyst split on if it should: Reuters poll*. Reuters. Retrieved from: <https://www.reuters.com/article/us-india-rates-poll/india-to-cut-rates-in-june-but-analysts-split-on-if-it-should-reuters-poll-idUSKCN1SZ0C7>
22. Regan, H. & Khan, O. (2019). *For Modi, India's marathon election ends where it all began*. CNN. Retrieved from: <https://edition.cnn.com/2019/05/19/india/modi-india-election-varanasi-intl/index.html>
23. Sanghera, T. (2019). *Modi 2.0- can India's re-elected PM deliver on the economy?* Al Jazeera. Retrieved from: <https://www.aljazeera.com/ajimpact/modi-20-india-elected-pm-deliver-economy-190530065014507.html>
24. Suneja, K. (2019). *FDI policy review begins as inflows drop despite auto route*. The Economic Times. Retrieved from: <https://economictimes.indiatimes.com/news/economy/policy/fdi-policy-review-begins-as-inflows-drop-despite-auto-route/articleshow/69568329.cms>
25. Salam, R. (2019). *Modi's New Challenge is Embracing Urbanization*. The Atlantic. Retrieved from: <https://www.theatlantic.com/ideas/archive/2019/05/modi-must-embrace-urbanization-build-new-india/590506/>
26. AFP News Agency (2019). *Why Uttar Pradesh state is the key prize in India's election*. Al Jazeera. Retrieved from: <https://www.aljazeera.com/news/2019/05/uttar-pradesh-state-key-prize-india-election-190518082052108.html>
27. Rashid, O. (2018). *Modi's U.P. Visit to Focus on Urban Development*. The Hindu. Retrieved from: <https://www.thehindu.com/news/national/other-states/modis-up-visit-to-focus-on-urban-development/article24497883.ece>
28. Scarr, S., Cai, W., Kumar, V. & Pal, A. (2019). *The race to save the River Ganges*. Reuters. Retrieved from: <https://graphics.reuters.com/INDIA-RIVER/010081TW39P/index.html>
29. Koyanagi, K. (2019). *Is Modi's Plan to Clean 'Mother Ganges' Working?* Nikkei Asian Review. Retrieved from: <https://asia.nikkei.com/Spotlight/Cover-Story/Is-Modi-s-plan-to-clean-Mother-Ganges-working>
30. Chaudhary, J. (2018). *India Revives Massive Yamuna Dam Project Despite Environmental Concerns*. The Wire. Retrieved from: <https://thewire.in/environment/india-revives-massive-yamuna-dam-project-despite-environmental-concerns>
31. The Times Now (2019). *Bhutan PM in India for Modi's swearing-in: A look at ever-strengthening ties between the two nations*. Retrieved from: <https://www.timesnownews.com/india/article/bhutan-prime-minister-to-attend-pm-modis-coronation-a-look-at-ever-strengthening-ties-between-two-nations/427766>
32. PTI Panaji (2019). *Goa government to spend Rs 1,000 crore to upgrade power network*. The Hindu BusinessLine. Retrieved from: <https://www.thehindubusinessline.com/economy/goa-government-to-spend-rs-1000-crore-to-upgrade-power-network/article27183569.ece>
33. Standing Committee on Energy (2019). *Hydro Power Forty Third Report*. Ministry of Power. Retrieved from: [http://164.100.47.193/lssccommittee/Energy/16\\_Energy\\_43.pdf](http://164.100.47.193/lssccommittee/Energy/16_Energy_43.pdf)
34. FICCI & PWC (2014). *Hydropower in India: Key enablers for a better tomorrow*. Retrieved from: <https://www.pwc.in/assets/pdfs/publications/2014/hydropower-in-india-key-enablers-for-better-tomorrow.pdf>
35. International Renewable Energy Agency (2012). *Hydropower*. Retrieved from: <https://www.irena.org/hydropower>
36. Seetharaman, G. (2019). *Hydel power in India is growing at the slowest pace*. The Economic Times. Retrieved from: <https://economictimes.indiatimes.com/industry/energy/power/hydel-power-in-india-is-growing-at-the-slowest-pace/articleshow/67704776.cms>
37. Prateek, S. (2019). *Large Hydro Power Projects Now Officially Categorized Under Renewable Energy Sources*. Mercom India. Retrieved from: <https://mercomindia.com/large-hydro-projects-renewable-sources/>
38. ETEnergyWorld (2019). *Cabinet approves renewable status for large hydro power projects*. Retrieved from: <https://energy.economictimes.indiatimes.com/news/renewable/cabinet-approves-renewable-status-for-large-hydro-power-projects/68304953>
39. The Economics Times. (2019). *India still not power-surplus nation; peak deficit at 0.8%, energy deficit at 0.6% in 2018-19*. Retrieved from: <https://economictimes.indiatimes.com/industry/energy/power/india-still-not-power-surplus-nation-peak-deficit-at-0-8-energy-deficit-at-0-6-in-2018-19/articleshow/68952124.cms?from=mdr>
40. Jolly, A. (2019). *Bhakra-Nangal dam irrigates both Green and White revolutions*. India Today. Retrieved from: <https://www.indiatoday.in/magazine/cover-story/story/20170821-bhakra-nangal-multi-purpose-dam-green-revolution-beas-project-river-dam-1028863-2017-08-11>
41. ASSOCHAM & PWC (2017). *Accelerating hydropower development in India for sustainable energy security*. Retrieved from: <https://www.pwc.in/assets/pdfs/publications/2017/accelerating-hydropower-development-in-india-for-sustainable-energy-security.pdf>
42. Dutta, S. (2019). *Inclusion of Large Hydro Power in India's Renewable Mix a Good Move?* Mercom India. Retrieved from: <https://mercomindia.com/large-hydro-power-indias-renewable-mix-good/>
43. The Economics Times (2019). *Cabinet clears Rs 33,500-crore power projects*. Retrieved from: <https://economictimes.indiatimes.com/industry/energy/power/cabinet-nod-to-nhpc-acquiring-lancos-teesta-hydro-electric-project/articleshow/68299329.cms>
44. Hussain, A., Sarangi, G., Pandit, A., Ishaq, S., Mammun, N., Ahmad, B., & Jamil, M. (2019). *Hydropower development in the Hindu Kush Himalayan region: Issues, policies and opportunities*. *Renewable and Sustainable Energy Reviews*, 107, 446-461. doi: 10.1016/j.rser.2019.03.010
45. Ministry of Energy of Russian Federation (2019). *Statistics*. Retrieved from: <https://minenergo.gov.ru/en/activity/statistic>
46. TASS (n.d.). *Putin signs new 'May Decree' spelling out Russia's development goals to 2024*. Retrieved from <https://tass.com/politics/1003160>
47. IEA (2019). *Oil Market Report*. Retrieved from: <https://www.iea.org/oilmarketreport/reports/>
48. Rodionov, M. (2019). *Russia, OPEC may ditch oil deal to fight for market share: Russian minister*. Reuters. Retrieved from <https://www.reuters.com/article/us-russia-opec-deal/russia-opec-may-ditch-oil-deal-to-fight-for-market-share-russian-minister-idUSKCN1RP0CM>
49. Critchlow, A. (2019). *Russia's OPEC alliance brings risks and rewards for Putin*. S&P Global Platts. Retrieved from: <https://blogs.platts.com/2019/02/18/russias-opec-alliance-brings-risks-rewards-putin/>
50. Wingfield, B., Dodge, S., Pogkas, D. & Sam, C. (2019). *OPEC, Allies Get Back on Track With Oil Cuts*. Bloomberg. Retrieved from <https://www.bloomberg.com/graphics/ope-production-targets/>
51. Gazprom (2019). *Projects*. Retrieved from: <http://www.gazprom.com/projects/>
52. Soldatkin, V. (2019). *Russian oil output reaches record high in 2018*. Reuters. Retrieved from: <https://www.reuters.com/article/us-russia-oil-output/russian-oil-output-reaches-record-high-in-2018-idUSKCN1OW0NJ>
53. Workman, D. (2019). *Russia's top 10 exports*. World's Top Exports. Retrieved from: <http://www.worldstopexports.com/russias-top-10-exports/>
54. Shemetov, M. (2019). *Russia's Natural Resources Valued at 60% of GDP*. The Moscow Times. Retrieved from: <https://www.themoscowtimes.com/2019/03/14/russias-natural-resources-valued-at-60-of-gdp-a64800>
55. US Energy Information Administration (2017). *Russia Overview*. Retrieved from: <https://www.eia.gov/beta/international/analysis.php?iso=RUS>

56. Fitch Solutions (2019). *Russia Oil and Gas Report Q1 2019*. Retrieved from EMIS
57. Economist Intelligence Unit (2019). *Oil Production at Risk of Long-Term Decline*. Retrieved from: <http://country.eiu.com.libproxy.smu.edu.sg/ArticleIndustry.aspx?articleid=1607874144&Country=Russia&topic=Industry&subtopic=Energy>
58. Depersio, G. (2019). *How does the price of oil affect Russia's economy*. Investopedia. Retrieved from: <https://www.investopedia.com/ask/answers/030315/how-does-price-oil-affect-russias-economy.asp>
59. Tenes, O. (2019). *Russian Economy gives Putin reasons not to extend OPEC Deal*. Bloomberg. Retrieved from: <https://www.bloomberg.com/news/articles/2019-05-21/russia-s-economy-gives-putin-reasons-not-to-extend-opec-deal>
60. Gorodyankin, G. & Yagova, O. (2019). *Russia cashes in as European oil refiners pay for US sanctions*. CNBC. Retrieved from: <https://www.cnbc.com/2019/04/12/reuters-america-analysis-russia-cashes-in-as-european-oil-refiners-pay-for-u-s-sanctions.html>
61. Sharma, G. (2019). *Bets on Ruble suggest Russia has upper hand in OPEC Deal as oil price rises*. Forbes. Retrieved from: <https://www.forbes.com/sites/gauravsharma/2019/05/20/bets-on-ruble-suggest-russia-has-upper-hand-in-opec-deal-as-oil-price-rises/#25103fce689d>
62. Wroughton, L. (2019). *US to end all waivers on imports of Iranian oil, crude price jumps*. Reuters. Retrieved from: <https://www.reuters.com/article/us-iran-oil/us-to-end-all-waivers-on-imports-of-iranian-oil-crude-price-jumps-idUSKCN1RX0R1>
63. El Gamal, R. (2019). *OPEC struggles to keep Russia on board with oil cut, may offer shorter extension*. Reuters. Retrieved from: <https://www.reuters.com/article/us-oil-opec-russia/exclusive-opec-struggles-to-keep-russia-on-board-with-oil-cut-may-offer-shorter-extension-idUSKCN1R91MB>
64. Simola, H. & Solanko, L. (2018). *Overview of Russia's oil and gas sector*. Institute for Economies in Transition. Retrieved from: <https://helda.helsinki.fi/bof/bitstream/handle/123456789/14701/bpb0517.pdf?sequence=1>
65. Adomaitis, N. (2019). *Oil prices fall as Russia suggests it will hike output*. CNBC. Retrieved from: <https://www.cnbc.com/2019/04/09/oil-market-libya-war-opec-supply-cuts-us-sanctions-in-focus.html>
66. McCormick, M. (2019). *Oil price recedes after knee-jerk' reaction to Russian suspensions*. Financial Times. Retrieved from: <https://www-ft-com.libproxy.smu.edu.sg/content/8ffda65c-6803-11e9-a79d-04f350474d62>
67. The Moscow Times (2019). *Russia's plan to cleanse tainted oil pipe proves slow going*. Retrieved from: <https://www.themoscowtimes.com/2019/05/14/russias-plan-to-cleanse-tainted-oil-pipe-proves-slow-going-a65575>
68. Paraskova, T. (2019). *Russia's Rosneft Aims at Asia's Oil Market with Trading Unit*. Oil Price. Retrieved from: <https://oilprice.com/Latest-Energy-News/World-News/Russias-Rosneft-Aims-At-Asias-Oil-Market-With-Trading-Unit.html>
69. Statista (2019). *United Arab Emirates Statista Country Report*.
70. OPEC (2019). *UAE Facts and Figures*. Retrieved from: [https://www.opec.org/opec\\_web/en/about\\_us/170.htm](https://www.opec.org/opec_web/en/about_us/170.htm)
71. Kamel, D. (2019). *Abu Dhabi starts Dh535m fund to support start-ups and venture capitalists*. The National. Retrieved from: <https://www.thenational.ae/business/economy/abu-dhabi-starts-dh535m-fund-to-support-start-ups-and-venture-capitalists-1.858475>
72. Export.gov (2018). *United Arab Emirates – Oil and Gas Field Machinery and Services*. Retrieved from: <https://www.export.gov/article?id=United-Arab-Emirates-Energy-Power>
73. Offshore Technology (2019). *Upper Zakum Offshore Oil Field Development, Abu Dhabi*. Retrieved from: <https://www.offshore-technology.com/projects/upper-zakum-offshore-uae/>
74. Sevastopulo, D., Williams, A., Raval, A. & Sheppard, D. (2019). *US ends sanctions waivers on Iranian oil imports*. Financial Times. Retrieved from: <https://www.ft.com/content/ad4647f2-649b-11e9-9adc-98bf1d35a056>
75. Shotter, J., Astrasheuskaya, N. & Raval, A. (2019). *Tainted Russian oil supply to Europe triggers fears*. Financial Times. Retrieved from: <https://www.ft.com/content/1428bad6-6b72-11e9-a9a5-351eeaf6d84>
76. Eaton, C. (2019). *Explainer: U.S. sanctions and Venezuela's exports and imports*. Reuters. Retrieved from: <https://www.reuters.com/article/us-venezuela-politics-crude-exports-expl/explainer-u-s-sanctions-and-venezuelas-exports-and-imports-idUSKCN1S82BI>
77. Oxborrow, I. (2019). *UAE petrol prices to rise more than 10 percent in May*. The National. Retrieved from: <https://www.thenational.ae/business/energy/uae-petrol-prices-to-rise-more-than-10-per-cent-in-may-1.854889>
78. Export.gov (2018). *United Arab Emirates – Oil and Gas Field Machinery and Services*. Retrieved from: <https://www.export.gov/article?id=United-Arab-Emirates-Energy-Power>
79. Gaffnery, Cline & Associates (2017). *Mature Fields Optimisation*. Retrieved from: [http://gaffnery-cline-focus.com/files/Brochures/GCA\\_Mature\\_Field\\_Optimisation\\_Brochure.pdf](http://gaffnery-cline-focus.com/files/Brochures/GCA_Mature_Field_Optimisation_Brochure.pdf)
80. Sertin, C. (2018). *ADNOC moving ahead with plans to expand its CO2 capture to boost oil recovery*. Oil and Gas Middle East. Retrieved from: <https://www.oilandgasmiddleeast.com/drilling-production/33088-adnoc-moving-ahead-with-plans-to-expand-its-co2-capture-to-boost-oil-recovery>
81. Muneeb, E. (2019). *Outlook 2019: Asia a crude oil buyers' market as producers defend share*. S&P Global Platts. Retrieved from: <https://www.spglobal.com/platts/en/market-insights/latest-news/oil/010319-outlook-2019-asia-a-crude-oil-buyers-market-as-producers-defend-share>

#### Databases:

1. Business Monitor International / Fitch Connect
2. Bloomberg
3. CEIC
4. CNBC
5. Euromonitor International
6. Fitch Solutions
7. IBEF
8. IMF
9. Ministry of Statistic and Programme Implementation (MOSPI)
10. Statista
11. World Bank