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Periodical Part

China's Energy Policies in the Wake of COVID-19

Oxford Energy Forum: A Quarterly Journal for Debating Energy Issues and Policies

Provided in Cooperation with:

The Oxford Institute for Energy Studies, Oxford

Suggested Citation: Fattouh, Bassam (Ed.) (2020) : China's Energy Policies in the Wake of COVID-19, Oxford Energy Forum: A Quarterly Journal for Debating Energy Issues and Policies, ISSN 0959-7727, The Oxford Institute for Energy Studies, Oxford, Iss. 125

This Version is available at:

<https://hdl.handle.net/10419/306987>

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A QUARTERLY JOURNAL FOR DEBATING ENERGY ISSUES AND POLICIES

CHINA'S ENERGY POLICIES IN THE WAKE OF COVID-19

CONTENTS

Introduction	2
Power sector reform in China: markets constrained by the state	5
<i>Philip Andrews-Speed</i>	
Directions for renewable energy in China	8
<i>Anders Hove</i>	
China's climate commitments and energy ambitions beyond COVID-19	11
<i>Sam Geall</i>	
Transforming China's coal cities	14
<i>Yingxia Yang</i>	
Supply security concerns are supporting the liberalization of China's oil and natural gas industry	19
<i>Erica Downs</i>	
Steps towards liberalization of China's natural gas market in the 14th five-year plan	22
<i>Lei Yang</i>	
Potential and challenges of China's second-tier LNG importers	25
<i>Michael Xiaobao Chen</i>	
Chinese independent refiners: the great survivors	28
<i>Tom Reed</i>	
China and Asian oil benchmarks: where next?	33
<i>Adi Imsirovic</i>	
How COVID-19 has changed the long-term outlook for China's oil demand	36
<i>Michal Meidan</i>	



INTRODUCTION

The year 2020 is an important year for China. President Xi Jinping, in his New Year speech in January 2020, called it a year of ‘milestone significance’ as the country was set to achieve its goal of building a ‘moderately prosperous society’—which entails doubling the size of the economy from its 2010 levels and eradicating poverty. At the same time, 2020 is an important year in the policy planning process, given that it is the final year of the 13th five-year plan (FYP) and the start of the drafting process for the upcoming plan, which will span 2021–2025.

The outbreak of COVID-19 complicated this critical year for China. The severity of the pandemic's economic impact has refocused the government's attention on short-term recovery, with a view to supporting employment and the private sector. At the same time, the deteriorating international political environment and the sharp escalation in US–China tensions following the outbreak have highlighted the importance of self-sufficiency in energy and technology. As China emerges from its COVID-19 economic paralysis and gets back to work, its priorities for the next plan are still in flux. Can Beijing pursue its commitment to structural change, including limiting the role of the state-owned sector in the economy, considering that this is the government's most reliable way to support growth? How will the provinces deliver growth while also providing end-users with sustainable, reliable, and affordable energy? Can China liberalize its markets, and increase the flexibility of its energy sector, while also reducing its import dependency? When considering its energy transition, is China looking to position itself as a global climate champion, or more narrowly as a leader in clean tech?

These policy choices matter for China and for global energy markets. With Beijing emphasizing reliability and affordability, the coal lobby is arguing for more coal-fired capacity. Meanwhile, the government's pledge to develop competitive power markets is seen as a key way to support renewables, but the state's enduring influence in the sector could complicate the process. Ongoing efforts to liberalize the oil and gas markets, in the context of relatively low oil prices, are unleashing an army of new importers into global markets. While this may serve to diversify the sector – and ultimately erode the monopoly of state-owned importers – it also suggests a rising import dependency. These varying, and seemingly contradictory, policy priorities are now being debated in China as the government prepares its blueprint for the next five years. This edition of the *Oxford Energy Forum* assesses some of these policy choices, the trade-offs between competing priorities, and what they mean for the 14th FYP.

In the first paper of this issue, *Philip Andrews-Speed* discusses the prospects for and limitations of power sector reform in China in the context of energy governance in China and the previous phase of power sector reform. Some of the issues raised here, including the leadership's preference to keep the major energy companies in state ownership to help the government deliver non-commercial policy objectives, alongside local governments' penchant for direct interference in the operation of markets, resonate throughout the different contributions, informing a cautious outlook on the prospects for effective reform. Andrews-Speed argues that the importance of security of supply and self-sufficiency will likely overshadow Beijing's desire to foster greater competition in power generation, especially in the wake of COVID-19, suggesting slow implementation of planned power sector reforms. Not only will Beijing look to state-owned companies to support the economic recovery and ensure energy supplies, especially as smaller companies struggle financially, but the recent reinforcement of the need to maximize energy self-sufficiency combined with the focus on boosting employment is likely to favour fossil fuels, especially coal. In short, the marginal cost of renewable energy may be lower than that of thermal power, but the dispatch decision remains political.

Anders Hove continues on this theme, discussing the contradictions between central- and local-government priorities as well as perceptions of renewables and coal, and what they tell us about the current direction for renewable energy development in China. While the decline in new wind and solar photovoltaic additions has been in the cards for several years, as funds to subsidize them dwindle and as these projects become increasingly cost competitive without government support, COVID-19 could disadvantage renewables. In the short term, this is because lower electricity demand growth means reduced revenues from renewable energy surcharges, the main funding source for renewable subsidies. At the same time, lower electricity demand may also mean that provinces restrict new renewable additions, as their energy systems remain tied to inflexible coal power plants and they opt to support state-owned incumbents during the economic downturn. That said, Beijing is still looking to promote stable and sustainable growth in renewables – as opposed to explosive growth – and it is doing so by mandating reduced curtailment, rather than by allowing spot markets to develop. Current trends would suggest that the 14th FYP will focus on stable growth for renewables, even as it allows for new coal projects to be developed too. Given the focus on economic stability post COVID-19 and a renewed emphasis on energy security, as US–China relations continue to sour, China's renewables ambitions seem unlikely to receive a strong boost.

As China's willingness to rely on coal increases, its commitments to its Paris climate pledges have become increasingly equivocal, *Sam Geall* argues. He charts the change in China's climate policy from UN climate talks in Paris in late 2015, when the country aimed to reposition itself as a global climate leader, to a much more ambiguous position following the election of Donald Trump and the ensuing trade tensions between the US and China. COVID-19 has injected additional uncertainty. On one hand, it has increased international tensions, which could spur further retrenchment and a focus on energy security, boosting coal-fired power. On the other hand, it may lead to calls from inside China for renewed environmental ambition, with Beijing taking the opportunity to lead in the technologies of the future. As this debate is taking place while the country prepares its 14th FYP, China has a clear opportunity to undertake an industrial and energy transformation, akin to Europe's Green Deal, and the focus on New Infrastructure suggests some commitment to that pathway. Yet debates around the expansion in coal-fired power capacity under the 14th FYP loom large; and if coal continues to receive a boost, it will call into question China's claim to the 'driver's seat' on climate.

In this context, the experience of Wuhai, a coal city in Inner Mongolia that accounted for almost a third of China's coal supplies in 2019, is instructive of the challenges China faces and the policy choices the government seems likely to make. *Yingxia Yang* describes how the fate of the city's economy has been intrinsically linked to the rise and fall in coal demand. Yet through its policies to promote economic transformation, Wuhai has managed to reduce the share of coal in its economy. Initially, efforts to transition to heavy chemical industry led to deterioration in air, water, and soil quality, but the subsequent shift to a coal-chemicals industry proved more successful, especially as this coincided with the government's broader focus on the chemicals industry as a way of promoting energy self-sufficiency. Indeed, given coal's and chemicals' contributions to energy security and employment, they are likely to weather the economic storm of low oil and gas prices. More recently, Wuhai has made considerable efforts to green its coal industry and use it as a basis for developing emerging industries, capitalizing on its chlor-alkali chemical industry to develop hydrogen. While other coal cities may not be able to replicate this exact strategy, they are all undergoing similar transformations and will seek to reinvent themselves by developing other emerging industries based on their competitive advantages. Fundamentally, however, Wuhai's experience shows that coal-rich provinces will seek, to the extent possible, to adapt their coal industry rather than dismantle it.

Coal is not the only fossil fuel on which China relies heavily. The deterioration in US–China relations and the increasing sense of energy insecurity is leading to a growing focus on self-sufficiency in oil and gas. *Erica Downs* argues that concerns about the security of China's oil and natural gas supplies are, perhaps counter-intuitively, also facilitating reforms aimed at opening China's upstream sector to more participants. The oil and gas industry is dominated by three national oil companies (NOCs) which are deemed critical to China's economic and national security. Given the country's rising import dependence and the decline in domestic oil production in 2016–2018, the NOCs have been mandated to increase domestic output, leading them to formulate seven-year plans to intensify domestic exploration and production. But even though Beijing intends for its three major NOCs to remain leading producers of oil and natural gas, the government is also seeking the help of foreign investors in developing China's resources, especially unconventional gas. To this end, China's authorities are taking steps to increase the number of players and the amount of investment in exploration and production. While these reforms are a step in the right direction, other factors will help determine whether other companies participate in domestic exploration and production. These include the quality of the oil and natural gas blocks available and whether Beijing develops an enforceable third-party access regime and establishes a regulator with the authority to ensure compliance by the new pipeline company and the NOCs.

Lei Yang delves deeper into the prospects for natural gas market liberalization in the 14th FYP and argues that even though the first significant step of unbundling the midstream infrastructure – with the creation of the pipeline company at the end of 2019 – is now well under way, the next five years will be critical. After completing the asset transfers to the pipeline company (PipeChina) later this year, the government will need to establish a network code, link the main trunk lines with regional distribution networks, pursue pricing deregulation, and encourage greater transparency and information-sharing in the natural gas industry. China would also benefit from an independent regulator, although for now it remains unclear which bureaucracy could take on that role effectively. The process is set to be gradual and could at times be disjointed given that reform is occurring across the supply chain, albeit at a different pace. Upstream reform, long seen as a key challenge to a more efficient natural gas system, is being pursued gradually, while downstream, the deregulation of city-gate prices is gaining momentum, with lower international oil and gas prices arguably accelerating this process. To facilitate the process, China has created two natural gas exchanges, but their ability to deliver truly market-based transactions is still limited by the small number of suppliers compared to the growing number of potential buyers. But there are still myriad procedural issues and questions to resolve, including how to set clear and simple transport tariffs – bearing in mind that China's current pricing structures are anything but



clear and simple. Going forward, PipeChina will need its tariffs to generate funds so it can invest in growing the country's midstream infrastructure while also accommodating a range of contractual commitments and different import prices. If successful, the midstream reform will enable gas to play a more prominent role in China's energy transition while also attracting private investors and newcomers to the gas industry in support of this process.

Mike Chen looks in further detail at the second-tier actors in China's natural gas market, taking stock of their rapid development over the past few years. The phenomenal rise in China's gas demand, alongside the government's liberalization agenda, has underpinned the diversity of these new LNG importers. Chen profiles these second-tier importers and analyses the main differences between the city-gas distribution companies (state-owned and privately owned), the power generators, and finally, the trading houses and LNG logistics companies and their market strategies. These newcomers are emerging from the shadows of the state-owned majors and partnering with each other, benefitting from the synergies that their diverse international and domestic exposure affords. While the current low-price cycle and progress on an independent midstream regulator should greatly benefit the second-tier LNG importers, the outlook remains challenging. Their finances have been squeezed by the COVID-19 demand downturn. Moreover, market liberalization, while providing opportunities, also suggests stronger competition that not all second-tier buyers are equally well placed to weather, especially as they own and operate smaller terminals with limited storage capacity and supply sources. On balance, they are likely to develop and grow their market share, but the pace will depend on the government's appetite for broader reform.

Private LNG importers are still a new and somewhat niche phenomenon as far as global markets are concerned; they accounted for about 7 per cent of China's natural gas imports in 2019. Their peers in the oil markets, however, the Shandong independents, have become a prominent force, as *Tom Reed* explains. They have existed at the margins of China's state-owned refining system, thriving in the mid-2000s, when the state-owned companies could not keep up with the fuel requirements generated by the country's booming economy, and then again since 2015, when the government decided to liberalize the crude-oil import system. Since 2015, the Shandong independents have accounted for half of the national increase in crude throughputs. Yet they are still seen as uncompetitive, technically outdated, and politically out of favour, suggesting their days are numbered. Nonetheless, the independents have skilfully managed to survive various government consolidation mandates, due to a combination of factors including their agility, the inefficiencies of the state-regulated pricing system; their contribution to the local economy, and their role as China's marginal fuel suppliers. Moreover, their innovative crude purchase pricing systems have allowed them to not only survive, but also develop a vibrant spot market in their home province of Shandong. And given their preference for a certain number of crudes, such as Brazilian Lula and Norwegian Johan Severdrup, whose prices cannot be assessed near their points of origin, Shandong now sends a clear pricing signal. In short, China's unloved independent refiners are global price makers.

Indeed, as crude imports are moving to Asia, and overwhelmingly to China, it is not surprising that the process of price discovery is also moving East. In his contribution, *Adi Imsirovic* discusses China's efforts to develop its own crude benchmark through the Shanghai crude futures contract, housed in the Shanghai International Energy Exchange (INE). China's decision makers have long sought to participate in and compete for oil pricing power, culminating in 2018 in the launch of a delivered contract for medium sulphur crudes, priced in the Chinese currency, the renminbi. With a large volume of trades on it shortly after its launch, the INE has become the third largest oil exchange in the world. Still, until early 2020, the contract remained a tool for retail and financial investors, with limited engagement from the independent refiners as the infrastructure for physical deliveries into Shandong province was constrained. The demand shock from COVID-19 has bolstered the exchange, as liquidity increased and the exchange was able to add physical storage space rapidly and is now able to supply the Shandong market too. But can the INE become a regional and global benchmark? The history of the Brent and West Texas Intermediate contracts suggests that a liberalized domestic market is a precondition for a well-functioning futures contract. This would involve the privatization of state oil companies; abolition of all price controls, including those in the currency and capital markets; encouragement of transparency; and access to key infrastructure for all market participants. While this is the general direction of travel in China, as other contributions to this issue of the *Oxford Energy Forum* highlight, the process is by no means easy or smooth. Imsirovic argues that, in the absence of such profound change, the INE could still become a local pricing hub, especially if the independents become more active on it – yet the development of the INE is by no means a precondition for China's pricing power in oil, as China's oil traders have established themselves as a force in international oil markets and benchmarks for years.

Their increased clout has developed alongside China's rising appetite for oil. Indeed, as *Michal Meidan* discusses in the final

contribution, China's oil demand has almost tripled over the past two decades, accounting, on average, for one-third of global oil demand growth. But even though China is set to dominate future growth and will likely overtake the US as the world's largest economy, the pace is slowing while the product makeup is shifting in line with the restructuring of the Chinese economy and policy efforts to curb local air pollution. Compared to almost 10 million barrels per day (mb/d) of oil demand growth over the past two decades, demand growth will likely drop to 3–4 mb/d between 2020 and 2040. But will growth be closer to 3 mb/d or 4 mb/d? China's trajectory is extremely significant for global markets, as even a small adjustment in the outlook for a country that consumed 14 mb/d of oil in 2019 has huge global ramifications for suppliers, refiners, and traders worldwide. Some of the emerging changes in consumer habits and policies in the wake of the COVID-19 pandemic suggest China's oil demand growth could be on the softer end of the scale, as the government's recovery package is likely to accelerate the electrification of the Chinese economy. While this should not be mistaken for a 'green' stimulus, as China risks electrifying faster than it decarbonizes, electrification will still weigh on oil demand in three main ways. First, the additional charging infrastructure for electric vehicles promised in the post COVID-19 recovery package is likely to accelerate electric vehicle penetration rates, while a new surge in shared e-bikes and e-scooters could define mobility trends in a deeper way. Second, the government's efforts to increase rail capacity and shift freight from road to rail will limit future diesel demand. Finally, the addition of high-speed rail lines could weigh on air travel going forward. Refiners in China, which have already started adapting to a world of lower oil demand growth, are unlikely to slow refining additions. Instead, they are looking to increase product exports, while also cutting product output and shifting to petrochemicals. COVID-19 seems to have accelerated that process, too.

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POWER SECTOR REFORM IN CHINA: MARKETS CONSTRAINED BY THE STATE

Philip Andrews-Speed

On his anointment as general secretary of the Communist Party of China in 2012, Xi Jinping announced that accelerating economic reform was one of his key policy priorities. These reforms were to include enhancing the role of markets, improving the performance of state-owned enterprises (SOEs), and providing more space for private enterprise. Within the energy sector, he devoted his first two years to dealing with corruption in the oil and gas industry. Meanwhile, officials were working on a plan to open up the electricity industry to competition. Or rather, they were updating plans and ideas that had been developed 10 years earlier but had not been implemented.

The reforms announced in 2015 proposed a number of measures to develop an electricity market, with competition in generation, distribution, and retail. Implementation has been gradual, but it is already clear that the reforms are meeting numerous obstacles – including interference by the state at central and local levels in the operation of the market, as well as abuse of market power by the grid companies. The sources of these impediments lie in the wider context of energy governance in China and in the nature of the previous phase of power sector reform.

Energy governance in China

The governance of China's energy sector today has its origins in the Marxist-Leninist system put in place by Mao Zedong after 1949. At that time, the state took full control of the sector through the planning of production and consumption, ownership of the main energy-producing and -consuming enterprises, and control over producer and consumer prices. The processes of enterprise privatization and market liberalization in the energy sector have been slow and hesitant, with decisive steps taken only during 1997–2003 and more recently under Xi Jinping.

Security of energy supply and self-sufficiency continue to be key components of the policy paradigm for the sector, along with the desire to provide widespread access to energy at affordable prices. This explains the strong and enduring influence of the central government over the energy sector. Today, this influence is expressed through state ownership of most of the large enterprises involved in the production and transformation of energy as well as the continuing control of some energy prices. The push for self-sufficiency and the abundance of the resource endowment have supported the long-standing dominance of coal in the primary energy mix. The abundance of cheap domestic coal resources has allowed the government to set energy tariffs at low levels, especially for energy-intensive industries and households.

The government's choice of policy instruments for the energy sector reflects the prevailing policy paradigm and the current state-dominated character of the sector. The preference has long been to combine administrative (command-and-control)

instruments with generous financing. Administrative instruments take the form of obligations and targets directed at different levels of government, at an entire industry, or at companies within a particular energy-producing or -consuming industry. Standards have been set for energy appliances and pollutant emissions, among others. Financial support in many forms has played a central role in promoting investment and technological advance in the nation's energy industries.

The SOEs in the coal, electricity, and oil and gas industries are key economic actors in the energy sector. Each of these industries originated as a central government ministry with bureaus at various lower levels of government. Gradual structural reforms initiated in the 1980s led to a progressive process of corporatization, structural unbundling and adjustment, forced mergers, commercialization, and partial privatization. Despite listing through initial public offerings, these enterprises possess strong market power and retain close links with government and the Communist Party at both central and local government levels.

Local governments also have considerable influence over the energy sector within their jurisdictions. They successfully collude with energy SOEs to undermine central government policies. Recent examples in the power sector include the surge in the construction of coal-fired power stations between 2013 and 2016 and the curtailment of renewable energy in favour of thermal power plants over the same period. Both actions undercut the central government's policy to promote clean sources of electricity.

Background to the current power sector reforms

Before 1997, much of the electrical power industry lay within the Ministry of Electrical Power, which acted as policymaker, regulator, and operational manager. Under the Ministry, the provincial power bureaus held monopoly power over transmission, distribution, and supply within their respective domains. In 1997, the State Power Corporation of China (SPCC) was created to take over the enterprise management functions from the Ministry, and the provincial and lower-level power bureaus were renamed as companies within the SPCC. The newly created corporation owned most of the transmission and distribution infrastructure and about 50 per cent of the nation's generation capacity. The rest of the assets were owned by a wide variety of SOEs, linked to different levels of government. The Ministry of Electrical Power was abolished in 1998.

Just five years after it was created, the SPCC was itself dismantled in 2002 in order to separate generation from transmission and distribution and to reduce the concentration of ownership of power-generating capacity. The generating assets of the SPCC were unbundled from the grid and, together with those of the pre-existing Huaneng Group, were assigned to five companies whose sole business was to be power generation. The transmission and distribution assets of the SPCC were divided between two new companies. The State Grid Corporation was to own and control the majority of the regional grids in the country, as well as the inter-regional transmission lines. The Southern China Power Grid Company took over the assets in the far south of the country. The government, through the National Development and Reform Commission (NDRC), continued to control wholesale and end-user tariffs, though various regions carried out experiments in wholesale competition through power pools.

In 2003, the government proposed reforms to the system for electricity pricing which would lead to three separate sets of tariffs: for generation, with both capacity and energy components; for transmission and distribution; and for retail, with the eventual separation of transmission and distribution tariffs. These and other initiatives to further reform the electricity industry were then suspended on account of massive power shortages that arose from the surge in economic growth in the early 2000s.

The current reforms

The unbundling of the vertically integrated power industry in 2002 created two transmission and distribution companies that have regional monopolies and together cover most of the country. The generating assets of the original SPCC were divided between five large, state-owned generating companies that today own about 45 per cent of the country's generating capacity. Another 45 per cent of capacity is owned by a variety of enterprises belonging to the central and local governments. The balance of about 10 per cent consists of privately owned and captive plants. Thus, about 90 per cent of generating capacity and almost 100 per cent of transmission and distribution capacity lies in the hands of the state at the central or local level.

The reforms announced in 2015 proposed a number of measures: the promotion of competition in power generation by allowing generating companies to negotiate directly with large customers, the introduction of pilot spot markets, a system for setting and regulating transmission and distribution tariffs, the opening of investment in and operation of new distribution networks to companies other than the two existing grid enterprises, and the introduction of competition in electricity retail.

Whilst it is still early days in the reform process, a number of challenges have already appeared that reflect historical development China's energy sector. At the level of central government, the NDRC and National Energy Administration (NEA)

are responsible for designing and implementing the reforms, as well as for regulating the emerging electricity markets. This arrangement is leading to confusion over objectives and to conflicts of interest, as the NDRC is broadly responsible for economic growth whilst the NEA should be focused on reforming the electricity market. The embedding of the NEA within the NDRC precludes independence of regulation.

Local governments have been interfering in the power market in different ways. They have been intervening in the bilateral transactions between generators and industrial consumers and not applying the agreed transmission and distribution tariffs. Local governments continue to obstruct inter-regional power trading in order to protect their local power generators. These actions undermine efforts to reduce the curtailment of renewable energy. Local agencies have also been distorting tenders for new distribution infrastructure projects as well as providing subsidies to loss-making power generators.

Central and local governments maintain a number of mechanisms for the cross-subsidy of end-user tariffs. Most notable is that between higher-income and lower-income regions, which is a key justification for not unbundling transmission and distribution. In October 2019, the central government removed the mechanism that linked power tariffs to coal prices, but at the same time decreed that tariffs for industrial and commercial end-users should decline in 2020. Not only does this strategy undermine the role of the embryonic power market, but it also threatens the commercial interests of the power generators that are already losing money in the oversupplied market.

In response to these financial losses, the government is encouraging mergers and joint ventures between coal and power companies. One example is the merger in 2017 between Shenhua, a coal mining company, and Guodian, a power generator, to create the giant, vertically integrated China Energy Investment Group, and the subsequent creation of a thermal-power joint venture between two of their subsidiaries. More recent is the move by the State-Owned Assets Supervision and Administration Commission to require the consolidation of state-owned generating assets in five provinces in northwest China. The result will be that each of the five centrally administered large generating companies will hold a dominant position in one of the five provincial markets. There have also been stories in the press for several months about a merger between two of the large state-owned power generating companies, Huadian and Datang. The ownership of renewable energy projects is also becoming more concentrated as the large state-owned generators buy up assets from financially weak companies that have not received their subsidies from the government.

Finally, the grid companies are able to use their strong market position to distort any emerging competition in distribution and retail. They have been demanding a controlling share of new distribution projects as a condition of providing access to the transmission infrastructure. Likewise, the grid companies have set up nominally independent power retailers that draw on staff and information from the parent company, thus unfairly undermining new entrants' competitiveness.

Outlook

Several elements of the wider governance environment have the potential to constrain the effective development of electricity and other energy markets in China. The first is the continued and recently enhanced authority of the Communist Party of China, which has resulted in a tightening of its grip over the government and society at large. Second, and linked to this, has been a strengthening of the role of the state in the economy, despite rhetoric to the contrary. Third, the legal system itself continues to be deployed as an instrument of the government and the party. As a result, no independent regulatory agency exists in any economic sector. Finally, despite the apparent authority of the political leadership, the governance system is highly fragmented due to the number of layers of government, ministries, and SOEs, all of which have their own interests and power bases. This results in significant deficiencies in policy coordination, especially at the implementation stage.

Likewise, a number of the long-standing features within the energy sector remain unchanged and are in direct conflict with the stated desire to introduce market forces. Of greatest importance is the leadership's preference to keep the major energy companies in state ownership in order that they can help government deliver non-commercial policy objectives. This preference is supplemented by central and local governments' practice of directly interfering in the operation of markets and by the growing market power of the largest energy SOEs.

The COVID-19 pandemic will almost certainly delay or slow down the implementation of power sector reform. Once this crisis is past, it is likely that the market power of the major energy SOEs will have grown even stronger, as smaller companies will be struggling financially. This will further undermine the effectiveness of the power market in enhancing technical and commercial efficiency. Whilst the large state-owned power generators and grid companies may well continue investing in new capacity, much of this may prove unnecessary and wasteful unless the economy recovers dramatically. Further, the recent reinforcement



of the need to maximize energy self-sufficiency combined with the focus on boosting employment is likely to favour fossil fuels, especially coal, at least in the short term. The marginal cost of renewable energy may be lower than that of thermal power, but the dispatch decision remains political.

DIRECTIONS FOR RENEWABLE ENERGY IN CHINA

Anders Hove

For many years, China has led the world in construction of new wind and solar facilities, yet China also continues to build new coal plants. The outlook for clean energy in China is muddled by several contradictions: national guidance versus local implementation, support for coal versus promotion of renewables, and emphasis on administrative planning while insisting markets should play a decisive role in allocating resources and setting prices. Based on policies and government guidance released so far in 2020, China is likely to focus on keeping annual installations for wind and solar stable, while attempting to tackle structural issues on a step-by-step basis. The ultimate result could still favour a clean energy transition driven by both markets and policy.

The trend leading into 2020

China continues to lead the world in additions of new wind and photovoltaic (PV) capacity, even though installations have slowed. In 2018, China added a combined 65 GW of wind and solar, and this declined to 56 GW in 2019 (26 GW of wind and 30 GW of solar PV).

The decline in installations has several explanations. First is the winding-down of renewable energy feed-in tariffs (FITs), due to the declining cost of wind and solar PV and growing deficits in the funds used to pay for the subsidies. In mid-2018, a sudden announcement halting further solar FITs for new projects led to a sharp drop in solar installations. In 2020, project approvals for any facilities that benefit from FITs are limited to the anticipated increase in surcharge funds, which rise in proportion to electricity demand growth.¹

Second, China continues to add coal-fired power capacity. Even though China's coal plants are operating at low utilization rates and most lose money, officials worry about the potential for power shortages, and see coal as essential for reliability. China's National Energy Administration (NEA) established a red-yellow-green provincial risk alert mechanism that marked most provinces as red for coal investment in 2016,² effectively halting most coal plant construction due to overcapacity and renewable curtailment, but each of the subsequent annual lists has green-lighted more provinces, and the latest map is mostly green.³

A third factor is the shift to new regions and technologies. Because onshore wind and utility-scale solar are more cost-competitive, policymakers have focused subsidies and supportive policies on distributed and rooftop solar and offshore wind. In 2019 distributed solar accounted for 30.6 per cent of new solar additions. Offshore wind grew by 37.8 per cent from the previous year.⁴

A focus on consumption

China's energy market is a hybrid of market and administrative planning. Under the 12th five-year plan, NEA set ambitious targets for wind and solar, supported by subsidized FITs, and the market often overshot these targets, which policymakers then revised upward. However, in the 13th five-year plan, NEA set 2020 targets for wind and solar that anticipated steadier growth, and declined to update the targets as the market outpaced them. Instead, NEA focused more on reducing curtailment, which

¹ *Opinions on Promoting the Healthy Development of Non-hydro Renewable Energy Power Generation*, Ministry of Finance, 3 February 2020, http://www.gov.cn/zhengce/zhengceku/2020-02/03/content_5474144.htm.

² *Notice on Establishing and Issuing Risk Early Warning Mechanism of Coal Power Planning and Construction in 2019*, National Energy Administration, 9 May 2016, <https://fgw.hebi.gov.cn/sfgw/638836/639672/639684/1446097/index.html>.

³ *Notice on 2023 Coal Planning and Construction Risk Warning*, National Energy Administration, 26 February 2020, http://www.nea.gov.cn/2020-02/26/c_138820419.htm.

⁴ *Photovoltaic Power Grid Operation Status 2019*, National Energy Administration, 28 February 2020, http://www.nea.gov.cn/2020-02/28/c_138827910.htm.



reached a high of 17 per cent for the full year of 2016, and as high as 40 per cent in some provinces, such as Gansu.⁵ A policy introduced in 2016 and re-emphasized in 2019 mandated full purchase of renewable energy, setting a minimum-operating-hours purchase rule for provinces,⁶ and requiring compensation for curtailment. The government in 2018 also introduced a target for provinces and grid companies to steadily reduce wind and solar curtailment, setting a goal of curtailment below 5 per cent in all provinces for both wind and solar by 2020.⁷ New market trading rules, such as generation rights trading between provinces and bidding of curtailed renewable energy into neighbouring provinces' power markets, also helped, as did new transmission lines. By 2019, annual wind curtailment had fallen to 4 per cent and solar curtailment to 2 per cent.⁸

China has also introduced green certificates and a renewable obligation to support renewable uptake, although their purpose and function differ dramatically from the markets that exist in the US and UK. In China, green certificate policies seek to reduce the government's subsidy payment obligation by transferring these payments to corporations or individuals, rather than creating a market for new renewable energy projects. For this reason, the green certificate market never took off. The renewable obligation also differs from similar mandates in the US and Europe as it specifies consumption targets for three years, making it an administrative planning quota, rather than setting long-term targets that help promote market-based investments. Indeed, the provincial obligation for 2020 was adjusted in June of this year to more closely reflect output.⁹

Lastly, spot electricity markets and ancillary services markets have become a top priority over the past two years, especially since the launch of seven spot-market pilots. Here, national authorities have released guidelines to allow provincial pilots to pursue various designs, with the aim of evolving gradually into a unified national market. In the medium term, the government sees spot markets and supporting market measures as critical for rationalizing power sector investment, driving down electricity costs and prices, and improving clean energy uptake. Most new wind and solar investments are funnelled either through competitive tenders for 'grid parity' project contracts – long-term contracts at the local coal grid tariff – or through competitive auctions for remaining FIT funds.

The COVID-19 pandemic could potentially further weigh on renewables. First, lower electricity demand growth means lower renewable energy surcharge revenue growth, which further reduces the space for renewable subsidies (which were already scaling off). The NEA set the 2020 subsidy for new PV plants at RMB 2.6 billion last November, but reduced it to RMB 1.5 billion in February.¹⁰

Second, even though lower electricity demand also means less demand for coal, to date it has not led to major changes or cancellations in coal plants resulting from lower output, nor has the NEA revised its risk alert levels for new coal plant approvals. But paradoxically, lower electricity demand may also mean that provinces further restrict new renewable additions, as provincial energy systems remain tied to inflexible coal power plants.

Support for stable growth of clean energy

Still, the current government work plan calls for 'stable growth' of renewable energy, and the policies released so far in 2020 all support this goal.

The draft Energy Law clearly states that renewable energy will have priority for development.¹¹ The draft mentions renewable energy in all its forms more often than any other fuel, and pays little attention to coal, in terms of either mentions or specific policy measures. (However, it does call for the development of advanced coal technology.) Many of the draft law's provisions relating to renewable energy represent codifications of policies – such as on the renewable obligation – that already existed in the form of individual policies set by ministries.

⁵ *Wind Power Grid Operation Status 2016*, National Energy Administration, 26 January 2017, http://www.gov.cn/xinwen/2017-01/29/content_5164027.htm.

⁶ *Management Measures for the Full Guaranteed Acquisition of Renewable Energy Generation*, National Development and Reform Commission, 28 March 2016, http://www.nea.gov.cn/2016-03/28/c_135230445.htm.

⁷ *Clean Energy Consumption Action Plan [2018–2020]*, National Energy Administration, 4 December 2018, https://www.ndrc.gov.cn/xxgk/zcfb/ghxwj/201812/t20181204_960958.html.

⁸ *Photovoltaic Power Grid Operation Status 2019 & Wind Power Grid Operation Status 2019*, National Energy Administration, 28 February 2020, http://www.nea.gov.cn/2020-02/28/c_138827910.htm.

⁹ *Renewable Energy Electricity Consumption Obligation in 2020 for Each Provincial Administrative Region*, National Energy Administration, 1 June 2020, https://www.ndrc.gov.cn/xxgk/zcfb/tz/202006/t20200601_1229674.html.

¹⁰ *Opinions on Promoting the Healthy Development of Non-hydro Renewable Energy Power Generation*, Ministry of Finance, 3 February 2020, http://www.gov.cn/zhengce/zhengceku/2020-02/03/content_5474144.htm.

¹¹ *Energy Law of the People's Republic of China [Draft for Comments]*, National Energy Administration, 10 April 2020, http://www.nea.gov.cn/2020-04/10/c_138963212.htm.



Other policies are aimed at increasing demand for clean energy from industry, emphasizing the promotion of various green industries, technologies, goods, and services¹² – with a focus on distributed energy, smart grid, energy storage technology, and multi-energy complementarity (the use of multiple sources of energy, energy storage, and flexible consumption to reduce the overall cost and increase the reliability of clean energy).

Renewable energy consumption as well as innovation were also emphasized in a draft guidance issued in May 2019.¹³ This guidance focuses on consumption rather than capacity building, stating that renewable energy developers should bear in mind local capacity to absorb renewable energy – although this is based on administrative planning. The guidance also vaguely mentions the need to coordinate renewable obligations and green certificates, and encourages participation of renewables in spot markets and ancillary services markets. Finally, it contains a list of innovative fields for policy promotion, including energy storage, multi-energy complementarity, and uptake of renewable electricity through port electrification, electric vehicle charging, hydrogen production, and heating and cooling.

Overall, the central theme of these measures is stable and sustainable growth in renewables, yet ‘priority development of renewable energy does not mean that there will be explosive growth.’¹⁴ As recently as 1 June 2020, a guidance from the National Development and Reform Commission stated that even if renewable quotas for 2020 are adjusted upward, ‘we shouldn’t blindly ratchet up expectations.’¹⁵ And while premier Li Keqiang’s speech at the National People’s Congress mentioned that carbon-free energy should supply the largest share of incremental energy production output, this was already the case in 2018–2019 for electricity.¹⁶

Obstacles to clean energy in China today

The unresolved question of whether coal or renewable energy has priority remains a key obstacle to clean energy in China. Coal is still perceived as a reliable, baseload fuel, and discussions of energy security in China generally fail to mention the role of renewable energy. Renewables are also portrayed as expensive even as academic studies show they are now competitive with coal in much of China.

This contradiction is also reflected in administrative planning at all levels. More provinces now have the green light for coal investment than for wind and solar. The limited flexibility of local power plants is unlikely to fully explain the relatively small space for renewables calculated by planners.

The slow adoption of spot markets also presents a challenge. Yet it remains unclear what market model China will adopt as the design of power markets is caught between central and provincial authorities—with central officials placing a higher priority on renewable energy and competition, while local officials often seek mechanisms such as capacity markets that might provide a safety net for local coal assets.

Preventing a collapse in the state-owned energy sector is also a goal, leading the government to consolidate coal plants under one power company to address losses and reduce overcapacity.¹⁷ But given the importance of coal in electricity production, consolidation under a single owner within each province could hurt the nascent provincial spot markets, although it could facilitate closure of unneeded coal capacity.

Conclusion

The 14th five-year plan is likely to anticipate stable growth for renewables, mention priority development of clean energy, and focus on pilot projects in innovative areas such as multi-energy complementarity and consumption of renewables in certain

¹² *Opinions on Accelerating the Green Production and Consumption Regulatory Policy System*, National Development and Reform Commission, 11 March 2020 https://www.ndrc.gov.cn/xxgk/zcfb/tz/202003/t20200317_1223470.html.

¹³ *Draft Guidance on Establishing a Sound, Long-Term Mechanism for Clean Energy Consumption*, National Energy Administration, 19 May 2019, <http://news.bjx.com.cn/html/20200519/1073753.shtml>.

¹⁴ ‘Li Junfeng discusses the draft Energy Law: renewables unlikely to see explosive growth’, https://mp.weixin.qq.com/s/M9FDAzd0FqKyA_crwldtMA.

¹⁵ *Renewable Energy Electricity Consumption Obligation in 2020 for Each Provincial Administrative Region*, National Energy Administration, 1 June 2020, https://www.ndrc.gov.cn/xxgk/zcfb/tz/202006/t20200601_1229674.html.

¹⁶ *Analysis and Forecast Report of National Electricity Supply and Demand Situation*, China Electricity Council, 21 January 2020, <http://www.cec.org.cn/guohuayutongji/gongxufenxi/dianligongxufenxi/2020-01-21/197090.html>.

¹⁷ *Pilot Scheme for Regional Integration of Coal and Power Resources in Central Enterprises*, State-Owned Assets Supervision and Administration Commission, 3 December 2019, <http://www.tanjiaoyi.com/article-29645-1.html>; *Pilot Scheme for Regional Integration of Coal and Power Resources in Central Enterprises*, State-Owned Assets Supervision and Administration Commission, 22 May 2020, <http://www.sxcoal.com/news/4610909/info>.

emerging industries. Development of new coal technology will almost certainly be mentioned, too. Given the present focus on energy security and economic stability, however, the plan may not include any revision of existing targets for non-fossil energy for 2030.

Two factors could change this situation. First, China's slow but steady development of electricity markets is likely to improve the market position of renewables over time, especially if prices for wind and solar tumble in 2020–2021. Given China's focus on renewable consumption, once industrial and commercial consumers begin to see clean energy as an economical alternative to grid power – especially if storage and electric vehicles also take off – demand for new wind, solar, and storage could exceed expectations.

Second, the improving market position of wind and solar in the rest of the developing world, and the decision to remove coal from the taxonomy of green bonds, could make state support for the country's coal sector seem even more disconnected from global market trends. We are already seeing economics-driven coal project cancellations in Africa and South Asia, as large solar and wind projects in these regions begin to take off. China's energy and infrastructure investors could well begin to shift their focus to these fields, which would in turn affect the domestic debate around coal.

CHINA'S CLIMATE COMMITMENTS AND ENERGY AMBITIONS BEYOND COVID-19

Sam Geall

After the UN climate talks in Paris in late 2015, there was little doubt that the People's Republic of China (PRC), the world's largest carbon dioxide emitter by volume, aimed to reposition itself as a global climate leader. But if China's commitment to ambitious climate policies was not entirely knocked off course by economic and geopolitical headwinds — particularly the election of US President Donald Trump and the ensuing trade tensions — it was certainly put under pressure.

Coal consumption began to tick upwards, even as it fell as a proportion of the energy mix, and China's commitment to climate policies at the UN became equivocal. COVID-19 injected a further element of uncertainty, which might cut both ways. On the one hand, it has increased international tensions, which could spur further retrenchment and a focus on energy security, boosting coal-fired power. On the other hand, it may lead to renewed calls from inside China for a deeper environmental commitment, with Beijing taking the opportunity to lead in the technologies of the future.

The pandemic came at a moment of flux. China's economic, energy, and climate goals in the 14th five year plan (FYP), covering 2021–2025, are currently being debated among policymakers and are scheduled to be unveiled in March 2021. There has also been a bureaucratic reshuffle. The 13th FYP period (2016–2020) saw the creation of two new super-ministries, with climate-change responsibilities moved out of the top economic planning agency, the National Development and Reform Commission, to the Ministry of Ecology and Environment (MEE). The MEE is under new, dual leadership: Minister Huang Runqiu is a well-regarded official who is not a member of the Chinese Communist Party (CCP), and Sun Jinlong is the new CCP secretary.

It appears that two approaches to a recovery, higher- and lower-carbon ('brown' and 'green') in emphasis, are being debated in elite circles, suggesting a renewed fragmentation and uncertainty regarding China's post-virus reconstruction. This article considers to what extent China might prioritize environmental and climate goals in its recovery, and what this implies for the country's energy transition and its participation in global climate and environmental cooperation.

Green hopes for 2020

In late 2015, China committed under the UN Paris Agreement to peak its greenhouse-gas emissions by 2030 or sooner, to cut carbon intensity (emissions per unit of GDP) by 60 to 65 per cent of 2005 levels by 2030, and to increase the share of non-fossil fuels in its primary energy mix to 20 per cent by the same date. Its domestic commitments were consistent with or exceeded these pledges.

In the 13th FYP (2016–2020), China set a goal of 15 per cent non-fossil-based energy in the country's primary energy mix by 2020, and set a cap on total energy consumption at 5 billion tonnes of standard coal equivalent by 2020, a 16.3 per cent increase in consumption from 2015 levels. This implied a reduction in the proportion of coal in the energy mix to below 58 per cent.

In the decade before signing the Paris Agreement, China's coal industry was already shedding jobs due to automation.



Traditionally coal-dependent provinces, such as Shanxi and Inner Mongolia, have seen continued job losses due to air pollution regulations and an increasing share of renewables. Even after Trump's retreat from the global agreement on climate, CCP General Secretary Xi Jinping announced, in a 2017 speech to the CCP, that China was 'in the driver's seat' on climate cooperation. Xi made 'ecological civilization' and other green buzzwords a signature element of his rhetoric.

Yet ambitious climate policies had other dimensions, beyond environmental or altruistic motives. They clearly aligned with some of China's key political and economic ambitions, including the following:

- to restructure the domestic economy away from energy-intensive, polluting industries and towards innovation and services, as the leadership aimed to realize a 'new normal' of slower, higher-quality growth;
- to move up the value chain through state-led industrial policies, such as Made in China 2025, and position China as the leading supplier of low-carbon technology to the rest of the world;
- to increase energy security through diversification, exposing China to less of the geopolitical entanglements and price volatility associated with fossil-fuel imports;
- to reduce choking smog (seen in China's landmark Air Pollution Prevention and Control Action Plan in 2013, for example), in large part to maintain domestic CCP legitimacy, given rising public concerns about the health effects of air pollution;
- to increase China's standing in the international arena, by taking a lead in global environmental governance, as seen in China's decision to host the 15th Conference of the Parties (COP15) of the UN biodiversity talks (the Convention on Biological Diversity or CBD), postponed to 2021.

Globally, CBD COP15 in Kunming was expected to be one of the most important elements of the 2020 'super year for the environment', characterized by synergies across and between environmental negotiations – including the UN-led climate talks in the UK and the EU–China summit in Leipzig, Germany – with the prospect of renewed international cooperation enabling greater global environmental ambition.

The UN climate talks are at a critical juncture: the Intergovernmental Panel on Climate Change has warned that keeping the world's average temperature rise to 1.5°C 'can only be achieved if global carbon dioxide emissions start to decline well before 2030'. Reaching that crucial goal requires parties to the treaty to make significant increases in their commitment to reducing greenhouse gases – part of the crucial 'stocktake' process of ratcheting up national targets.

The impact of COVID-19

Given the US planned withdrawal from the talks, China is central to the future of not only the United Nations Framework Convention on Climate Change (UNFCCC) but also the outcome of the climate crisis itself. Yet it barely needs saying that 2020 has not turned out as planned, and the impacts of the COVID-19 crisis have been grave and myriad. These effects already include delays and cancellations of international environmental negotiations and government meetings in 2020, including the postponement of UNFCCC COP26, the Leipzig EU–China Summit, and CBD COP15.

It has also meant delays for domestic policymaking, including the opening of the annual legislative meetings in 2020, the submission of emissions pledges to the UN climate talks stocktake (known as nationally determined contributions, which are now not expected until the end of the year, after the US presidential election), and the hoped-for synergies between international meetings and engagements during the 'super year' (bilateral meetings have been delayed until after the "Twin Sessions" legislative meetings, which convened in late May 2020, instead of early March 2020).

Furthermore, the fallout from COVID-19 has created greater international tensions and the further deterioration of the US–China relationship (seen prominently in spats over the origin of the coronavirus and calls for an international inquiry), once a linchpin of climate cooperation, making protectionist and nationalist approaches to energy and the environment all the more likely.

Finally, there have been profound negative impacts on supply and demand in the global economy, and rising fears of a recession or depression – leading in some places, including the United States, to a further downgrade of climate change on the political agenda and calls for environmental regulation to be reduced. The federal bailout of industries affected by the pandemic in the United States, for example, looks to include billions of dollars of concessions to oil, gas, and coal companies — including US\$3.9 billion from the Paycheck Protection Program and \$1.9 billion in tax credits in the CARES Act passed by Congress.



Before COVID-19, there were signals in China that environmental concerns were in danger of slipping further down the political agenda. Some local governments pushed to expand coal power generation (just as others supported the transition away from coal), typically to ensure continued employment, short-term financial stability, and tax revenues. In the background loomed a number of growing stresses: the US–China trade war, ongoing protests in Hong Kong, distrust of China’s practices and motives around the Belt and Road Initiative, and the pressure to meet highly symbolic poverty-alleviation targets: to eradicate poverty by 2021, the centenary of the CCP’s founding, and to become a ‘moderately prosperous’ country by 2049, the centenary of the PRC’s founding.

With the shock to the system posed by COVID-19 came a significant reduction in energy use, emissions, and pollution, but also bigger questions over what form the recovery might take and how it would impact energy and the environment. As the country continues to address a potential resurgence of infections and delays to policymaking, the shape of the post-pandemic stimulus, let alone an economic recovery, is still an open question. The most important questions for China’s energy transition, climate, and environmental policy outlook, therefore, are being debated now in elite circles, in the context of the stimulus and recovery plans the government is formulating.

Signals for the recovery

To understand what type of recovery is being targeted, we need to look for signals not only to President Xi and the CCP’s rhetorical commitments to the environment, but also to the futures targeted under the next FYP, stimulus packages, and other policy measures related to the post-virus recovery. Politburo statements have set out conceptual frameworks for this recovery, such as the ‘six ensures’: to ensure employment, basic livelihood, market entities, food and energy security, stability of the supply chain, and the ‘functioning of grassroots institutions’.

But the moment is very different from the 2008 crisis, when China unveiled a huge central stimulus package that included its largest ever set of green measures (alongside high-carbon infrastructure investment). Chinese economists are divided about the risks of a post-virus recession in China; some caution against a large expansion in liquidity and warn that unrealistic targets could lead to ill-considered stimulus projects.

The 2020 Twin Sessions legislative meetings reflected this cautious stance. Premier Li Keqiang’s flagship Report on the Work of the Government¹⁸ did not set a GDP growth target for 2020, the first such omission since 2002. A fiscal stimulus package was passed, but at 6.35 trillion yuan (US\$895 billion) it was far smaller than expected. In his press conference, Premier Li emphasized that spurring consumption, rather than infrastructure investment, was the priority for the government’s recovery plan.

When it comes to coal, however, the signals are not so cautious. In February, the National Energy Administration lowered the risk ratings for coal-power overcapacity in many parts of the country for the third year running, opening the door for more regions to build coal power in 2021–2023. In theory, these risk ratings are used by central government to cool the expansion of coal-fired power, since approval powers have been devolved to the local level. It might be expected, too, that the risks are high: coal companies are losing money and utilization rates are low. A 2018–2019 report from the China Electricity Council found almost 50 per cent of Chinese thermal power generators lost money over the year.

However, the government’s low risk rating – perhaps reflecting political concerns about unemployment or a future supply crunch – gave a green light to new coal: Global Energy Monitor reported that in just the first 18 days of March, China approved the construction of 7.96 GW of coal power – more than the 6.31 GW approved over the whole of 2019. In March, a [Carbon Tracker analysis](#)¹⁹ found that China has 99.7 GW of coal power capacity under construction, and 106.2 GW more in the planning pipeline – accounting for 40 per cent of global capacity under construction or in planning.

On the other side of the energy ledger, Carbon Tracker found that 70 per cent of the country’s operating coal plants cost more to run than the cost of building new onshore wind or utility-scale solar photovoltaic. The new draft Energy Law, released on April 10, stipulates that ‘energy exploration and development should be consistent with ecological civilization’, but indications are that renewable-energy targets under China’s 14th FYP will not rise above the 2030 target set in Paris. The direction of renewable energy policy has been towards the removal of subsidies in order to cool the market and prevent curtailment, where renewable power capacity outstrips the demands or even reach of the grid. Whether this might change is yet to be seen.

¹⁸ <http://english.www.gov.cn/2020special/govtworkreport2020>

¹⁹ “How to waste over half a trillion dollars: The economic implications of deflationary renewable energy for coal power investments”, Carbon Tracker, 12 March 2020, <https://carbontracker.org/reports/how-to-waste-over-half-a-trillion-dollars/>

While there are indications that the 14th FYP could include a carbon emissions cap for the first time, there have also been proposals for a yet looser cap on coal-fired capacity – specifically, to expand it by 200 GW to 2030, and to 1,300 GW in total. At the same time, there are clear signals that ‘new-infrastructure’ – a catch-all term that includes 5G, ultra-high-voltage grid transmission, intercity rail, electric vehicle charging stations, big data centres, artificial intelligence, and more – will form a part of any such spending.

Conclusion

Any ‘new-infrastructure’ plan will need to be energy efficient and run on renewable power in order to be green and low carbon. But it is a signal that elite actors in China are considering investment in innovation, including electric vehicles and energy technologies, rather than merely bailing out incumbent industries. The MEE, under new leadership, has an opportunity to burnish its environmental credentials, and a resilient recovery that emphasizes nature, climate, and health is an appealing message for China to advance on the world stage.

There is a significant opportunity to advance such an agenda in the run-up to COP26 in Glasgow, postponed to late 2021. On the road to Glasgow, there are a number of meetings at which China, by signalling its interest in raising climate commitments, could help to spur further coordination to promote a resilient recovery. These include the postponed EU–China summit, which should reflect Europe’s comprehensive effort to mainstream a 2050 carbon neutrality target in budgets, plans, and industrial strategies across the bloc; the G20, hosted by Italy, a COP26 co-host; and CBD COP15.

The ‘super year’ for the environment may have been postponed, but the climate crisis can’t be, and a resumption of environmental negotiations in 2021 will see higher awareness than before of the centrality of biodiversity and wildlife protection in the preservation of public health and prevention of zoonotic disease transmission. China can take this opportunity not only to showcase new legislative and enforcement action against wildlife consumption and trade – seen also in the Twin Sessions in 2020 – but also to demonstrate particular synergies with the COP26 climate talks, since climate change is one of the largest identified drivers of biodiversity loss, particularly around the theme of ‘nature-based solutions’, which China chairs under the UNFCCC.

However, the uncertainties are many, not least associated with the sharpening geopolitics of COVID-19 and the results of the US elections in 2020. The opportunity exists for a renewed commitment to industrial and energy transformation – much as the Green Deal is being mainstreamed into economic recovery and energy planning in Europe – and signals that ‘new-infrastructure’ will form a pillar of that recovery suggest some commitment to that pathway. Government-connected figures are arguing, in private at least, against any further expansion in coal-fired power capacity under the 14th FYP. If coal continues to receive a boost this year, it will call into question China’s claim to the ‘driver’s seat’ on climate.

TRANSFORMING CHINA’S COAL CITIES

Yingxia Yang

Coal mining regions in various parts of the world face a huge economic predicament as the world transitions to clean energy alternatives such as renewables and natural gas. In the US, employment in the coal mining industry has dropped by more than 40 per cent since 2012.²⁰ At least 11 coal mining companies have filed for bankruptcy since 2017, including the ones among the top 10 producers in the US in 2018.²¹ In Germany, the government plans to phase out all coal power plants by 2038 and has set aside €40 billion to help coal states transition to new industries.²² While China continues to build new coal-fired power plants, its coal mining regions have had to adapt to decreased coal consumption due to slowed economic growth since 2013 as well as government measures to deal with severe air pollution, despite the bounce-back in coal consumption in the last couple of years.

This article focuses on a small coal city called Wuhai in China and reviews its efforts to decouple its economy from coal.

²⁰ U.S. Bureau of Labor Statistics, ‘All employees, coal mining [CES1021210001]’, *Federal Reserve Bank of St. Louis*, 23 May 2020, <https://fred.stlouisfed.org/series/CES1021210001>.

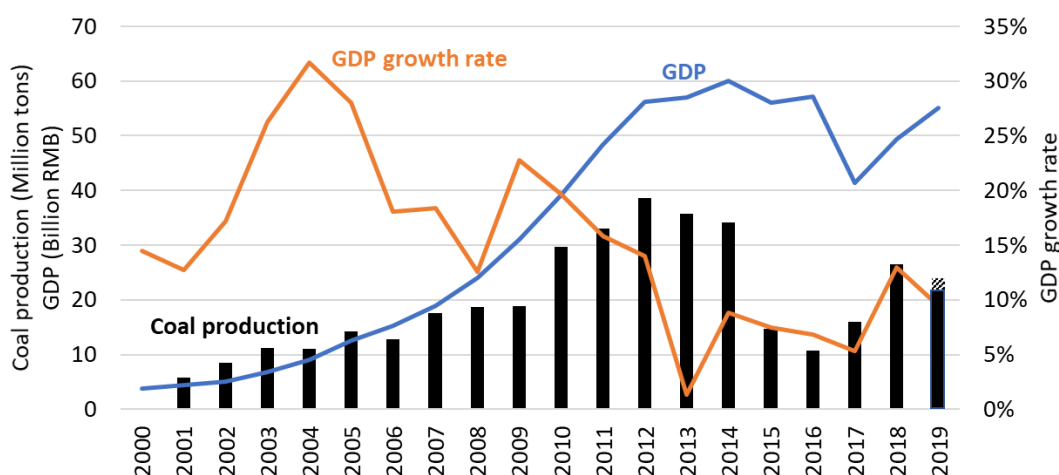
²¹ Danial Moritz-Rabson, ‘Eleven coal companies have filed for bankruptcy since Trump took office’, *Newsweek*, 30 October 2019, <https://www.newsweek.com/eight-coal-companies-have-filed-bankruptcy-since-trump-took-office-1468734>.

²² Cecilia Jamasmie, ‘Germany’s plan to exit coal by 2038 made law’, *S&P Global*, 3 July 2020, <https://www.mining.com/germanys-plan-to-exit-coal-by-2038-becomes-law/>.

Economic ups and downs in Wuhai

The city of Wuhai is located in Inner Mongolia, the largest coal-producing province in China, which provided 28 per cent of China's coal in 2019.²³ First started in 1958 by the central government as a coal supplier to a state-owned steel maker, the region was officially designated a city in 1976.²⁴ Wuhai's economy has been largely dependent on coal production, with its first two decades of development made possible by mining coal and exporting it to other regions. Even though Wuhai only provided around 7 per cent of the coal in Inner Mongolia in the early 2000s, the fate of the city's economy has mirrored that of China's energy demand growth: starting at that time, its economic development accelerated, driven by a rapid increase in the demand for coal to power China's economic growth. In 2000–2012, the city's GDP grew at double-digit rates. Coal production over the same period increased from around 5 million tons to almost 40 million tons. However, economic activity between 2013 and 2017 slumped as coal production plummeted. In 2015 and 2016, coal production dropped to 10–15 million tons, before bouncing back in 2018 and 2019 with increased GDP.

Wuhai's coal production and GDP, 2000–2019



Sources: GDP and GDP growth rate: China Data Online and Wuhai Economic and Social Development Statistical Reports; coal production in 2001–2018: Inner Mongolia Statistical Bureau and Inner Mongolia Statistical Yearbook 2002–2019; coal production in 2019: Wuhai Industrial Economy Operation Status in January–November 2019 and Inner Mongolia Statistical Bureau.

Note: The striped part of the bar for 2019 represents coal production in December 2019, which was estimated based on the ratio of coal production in December to total annual production in Inner Mongolia.

While the data above suggests that Wuhai's economic ups and downs have been largely driven by coal production, the city's economy has also changed over the years and diversified into non-coal industries. Non-coal industry now accounts for about 70 per cent of the total industrial output value, with more than 50 types of industrial products.²⁵ Coal mining jobs as a proportion of total employment in the secondary and tertiary industries dropped from 24 per cent in 2013 to 12 per cent in 2018,²⁶ while the share of tertiary industry increased over the years. The average share of tertiary industry in Wuhai's economic structure in 2013–2019 was close to 40 per cent, up from around 30 per cent in 2001–2004, in large part due to strong growth in the tourism industry.

The remainder of the article discusses Wuhai's past and current efforts at economic transformation, lessons learned from these efforts, and future directions as China contemplates its 14th five-year plan.

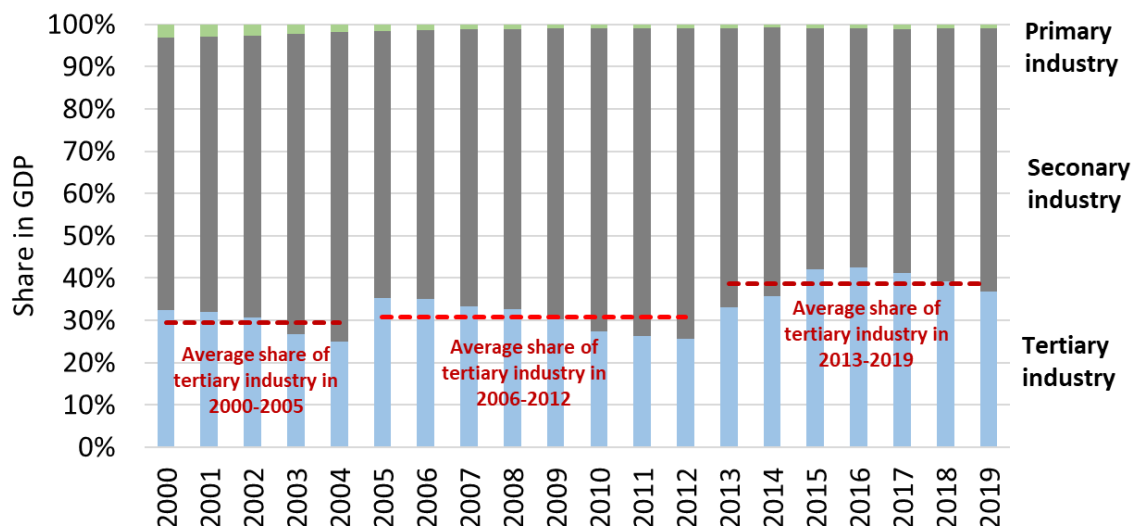
²³ China Report Network, 'In 2019, coal industry output showed an overall growth trend, but the current import volume is still higher than the export', 3 March 2020, <http://free.chinabaogao.com/nengyuan/202003/0334Q6462020.html>.

²⁴ Wuhai City Government, 'Overview of Wuhai', <http://www.wuhai.gov.cn/wuhai/mlwh/whgk/548453/index.html>.

²⁵ Inner Mongolia Daily, 'Magnificent 70 years: a new era of striving to build the beautiful landscape of the northern border of the motherland – Wuhai City', 3 September 2019, http://szb.northnews.cn/nmgrb/html/2019-09/03/node_17415.htm.

²⁶ Wuhai Statistics Bureau, *The National Economic Census Reports of Wuhai City in 2013 and 2018*, <http://www.wuhai.gov.cn/tjj/682822/zfxgk9/fdzdgknr55/tjxx39/tjgb20/702de8da-1.html> and <http://www.wuhai.gov.cn/tjj/682822/zfxgk9/fdzdgknr55/tjxx39/tjgb20/872014/index.html>.

Wuhai's economic structure, 2000–2019



Source: China Data Online.

Economic transformation in Wuhai

First transformation: introducing heavy chemical industry

Wuhai's first attempt to diversify from coal mining happened in 1998. At the time, state-owned coal companies nationwide suffered severe profit losses due to inefficient operations, in part as they were overburdened with societal responsibilities under the planned economy. The government laid off employees to improve operational efficiency as it privatized state-owned companies. Triggered by the 1997 Asian financial crisis, state-owned enterprises laid off about 6 million employees in 1998 alone and a total of 13 million in 1998–2003.²⁷

Coal mining companies in Wuhai faced a similar issue. In addition, Wuhai had limited railroad transportation to export its coal to other regions, hindering economic growth. To reduce its reliance on coal exports, Wuhai started to promote the development of a heavy chemical industry and other energy-intensive industries using its cheap coal, electricity, and other mineral resources. This also helped Wuhai to address the issue of limited railroad transportation by consuming coal and electricity locally. Pollution was an issue, but the priority then was to keep the economy going and help people survive. There was little pressure to address climate change domestically and internationally at the time.

With economic incentives from the city government – such as low electricity prices, tax rebates, and the development of industrial parks to provide the infrastructure needed by new manufacturing plants – Wuhai's heavy chemical industry took off. Over the past two decades, Wuhai has built four industrial parks that host about 400 companies across many industries, dominated by the coking, chlor-alkali, and fine chemical industries. Today 90 per cent of Wuhai's coal is consumed locally, compared to 20 per cent in the early 1970s.²⁸

Second transformation: launching a coal chemical industry

After the Asian financial crisis, and following China's accession to the World Trade Organization in 2001, China's economy began to recover and accelerate. With strong demand for coal for electricity, cement, and steel making, Wuhai soon entered a golden period of rapid economic development. The surge in China's economy also drove up demand, imports, and prices for oil

²⁷ Ross Garnaut, Ligang Song, and Cai Fang, 'State-owned enterprise reform in China: past, present and prospects', in *China's 40 Years of Reform and Development: 1978–2018*, https://www.jstor.org/stable/j.ctv5cgbnk.27?seq=1#metadata_info_tab_contents; University of Minnesota Human Rights Library, 'Ministry of Labor and Social Security,' <http://hrlibrary.umn.edu/research/CHmolss.html>.

²⁸ Inner Mongolia Daily, 'Magnificent 70 years: a new era of striving to build the beautiful landscape of the northern border of the motherland – Wuhai City', 3 September 2019, http://szb.northnews.cn/nmgrb/html/2019-09/03/node_17415.htm.



and natural gas. When international oil prices skyrocketed to US\$160 per barrel during the 2008 economic crisis, out of concern for energy supply security, China determined to develop industries that use coal, rather than oil and natural gas, as the feedstock for petrochemical products.

About the same time, Wuhai began to develop the coke chemical industry, which uses the waste products of the coking process, such as coal tar and coke oven gas, to make chemical products such as carbon materials and liquified natural gas.²⁹ This circular industrial process enhances the economic value of the coking industry and the downstream chemical industries and helps to reduce the pollution associated with releasing coal tar and coal gas from the coking process.

Today, Wuhai has emerged as an important coke chemical industry base with deep processing capacity of 900,000 tons of coal tar each year, around 35 per cent of the national capacity in 2018.³⁰ Wuhai has the world's largest project for comprehensive utilization of coke oven gas, including two plants to convert coke oven gas to liquefied natural gas (LNG) at 500,000 tons per year, and a pipeline that collects the coke oven gas from coking companies and transmits it to other regions for use as industrial feedstock.³¹

Third transformation: upgrading to strategic emerging industries

In 2013, as China's economic growth slowed and air pollution concerns prompted the government to shut down inefficient coal-fired boilers, coal demand decreased. In Wuhai, many businesses suffered and laid off employees.

Accompanying the economic recession was environmental devastation. Soil erosion made some houses too dangerous to inhabit, and water and air quality had deteriorated due to industrial waste and pollutant emissions from energy-intensive industries. Meanwhile, Wuhai was designated as a 'resource depletion' city in 2011 by the central government after more than two decades of relentless mining.

Recognizing the severe environmental cost paid for its economic development, Wuhai is working and investing to remedy the damage and reduce future damage. To address air pollution, the Wuhai government required higher efficiency and environmental standards for new industrial processes and shut down inefficient and highly polluting small plants in energy-intensive industries and coal production.³² To fix the damage to the land and mountains, Wuhai invested in replanting former coal mine sites. In 2018, Wuhai started to work with the United Nations on a pilot project to explore ways to develop a green and sustainable mining industry.³³ By 2020, Wuhai had finished seven coal mine greening projects.³⁴ After the process of shaping, soil covering, solidification, and planting, the abandoned mining land can be used for agriculture, tourism, and other applications.³⁵

Wuhai is also gearing itself for high-tech, clean energy, and other emerging industries. In recent years, it has attracted investments in the advanced materials industry, such as manufacturing materials used in lithium batteries by using the coal tar from its coke chemical industry. With its capacity for converting coke-oven gas to LNG, Wuhai sought to extend to the downstream by assembling LNG-fuelled trucks, which have gained traction in the Chinese market in recent years. Wuhai also has an advantage in developing the hydrogen industry, as the manufacture of chlor-alkali products also produces hydrogen as a by-product with higher purity than other hydrogen production processes. These new industries build on Wuhai's existing

²⁹ P5W, 'Black cat stock: Wuhai Black Cat 300,000 tons of coal tar deep processing project was completed and put into production', 6 December 2010, <http://www.p5w.net/stock/ssgsyj/sme/201012/t3334430.htm>; Inner Mongolia News Network, 'The world's largest coke oven gas to liquefied natural gas project successfully put into operation in Wuhai', 8 January 2014, <http://inews.nmgnews.com.cn/system/2014/01/08/011390008.shtml>.

³⁰ Inner Mongolia Daily, 'Magnificent 70 years: a new era of striving to build the beautiful landscape of the northern border of the motherland – Wuhai City', 3 September 2019, http://szb.northnews.cn/nmgrb/html/2019-09/03/node_17415.htm; 'The throes of change: a review of the domestic coal tar deep processing industry', 10 October 2018, https://www.sohu.com/a/259047118_117959.

³¹ Zeliu and Ming Li, 'Wuhai City's coke oven gas turns waste into treasure,' *Ifeng News*, 16 October 2012, http://news.ifeng.com/gundong/detail_2012_10/16/18285154_0.shtml.

³² Inner Mongolia News Network, 'Economic transformation of Wuhai City: from black development to green development', 10 September 2012, <http://inews.nmgnews.com.cn/system/2012/09/10/010832192.shtml>.

³³ United Nations Development Programme, 'Facilitating economic transformation and sustainable development in Wuhai City,' 27 September 2018, <https://www.cn.undp.org/content/china/en/home/presscenter/articles/2018/facilitating-economic-transformation-and-sustainable-development.html>.

³⁴ Wuhai City Government, *Wuhai City Government Report in 2020*, 1 April 2020, <http://www.wuhai.gov.cn/wuhai/zwqk/jbxxqk/qzbg/804200/index.html>.

³⁵ Wuhai Ecosystem and Environment Bureau, *Wuhai Building Green Mines and Realizing Green Development – Summary of the Comprehensive Promotion of Green Mine Construction in Wuhai City*, 8 August 2019, <https://m.huanbao-world.com/view.php?aid=109257>.



industries, which give Wuhai a competitive advantage when upgrading or extending to strategic emerging industries.

Fourth transformation: developing the tourism industry

In recent years, to further diversify its economy, Wuhai has invested heavily in its tourism industry. As part of the Haibo Bay water conservancy project completed in 2014, Wuhai now has an artificial lake that has improved the climate and ecosystem and completely changed its natural landscape. The deserts have become the site of desert races and sand games. Thanks to supportive government policies, Wuhai's wine industry, which once had almost no economic value, now employs more than 10,000 people, and four companies produce multiple wine brands sold in China and other countries.³⁶ Vineyards are open to visitors, like in the Napa Valley of California, bringing additional tourism revenue. To boost its international reputation and attract foreign visitors, Wuhai hosted the World Sailing Race and World Desert Grape Wind Festival in 2019.

In 2018, Wuhai received visits from 3.5 million people, and tourism revenue reached RMB 7.6 billion (about US\$1.1 billion), a 17.5 per cent growth from 2017.³⁷

The road ahead

Wuhai is a microcosm of China's efforts to develop its coal mining regions over the past two decades. Other cities in Inner Mongolia, and in other coal-producing provinces such as Shanxi, are embarking on similar efforts to reduce their reliance on coal by improving the coal industry for cleaner and more efficient consumption, upgrading to strategic emerging industries, and developing their tertiary industries.³⁸

These efforts are important steps in the right direction. In the 14th five-year plan, China should continue guiding and encouraging coal regions to pursue these efforts, as they will help these regions address both near-term and long-term challenges. In the near term, coal will remain central to China's energy supply due to challenges with integrating renewables, the lack of oil and gas resources, and concerns about energy security, which may be elevated with the US–China trade war and the deglobalization trend sparked by the coronavirus. The efforts to move to a more efficient and environmentally friendly development model will help the coal regions to produce and use coal in a way that reduces its environmental damages. Over the long term, coal consumption is expected to decrease significantly with deeper penetration of clean energy alternatives. Continuing efforts to develop other industries will help the coal regions to decouple their economies from coal, avoid sudden economic depression with reduced coal demand, and build the bridge to a vibrant economy not reliant on coal in the long term.

Wuhai needs to increase its efforts to diversify its economy, which still relies heavily on coal, as indicated by the correlation between coal production and GDP growth. There will be challenges on this path. New industries may face high barriers to entry, such as the lack of highly skilled workers, capital resources, or an ecosystem with upstream and downstream suppliers. The coal chemical industry also faces issues related to carbon emissions and water consumption that need to be addressed through further technology advancement, and economic viability is challenging in an era of low oil and natural gas prices. Imposing higher environmental standards will impact its economic competitiveness negatively. When encountering these difficulties, there is always the temptation to return to reliance on coal or highly polluting industries to maintain economic growth, as witnessed with the revival of coal production in the last couple of years.

Despite these challenges, China should not stop or slow its efforts to diversify and green the economy. Existing damage to the environment and natural resources may require a long time and substantial cost to repair. In some cases, the damage, such as the adverse impacts on public health caused by air pollution, is irreversible. These are the lessons coal regions learned during the past two decades, and they should not be repeated.

Conclusion

Over the past two decades, as a city founded on coal, Wuhai experienced significant economic growth as well as economic recession due to the ups and downs of coal demand. Through its economic transformation policies, Wuhai has managed to reduce the share of coal in its economy. While efforts to transition to a heavy chemical industry led to severe deterioration in air, water, and soil quality, the subsequent shift to a coal chemicals industry proved more successful, especially as this coincided

³⁶ Inner Mongolia Daily, 'Magnificent 70 years: a new era of striving to build the beautiful landscape of the northern border of the motherland – Wuhai City', 3 September 2019, http://szb.northnews.cn/nmgrb/html/2019-09/03/node_17415.htm.

³⁷ Wuhai City Government, *Wuhai City Government 2019 Report*, 25 February 2019, http://www.nmg.gov.cn/art/2019/3/7/art_4225_254843.html.

³⁸ For an example, see Xinhua Net, 'From coal boss to the frontier of the energy revolution – Shanxi opens a new chapter in transformation and development', 3 September 2019, http://www.xinhuanet.com/2019-09/03/c_1124956298.htm.

with the government's broader focus on the chemicals industry as a way of promoting energy self-sufficiency. Indeed, even if a low oil and gas price cycle is challenging for the coal chemicals industry, its contribution to energy security and employment may well offset these economic concerns, leading to ongoing policy support for the sector.

Finally, Wuhai has made considerable efforts to green its coal industry and use it as a basis for developing emerging industries, capitalizing on its chlor-alkali chemical industry to develop hydrogen. While other coal cities may not be able to replicate this strategy, they will seek to develop other emerging industries after strategically assessing their competitive advantages. Fundamentally, however, Wuhai's experience shows that coal-rich provinces will seek, to the extent possible, to adapt their coal industry rather than dismantle it.

SUPPLY SECURITY CONCERNS ARE SUPPORTING THE LIBERALIZATION OF CHINA'S OIL AND NATURAL GAS INDUSTRY

Erica Downs

Heightened anxiety about the security of China's oil and natural gas imports is driving the implementation of reforms aimed at encouraging more companies to invest in exploration and production in China. China's oil and natural gas industry has long been dominated by a trio of national oil companies (NOCs) – the China National Petroleum Corporation (CNPC), China National Offshore Oil Corporation (CNOOC), and China Petroleum & Chemical Corporation (Sinopec) – which rank among the 50 'core' state-owned-enterprises deemed critical to China's economic and national security. While Beijing intends for its three major NOCs to remain China's leading producers of oil and natural gas, it also wants to create more space for other companies, including foreign firms, to help boost the country's output, especially of unconventional gas. In short, increasing insecurity about China's reliance on foreign sources of oil and natural gas is spurring Beijing to seek the help of foreign investors in developing China's resources.

Back to the future?

Unease in Beijing about supply security is arguably at its highest level since the mid-2000s. At that time, China's increasing oil demand and the efforts of its NOCs to help satisfy it through the acquisition of exploration and production assets abroad contributed to growing anxiety about oil scarcity and rising resource nationalism around the world. In the United States, concerns about China's growing demand putting upward pressure on prices, fears that its NOCs were seeking to 'lock up' oil through overseas investments and somehow shrink the pool of oil available to other consumers, and the hostile reaction of the US Congress to CNOOC's attempted acquisition of Unocal in 2005 contributed to a heightened sense of oil insecurity in Beijing. Officials and analysts worried about the political risks China's NOCs faced in their attempts to acquire overseas assets. They also worried that other countries, notably the United States, might disrupt China's oil imports, the majority of which were (and still are) seaborne and pass through the Strait of Hormuz and the Strait of Malacca, the world's two largest oil chokepoints.

China's supply security concerns appeared to have eased in the first half of the 2010s. As the US shale revolution moved the world from oil scarcity to oil surplus, anxieties about competition for oil faded. Meanwhile, China's NOCs took advantage of the oil price collapse and tightened credit markets resulting from the global financial crisis of 2008 to emerge as some of the world's biggest buyers of exploration and production assets. In addition, oil and gas pipelines stretching from Central Asia, Myanmar, and Russia to China went into operation, which helped to diversify China's oil import routes away from the Straits of Hormuz and Malacca.

The most important of these routes is Russia's East Siberia Pacific Ocean pipeline and its spur to China, which together have the capacity to deliver as much as 1.6 million barrels per day (bpd) to China by land and by sea. (ESPO 1, which runs from Taishet to Skovorodino, has a capacity of 1.6 million bpd. The ESPO spur to China, which runs from Skovorodino to Mohe on the Chinese border, has a capacity of 0.6 million bpd, and ESPO 2, which runs from Skovorodino to the port of Kozmino, has a capacity of 1 million bpd.) Russia also ships around 200,000 bpd to China via the Kazakhstan–China oil pipeline.

Concerns about oil and natural gas supply security elevated on the eve of the 14th five-year plan (FYP) period (2021–2025). Arguably the clearest indication of the unease in Beijing was the directive issued by President Xi Jinping to China's NOCs in July 2018 to increase domestic oil and natural gas exploration and production to enhance national energy security. The companies responded by increasing their capital expenditure budgets for 2019 to the highest levels in five years. They also formulated their first-ever seven-year plans to intensify domestic exploration and production.



Meanwhile, the release of an updated draft energy law in April 2020 also revealed that Chinese officials were paying more attention to supply security. The new version uses the term 'security' 64 times, while the previous (2007) version only used it 30 times (thanks are due to Kevin Tu for this observation).

Sources of increased supply insecurity

The elevation of supply security concerns in Beijing is due to three factors: increasing import dependence, the decline in domestic oil production in 2016–2018, and the deteriorating US–China relationship.

Increasing import dependence

Growing reliance on imports continues to be a concern for China, the world's largest oil and natural gas importer. The country, which became a net oil importer in 1993, relied on imports for 71 percent of its consumption in 2019. In that year, 85 percent of China's oil imports of 10.2 million bpd travelled long distances by sea. Russia, China's second largest oil supplier after Saudi Arabia in 2019, supplied virtually all of the remainder. Meanwhile, China, which began importing natural gas in 2006, relied on imports for 43 per cent of its consumption in 2019. In that year, 61 per cent of China's imports were LNG and 39 per cent were pipeline gas. China's largest LNG supplier was Australia, and its largest pipeline gas supplier was Turkmenistan.

Declining oil production

The drop in China's oil production from 2016 to 2018 also heightened concerns about supply security. In early 2016, CNPC and Sinopec announced plans to close oilfields that were not profitable to operate with crude trading below the average production cost in China of \$40–\$50 per barrel. These production cuts were the first-ever deliberate reduction of oil output in China, and they accelerated a decline in production that was already underway due to the maturity of China's major oilfields. The country's oil output fell from a peak of 4.3 million bpd in 2015 to 3.8 million bpd in 2018, making it seem unlikely that China would be able to meet its 13th FYP (2016–2020) goal of increasing oil production to 4 million bpd by 2020.

China's NOCs were able to stop the drop in China's oil production in 2019. In that year, the country's oil output grew by just 38,000 bpd. In addition, China produced 3.9 million bpd in January–July 2020, a year-on-year increase of 1.4 percent. However, the change in fortune may prove to be short-lived, given the collapse in crude prices due to COVID-19. Indeed, in May 2020, former CNPC Chairman Wang Yilin warned that low oil prices had severely impacted the production of China's oil companies, which he said was not conducive to the stable supply of oil and natural gas in the long run.

Deteriorating US–China relationship

Increasing tensions between China and the United States also added to the unease in Beijing about the security of China's oil and natural gas supplies. The launch of the trade war, and the Trump administration's ban on exports to China's telecommunications equipment manufacturers Huawei and ZTE in the spring of 2018, underscored for Beijing the risks of relying on imports for critical inputs into the Chinese economy. The US export controls spurred Xi to call for greater self-sufficiency in key inputs China buys from other countries in remarks made in April and September 2018.

It was against these broader concerns about foreign dependence that Xi told China's NOCs to increase domestic oil and natural gas production in July 2018. Articles published by the newspapers of CNPC and Sinopec in August 2018 indicated that Xi's directive is rooted in his concerns that China's growing dependence on imported oil and natural gas may pose major challenges.

Meanwhile, NOC executives also spoke of the dangers of foreign dependence. On 29 May 2019 former CNOOC and Sinopec chairman Fu Chengyu warned that China should be prepared for an oil cut-off in the short term. On that same day, Wang Yilin, then the chairman of CNPC, urged employees to pursue greater innovation and localization to prevent imports of key technical equipment from being cut off. China's oil industry relies on American firms for a variety of technologies and equipment, especially for the exploration and production of unconventional and deepwater oil and natural gas.

Any hopes that Beijing may have had for the signing of the phase-one trade agreement in January 2020 easing tensions in the bilateral relationship were short-lived, thanks to the COVID-19 pandemic. The pandemic triggered a collapse in oil demand and prices that makes it extremely unlikely that China will be able to meet the trade agreement's energy purchase targets, which call for China to increase its imports of US energy by \$18 billion in 2020 and \$34 billion in 2021 over the 2017 level.

The coronavirus also sparked a further downward spiral in the US–China relationship. Not only have both sides engaged in a war of words, each blaming the other for the pandemic, but tensions have flared over an ever-growing list of issues. For example, the Trump administration has also sought to further restrict Huawei's access to technology, the US Congress is



considering legislation that would likely result in the delisting of Chinese firms from US stock exchanges, and bilateral tensions have flared over China's passage of legislation supportive of crackdowns in Hong Kong. On May 24, during the National People's Congress, Foreign Minister Wang Yi warned that American politicians were pushing the two countries to the brink of a new Cold War.

The increase in hostility between the United States and China appears to be increasing Beijing's anxiety about supply security. In the spring of 2020, Fu Chengyu urged China to prepare for the possibility that China's energy supplies and industry supply chain could be cut off. Ma Yongsheng, general manager of Sinopec, also recommended localizing the production of major equipment used in China's petroleum and petrochemical industries at the National People's Congress. He also proposed financial subsidies for projects aimed at reducing dependence on imports of high-end materials, core components and key pieces of equipment.

The supply insecurity–reform nexus

Heightened concerns about the security of China's oil and natural gas supplies are supporting the implementation of reforms aimed at liberalizing China's upstream sector. China's government noted in the 13th FYP's for both the oil and natural gas industries, published in May 2017, that there were too few players and too little investment in domestic exploration and production, especially of unconventional gas. Beijing's oil and gas reform plan, also released in May 2017, calls for allowing more firms to participate in China's upstream. To this end, China's authorities are taking steps to increase the number of players and the amount of investment in exploration and production – including abolishing the requirement that foreign companies partner with one of China's NOCs, and continuing to develop a regime for third-party access to China's oil and gas pipelines.

Removal of restrictions on upstream investment

In July 2019, China's Ministry of Commerce and National Development and Reform Commission removed the requirement that foreign oil companies partner with one of China's NOCs for upstream activities. In January 2020, the Ministry of Natural Resources provided more details, announcing that companies with net assets of at least RMB 300 million (US\$43 million) can apply for exploration and production licenses. The goal is for foreign and domestic firms to supplement the activities of the NOCs and boost domestic production.

Ensuring access to pipelines

Beijing is also seeking to attract more companies to China's upstream by ensuring fair access to the country's oil and natural gas pipelines through the establishment of a state-owned pipeline company and the development of a third-party access regime. Historically, the ownership of China's major oil and natural gas pipelines by China's NOCs deterred other companies from entering China's upstream, because the NOCs were reluctant to make any spare capacity available to other companies to avoid losing revenue and market share. Anecdotal information indicates that this lack of third-party access to pipelines has hampered the development of coalbed methane in China.

Beijing is pursuing a two-pronged approach to opening up China's pipelines to a more diverse group of companies. First, Beijing established the National Oil and Gas Piping Network Company in December 2019, and the NOCs are in the process of transferring pipelines to the new firm. Second, the central government is developing a regime for third-party access to the country's pipelines and other midstream infrastructure. The most recent draft regulations, released in April 2020, aim to address some past problems, such as the lack of a definition of spare capacity, which resulted in the NOCs claiming they had no spare capacity for other companies to access.

Conclusion

Heightened concerns about the security of China's oil and natural gas supplies on the eve of the 14th FYP are facilitating the implementation of reforms aimed at opening up China's upstream sector to more participants in a bid to increase domestic production and slow the growth of import dependence. While these reforms are a step in the right direction, other factors will help determine whether other companies participate in domestic exploration and production. These include the quality of the oil and natural gas blocks available and whether Beijing develops an enforceable third-party access regime and establishes a regulator with the authority to ensure compliance by the new pipeline company and the NOCs.

STEPS TOWARDS LIBERALIZATION OF CHINA'S NATURAL GAS MARKET IN THE 14TH FIVE-YEAR PLAN

Lei Yang

China's natural gas market reform has taken a significant step forwards, with the establishment of the National Oil and Gas Pipeline Network Corporation, (PipeChina) in December 2019, as this is considered a milestone for gas infrastructure unbundling. Following this first step, further liberalization will be a key goal in the 14th five-year plan (FYP), spanning 2021–2025, which is being drafted in 2020. While the government is currently laying the policy framework for the pipeline company, the next five years will need to see additional progress in a number of areas, including establishing a network code to link the inter-provincial trunk lines with the myriad of local companies, pursuing pricing deregulation, and developing functioning market signals. This, in turn, will require greater transparency and information sharing as well as designating a regulator to oversee the market.

China's growing gas demand

During the 13th FYP period (2016–2020), China's gas consumption grew by more than 20 billion cubic metres (bcm) annually, posting an average 12 per cent year-on-year increase, reaching 306.7 bcm in 2019, compared to 205.8 bcm in 2016. In 2020, even with the COVID-19 effect, gas consumption recovered quickly during the second quarter, and has kept increasing since April, posting a 10 per cent year-on-year increase in the first 7 months.

While China holds vast reserves of natural gas, strong demand growth has led to a doubling of China's gas imports during the 13th FYP, with an average annual growth rate of more than 16 per cent. China has leapt from the world's fourth to its top natural gas importer, with LNG playing an increasingly important role in China's natural gas imports. In 2019, China had 22 LNG terminals with a nameplate capacity of 90 million tons per year, 13 million tons of which came online during the 13th FYP period. At present, there are 14 terminals under construction and expansion, and once fully operational (likely by 2025), they will add 38 million tons per year of regas capacity.

While the domestic gas sector is heavily dominated by state-owned companies, it is worth noting that in 2019, privately owned LNG terminals received 5.65 million tons of LNG, accounting for 6 per cent of total imports – which means the number of competitive entities in the market is increasing, given that before 2018 the volumes were extremely limited – highlighting the government's ongoing commitment to opening up the sector to competition.

Deregulation and liberalization

With a gas market heavily dominated by state-owned companies in the upstream and midstream, and prices set by the government, the government in the 12th FYP (2010–2015) introduced plans to reform the sector, increasing government regulatory oversight over the mid-stream while deregulating both upstream and downstream.

One strand of reform has been pricing deregulation: The Chinese government has been gradually reforming the domestic gas pricing mechanism but has been maintaining pricing control throughout the supply chain. In March 2020, the National Development and Reform Commission released a revised *Central Pricing Catalog* – the document which sets the policies of gas prices – stating that a number of prices – for offshore gas, shale gas, coal-bed methane, synthetic natural gas, LNG, gas sold directly to end users, gas from storage facilities, gas traded on trading platforms, and pipeline natural gas imported after 2015 – will be negotiated between buyers and sellers. Moreover, the city-gate benchmark prices in provinces with proper competitive conditions will also gradually be deregulated. While the 'proper competitive conditions' have yet to be defined, provinces with several gas supply sources and a variety of end-users will likely be able to experiment with competitive prices.

Apart from changes to the gas pricing mechanism, some progress has also been made in the midstream too. Transportation prices, which were previously at the discretion of the national oil companies that owned and operated the pipelines, are now set by the government in accordance with the principle of 'permitted cost plus reasonable profit', with the internal rate of return of the pipeline projects set at 8 per cent. In addition, by clarifying transportation rates, the government is further promoting third-party access. Critically, in order to enable third-party access, in May 2017, the Central Committee of the Communist Party of China and the State Council published *Several Opinions on Deepening Oil and Gas System Reform*, which required the separation of the oil and gas pipeline assets from China's three major state-owned oil companies, given that they own most of the country's major trunk lines and LNG receiving terminals.

At the end of 2019, PipeChina was officially created, with the State-Owned Assets Supervision and Administration Commission (SASAC, a special commission under the Chinese government which effectively manages state-owned assets) assigned as its

largest shareholder. PipeChina's assets include the main pipeline network assets of the three major oil companies, the equity of the relevant provincial pipeline network companies, and some LNG receiving stations and gas storage facilities. SASAC then transferred most of its shares to other state-owned corporations and financial organizations. China National Petroleum Corporation (CNPC), Sinopec and China National Offshore Oil Corporation (CNOOC) are also shareholders, albeit without decision-making power in the company. While the company will own some of the assets and operate midstream infrastructure, PipeChina will be prohibited from trading gas in the market. The asset transfers and reorganization are still underway, but the goal is for PipeChina to operate the major midstream assets by the winter of 2020. The establishment of PipeChina marks a new stage in China's gas market reform with the opening of infrastructure to third parties, paving the way for it to become increasingly competitive. Yet a number of challenges remain.

The challenges

Upstream competition remains limited, as the three major national oil companies supply around 90 per cent of the gas to the market, with this share decreasing only slightly over the past few years, even as liberalization has accelerated. CNPC is the primary owner of natural gas resources in China, followed by (CNOOC) and Sinopec. In 2019, CNPC supplied around 59 per cent of China's natural gas, from both domestic production and imports.

As a fully market-oriented system has yet to be established in China, the natural gas price is still heavily subject to the regulated city-gate prices. From 2015 to 2017, in order to promote the deregulation of natural gas pricing, China established two oil and gas trading centres in Shanghai and Chongqing to provide an open trading platform. However, there are few natural gas suppliers on these platforms and many potential buyers, resulting in mostly bidding or over-the-counter transactions and few transactions at market-based competitive prices. The original intention of trading at market prices has not been well achieved, mainly due to the market structure, an issue which cannot be resolved by the trading centres and points to the need for further and deeper structural reforms.

While more trading is occurring, facilitated by the government's commitment to increasing third-party access, local pipeline systems remain controlled by local-government-owned corporations. Among the 32 provinces, municipalities, and autonomous regions in the country, 25 have established 35 provincial gas pipeline network companies, each with its own operating history, investment scale, pipeline network coverage, equity structure, financing, and operating mode. In this context, assigning the assets of provincial pipe network companies to the national pipeline corporation in order to form a national pipe network, is a complicated challenge with uncertain outcomes. As a result, to begin with, there will likely be a number of operational guidelines to enable connections throughout the pipeline network rather than an incorporation of all regional assets. A number of pilot cases are under consideration.

In the near term, promoting competitiveness in the downstream sales market is arguably a more pressing need, which requires adding physical connections to facilitate the entrance of new gas importers and sellers. China's natural gas pipeline network is still in a period of rapid development, during which more pipelines need to be built and connectivity between the pipelines needs to be improved. Attracting more investment to build more pipelines will be as important as integrating existing pipelines.

Finally, during this transition period, the long-term gas import contracts present complications. Many term pipeline gas and LNG contracts have been signed as take-or-pay agreements, especially the Turkmenistan pipeline supplies and the LNG deals with Qatar and Australia. The prices are much higher than current spot prices, but transitioning from the current system of long-term take-or-pay gas contracts to spot contracts may lead to stakeholder losses.

The tasks of gas market liberalization in the 14th FYP

The 14th FYP is a critical time in China's natural gas market liberalization, as the policy framework must allow for additional pipelines to be built while also forming a competitive market. Yet China's market size and characteristics make it difficult to directly copy the experience of Europe or the United States. Nonetheless, the following steps are necessary.

Assets transfer

First, the national pipeline corporation must complete the time-consuming process of asset separation and transfers. At the same time, new operational rules and regulations regarding the connection with local pipeline networks are prerequisites for the smooth operation of PipeChina.

Establishing policy tools

Various policy tools will continue to be established. A shipper system similar to the system in Europe and the United States is essential. This will determine the rights and obligations of new market players. It is also expected that anchor shippers could help resolve existing long-term contract problems and accelerate the construction of new pipelines.

Establishing capacity allocation mechanisms and congestion management procedures is critical, because natural gas supply security is always a high priority on the Chinese government's agenda; therefore, this will also have a strong impact on the formulation of various policy tools.

Transport tariff setting is another key issue, as the current spot to spot tariff may not be compatible with the new trading framework. The new tariff setting needs to be fair but also efficient. Creating a simple and clear pipeline tariff will help to encourage more shippers.

Transparency and availability of data are essential for building confidence among market players, which is the basic condition for ensuring a fair and open market.

Market design

With the limited number of domestic producers, the proper design of the market structure is crucial. It is essential for China to establish an open gas market with competitive gas supplies. Natural gas markets have opened at different rates in different regions; however, such processes have all proceeded to the same common objective: to foster competition and market liquidity to benefit end users. China can learn from the experiences of other countries, especially on the development of market design, to overcome current obstacles. For instance, formulating several provincial-level virtual trading hubs could be an easy and relatively low-risk step to take.

Enhanced regulatory function

China currently does not have an organization like the natural gas regulatory authorities in Europe and the United States. The relevant regulatory functions are divided among different departments and local energy regulatory authorities. During the 14th FYP period, it is of great importance to ensure the integration of these supervisory entities. The government is the main driving force behind the market changes in the promotion of natural gas market liberalization. Any progress towards that goal also largely depends on execution, for which the role of the regulator is also crucial, yet in the near term, there are no ready administrative bodies that can assume these regulatory functions. Improved coordination among the existing bodies may be the first step forward.

Experimental projects

Experimental local market projects should be encouraged. It will be important to move carefully at first, 'crossing the river by feeling the stones', in order to further market-oriented liberalization. By establishing experimental market centres in major consumption or supply provinces, such as Sichuan, Guangdong, and Zhejiang, China can learn valuable lessons that can be applied across the country to support the establishment of an internationally acceptable, market-oriented price index. At the same time, the transition period must include consideration of ways to develop appropriate mechanisms to deal with long-term contracts.

International cooperation

International cooperation is useful not only for learning lessons from other jurisdictions but also for developing a more transparent and open policymaking process to enhance the confidence of international investors. This will encourage foreign companies to supply more natural gas to China and play a more active role in the market. This itself is an important goal of the market-oriented reform.

Conclusion

China's 14th FYP will be a crucial period for natural gas market liberalization. If regulations on market design, regulatory function, supervision, and pricing are properly implemented, China's natural gas liberalization will make impressive progress by 2025, allowing demand to keep rising, facilitated by natural gas price indexes in line with international standards. This will make China's natural gas market more open and transparent and help to form a more robust market, attracting more international resources and investment.

In the process of the global energy transition, a more open and competitive natural gas market will also help natural gas become a vital transitioning force, which is significant for China as well as the global natural gas market.

POTENTIAL AND CHALLENGES OF CHINA'S SECOND-TIER LNG IMPORTERS

Michael Xiaobao Chen

As part of China's reform programme, the government has sought to open the energy sector to private actors and increase competition within it. A number of reform priorities – including efforts to create a level playing field for the private sector alongside state-owned enterprise reform, price liberalization, and ongoing efforts to increase third-party access to midstream infrastructure – have supported the emergence of new players in China's gas sector. Moreover, the country's seemingly insatiable appetite for natural gas has led to a rapid increase in second-tier buyers, which have been accounting for a rising share of imports and infrastructure development.

While government support will help these new entrants gain market share, the road ahead remains bumpy. The second-tier actors will need to adjust to ongoing changes in the domestic system, as the midstream company is established and the regulatory and financial framework evolves – especially in the aftermath of COVID-19, as a number of private companies face economic and financial headwinds and the country's gas demand growth slows.

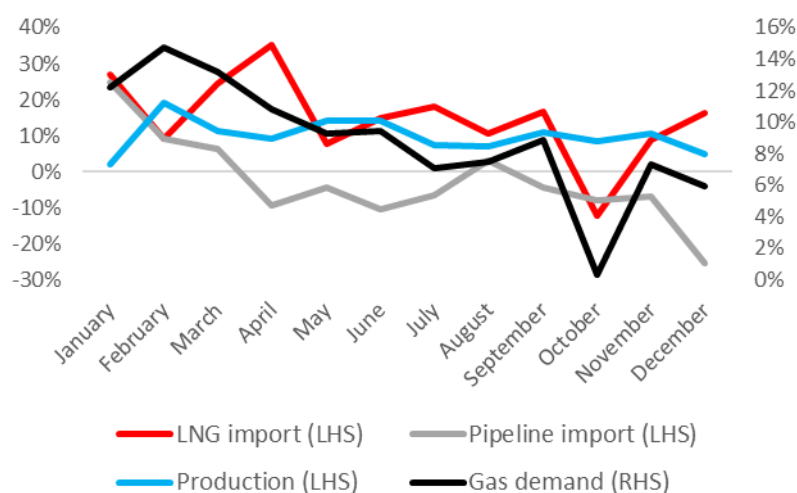
China's second-tier LNG importers have been taking on a larger role

China's three national oil companies – CNPC (China National Petroleum Corporation), Sinopec (China Petroleum & Chemical Corporation), and CNOOC (China National Offshore Oil Corporation) – dominate China's natural gas industry, each with varying degrees of control across the supply chain. CNPC and Sinopec dominate the domestic upstream, while CNOOC controls offshore development. Until the creation of the new midstream company (PipeChina), CNPC owned the vast majority of national pipelines. Combined, the majors own 16 of the country's 22 LNG import terminals. Yet over the past few years, the surge in natural gas imports and the government's liberalization agenda have underpinned the diversity of current and potential LNG importers and the rapid infrastructure expansion.

Indeed, in 2019, China's gas demand grew by 8 per cent year on year (y/y) or 23 bcm, with LNG imports rising by 12 per cent y/y, marking the fourth year in a row of record LNG imports, and growing faster than pipeline flows. The phenomenal surge in inflows, which led import dependency to increase to 43 per cent in 2019, has also been accompanied by a focus on developing indigenous supplies, which are capping the growth of LNG imports.

COVID-19 has challenged the global gas fundamentals, as the low-oil-price environment has brought the average landed price of LNG imports down, while lockdowns, weak economic growth, and cost consideration have weakened global gas demand. Yet China's gas demand has remained robust: In Q1 2020, implied demand growth (domestic production and net imports) reached 6.5 per cent, half of Q1 2019 levels, while import growth slowed to 2.1 per cent y/y. Still, China's long-term effort to improve air quality and diversify its energy structure remains unchanged, while the low-LNG-price environment has offered attractive import conditions. And with steady economic recovery from COVID-19 and the expected growth in gas demand, Beijing remains committed to its liberalization agenda.

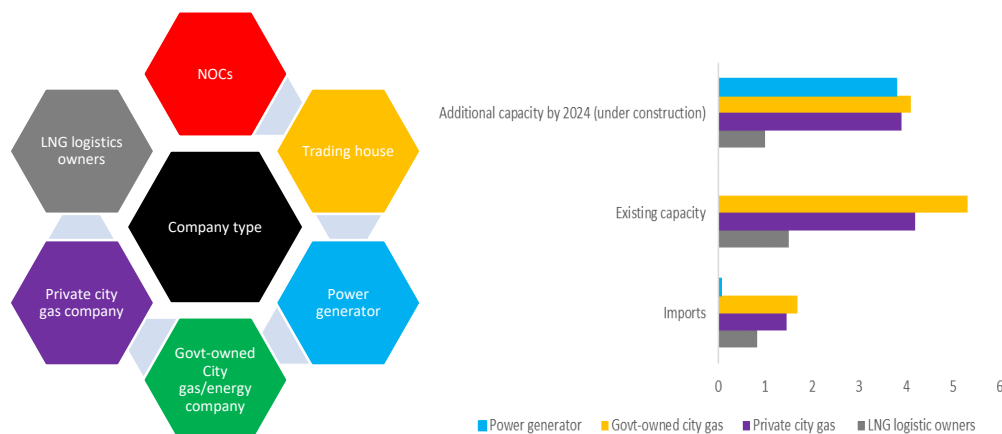
LNG and pipeline imports, 2019



Sources: China Customs Statistics; NDRC.

In recent years, the second-tier LNG importers, in addition to the traditional LNG importers of national oil companies (NOCs), have grown in numbers and types. There are six types of current or potential LNG importers, when considering their backgrounds and capability. Non-NOC LNG importers in 2019 owned six LNG terminals, accounting for 15 per cent (11 mtpa) of regas capacity, and imported 7 per cent of total LNG imports (close to 5 mt). They could account for close to 30 per cent of China's LNG regas capacity addition by 2024 if the projects currently under construction are delivered on schedule.

Type of LNG importers, second-tiered LNG import and regas capacity growth, million tons, 2019



Source: China Customs Statistics, NDRC, author's compilation.

The second-tier importers can be divided into the following categories:

1. **Privately owned city-gas distribution companies:** This category includes companies such as Guanghui and ENN, which already operate regas terminals or are building terminals. These companies already have access to downstream markets through their existing distribution networks and have a strong position in premium regions (Guanghui in Jiangsu and ENN in Zhejiang). To date, despite owning regas terminals, some of them have worked with China's national oil companies for their LNG supplies or with provincial government-owned energy company for pipeline connection. Guanghui works closely with CNPC: it often splits cargoes with CNPC's Rudong terminal, given that it has no pipeline connection to the local distribution network and very limited storage capacity. It also has access to volumes from the West–East Pipeline.
2. **Government-owned city-gas distribution companies:** This category includes companies such as Beijing Gas, Zhejiang Energy Group, Guangzhou Gas, and Shenergy. Most of them own local gas grids and are majority-owned by the provincial government. Some of them are building their own LNG terminals or are operating terminals partly owned by NOCs. For example, Shenergy, which is owned by the Shanghai government and CNOOC, relies on CNOOC for its LNG supplies.
3. **Power generators:** Companies such as Huadian, one of China's 'big five' power generators and the largest operator of gas-fired power capacity in China, as well as Yudean, a local power generator, are seeking access to LNG imports in order to expand their gas-fired installed capacity and diversify their portfolios.
4. **Trading houses and LNG logistics owners:** This category includes a variety of companies – among them Zhenhua Oil, an established oil trading company that also owns upstream assets overseas, Sinoenergy, and Hengtong Logistics. These companies are utilizing their trading and logistics experience and partnership with other second-tier importers to develop new markets.

Currently, the second-tier LNG importers operate independently or in partnership. Some of the more established second-tier companies have developed in partnership with the state-owned majors or local governments. They have increasingly been working together to gain access to existing terminals (owned by the NOCs) while also gaining approval to build their own terminals. Diverse partnerships between trading houses, utilities, logistics companies, and city gas companies enhance penetration of local markets, help risk-sharing in financing LNG terminals and commodity imports, or integrate trading and wholesale expertise.

The trading house Zhenhua Oil – in partnership with Longkou Senton Energy logistics company, which specializes in LNG trucking – has imported spot LNG cargoes using Shanghai Oil and Gas Futures Exchange windows and CNOOC's terminals. This allows them to combine Zhenhua's overseas energy trading experience with Senton's familiarity with the local market. On the other hand, local-government-owned city gas company Guangzhou Gas and utility company Guangdong Power Group jointly signed an agreement with CNOOC to access the Dapeng terminal while building their own terminals, which are expected to come online in 2023 and 2024. Their combined leveraged power from residential and electricity market, government support, financial strength, and healthy relationship with CNOOC enabled them to gain access to CNOOC's terminal.

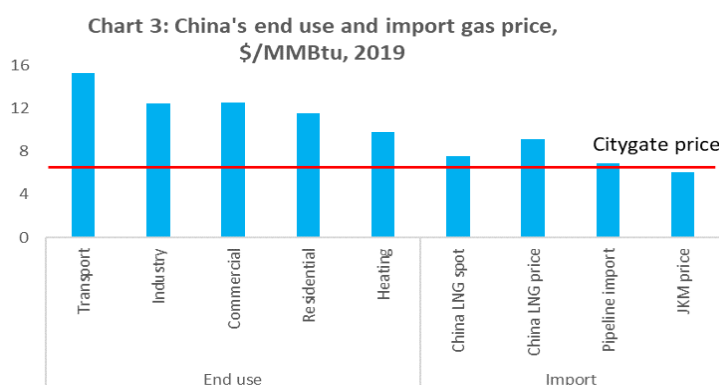
Government's general support for coal-to-gas switching and its infrastructure access are driving the growth of second-tier LNG importer

The second-tier companies' ascent has been accelerated by the country's rapid demand increase, due to coal-to-gas switching, increasingly competitive LNG spot prices, and the government's commitment to improving access to gas infrastructure.

As local governments have been assigned clean energy targets, which are linked with their performance assessments, more affluent provinces that have more well-developed industry structures and fewer independent gas resources tend to offer more support to second-tier LNG importers.

In addition, LNG spot cargoes have become increasingly competitive at the city gate compared to LNG term cargoes. Even pipeline imports that are cheaper than LNG spot cargoes at the border are still more expensive at the city gate when taking into account transit costs. The current soft spot market environment offers second-tier LNG importers an opportunity to secure competitive term cargoes and lobby for approval of their LNG terminals.

China's end use and Import gas price, \$/MMBtu, 2019



Sources: NDRC, ICE, China Customs Statistics.

In addition, the second-tier importers continue to benefit from the gradual liberalization of gas pipelines, storage facilities, and LNG terminals for third-party access. CNOOC is currently offering both short- and long-term LNG terminal access on the Shanghai Petroleum and Gas Exchange, although access to CNOOC's terminal remains contingent on purchases of some of CNOOC's term volumes. Provincial state-owned utilities Guangdong Energy Group and Shenzhen Energy Group received their first jointly purchased LNG cargo from Petronas at the Dapeng LNG terminal in May 2019. Moreover, a consortium led by Zhenhua Oil signed a 27-month deal with CNOOC for its LNG terminal access.

Several challenges remain that could slow non-NOCs' LNG imports

While the government's reform agenda and rapid gas demand growth create significant opportunities for China's second-tier importers, several challenges remain. First, the post-COVID-19 environment and prospects of softer economic growth – due to an adverse external demand – could lead the government to reemphasize affordability and soften its stance on the coal-to-gas switch. This, in turn, will moderate China's gas demand growth and appetite for imports.

In addition, the swift changes in market dynamics driven by COVID-19, and the need to prioritize energy security, in light of deteriorating relations with the US and China's rising import dependency, are favouring domestic production and pipeline imports. The Power of Siberia pipeline in particular, which came online in December 2019 and is expected to ramp up through 2025, could reduce LNG demand in northern China and limit the need for LNG terminals along its route.



This uncertainty surrounding the pace of demand growth in China and the potential competition from pipelines and domestic production is compounded by the regulatory changes within the country. While pricing reform and third-party access should facilitate imports by second-tier importers in the medium term, they inject considerable uncertainty into short-term planning.

First, the newly formed national pipeline corporation is set to own some LNG terminals assets and offer third-party access, but greater connectivity could also mean fiercer market and price competition. In some provinces, supplies are relatively abundant from domestic upstream sources as well as LNG term supplies from the NOCs, potentially limiting the tier-two players' role. Second, non-NOC terminals tend to be smaller than NOC terminals, with less storage capacity. This limits the size of cargoes they can accept, their shipping flexibility, and their potential supply sources. Finally, as the market matures and import projects multiply, the current tax rebate on LNG imports – which relieves the burden of the citygate pricing system for companies importing LNG – could be withdrawn.

Second-tier importers still have a long way to go, and more comprehensive government support is needed

While the second-tier importers face considerable challenges, on balance they are still set to develop and grow their domestic market share. Coal-to-gas switching has been costly for local authorities, and will likely be difficult to sustain during softer economic growth. At the same time, the current economic uncertainty creates financial challenges to second-tier LNG terminal projects in development, but more cautious planning could reduce any potential over-construction and still allow second-tier players to enjoy a decent market share, alongside better mid- and downstream integration.

Moreover, the government's tax benefits and liquidity support post-COVID-19 could improve the outlook for second-tier LNG importers, especially as price reform and third-party access continue. Given their diverse and agile ties – such as those between Guangdong Energy and Shenzhen Energy or Zhenhua Oil and private gas companies – the new entrants can be expected to share risks and increase their market share, overcoming these short-term challenges.

Finally, the midstream company could offer new opportunities for the second-tier players as they build experience from trading spot cargoes. The gradual liberalization of citygate pricing could increase the price flexibility and become more reflective of global market balances. The weak price environment, if sustained over the medium term, could encourage more imports from second-tier importers on a spot and medium-term basis and help induce more gas market reform by the government, as it seeks to take advantage of the abundant and affordable supplies to accelerate its clean air efforts.

CHINESE INDEPENDENT REFINERS: THE GREAT SURVIVORS

Tom Reed

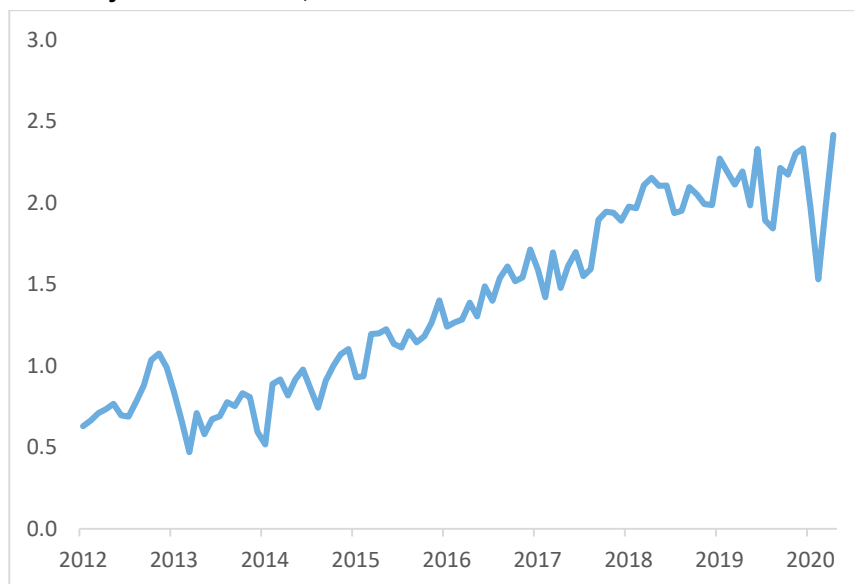
'Reports of my death are greatly exaggerated,' the American writer Mark Twain is reputed to have said when his obituary was published in 1897. The imminent demise of China's independent refining sector has been similarly heralded – on the grounds that it is uncompetitive in a cut-throat market environment, technically outdated, being 'consolidated', or politically out of favour.³⁹ But, far from being moribund, independent refiners in north China's Shandong province – also known as teapots – have flourished lately.

The independents processed record amounts of crude in April this year, as the industry bounced back from COVID-19. And they are likely to take delivery of record amounts of imported crude over the summer. Since liberalization in 2015,⁴⁰ the Shandong independent sector has raised crude throughputs by 1 million barrels per day (mb/d), equivalent to half of the national increase over the same period.

³⁹ 'Should China's state-owned giants fear the teapot refineries?', *Platts*, 13 March 2015, <https://blogs.platts.com/2015/03/13/chinastate-teapot-refineries/>; Alfred Cang and Serene Cheong, 'China oil stars risk being dimmed by their giant version 2.0', *Bloomberg*, 2 October 2017, https://www.rigzone.com/news/oil_gas/a/151920/china_oil_stars_risk_being_dimmed_by_their_giant_version_20/; 'China strives to reduce capacity of "teapot" oil refineries', *Financial Times*, <https://www.ft.com/content/2b6d92cc-946c-11e7-bdfa-eda243196c2c>.

⁴⁰ 'Teakettle refiner runs out of steam', *Argus*, <https://direct.argusmedia.com/newsandanalysis/html/1077518>.

Shandong independent refinery crude unit runs, mb/d



Source: Argus.

Independent refiners have always existed on the margin in China. That is true both in a literal sense, because they sprang up on the edges of Sinopec's giant Shengli oilfield, and because they are the market's suppliers at the margin. In the mid-2000s, when state-owned enterprises could not keep pace with the fuel requirements of China's booming economy, the independents stepped in.

At the time, banned from importing crude, they processed large amounts of straight-run fuel oil to produce mainly low-grade, high-sulphur gasoil and, by 2008, 60 per cent of the bitumen needed for China's massive infrastructure expansion. China's loose monetary policy in 2009–10 spurred a refining investment binge that allowed many to expand crude unit capacity and add secondary units. But by 2014, many were grappling with a major debt hangover.

Fixing the market

By late 2014, as the country's oil demand growth was beginning to slow and the spectre of bankruptcy loomed over many independents, both local and central governments stepped in. When one, in Shandong's Boxing county, teetered on the brink of collapse that year, it was ultimately bailed out by another state-owned company, because the refinery was the single largest contributor to local government coffers.⁴¹ In China, while consumption tax flows to the centre, local governments receive nearly half of corporate income taxes. And Shandong's independent oil sector, with its 3.7 mb/d of crude unit capacity, was simply too big to let fail.

Liberalization of crude imports in 2015 soon emerged as the most politically palatable option for bailing out independent refiners. It helped secure crude supplies at a time when state-owned majors were crippled by anti-corruption investigations, and it aligned with China's long-term goal of opening the domestic market to non-state actors. And the government has managed to retain oversight of the sector – and control of its imports – by limiting the amount of crude independents may clear through customs via a quota system.

The timing couldn't have been better for the Shandong independents: crude prices collapsed in 2016, but pump prices – controlled by China's top economic planning body, the National Development and Reform Commission (NDRC) – did not, encouraging them to expand into the seaborne market and run their plants hard.

Such artificial incentives, coupled with the relative price inelasticity of fuel demand, have allowed China to twice ride to the rescue of world oil markets, in 2016 and 2020. When crude prices fell below \$40/barrel in mid-March 2020, the NDRC again halted pump price cuts, and independents' crude purchases soared.

⁴¹ 'Producers vie for Chinese sour crude demand', Argus, <https://direct.argusmedia.com/newsandanalysis/article/2085266>.

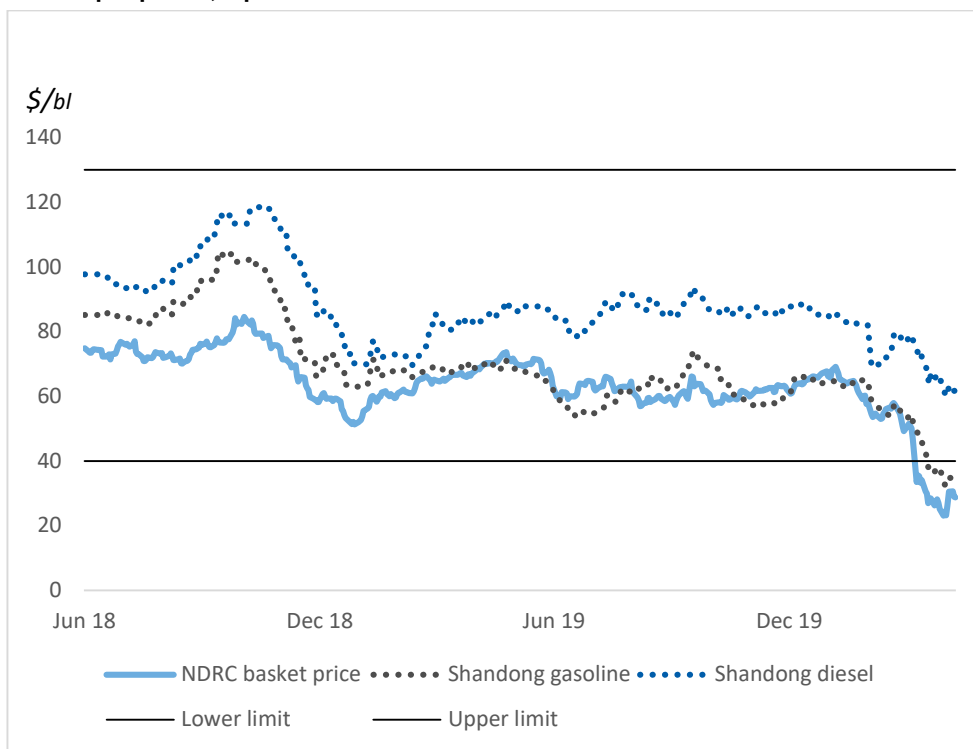
The quick or the dead

Shandong still accounts for perhaps a quarter of China's diesel production and a good chunk of its bitumen. Unlike PetroChina and Sinopec, independent refiners have no social contract to supply the market come what may – allowing them to run hard when margins are strong and shut units when they are negative. Unlike the national oil giants, independents have no annual output or sales targets, and they enjoy far more flexibility to adjust yields. Independent oil firms cut runs first and hardest this year, as the scale of the pandemic became evident, but came back on stream far more rapidly than their state-owned peers to capitalize on the strength of refining margins.

Because they lack integration and have few retail assets of their own, Shandong independent refiners must sell fuel at a level that allows the marketing arms of oil giants PetroChina and Sinopec to favour third-party supply over their refining arms' own output. And they do. Fuel produced by the independent refineries is trucked all over China, displacing state-owned firms' fuel into the seaborne markets.

But balancing their profit and loss accounts is a tightrope act. There is no means to hedge domestic product sales. The NDRC derives retail prices on a cost-plus basis from a basket of ICE (Intercontinental Exchange) Brent, Dubai Mercantile Exchange Oman, and New York Mercantile Exchange West Texas Intermediate crude futures – adjusting pump caps based on the change in the basket price over the previous 10 trading days. This sets an upper limit on wholesale prices but does not provide a floor.

NDRC crude basket vs spot prices, \$ per barrel



Source: NDRC, Argus.

If ICE Brent prices are low, refiners will start to trigger front month ICE Brent futures as they sell product and lock in a margin. If crude prices are high, the refiner will seek to defer establishing a feedstock cost as long as possible, essentially gambling that the refinery's procurement manager can beat the market.

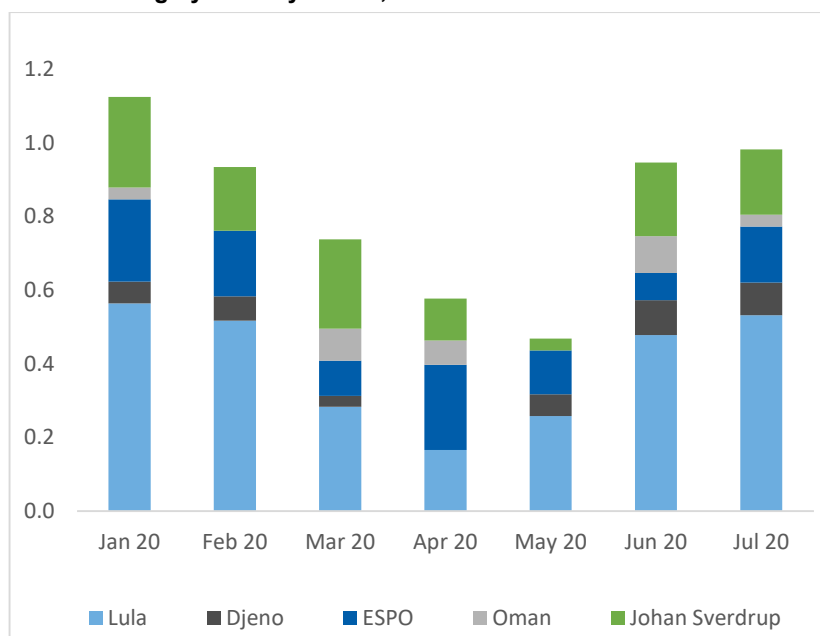
As often as not, a refiner will wait as long as possible to trigger in the hope of securing the lowest possible feedstock cost. But many rushed to lock in triggers as June Brent futures fell below \$20/barrel in April. A handful of more sophisticated independents prefer to pay month-average crude futures prices, which gives their Singapore-based trading arms the option of hedging crude purchases, and are pushing for a move from fixed to floating price differentials to Brent futures.

A China price

The evolution of vibrant spot trade around the port city of Qingdao now generates China's first clear pricing signal for crude valued at differentials to ICE Brent futures on a delivered ex-ship (DES) Shandong basis. Typically, refiners will agree to pay suppliers a fixed differential to ICE Brent for 1 million barrels of crude to be delivered around 60–80 days forward. It is a diversified market, with a high number of buyers and sellers, where all the major global trading companies, including state-owned ChinaOil and Unipac, compete to market cargoes to 30–40 refineries.

Independent plants tend to lack the extensive hydrotreating capacity of their larger, state-owned peers, and favour sweeter crude from West Africa and Brazil, or Russian ESPO Blend. Brazilian Lula crude and Norwegian Johan Sverdrup, whose prices cannot be assessed on an FOB basis near their points of origin due to limited liquidity, both send clear pricing signals from Shandong, where they can account for two-thirds of spot trade. Lula, in particular, is in high demand, with spot traded volumes averaging nearly 0.50 mb/d in 2020. Even major refiners such as Rongsheng or PetroChina will buy Lula or Johan Sverdrup on a DES basis.

Spot crude transactions in Shandong by delivery month, mb/d



Source: Argus.

But there is demand for sour grades, too. When Saudi Arabia launched its price war for market share in March 2020, after the failure of the OPEC+ meeting in Vienna, that showed up clearly in the Shandong spot market. Saudi Arab Light established a clearing price in China for May-arriving cargoes, only to be priced out by tumbling discounts on June-arriving cargoes of Russian Urals. The latter, in turn, was undercut by US Mars for July delivery trading \$8/barrel below Brent futures.⁴²

The success of the Shandong spot market in generating a price signal that is truly Chinese is an irony not lost on the central government, which strongly backed the Shanghai International Energy Exchange crude futures exchange as a potential Asian benchmark. In late 2019, the NDRC encouraged the state-owned Qingdao Ports Group to establish spot indexes based on trade in crude delivered to Shandong – echoing the DES Shandong assessments launched by price-reporting agency Argus in 2018 and Platts in 2019. Although the Qingdao Ports Group-backed price exhibits few of the International Energy Exchange's curious pricing trends, neither international oil companies nor foreign governments currently place great faith in the idea of a benchmark formulated under Beijing's auspices.

Reading the tea leaves

A Damoclean sword still hangs over China's independent refining sector, despite the NDRC's imprimatur for the Qingdao price signal. It remains an unloved contributor to the economy in a regulatory grey area. China's product market is oversupplied. The

⁴² 'China's Shandong consolidation faces roadblock', Argus, <https://direct.argusmedia.com/newsandanalysis/article/1893761>.



country is a growing exporter of transport fuel to a global market which is, itself, currently oversupplied. Independent refineries have little chemical integration and typically yield large amounts of diesel, demand for which is shrinking.

Rather than rein in powerful state-controlled oil giants or inhibit construction of new plants, the central government would like to see China's independents 'consolidated' – an over-used euphemism for shut – and replaced with giant, highly integrated, value-added refining and petrochemical facilities of the type opened last year by textile giants Rongsheng and Hengli.

Their technical and commercial sophistication gives these new, giant refiners a comparative advantage over state-owned PetroChina and Sinopec, as well as Shandong and Liaoning's independents. The future of these giant greenfield refiners looks bright, enjoying as they do the political favour which Shandong independents lack, as well as an ability to fit utilization rates and yields to market needs rather than the political diktats which hamstring China's national champions.

By 2022, Beijing aims to eliminate all refineries below a threshold 60,000 b/d of crude unit capacity. The question remains how to go about this without destroying the economy of Shandong.

In April 2019, the governor of Shandong province, Gong Zheng, proposed encouraging independents to exchange equity in their own small-scale plants for equity in a proposed new mega-refinery with 0.40-0.80 mb/d of capacity with integrated petrochemical facilities at Yulong on Shandong's Yantai peninsula.⁴³ This would potentially replace around 11 of the province's existing independents. The plan languished on planning authorities' drawing boards for a year until March 2020 when, as part of a national push to invest China's way out of potential recession, the government ordered work to start on the Yulong project. In June, the NDRC gave its formal blessing to construction plans.

But equity in Yulong no longer appears on the cards for independents agreeing to close. Yulong will be developed, instead, by the well-connected aluminium producer Nanshan. Independents agreeing to close crude unit capacity will now receive only cash remuneration to the tune of RMB 800–900/t (\$114–128 b/d) of crude unit capacity and RMB 50/t (\$7.12/barrel) compensation for their loss of crude import rights. The government has set aside a pot of RMB 20 billion in compensation suggesting that, in total, it is budgeting to close around 14 per cent of Shandong's independent sector capacity. But so far, just two independents have taken up the offer, and closures this year are likely to total 0.15 mb/d. One of those agreeing to shut, Jinshi Bitumen, had not operated for several months. Neither it nor the other – Binyang Gasification – had a crude import quota.

Few consider the proposed levels of compensation adequate. And many doubt that the project, which appears to run counter to many of the central government's short-term goals, will be pursued vigorously, this year at least. Unemployment has ballooned in the wake of the COVID-19 pandemic and is almost certain to rise further should one large plant replace multiple smaller facilities. The independent refineries, many of them solvent in their own right, guarantee billions of yuan of bank debt held by less solvent entities. China's balance sheet is already expanding and its fiscal deficit widening. Eliminating the independent sector could trigger multiple cross-sector defaults and lead, ultimately, to bank recapitalizations on a significant scale. Dongying's local government, facing a major loss of tax revenue, opposes the plan.

For now, the independents of Shandong and Liaoning provinces are doing more than just clinging on – they are thriving. But whether they survive another 13 years, as Mark Twain did after his obituary was first published, does look doubtful. The continued expansion of its refining base makes China's domestic market increasingly cut-throat. The trend towards private-sector large-scale integrated refining and petrochemical refineries is almost certainly the biggest threat the independent refiners face. Whether or not Yulong goes ahead, Rongsheng plans to double the size of its refinery in 2021, to 0.8 mb/d. Another private-sector firm, Shenghong, will open a large refinery in Jiangsu next year.

⁴³ 'China's Shandong consolidation faces roadblock', Argus, <https://direct.argusmedia.com/newsandanalysis/article/1893761>.

CHINA AND ASIAN OIL BENCHMARKS: WHERE NEXT?

Adi Imsirovic

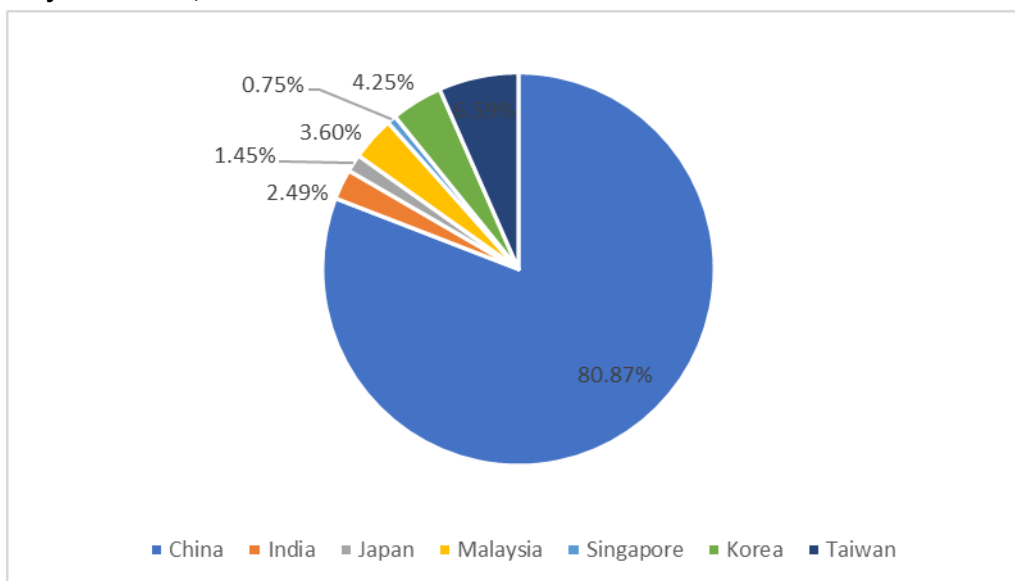
Transition

This century started as a period of transition of the centre of gravity of the oil trade from the Atlantic basin towards Asia, primarily driven by Chinese economic growth. The last 10 years have seen a consolidation of that shift. China is comfortably the second biggest consumer and the largest importer of oil in the world. Chinese state-owned oil companies (the ‘majors’) are recognized in the world markets as a major force to be reckoned with. (ChinaOil, the trading arm of PetroChina, certainly proved this in August 2015 when it purchased pretty much every cargo that could be delivered in the October Dubai contract.) As the marginal barrels moved east, so did the process of price discovery.

As a part of the country’s economic ascent, there has been a conscious decision by the Chinese leadership to participate and ‘compete for oil pricing power’: ‘We must focus on establishing futures for crude and other commodities, to gradually strengthen China’s pricing power in international markets,’ said Guo Shuqing, chairman of the China Securities Regulatory Commission, China’s top regulatory body. This is not unexpected, as China was expected to become the world’s largest oil consumer before 2040.

While the Chinese futures contract was in the making for years, Chinese traders were steadily gaining pricing power on other benchmarks. In July 2007, a joint venture between Dubai Holding, Oman Investment Fund, and CME Group saw the establishment of the Dubai Mercantile Exchange (DME) with the physically delivered Oman crude oil contract. With over 80 per cent of all the Oman crude oil heading for China, the trading arms of Sinopec Group (Unipet) and CNPC (ChinaOil) became the major players in this futures contract.

Oman deliveries by destination, 2020

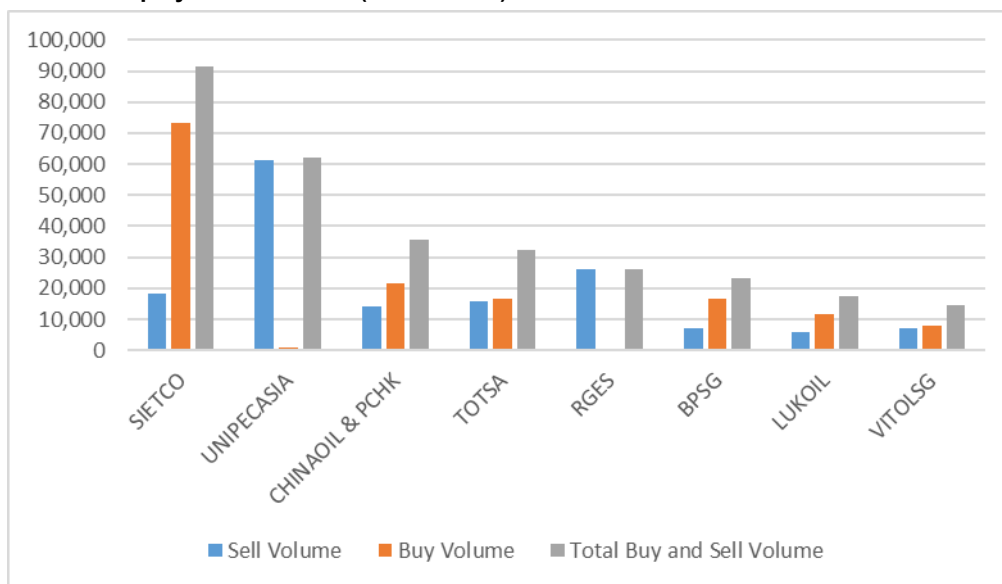


Source: Clipper data.

With growing competition on it, the Dubai benchmark saw a significant increase in liquidity, matching and sometimes exceeding the number of trades in the Brent benchmark, at least during the Platts pricing window (16.00–16.30 Singapore time). The sheer size of the increase in Dubai-priced crude to the East in the early 2010s meant that Chinese majors could not continue to rely on market-makers (usually trading companies) to provide the liquidity in Dubai swaps for hedging these flows.

The only option left to them was to get directly involved in the process of price discovery itself. ChinaOil and Unipet became prominent and assertive players in the Platts window,⁴⁴ rapidly emerging as two of the top three players in that venue.

⁴⁴ Adi Imsirovic, ‘Oil markets in transition and the Dubai crude oil benchmark’, *Oxford Energy Comment*, October 2014.

Platts Dubai partials: main players since 2018 ('000 barrels)⁴⁵


Source: Platts.

International Energy Exchange

With encouragement from the top of the Chinese leadership, the Shanghai International Energy Exchange (INE) launched its own crude oil futures on 26 March 2018. The contract is for delivered (into designated bonded shore tanks so that the price is net of tax) medium sulphur grades of crude oil (32 API and 1.5 per cent sulphur), priced in Chinese yuan (RMB). The deliverable grades of oil include domestic Shengli and six other Middle Eastern grades: Basrah Light, Oman, Dubai, Upper Zakum, Qatar Marine and Masila. The contract was almost an instant success, with volume of trades quickly exceeding those on the DME exchange, making INE the third largest oil exchange in the world.

However, in spite of its success, the INE crude oil contract has a number of problems. Even though it is a delivered contract, well suited for smaller importers with no access to shipping, it has not been used by the independent refiners to procure supplies. Most of the volume is traded by retail and financial participants with limited access to international oil exchanges.

While the government has been gradually liberalizing energy markets, the oil market in China is still highly concentrated and dominated by the three biggest national oil companies: PetroChina Company Limited, Sinopec Group, and China National Offshore Oil Corporation. The government has been granting rights to an increasing number of independent companies to import crude oil. So far this year, the Ministry of Commerce has issued import permits to 62 non-state-owned enterprises. While this is a lot, the quotas are issued piecemeal with no guarantee of further volumes, making it hard for these companies to make long-term supply arrangements.

In China, domestic product prices are controlled by the government. They are based on a formula, linking them over time with the international oil market (based on Brent 40 per cent, DME Oman 40 per cent, and West Texas Intermediate (WTI) 20 per cent, with a floor of \$40). This incentivizes the three Chinese majors as well as other refiners to focus on these benchmarks for price risk management purposes. While the 'big three' are comfortably involved with all of these benchmarks, the independent refiners are particularly fond of buying oil based on the Brent futures contract. Their favourite pricing formula is a differential to the Brent futures contract with a 'trigger' (a mechanism by which a supplier allows buyers to trigger the price at the time of their own choosing, as long as it can be executed on the exchange). The final price is then calculated as a weighted average of these triggers plus the pre-agreed quality differential. For most sophisticated suppliers, this is a minor inconvenience, while the buyer receives the important ability to fix the oil purchase price relative to the expected domestic product prices (allowing for a refinery profit). If the INE contract was a part of this product price formula, it might catch the interest of the

⁴⁵ The participants are: SIETCO (Shell Trading), Unipac Asia (Hong Kong), China Oil and PetroChina Hong Kong, Total Trading, Reliance Singapore, Lukoil Trading and Vitol Singapore.

independent refiners and encourage them to use it to hedge a portion of their crude oil purchases.

To make INE truly international, the issue of the RMB's convertibility will also have to be resolved. It has been argued that the INE crude oil contract fits well into a programme of promoting capital account liberalization,⁴⁶ but this is impossible to achieve without some sort of exchange rate reform. The trade-off between free capital flows and RMB stability has become a policy issue, requiring INE to resort to a quota management system for foreign investors. However, large foreign firms and traders with established commercial entities within China can probably get around this problem and continue to be active on the exchange.

There are some operational issues with the INE contract: in April this year, the bonded oil tanks which guarantee future delivery into the contract (in Ningbo, Zhoushan, Qingdao, and Dalian) proved insufficient. They were swiftly doubled to 57 million barrels, by hiring additional tanks, of which close to 40 mb were full in July. This is due to relatively cheap INE storage compared with the extent of the contango in prices.⁴⁷

The problem is exacerbated by financial and retail players' preference for long positions in the deferred delivery months (as judged by open interest), indicating speculative rather than hedging activity in the market. As a result, amplified by the demand shock from the COVID-19 pandemic, the INE contract for July delivery decoupled from the international markets. At one stage, it was trading as much as \$14 higher than the equivalent June DME Oman contract (June FOB loading DME Oman can be purchased, shipped, and delivered into the July INE contract). At the end, the market worked and the state companies Sinopec, PetroChina, and Zhenhua Oil purchased Oman and Basrah Light for delivery into the contract, partly alleviating the problem. Arranging the additional tankage helped resolve the storage issue, but supplies into China remained constrained by operational problems such as pipeline bottlenecks.⁴⁸

The episode highlighted some of the issues facing the growing INE contract, as well as its ability to adapt to meet emerging needs. But while the INE contract has been bolstered by the post-COVID-19 price crash, paving its way to becoming a more active exchange, it is still far from becoming a regional or global benchmark. But it has a fighting chance.

Where will the Chinese oil market go from here?

To assess the possibility of the INE crude oil contract becoming a serious tool for price discovery, some historical experience with Brent and WTI may prove a good guide. The birth of the WTI contract in the 1980s was preceded by a key event, the lifting of US price controls by the Reagan administration in 1981. The creation of the WTI futures contract on the New York Mercantile Exchange followed in March 1983. The physical spot markets quickly grew, and the price reporting agencies started surveying and publishing prices.

The UK experience was similar: the Thatcher government's liberalizing of the energy markets in the UK in 1981/1982 was instrumental in the growth of the Brent market. The exploration and production business of the national 'champion', British National Oil Corporation, was privatized, and later became a part of BP. The oversupplied market in the mid-1980s also helped the growth of both benchmarks. Oil producers in the North Sea and elsewhere were happy to use a new mechanism for marketing their oil, and refiners had not only an alternative source of supply but also a liquid tool for managing the price risk. Finally, Brent crude trading as a 'forward' physical or 'cash' market was greatly helped by the British government's tax treatment of the produced oil.⁴⁹

The lesson from history is that a liberalized market is a precondition for a well-functioning futures market. This would involve the privatization of state oil companies; abolition of all price controls, including those in the currency and capital markets; encouragement of transparency; and access to key infrastructure for all market participants. Given that it is a top-down measure, it should not be a difficult task for the Chinese leadership. The key is political will. Initially, such changes may lead to volatility and industry consolidation. That may not be bad, as the Shandong independents could certainly do with some consolidation.

In the absence of such profound measures, INE could still become an important local pricing hub. The exchange has already

⁴⁶ Jie Zhang and Naoki Umehara, *How Far is Shanghai INE Crude Oil Futures from an International Benchmark in Oil Pricing?*, Institute for International Monetary Affairs, March 2019.

⁴⁷ Platts, 'INE's Shanghai Crude contract sustains Chinese demand for cheap Middle East barrels', May 2020.

⁴⁸ Argus, 'Shandong pipelines face overload', 29 May 2020.

⁴⁹ J. Stern and A. Imsirovic, 'A comparative history of oil and gas, markets and prices: is 2020 just an extreme cyclical event or an acceleration of the energy transition?', *OIES Energy Insight* 68, April 2020.

provided sizeable delivery storage in Shandong and Liaoning provinces, home of the independent refiners. Better pipeline logistics could tempt the teapots (small, private refineries) to become more active in the INE crude contract and even procure some of their barrels there. The government could help, too, by basing at least some of the controlled product prices on the INE crude contract (as already mentioned, they are entirely based on international oil prices), enticing all the refiners to hedge some of their refinery margin there. The biggest oil importer in the world can certainly provide the required liquidity for a successful regional hub.

Concluding remarks

China acquired pricing power a long time ago; Chinese oil traders have been a force in the international oil markets for many years. The INE crude oil or any other contract is not necessary to achieve this goal. So far, the Brent benchmark has served both the independent Chinese refiners and their suppliers well. Local market conditions have simply been reflected in the quality differentials to Brent futures.

There is certainly room for one or more delivered oil contracts into China – for example, a low sulphur crude contract possibly based on a basket of Russian ESPO, Brazilian Lula, and Congolese Djeno. Independent refiners could utilize such a contract for procuring physical barrels as well as hedging the price risk. Sellers, who are mainly international oil companies, would find it a good mechanism for price discovery, managing risk as well as sales of physical oil. Additional infrastructure, such as more connecting pipelines and storage, could make the contract more attractive to the independents. Basing domestic product prices at least partially on the INE contract could force all the refiners to hedge on the exchange. All of these steps could create an active regional hub with at least one liquid and successful oil contract in Shanghai. And if the financial and commodity markets were ever to be fully liberalized in China, the contract could even become an international benchmark.

HOW COVID-19 HAS CHANGED THE LONG-TERM OUTLOOK FOR CHINA'S OIL DEMAND

Michal Meidan

China's oil demand has almost tripled over the past two decades – accounting, on average, for one-third of global oil demand growth. China is also set to dominate future growth as it will likely overtake the US as the world's largest economy. But the pace of the country's oil consumption is slowing while the product makeup is shifting, in line with the restructuring of the Chinese economy and policy efforts to curb local air pollution. Compared to close to 10 million barrels per day (mb/d) of oil demand growth over the past two decades, demand growth will likely fall to 3–4 mb/d between 2020 and 2040. These relatively robust growth volumes are based on the fact that China's per capita oil use is currently around one-third of OECD levels. When considering that China today has one-fifth of the global population and accounts for 15 per cent of global GDP, its oil demand still has strong growth potential, even though growth rates will be tempered by the government's efforts to tackle air pollution.

In the context of the global energy transition and concerns about peak oil demand, China's trajectory is extremely significant for global markets, as even a small adjustment in the outlook for a country that consumed 14 mb/d of oil in 2019 has huge ramifications for suppliers, refiners, and traders worldwide. The aftermath of the COVID-19 pandemic could herald such an adjustment. The government's recovery package is likely to accelerate the electrification of the Chinese economy, which could soften oil demand. While this should not be mistaken for a 'green' stimulus, as China risks electrifying faster than it decarbonizes, electrification will still weigh on demand for various oil products. Refiners in China, which have already started adapting to a world of lower oil demand growth, are unlikely to slow refining additions. Instead, they are looking to increase product exports, while also cutting product output and shifting to petrochemicals. COVID-19 seems to have accelerated that process, too.

China's economy comes bouncing back

As China gradually emerges from the COVID-19-induced economic shock, policymakers have been looking to hasten the country's economic recovery in the short term while supporting efforts to increase China's position in global value chains in the long term. Short-term support for industrial activity seems to be paying off, as China's Q2 2020 GDP pointed to a very strong recovery, at 3.2 per cent year on year (y/y), following the steep 6.8 per cent y/y decline in Q1. Even though the government has refrained from issuing a GDP growth target for the year, it will want to deliver on its pledges to eradicate poverty and double the size of the economy from 2010 levels, suggesting efforts to deliver a solid economic recovery.



Moreover, in light of the global economic downturn and rising tensions with the US, Beijing is now focusing on a 'dual circulation' strategy, which seeks to make the economy less vulnerable to external shocks by becoming self-reliant in key technologies (while also continuing to open the domestic market to foreign investors). Put simply, China's economic growth prospects still look solid, underpinning the ongoing urbanization process, so rising incomes will continue to drive demand for transport fuels as well as consumer goods. But the focus on technological self-reliance points to a faster electrification of Chinese cities and energy end-use. The government's New Infrastructure plan, which lies at the heart of its short-term recovery and its long-term development, focuses on seven specific fields: 5G networks, data centres, artificial intelligence, the industrial Internet of Things, ultra-high voltage power transmission, high-speed rail, and electric vehicle charging infrastructure.⁵⁰ To be sure, many of these promises reiterate existing policy priorities, but there is now greater urgency to fulfil them.

Electric dreams

Electrification, however, will weigh on oil demand across the barrel. First, despite an uptick in short-term gasoline demand, as private mobility displaces public transport, the government's focus on building out the infrastructure to support its growing electric fleet (for both private and public travel) will weigh on both gasoline and diesel demand growth. To be sure, the auto market has been getting mixed messages: local officials have been easing licence plate restrictions for internal-combustion-engine vehicles and introducing new 'cash for clunker' trade-in deals, while the central government has delayed the roll-out of stricter motor emissions standards, alleviating some of the pressure on domestic car sales. Yet the government has also stepped in to support new energy vehicle (NEV) sales – which were slowing before the pandemic due to lower subsidies and the economic downturn – by extending subsidies until 2022. In March, China's top economic planning body, the National Development and Reform Commission, announced that it will accelerate the country's transition to NEVs. Finally, local governments in Shanghai, Guangzhou, and Sichuan, for example, are also offering additional subsidies for NEV sales through the end of the year.

Overall, then, even though gasoline demand is set to recover strongly this year and next, the government's support for NEVs remains unchanged. Already by 2020, a number of cities were aiming to have 8 per cent of new urban fleets – including buses, sanitation trucks, postal vehicles, taxis, and commuting coaches – powered by new energy. Local initiatives – including Beijing's pledge to convert 20,000 taxis to electric vehicles by the end of this year and the switching of bus fleets to electric vehicles in Shenzhen and other cities – still hold.

In a post-COVID-19 recovery, however, efforts to add charging infrastructure and create a robust digital and technological ecosystem for electric fleets could accelerate the uptake of electric mobility. Already, greater use of artificial intelligence and big data technologies has led to a surge in the use of e-bike and e-scooter sharing platforms in Chinese cities in the aftermath of the COVID-19 outbreak. According to data from bike-sharing companies, before the pandemic, riders looked to bike sharing for short distances (the 'first' or 'last' mile from their home or office to the train stop); but now, they shun public transport and prefer to take the whole journey by bike. The addition of e-bike or e-scooter sharing platforms makes longer journeys more convenient.⁵¹ Even before COVID-19, electric two-wheelers and low-speed electric vehicles were blossoming in smaller Chinese cities, as they do not require a driver's licence and sell for as little as \$1,000. With a faster roll-out of additional sharing platforms, more new drivers are already on an electric mobility trajectory.

A shift from road to rail

The electrification trend will also impact diesel demand for freight, given the potential for a faster shift from trucks to rail. The government has sought to reduce commodity trucking because diesel-powered freight trucks are responsible for 60 per cent of the nitrogen oxides and 85 per cent of the particulate-matter pollution released on China's roads, despite making up only 8 per cent of all vehicles. Shifting the transport of goods and commodities from roads to designated rail lines and rivers is likely to be a key part of the 14th five-year plan.⁵² The expansion of rail lines, as part of the country's stimulus programme, could accelerate this change. Moreover, new high-speed rail lines, which are part of the New Infrastructure plan, could dent the anticipated surge in air travel, and therefore jet fuel consumption, going forward. The competition between high-speed rail and air travel is not

⁵⁰ *White Paper on the Development of 'New Infrastructure'* (in Chinese), CCID Research Institute for Information Technology, <http://www.miithinktank.org.cn/aatta/20200324225821366/1-2003231F017.pdf>.

⁵¹ Winston Ma Wenyan, 'Here are 4 major bike-sharing trends from China after lockdown', *World Economic Forum*, <https://www.weforum.org/agenda/2020/07/4-big-bike-sharing-trends-from-china-that-could-outlast-covid-19/>.

⁵² Ministry of Ecology and Environment, *Vehicle Environmental Management Annual Report* (in Chinese), 2019, http://www.gov.cn/xinwen/2019-09/05/content_5427449.htm.



new,⁵³ but a concerted push to develop high-speed rail lines, alongside consumer reluctance to fly after COVID-19, could slightly moderate an otherwise extremely strong potential for jet demand growth.

A chemical reaction

As the Chinese economy continues to recover from the COVID-19 shock, oil demand growth is set to return to 2019 levels by 2021, rebounding strongly next year. And the longer-term outlook for rapid urbanization and a rising middle class remains unchanged. But small changes to mobility trends, and even gradual shifts from road freight and air travel to rail, could shave off as much as 1 mb/d of potential product demand through 2040, bringing China's incremental growth down from 4 mb/d to 3 mb/d.

At the same time, despite China's current refining overcapacity, there is plenty of appetite for new refining additions, with over 2 mb/d of new refining additions planned through 2025. For now, the government shows no sign of slowing the pace of capacity additions, in part because new plants are being built by private companies – as part of the government's effort to open the sector to non-state actors – and because they are integrated petrochemical plants, which support the government's goal of self-sufficiency in chemicals. The switch to petrochemical output has been in the making for several years, with the state-owned refiners also looking to value-added products to help them compete in the global market and maximize profitability. Indeed, Chinese refiners have been investing heavily in olefins and aromatics capacity as they seek to reduce the share of refined products and expand further downstream over time.

Sinopec, China's largest refiner, has been increasing its chemicals capex over the last five years, and before COVID-19 hit, the company was planning to increase it by 44 per cent y/y to RMB 32 billion, accounting for 22 per cent of total capex. While the capex spending may be scaled back this year due to the oil demand shock and falling prices, chemical conversion projects continue. Sinopec reportedly started work in May to reorient its 0.18 mb/d Anqing refinery in Anhui province towards petrochemical production, with plans to add around 2 million tonnes per year of olefins and aromatics capacity. The end goal is cutting refined product output by a third. PetroChina's annual guidance also points to increased investments in chemical transformation and upgrading capacity. In 2019, the company upgraded its 0.20 mb/d Liaoyang refinery in Liaoning province, added 0.80 million tonnes per year of paraxylene capacity, and earmarked funds for its Guangdong petrochemical refining and chemical integration project, as well as the Daqing petrochemical upgrade project. China is already the world's largest chemical producing country, a position that will be strengthened as it continues to invest in olefins and aromatics chains, but it currently relies on petrochemical imports for much of its feedstock. But with a surge of new capacity additions, in 2020, it is estimated to account for half of global ethylene capacity additions, and three-quarters of propylene capacity. Given that these new additions are for the most part integrated (refineries and chemical plants), they are benefitting from competitively priced naphtha and LPG—their main feedstock—and in turn are able to produce PX that is often cheaper than imports. Not only does this help support jobs further downstream, but it also reduces petrochemical imports. PX imports in 2020, for example, could fall to just 9 Mt, from 15 Mt in 2019.

If trends in China's oil market in the first half of 2020 are anything to go by, the shift may be happening faster than previously expected. Refinery yields for gasoline, diesel, and jet fuel have been falling since the beginning of the year. This is unsurprising for Q1 2020, when refinery runs and economic activity collapsed. In Q2, however, the outlook changed slightly: the collapse in crude costs and the guaranteed margins offered by the domestic pricing system led to a strong increase in refinery runs. Still, gasoline yields were lower y/y by 2.5 percentage points (ppts) jet yields fell by 3.2 ppts, and diesel yields shrank by 2.3 ppts, while LPG and naphtha yields have been rising.

An altered outlook

As the Chinese economy recovers from its COVID-19-induced shock, there seems to be little to suggest that its long-term oil demand trajectory has changed: The country's economic growth seems almost back on track, with urbanization and the growth of the middle class supporting rising oil demand. At the same time, the government remains committed to curbing pollution, making it likely that the rate of growth will be slower than in the past. Finally, refiners, seeing the excess product supply domestically, are aligning themselves with the government's ambition to shift towards specialty-chemical growth, reflecting the increasing sophistication of consumer demand and China's industrial output.

⁵³ Hongchang Li, Jack Strauss, and Liu Lu, 'The impact of high-speed rail on civil aviation in China', *Transport Policy*, 74 (February 2019), pp. 187-200.



COVID-19 seems to have exacerbated the product oversupply and accelerated the shift to chemicals. Going forward, the government’s twin focus on economic recovery and accelerated electrification of energy end-uses could soften the outlook for oil demand. Electrification will be supported by efforts to add charging infrastructure and the creation of a robust digital and technological ecosystem, which in turn could support shared e-mobility. At the same time, the addition of rail lines could displace diesel freight and weigh on future jet fuel demand for air travel. Already in the first half of 2020, as refiners have grappled with the product oversupply and cheap feedstock, they seem to have focused on shifting to chemicals, while expanding their olefins and aromatics capacity. As such, COVID-19 might be offering a glimpse of China’s future oil demand and supply system.

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