BHP

BHP's economic and commodity outlook

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Market outlook

Six months ago, at the time of our full year results for the 2020 financial year, we felt that the balance of probabilities indicated that the worst of the physical demand shock from COVID–19 was behind us. While some of our commodities have continued to face a challenging environment in absolute terms since that time, others have entered a clear recovery phase for both demand and price. [1]

For the 12 months ahead, we assess that weighted directional risks to prices across our diversified portfolio are positive, with COVID-19 vaccines progressively being deployed, pent–up demand being released and large amounts of policy stimulus already in the system. While some uncertainties remain, our base case is constructive.

We expect the demand–supply balance to remain relatively tight in both iron ore and copper. The balance of risks for oil prices are tilted upwards, while metallurgical coal prices and differentials will be influenced as much by policy as by fundamentals. There is obviously still some residual uncertainty as to how vaccine deployment and the policy and behavioural response to the newer, more infectious strains of COVID–19 will interact over the coming quarters. It is also notable that the early trends in the regional distribution of vaccines in calendar 2021 is similar to the distribution of stimulus policies in calendar 2020: the gap between wealthy economies and the bulk of the developing world is stark. So while the “uncertainty discount” in the risk appetite of households and businesses we have noted in previous communications is definitely fading, it is doing so in uneven fashion across the world. Those societies that are best equipped to rapidly mobilise resources under the pressure of a crisis – whether that be fiscal spending, hospital beds, vaccine production or cold storage logistics for the same – are distinctly advantaged over those with lesser capacity to move swiftly at scale.

Looking beyond the immediate picture to the medium–term, we continue to see the need for additional supply, both new and replacement, to be induced across most of the sectors in which we operate: notwithstanding the reality that COVID–19 has significantly lowered the starting point for demand across most of our exposures and in some instances has also left a temporary overhang of supply in its wake.

After a period of adjustment in which demand rebalances and supply is recalibrated, we anticipate that higher–cost supply will be required to enter the cost curve in our preferred growth commodities.

In isolation, the demand shock associated with COVID–19, some aspects of which can be reasonably expected to endure beyond the immediate horizon in some regions and industries, is likely to delay the rational timing of such entries by a number of years versus pre–pandemic estimates. This timing must then be adjusted based on the expected duration and scale of the direct and indirect impacts of the virus on the supply landscape in each industry.

The combined impact of these factors could well delay the onset of inducement pricing in some industries but at this very early stage we do not feel that inducement prices themselves are in need of substantial revision.

COVID–19 has altered many things, but it does not alter geology or define the frontier of operational efficiency in each commodity sector. Besides demand, these are the two most critical factors for identifying marginal sources of long run supply: and what it will cost to bring those resources to market.

The steepening of some industry cost curves that we monitor, albeit delayed from prior expectations, can reasonably be expected to reward disciplined owner–operators with higher quality assets.

In the medium and long term, on the demand side, we continue to see emerging Asia as an opportunity rich region. Later stage urbanisation and industrialisation in China, early–stage urbanisation in India and ASEAN and the multi–decadal impact of China's Belt and Road initiative are all expected to provide additional demand for our products. As the true costs of a partial retreat from economic openness and a lack of climate action are progressively recognised, we anticipate a popular mandate for a more open international trading environment will eventually re–emerge, along with a concerted effort to confront climate change as a basic imperative.

We note that the younger generations that will define our future – both Millennials and Generation Z – are not only more concerned about a lack of action on climate change than their elders in both East and West, they are also more favourably disposed towards globalisation.[2]

On that uplifting note, we confidently state that the basic elements of our positive long–term view remain in place.

Population growth, the infrastructure of decarbonisation and rising living standards are likely to drive demand for energy, metals and fertilisers for decades to come.

In the 2020s specifically, we expect global population to expand by 0.8 billion to 8.5 billion, urban population to also expand by 0.8 billion to 5.2 billion, nominal GDP to expand by $65 trillion to $152 trillion and capital spending to expand by $12 trillion to $35 trillion.[3] Each of these basic fundamental indicators of resource demand will increase by more in absolute terms than they did across the 2010s.

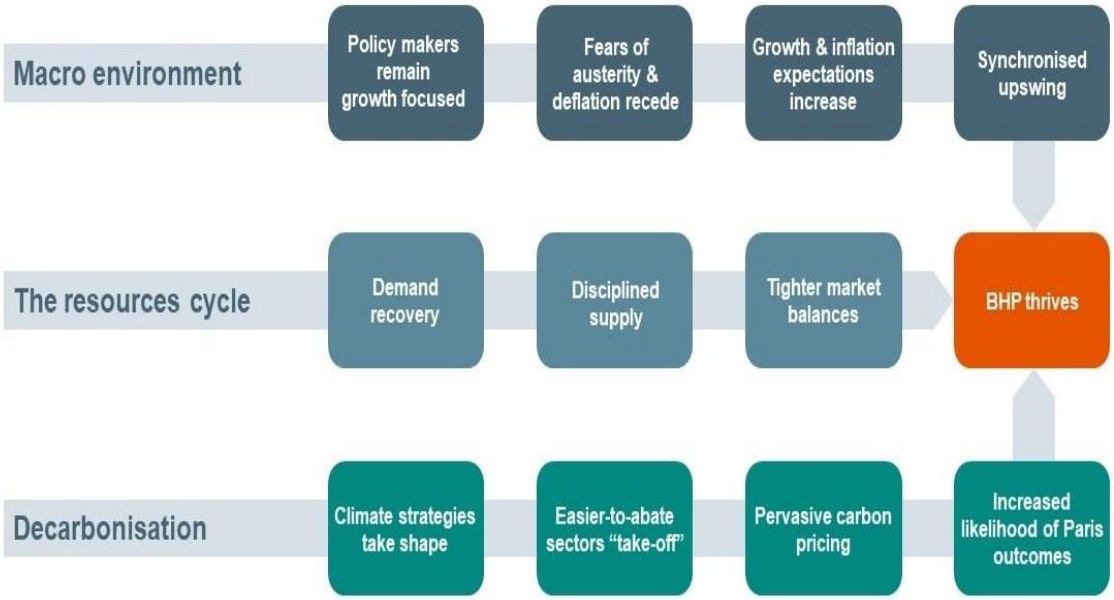
Sources: UN World Population Prospects 2019, UN World Urbanization Prospects 2008 Revision, IMF World Economic Outlook October 2020, and BHP analysis.

Furthermore, with fiscal and monetary policy makers in key economies committing themselves to a reflationary agenda, the secular fundamentals that make our industry attractive may be amplified.

We firmly believe that our industry needs to grow in order to build a better, Paris–aligned world.

[4]As illustrated by the scenario analysis in our **Climate Change Report**, if the world takes actions that limit global warming to 1.5 degrees it is advantageous for our portfolio.[5]

Add to these constructive themes the fact that the industry has been disciplined in its allocation of capital over the last half decade. With this disciplined historical supply backdrop as a starting point, any sustained demand surprise seems likely to flow directly to tighter market balances.



Investment that seeks to abate emissions and/or adapt to, insure against and mitigate the impacts of climate change are expected to rise to become a material element of demand for parts of our portfolio. The electrification of transport and the **decarbonisation of stationary power** are expected to progress rapidly, as will the desire to tackle harder–to–abate emissions elsewhere in the energy, industrial and land–use systems. Comprehensive stewardship of the biosphere and ethical end–to–end supply chains will become even more important for earning and retaining community and investor trust.[6]

The ability to provide and demonstrate social value to our operational and customer communities is both a core enabler of our strategy and a source of competitive advantage.

Against that backdrop, we are confident we have the right assets in the right commodities in the right jurisdictions, with attractive optionality, with demand diversified by end–use sector and geography, allied to the right social value proposition.

Even so, we remain alert to opportunities to expand our suite of options in attractive commodities that will perform well in the world we face today, and will remain resilient to, or prosper in, the world we expect to face tomorrow.

Global economic growth

The world economy contracted heavily in calendar 2020, with a previously unfathomable rate of decline in economic activity registered in the first half of the year. The Chinese economy contracted by roughly 10 per cent in the March quarter as it fought to control its initial outbreak, while the "The Great Lockdown" (as the IMF has appropriately dubbed this crisis) saw the rest of the world essentially in freefall in the June quarter, with quarter-on-quarter contractions of more than 20 per cent recorded in major economies like India and the UK. That, thankfully, was as bad as it got. While no major economy but China will escape calendar 2020 without an aggregate decline in activity, most cobbled together a recognisable recovery in the second half, while "dancing" with the virus. Along with the tragic loss of life and strain on healthcare systems, billions of people have seen their livelihoods disrupted, with informal labour markets in the developing nations particularly hard hit.

Against this backdrop, exchange rates were extremely volatile, with the US dollar index (DXY) spiking close to the highs of historical cycles, before entering a relatively steep downtrend still in place at the time of writing. The spike upwards was most marked against emerging markets outside East Asia, where COVID–19 outbreaks were particularly severe and balance of payment positions were most vulnerable to lower commodity prices and/or rapid capital outflow. The subsequent US dollar downtrend has proceeded in two stages, with developed currencies leading initially, and then emerging markets catching up as investor sentiment turned increasingly bullish in the final months of the calendar year. In real trade weighted terms, as of December 2020 the US dollar had declined by roughly –10 per cent from its intra–year peak.

The volume of global trade growth initially collapsed under the Great Lockdown, falling by –17.7 per cent YoY in May 2020. Yet, full–year outcomes are going to be much better than many feared around that time, with trade returning to the December 2019 level by November 2020. The International Monetary Fund (IMF), World Trade Organisation (WTO) and the United Nations Conference on Trade and Development (UNCTAD) all anticipated a full year decline in goods trade in the high single–digit or low double–digit range around mid–year, while Clarksons, the shipping consultancy, forecast that container trade would decline –10 per cent. UNCTAD "Nowcasts" are currently predicting the fall in the value of goods trade will be closer to half of that, at 5–6 per cent. One inference that can be drawn from this is that (much maligned) global value chains were in fact highly resilient to the pandemic stress test.

As global policymakers shift their attention from cushioning the impact of COVID–19 to actively spurring recovery, it is worth recalling that the underwhelming performance of the global economy in calendar 2019 was in large part due to weak international trade and the associated negative impacts on business confidence.

Trade is the essential lubricant of global economic growth, and a reflationary agenda must acknowledge that fact.

In addition, we strongly encourage policymakers to prioritise structural reforms at home as the surest route to sustainable productivity growth, and ultimately, prosperity, coming out of COVID–19.

Remaining open to the cross–border flow of people, goods, capital and ideas is vital to this end: free trade based on comparative advantage, competition, productivity and innovation are close companions.

These arguments highlight the importance of continued and vocal advocacy for free trade, open markets and high quality national and multilateral institutional design by corporations, governments and civil society.

The International Monetary Fund (IMF) expects the world economy to shrink by –3.5 per cent in calendar 2020, (considerably firmer than their –4.9 per cent forecast at the time of our annual results in August 2020) and to grow by +5.5 per cent in calendar 2021 and +4.2 per cent in 2022. Within our range, our base case is a little stronger measured across the two forward years. The associated quarterly path implies that under this case activity would return to the pre–COVID–19 level in the June quarter of 2021 (one quarter earlier than previously expected). Our base case projects the world economy to be around –4½ per cent smaller than it would otherwise have been in calendar 2021 than if COVID–19 had not occurred.

The impact of the Great Lockdown on labour markets has been profound. The International Labour Organisation (ILO) estimates that global hours–worked declined by –5.2 per cent in the March quarter, –18.2 per cent in June quarter, –7.2 per cent in the September quarter, and –4.6 per cent in the December quarter (all measured against a December quarter of 2019 baseline). That equivalent to the loss of 255 million full–time jobs over the entire year and the loss of 8.3 per cent of earned labour income.[7] The developed world did relatively better than average on this score, at –7.8 per cent, but when one considers the trillions spent on income support by governments across the developed world under COVID–19, the gap between the pandemic experience of the median household in the developed and developing world gets even wider.

Global fiscal stimulus (excluding loan guarantees and automatic stabilisers[8]) of almost 8 per cent of world GDP has been committed, roughly double that "inspired by" the Global Financial Crisis (GFC) of 2008/09. 80 per cent of these funds have been committed by the governments of developed countries. On the monetary side of the sovereign balance sheet, central banks in developed countries have expanded their balance sheets by an average of 17 per cent of GDP this year, versus 9 per cent of GDP during the GFC. Central banks in the developing world have expanded their balance sheets by just under 4 per cent of GDP.[9] The picture that emerges from this data is one of potentially over–cooked stimulus in the developed world set against a clearly insufficient outlay in developing countries. Quite remarkably, US households have managed to generate $1.6 trillion in excess savings across calendar 2020.[10]

We argued consistently over the last year that where "hibernation policies" were enacted, a smoother resumption of activity than would otherwise have been the case might be reasonably expected. Econometric evidence now shows that for every +1ppt of fiscal stimulus, working–hour losses were reduced by 0.8ppt in the June quarter of 2020.[11] That implies that in the absence of a fiscal policy response, working hour losses could have been as high as –28 per cent globally. The US example above is extreme, but instructive. What is still uncertain is whether traditional monetary and fiscal stimulus policies will have below–average or above–average multiplier effects. We wrote in August that: "A lower multiplier could result from depressed consumer and business confidence due to the deleterious impact of COVID–19 on both jobs and profitability. A higher multiplier could occur if the lagged impact of stimulus coincides with the release of pent–up demand as economies wake from hibernation. Overlaid with pessimistic and optimistic paths for COVID–19 containment respectively, each is a plausible book–end for assessing where the global economy might be at the end of calendar 2021." From the vantage point of today, the optimistic book–end feels like a very plausible option where considerable stimulus has been applied and vaccines are being deployed: whereas regions that were unable or unwilling to stimulate aggressively will lag behind, as the income and labour market scars of the 2020 collapse linger.

That leads to the natural conclusion that the arc of recovery will vary widely across countries. We consider the major regions in turn below.

China

China's economy shrank by around –10 per cent in the March quarter, but as envisaged in our consistently messaged V–shaped base case, it has been on a clear recovery path in the time since. As of early calendar 2021, the economy appears to be on a firm footing, with balanced contributions to growth coming from each of the key pillars of investment, the consumer and (net) exports.

Six months ago, we indicated the major risk to China's V–shaped rebound was the possibility of a new wave of infections emerging (potentially from imported cases) that required lockdowns to be reinstated on a macro–economically significant scale. This did not eventuate, with the inevitable localised flare–ups swiftly doused. We anticipate that the current concerns in some northern provinces will be contained in similar fashion. We also note that a very cautious approach is being taken to the mass movement of people around the Spring Festival, with both source and destination regions encouraging migrant workers not to travel home for the holiday. Recall that a year ago it was the shortage of migrant workers, who were "marooned" in their home provinces/cities/towns/villages while strict measures to contain the virus were in place immediately following the Lunar New Year, that was a major factor delaying the restart of factories, trucking and building sites in the March quarter. We also stated "Domestic industrial activity is not expected to flag this year or next for wont of policy support, as the state of credit growth, the stance of fiscal policy and the range of announcements (and re–announcements for signalling purposes) at the delayed "Two Sessions" collectively make clear." That has certainly been a solid guide to real world developments since.

At this point, it is important to consider where China presently stands on the spectrum of over/under stimulus, and what the implications of that judgment might be for the coming decade

Our assessment is a benign one. While in an absolute sense China has made a considerable effort to support jobs through the pandemic, in a relative sense China has not over–stimulated, either compared to developed countries during the pandemic, or relative to its own actions in response to the GFC. Our reasoning is as follows.

Announced central fiscal packages are measured in scale and heavier on tax and fee/cost relief for business than on (potentially wasteful) centrally funded investment. Local governments have generally been raising funds on–balance–sheet through the bond market, rather than through rampant, opaque off–balance sheet activity. The general stance of monetary policy has been supportive, but it has not resulted in extravagant credit growth. A somewhat wary macro–prudential eye has been kept on the property market. And the People's Bank of China has only expanded its balance sheet by a modest amount that is close to the developing world central bank average: certainly nothing like the major developed countries. All of which is to say that we do not see China emerging from COVID–19 with the sort of extreme imbalances that characterised the GFC stimulus hangover. Recall that after the GFC, the stimulus hangover lasted for more than half a decade: state owned enterprise (SOE) and local government debt rose to troubling heights; excess capacity was rife across a range of industrial sectors; profitability was weak; PPI deflation was entrenched and GDP growth slowed for six consecutive years. These very worrying trends were ultimately curtailed only by decisive official intervention to retire excess capacity under the banner of supply side reform (SSR).

Coming back to the present, the performance of key minerals end–use sectors relative to our views six months ago have either met our expectations (real estate and infrastructure) or exceeded them (machinery, consumer durables, transport).

We anticipate that national level housing policies and rhetoric will remain directed towards limiting speculation, managing macro–prudential risks and building rental markets. From a cyclical perspective, the policy environment was loosened as part of the broader effort to support activity coming out of lockdown. That resulted in a relatively swift rebound in sales volumes, with the level of activity back in the normal range by the June quarter. Across calendar 2020, housing sales increased by 2.6 per cent. Housing starts were expected to decline mildly, which they did (–1.2 per cent). However, the long awaited upcycle in housing completions, extending the promising momentum seen in late calendar 2019, did not eventuate in 2020, as developers pivoted back towards sales under the more favourable policy climate. The result of all of the above in terms of floor space under construction was a solid 3.7 per cent growth rate in 2020.

In terms of the outlook for calendar 2021, with policy now pointing firmly the other way (under the new regulatory framework, developers are incentivised to complete projects and move them off balance sheet, as they are a liability until they hand over the keys) completions are expected to lift materially in calendar 2021. Starts are expected to decline marginally for a second straight year, while sales are expected to be flat or slightly down. Off–market starts are expected to be slightly firmer than what is observed in the commercial market. Growth in floor space under construction is expected to be stronger than in 2020, but not back to the very strong 2019 level of 8.7 per cent.

Auto production inevitably lagged other areas of manufacturing in the first half of calendar 2020, given the importance of Hubei province to the aggregate supply chain.[12] However, auto sales rebounded as lockdowns eased, and while full year production will fall for a third straight year, there was solid momentum as calendar 2020 closed (5.7 per cent YoY in December). Machinery production was strong for much of the year. Segments linked to infrastructure and domestic demand more broadly led the way. Those more closely linked to international markets have been weaker. Consumer durables outside of personal computing and peripherals were mixed, with washing machines and refrigerators up, but air conditioners down.

On exports more generally, Chinese manufacturing benefited from the health equipment and consumables imperative and the work–from–home IT hardware boom but suffered from weakness in global discretionary household consumption and non–IT capital equipment through the middle of the year. The aggregate outcome has been a far more resilient picture than might reasonably have been expected, with exports back to pre–COVID levels in volumes terms by July, four months ahead of global trade reaching that milestone. Indirect exports of steel and copper were a positive surprise within the overall figures.

Over the longer term, our view remains that China's economic growth rate should moderate as the working age population falls and the capital stock matures. China's broad production structure is expected to continue to rebalance from industry to services and expenditure drivers are likely to shift from investment and exports towards consumption.

Nevertheless, China is expected to remain the largest incremental contributor to global industrial value–added and fixed investment activity through the 2020s even as its growth rates mature.

Within industry, we expect a concerted move up the manufacturing value–chain. This will require further improvements in the domestic innovation complex. Notwithstanding the natural emphasis now being placed on "dual circulation"[13], given the times we live in, we anticipate that the concerted move outwards of recent years is likely to continue, with an emphasis on South–South cooperation, regional trade agreements[14], and the **Belt–and–Road** corridors. More broadly, we anticipate environmental concerns will become an even more important consideration in future policy design than they are today. Within this context, China's plans to see emissions peak in advance of 2030 looks readily achievable, while hitting its net zero by 2060 objective is a considerably more challenging task.

Major advanced economies

The US economy's eleven–year expansion came to an abrupt end in calendar 2020. COVID–19 lockdowns led to both a steep contraction in economic activity and the loss of more than 20 million jobs at the peak of disruption. In response, fiscal support of around $3.8 trillion had been committed as of early January (with more being promised by the Biden administration), and the Federal Reserve has expanded its balance sheet by around 15 per cent of GDP. The Fed has also adopted a new "average inflation targeting" (AIT) framework that prioritises the pursuit of full employment: and to help accommodate that pursuit, periods where inflation is sustained above the historical 2 per cent objective are now explicitly condoned.

The outcome of the Presidential and Congressional elections has removed one source of high–level uncertainty from the outlook.

The Biden administration is a pivotal one in global history:

- It has the potential to rapidly accelerate global decarbonisation trends.
- It faces monumental geopolitical choices, both in terms of its approach towards multilateralism and its attitude towards key bilateral relationships.
- It has the potential to re–set the prevailing macroeconomic policy orthodoxy.

Specific uncertainties on a plethora of matters within this general framework remain, despite some prominent Day One activity. These include announcing a return to the Paris Agreement, a temporary moratorium on oil and gas drilling on federal lands, and launching a holistic, multi–agency review of Trump–era regulations deemed to have had negative environmental consequences. With the COVID–19 crisis an urgent priority, it may be some time before additional major foreign, domestic economic and trade policy priorities are revealed. Much depends on these choices, for the US itself and the world.

In Europe and Developed Asia, disruptions to manufacturing value chains dissipated along with the easing of first wave lockdowns in the second half of calendar 2020, allowing a recovery to take hold.

In Developed Asia, Japan had a relatively difficult time suppressing its initial outbreak and it struggled to cope with the collapse in auto demand at home and abroad while also dealing with the financial and psychological blow of delaying the Tokyo Olympic Games. A second wave has emerged during the current cold winter, which will temporarily hinder broader recovery efforts from gathering pace. South Korea has been somewhat more resilient, containing its initial outbreak quite effectively while also benefitting from the observed improvement in the global electronics sector. South Korea's semiconductor exports rose an impressive 30 per cent YoY in December 2020.

In Europe, a variety of national responses to both lockdown and reopening have been put in place, both in the first major wave and in the current case spike. Fiscal stimulus plans were slower to come to fruition than in the US and are of smaller scale, which partly explains the performance gap in the two economies in calendar 2020 (the IMF estimates that the US shrank by –3.4 per cent, the Eurozone by –7.2 per cent). Europe's plans, however, are arguably more strategic and effectively targeted. An emphasis on "building back better" by sponsoring an accelerated energy transition has been the clear theme, including both direct spending on, and subsidies of, green technology and infrastructure, alongside guarantees/bailouts with green conditionality attached. European countries mobilised $166 billion of energy transition related investment in calendar 2020, more than the other two big spenders, China ($135 billion) or the US ($85 billion).[15]

The agreement to finance recovery spending via mutualised public debt (European Commission bond issuance) is an important landmark for the European project. Monetary support and system stability measures were faster to arrive than fiscal stimulus. The European Central Bank expanded its balance sheet by almost 25 per cent of GDP in calendar 2020 (more aggressive than the Fed and the Bank of England), while major national governments committed to off–balance sheet loan guarantees averaging around 21 per cent of GDP, ranging from ~12 per cent in Spain to a staggering ~37 per cent of GDP in Germany.[16]

India

India's economy stuttered in calendar 2019 and then it collapsed under the pressures of COVID–19. Even among the large pile of spectacular statistical debris left in the wake of the Great Lockdown, India's June quarter capitulation stood out. However, industrial activity has rebounded smartly from the nadir, such that industrial value–added was back in positive YoY growth territory in September and October (+4.2 per cent in the latter) having fallen as low as –57.3 per cent YoY in April. Capital inflow has also returned, with a promising uplift in foreign direct investment in the September quarter. Notably, the IMF has responded to this momentum shift by revising its 2021 growth forecast by +2.7 percentage points (January 2021 versus October 2020, Indian fiscal year basis) to +11.5 per cent.

The rebound has come despite the fact that the government's efforts to directly support the economy have been modest. The majority of India's announced stimulus in calendar 2020 came from the monetary side of the aggregate public balance sheet, with a focus on credit supply and liquidity support. Even so, the RBI balance sheet has only expanded by 6 per cent of GDP, just a little above the developing world average, with an additional 5 per cent of GDP in off–balance sheet loan guarantees. Complementing these moves with a more decisive expansion of direct fiscal outlays on investment and income support would be a positive step towards further consolidating the recovery path. The Union Budget for fiscal year 2021/22, delivered on February 1, 2021, fell a little short of ensuring that, notwithstanding a welcome focus on increasing infrastructure outlays on balance sheet, larger allocations for health, and the general feeling of relief that an austere policy stance was not introduced.[17]

Beyond the immediate matter of COVID–19 recovery, returning India to a healthy and sustained medium–term growth trajectory will require a reduction in policy uncertainty, an increase in social stability, a greater focus on unlocking the country's rich human potential, and an increase in international competitiveness in both manufacturing and traded services. The emphasis on moving up the "ease of doing business" rankings, and the steps taken to increase India's share of geographically mobile foreign manufacturing investment that has come through during COVID–19 are both sensible steps. The decision to be less engaged with the regional trade agreement landscape, and inconstant attitudes towards domestic market access for foreign players, collectively present a mixed message in terms of reform appetite, given the positive impact that freer trade and increased competition would have on productivity growth and innovation. Back on the positive side, the lower customs duties at various points of the steel and copper value chains announced in the 2021/22 budget are a sensible measure to lower construction and manufacturing costs.[18]

Steel and pig iron

Global crude steel production had been extremely unbalanced for two years from a geographic perspective, with COVID–19 amplifying a trend already underway in calendar 2019. In that year, China had expanded by around 8 per cent and the rest of the world had contracted by around –2 per cent. The gap has widened further under COVID–19, with China surging ahead at record run–rates, while ex–China output declined by a high single digit percentage.

In calendar year 2020, Chinese production rose to 1.053 billion tonnes, comfortably above the "mystical" nine zero level.

The approximate 3 per cent growth in demand from end–use sectors that we project for calendar 2021, if met solely from domestic sources, may see reported annual production close to 1.1 Bt: a level surpassed on a monthly annualised basis on a few occasions in calendar 2020.

China's blast furnace utilisation rate increased from around 80 per cent in February 2020 to well above 90 per cent throughout the second half of the calendar year. Along with a 50–60 percentage point swing in electric–arc furnace utilisation (from a low of 12 per cent in February to around 60–70 per cent during H2 CY20), that has led to the stunning crude steel output level of 1,053 Mtpa referenced above, representing growth of +5.2 per cent year–on–year. This was a little stronger than our base case. Pig iron grew at a similar pace to crude steel in calendar 2020, reflecting constrained scrap availability for Chinese EAF mills.

Finished steel inventories built up to historically high levels during the March quarter as blast furnace operations consciously produced in advance of demand, trusting that sales would pick up when the lockdown was lifted. This faith proved to be well placed, as finished inventories fell swiftly though the June quarter and in the second half of the calendar year, such that stock levels at both mills and traders had returned to normal by December.

We note that slightly less than 10 per cent of Chinese apparent steel demand is exported in finished products. That is a lower degree of external exposure than, say, Japan (around 14 per cent) or Germany (around 19 per cent). An additional 5 per cent of Chinese production is exported directly. Reflecting China's status as the "clearing market for everything" for much of the year, China's direct net exports of steel fell sharply to just 16 Mt in calendar 2020, with imports (including semi–finished products) up around 150 per cent YoY to 40Mt while exports have declined by around –17 per cent YoY to 56Mt. The month of June itself saw China's first steel trade deficit since 2008.

The unique circumstances of COVID–19 have altered a number of fundamental relationships across our commodity suite. In Chinese steel, the relationship between capacity utilisation and profit margins has been impacted. Profit margins have been slim this year despite the sharp increase in utilisation, with higher input costs (especially seaborne iron ore, scrap and merchant coke) and the large inventory run–up of the first half of the calendar year (+30 per cent YoY for mills plus traders) being two key reasons for that disconnect.

Turning to the long term, we firmly believe that, by mid–century, China will almost double its accumulated stock of steel in use, which is currently 7-8 tonnes per capita, on its way to an urbanisation rate of around 80 per cent[19] and living standards around two–thirds of those in the United States. China's current stock is well below the current US level of around 15 tonnes per capita. Germany, South Korea and Japan, which all share important points of commonality with China in terms of development strategy, economic geography and demography, have even higher stocks than the US.

We estimate that this stock will create a flow of potential end–of–life scrap sufficient to enable a doubling of China's current scrap–to–steel ratio of around 20 per cent by mid–century.[20] As we argued in our **blog on regional pathways for steel decarbonisation**, increasing scrap availability is a powerful lever at the China industry's disposal as it seeks to contribute to the national objective of net zero emissions by 2060.

The exact path to this end–state is uncertain. Among the range of possibilities we consider, our base case is that Chinese steel production has entered a plateau phase, with the literal peak to occur no later than the middle of this decade. Our low case[21] for China, which underpins our global view on steel–making raw materials, assumes that the peak year is contemporaneous. The industry is then assumed to immediately embark upon a multi–decadal decline phase in the annual output of both steel and pig iron, highlighted by an even more aggressive long–run scrap–to–steel ratio increase than the doubling outlined above.

Steel production outside China collapsed under the pressures of the Great Lockdown, with a high single digit percentage decline across calendar 2020.

In the calendar year 2020, India's crude steel output fell by –10.6 per cent while pig iron output fell by –8.7 per cent YoY. In the same period, Japan, Europe and South Korea contracted by –16.2 per cent (pig iron –17.8 per cent), –8.8 percent (pig iron –12.4 per cent) and –6.0 per cent (pig iron –4.0 per cent) YoY respectively. Note that the exposure to indirect exports of these three regions (with Germany as a proxy for Europe) sits between 14 per cent and 19 per cent. The Developed Asian producers are also highly exposed to direct exports, at 31 per cent and 20 per cent of production for Japan and South Korea respectively, versus a trivial 1 per cent for Germany.

The stark dichotomy between China and the rest of world produces a weighted global crude steel outcome for CY2020 of –0.9 per cent (–0.6 per cent pig iron).

Indicators of a partial recovery outside China began to come through in June and July, with the rebound gathering steam in the December quarter. India led the way in terms of restarting offline capacity, initially supported by exports and a strong position on the global steel cost curve. With domestic demand also rebounding, most major Indian mills were running at 90 per cent utilisation or above as calendar 2020 drew to a close. For calendar 2020 as a whole, the weakest end–use sectors were transport, urban housing, non–residential building and capital goods. Rural housing and infrastructure were somewhat more resilient by the standards of the moment. Encouragingly, the high inventory position that built up pre–COVID has been corrected, with a normal stock position in place as calendar 2021 opens.

In North Asia, South Korean producers have brought capacity back online a little earlier than previously expected, while Japanese producers have proceeded on the basis of the (pessimistic) plans instated under the pressure of the June quarter collapse. Even in Japan though, we observe that idled coke ovens have been restarted and the process of restarting "banked" blast furnaces is underway. The successful restart of downstream activities, and attractive margins in a recovering world with lean inventories of finished steel, have flowed through to better sentiment amongst our European customers. In December 2020, rest of world momentum was sitting at +4 per cent YoY and utilisation reached around 69 per cent. Regional hot–rolled coil (HRC) price benchmarks have lifted smartly, with Europe above $700/t and the US above $1000/t.

Iron ore

Iron ore prices (62 per cent, CFR, Platts) have been strong, ranging between $100/dmt and $177/dmt over the first half of financial year 2021, averaging around $126/dmt. China's V–shaped recovery and spectacular pig iron run–rates have led to consistently strong port outflow. Lower than expected exports from Brazil have outweighed record shipments from Australia, an uplift in Chinese domestic production and the redirection of cargoes from Europe and Japan into China. Seaborne lump premia were volatile in the same time period, trading in the range of $0.04 to $0.18/dmtu and averaging $0.08/dmtu.

Chinese port stocks closed the calendar 2020 at 124 Mt, according to Mysteel, slightly lower than the closing position of 127 Mt in calendar 2019. However, there was considerable change within the year. Stocks trended lower in the first half of the calendar year, reaching a trough of 106Mt in June. They then built up again to 128 Mt in early October, before they again drifted lower moving into year–end, with China's steel "sprint" continuing and demand from the rest of the world on a normalising trajectory.

Twelve months ago, we spelt out our "from famine to feast" hypothesis for iron ore in the year–ahead. Specifically, we argued that:

"… if COVID–19 is effectively and demonstrably contained within the March quarter, we expect that an accelerated run–rate in the construction and manufacturing sectors for the remainder of the year can make up for the loss of activity seen at the outset of the year. … The sprint required to meet the annual plans of public and private entities in China in nine months rather than twelve (to stylise) will amplify the normal seasonal swings in steel end–use, potentially creating a shift from 'famine' to 'feast' for the iron ore market."

We defined the "feast" as a run–rate approaching the never before seen 1.1 Btpa area. Remarkably, this run–rate was achieved in multiple months in calendar 2020, producing record high annual crude steel production of 1053 Mt and a "lucky" 888 Mt for pig iron. This exceptional demand absorbed 9.3 per cent YoY growth in iron ore imports (to 1170 Mt), 2.3 per cent growth in domestic concentrate (to 217Mt) and a –47 Mt YoY decline in rest of world imports: a combination of outcomes that under ordinary demand conditions would be associated with large port stock increases and lower prices. The reality is of course that stocks declined and prices appreciated markedly.

The observation that seaborne supply conditions for this calendar year and next are highly uncertain, both in aggregate and in terms of quality profile, is self–evident, as it has been since the Brumadinho tailings dam tragedy in January 2019. Brazilian exports were unable to increase materially off the depressed calendar 2019 base, for a variety of reasons including weather and one of the world's most severe outbreaks of COVID–19. While we do not think that the current constraints on Brazilian exports are informative for long run equilibrium pricing, we reiterate that the normalisation process could be a multi–year event. The inevitable ups and downs of the path back to a more stable and predictable Brazilian export performance can be reasonably expected to generate volatility in both index and product pricing.

We estimate that price sensitive seaborne supply increased by around 36 Mt (natural grade wet basis) in calendar 2020. That was a rational response to the attractive price environment: no doubt that number would have been higher without COVID–19 disrupting logistics and mining activity in a range of jurisdictions capable of producing swing supply. How prospective Indian exporters balance their priorities between the recovery in domestic steel demand and attractive seaborne pricing is an uncertainty for calendar 2021 (albeit a secondary one in the broad context of the market balance). Other second tier supply uncertainties include the scale of scrap imports that enter the country under the relaxed regulation, and the competitiveness of imports of semi–finished steel.

Chinese domestic iron ore concentrate production started the year at a low ebb under COVID–19. We estimate that the run–rate dropped from 211 Mtpa in December 2019 to just 187 Mtpa in February 2020. It then recovered steadily for the remainder of the year, hitting a multi–year high of 230 Mtpa in November 2020. That is around 10 Mt higher than previous levels reached under "surge" conditions induced by attractive prices. Going forward, we expect that, in addition to structural market based drivers, safety and environmental inspections are likely to have a material influence on the average level and seasonal volatility of Chinese domestic iron ore production.

On the topic of differentials, we note that direct–charge materials – pellet and lump – had a volatile year. Direct charge premia compressed materially for much of calendar 2020, with strong lump supply out of Australia and redirected pellet cargoes from Europe contributing to a build–up in port stocks of these products even as fines inventories were declining to multi–year lows. These unique circumstances have since corrected, and premia have widened again, with lump premia spiking substantially higher in January 2021 to $0.38 per dmtu, up from a meagre $0.04/dmtu during the rainy season lull. Fines differentials to the 62% index for the 65% and 58% indexes narrowed very slightly half-on-half (lesser premium for higher grade, smaller discount for lower grade).

In the medium to long–term, as described in our steel decarbonisation blogs (**technology** & **pathways**) high quality seaborne iron ore fines and direct charge materials such as lump are important abatement sources for the blast–furnace steel making route during the optimisation phase of our **three–stage steel decarbonisation schema**. In China of course, the BF–BOF route represents 90 per cent of steel–making capacity, with the average facility being just 10–12 years old. The South Flank project, which was approved in June 2018 and was 90 per cent complete at the time of writing, will raise the quality of our overall portfolio, in addition to increasing the share of lump in our total output, with first production anticipated in mid calendar 2021.

Our analysis indicates that the long run price will likely be set by a higher–cost, lower value–in–use asset in either Australia or Brazil. That assessment is robust to the prospective entry of new supply from West Africa, the likelihood of which has increased. This implies that it will be even more important to create competitive advantage and to grow value through driving exceptional operational performance.

Metallurgical coal

Metallurgical coal prices[22] have ranged from a low of $97/t FOB Australia on the PLV index to a high of around $139/t during the first half of the financial year. MV64 has ranged from $86/t to around $115/t; PCI has ranged from $66/t to $92/t; and SSCC has ranged from $58/t to $86/t. Three–fifths of our tonnes reference the PLV index, approximately.

For the half year overall, the PLV index averaged $111/t, down by –18 per cent compared to the previous half and –26 per cent from the first half of financial year 2020. The differential between the PLV and MV64 indexes averaged 17 per cent in the first half of financial year 2021, 2 percentage points higher than in the previous half. Those figures hide considerable change within the half. The spread averaged 24 per cent in the September quarter and narrowed to 10 per cent in the December quarter.

The metallurgical coal industry endured a very strange year in calendar 2020. In the first half, the trade effectively cleared through China, with demand from other geographies having collapsed under the pressure of COVID–19 lockdowns. After a quarter of relative calm in September, with green shoots emerging in India, Europe and South Korea allied to the continuation of strong Chinese demand, we experienced trading conditions that were the near polar opposite of those seen in the first half.

A spike in uncertainty regarding China's import policy towards Australian origin coals was the key influence on markets late in the calendar 2020. The result was a rapid widening of the spread between the FOB Australia market and the China CFR market, noting there was already a large differential between seaborne and Chinese domestic pricing driven by the general annual quota limits that have been in place, informally, since 2017. The industry faces a difficult and uncertain period ahead.

In the last "normal year" for the commodity, calendar 2018, seaborne imports of approximately 300 Mt were shared relatively equally across China, Europe, India and Japan, with each region importing roughly between 50 and 60 Mt. South Korea took an additional 33 Mt (11 per cent), taking the share of the top five importers to around 86 per cent. China's individual share was 18 per cent, with the other four taking 68 per cent. Compare that to the seaborne iron ore trade, where China accounts for close to three–quarters of the total.

In calendar 2020, the seaborne trade of 284 Mt broke down like so: China 57 Mt (20 per cent share), India 54 Mt (19 per cent), Japan 50 Mt (18 per cent), Europe 44 Mt (15 per cent) and South Korea 30 Mt (11 per cent). That is an 83 per cent share for the top five, not too different from calendar 2018, in a 16 Mt smaller trade than in calendar 2018. However, in terms of how these demands are being met, the natural flows between the major supply nodes and these consumption hubs have been disturbed by the China question: not to mention customer preferences regarding desired product specifications.

Safety concerns at some mines in Queensland, weather impacts and some curtailment decisions under low prices saw Australian exports fall by–7.6 per cent YoY in the calendar year–to–November. Also, swing exports from the US are down heavily in the same time period (–22 per cent). Canadian total exports fell –5.6 per cent; truck flow over the Sino–Mongolian border has oscillated between one fifth and one half of normal levels on COVID–19 risks, leaving exports down –30 per cent; supply from Mozambique fell heavily; while Russia's combined seaborne and landborne exports have fallen –9.3 per cent.

Domestic Chinese hard coking coal supply in calendar 2020 was largely unchanged compared to the previous year. Supply in the premium low–sulphur bracket, however, has increased 7 per cent YoY against a background of relatively attractive domestic prices and a low base in calendar 2019. We estimate that capacity is still –12 per cent versus pre–supply side reform levels, with efficiency gains leaving output down by a lesser –8 per cent. Total imports of coking coal were down by –2.8 per cent YoY in calendar 2020, aggregating to 72.6 Mt (seaborne plus landborne). Shipments from Australia to China were down by –9 per cent YoY to 38.8 Mt, on the back of a strong flow in the first half of the year. At the end of December 2020, there was a queue of 41 vessels (approximately 3 Mt of metallurgical coal) from all origins waiting off Chinese ports.

Longer term, we argue that the continued policy focus on environmental considerations and financial sustainability in Chinese coal mining, in addition to the intent to embark upon an effective decarbonisation path for steel making, should highlight the competitive value of using high quality Australian coals in China's world class fleet of coastal integrated mills. As we argued **here**, China's steel industry is still in the optimisation phase of its decarbonisation journey, in which higher quality raw materials make a clear difference to the energy and this emissions intensity of the BF–BOF[23] route, which accounts for 90 per cent of Chinese and 70 per cent of global crude steel production.

In coming years, most committed and prospective new metallurgical coal supply is expected to be mid quality or lower, while customer intelligence implies that some mature assets are drifting down the quality spectrum as they age.

The relative supply equation underscores that a durable scarcity premium for true PLV coals is a reasonable starting point for considering medium terms trends in the industry. The advantages of premium coking coals with respect to emissions are an additional factor supporting this overarching industry theme.

The flip side of PLV–privilege is that the non–PLV pool could face fundamental headwinds for an extended period in the disrupted post COVID–19 world.

On the topic of technological disruption, our analysis suggests that blast furnace (BF) iron making, which depends on coke made from metallurgical coal, is unlikely to be displaced at scale by emergent technologies this half century. The argument hinges partly on the sheer scale of the existing stock of long–lived BF–BOF capacity (70 per cent of global capacity today, average fleet age[24] of just 10–12 years in China and around 18 years in India). It also highlights the lack of cost competitiveness, technological readiness (or both) that will inhibit a wide adoption of theoretically promising alternative iron and steel making routes, or high–cost abatement levels such as hydrogen iron making and carbon capture and storage, for a couple of decades at least. Steelmaking is a low margin industry where every cent on the cost line counts.

We do acknowledge that (a) PCI could be partially displaced in the BF at some point by a lower carbon fuel, and (b) the well–established electric arc furnace (EAF) technology, charged with scrap and without any need for metallurgical coal, will be a stern competitor for the BF at scale to the extent that local scrap availability allows. In a decarbonising world, EAFs with reliable scrap supply running on renewable power will be very competitive. Our base case has the BF–BOF[25] share of global steel–making capacity drifting down from 70 per cent today to between 55 per cent and 60 per cent in 2050, with EAF mills gaining that share

Information on our scope 3 partnerships with ***China Baowu*** and Japan's ***JFE Steel*** can be found on our website.

Copper

Copper prices ranged from $6017/t to $7964/t ($2.73/lb to $3.61/lb) over the first half of the 2021 financial year, averaging $6840/t ($3.10/lb).[26] The average was around +24 per cent higher than in the prior half and +17 per cent versus the equivalent half of financial year 2020. The price trend within the half was steadily upwards, with the daily low for the period recorded on July 1 and the daily high being recorded on December 18.. Investor risk appetite was particularly strong from late-November to mid-December, with US stimulus deals and positive vaccine news being the major catalysts. Early in calendar 2021, with news that the US Democrats would have a narrow majority in the US Senate, the LME settlement price moved above $8000/t.

The storyline for copper in the first half of calendar 2020 was a balanced blend of industry specific fundamental factors and swings in broader macro sentiment. The second half was less balanced, with specific fundamental factors taking a relative back seat to general macroeconomic tailwinds.

Copper demand trends in China (roughly half of refined demand) have been starkly different to the rest of the world. Chinese semis demand was flat in calendar 2020, while ex–China markets declined by –9 per cent.

On an end–use basis, Chinese demand was mixed in calendar 2020. Demand from power and telecom infrastructure, machinery, white goods and electronics expanded, while construction, transport and air conditioners declined. Within the power infrastructure sub–set, energy transition investments (renewables generation) was the major source of growth, rather than the traditional driver of conventional investment in the grid.

Our preliminary base case for calendar 2021 has global copper semis demand recovering to a level just above the calendar 2019 total. Within that, Chinese demand is expected to be roughly 5 per cent higher than it was in calendar 2019, with ex–China demand taking another year to achieve the 2019 benchmark, despite strong percentage growth in calendar 2021.

On the supply side of the industry, Chile and Peru, the two largest exporters of primary copper, have both experienced difficulty in containing COVID–19, with flow–on impacts to copper operations and the broader supply chain. This has led to a material tightening of the copper concentrate balance, with treatment and refining charges moving lower in response, despite challenged smelter profitability. Scrap availability has also been constrained globally, for both logistical and economic reasons.[27] As of December 21, 2020 (i.e. in advance of December quarter operational reviews), Wood Mackenzie had identified 1.2Mt of disrupted production year–to–date, equivalent to 5.6 per cent of their initial annual production expectations. The South American mining industry at large has faced understandable issues with employee absenteeism under COVID–19, especially in localities where hospital capacity is under pressure. The current outbreak in Chile, for example, is putting considerable pressure on hospital capacity in Antofagasta, the gateway city for the mines of Northern Chile. The continent provided 42 per cent of the world's primary copper in calendar 2019.

Turning to the medium–term outlook, the net effect of the COVID–19 shock is tentatively expected to push back the timing of a structural deficit by one or two years versus prior estimates, principally due to the lower starting point for demand. That said, prices are comfortably above the long–term inducement level today, and with balances potentially tight in the next year or two, it is possible that they remain so for the interim. The next "challenge" for the market is expected to come when a cluster of in–development projects (Peru, Chile, central Africa and Mongolia) come on–stream somewhere in the 2022–2024 window, even as the scrap share of copper units moves higher on the increasing size of the end–of–life pool in China, strong economic incentives for collection and fewer physical constraints from social distancing. Once that phase of the decade is navigated, a structural deficit is expected to open in the mid–to–late 2020s, at which point we again see some sustained upside for prices.

A "take–off" of demand from copper–intensive easier–to–abate sectors (renewable power generation, the electrification of light duty transport, and the infrastructure that supports them both) is expected to be a key feature of industry dynamics in the second half of the 2020s.

Looking even further out, long term demand from traditional end–uses is expected to be solid, while broad exposure to the electrification mega–trend offers attractive upside. Grade decline, resource depletion, water constraints, the increased depth and complexity of known development options and a scarcity of high–quality future development opportunities are likely to result in the higher prices needed to attract sufficient investment to balance the market.

It is these parameters that are critical for assessing where the marginal tonne of primary copper will come from in the long run and what it will cost. We estimate that grade decline could remove –2 Mt per annum of mine supply by 2030, with resource depletion potentially removing an additional –1½ and –2¼ Mt per annum by this date, depending upon the specifics of the case under consideration.

Our view is that the price setting marginal tonne a decade hence will come from either a lower grade brownfield expansion in a lower risk jurisdiction, or a higher grade greenfield in a higher risk jurisdiction. Neither source of metal is likely to come cheaply.

Crude oil

Crude oil prices (Brent) ranged from a low of around $37/bbl to a high of around $52/bbl in the first half of financial year 2021. Brent was up by around 5 per cent from the average of the prior half. West Texas Intermediate (WTI) Cushing ranged from $36/bbl to $49/bbl.

The front–month Brent minus WTI spread was materially narrower on average half–on–half, contracting to $2.48/bbl in the first half of the financial year 2021 from $5.05/bbl. The WTI minus MARS[28] spread has averaged around –$0.9/bbl for the last twelve months (i.e. MARS at a premium to WTI).

After the extraordinary drama of the prior half, the half just gone was relatively calm. From July to October, range trade from the high $30s per barrel to the mid $40s per barrel was the order of the day. Sentiment then turned positive from early November (i.e. around the time of the Presidential election), with Brent adding ~$14 in the final two months of the calendar year to close in the low $50s per barrel. Early in calendar 2021, further modest gains have been registered, with prices moving above $60 in February.

We have been comfortable for at least six months that the most significant physical risks to the industry have passed. However, the recovery path has not been linear and it is unlikely to become so any time soon.

While we are confident that demand will rebound elastically this calendar year, and the price path will have an upward tilt on average, the situation remains complex. The tapering of OPEC+ cuts, the possibility of lower cost US shale assets hedging their way back in if the forward curve steepens just a little, and storage rundowns are all likely to lean against the price recovery.

There are upside risks as well. Under ordinary circumstances, 1 percentage point of growth in world GDP tends to be associated with 0.3–0.5 percentage points of oil demand growth. In other words, oil demand is a relatively stable function of overall economic activity and it is also typically less volatile than the broader economy. However, oil demand fell by much more than GDP in 2020 due to the unique circumstances of the Great Lockdown. For the calendar year as a whole, world GDP contracted by –3.5 per cent and oil demand by –8.5 per cent: or a ratio of –2.4 to –1. That is an 8 fold increase in sensitivity. With GDP flipping to well above trend growth in calendar 2021, if the sensitivity stays high (say, greater than +/– 1) then oil demand could move very rapidly indeed.

Shifting to the longer term, while demand has been hit very hard in the short–term, it is still highly uncertain to what degree, if any, demand has been impaired structurally. Six months ago we outlined some preliminary analysis on potential headwinds coming from (1) the loss of vehicle miles travelled as a portion of commuter trips are lost due to working from home (2) reduced aviation intensity (3) policy support for EVs that could drive uptake closer to our current high case in terms of fleet and sales share, and (4) Weaker economic growth in the populous developing countries hardest hit by COVID–19, leading to slower uptake of auto ownership and slower growth in demand for logistics and air travel, was a further possibility. Of these four, the one that has shifted most materially from the point of view of long–term oil demand is our view of EVs. Despite already being very much at the bullish end of this debate, we have revised up our low and mid case sales share estimates, and accelerated the timing of 100 per cent sales in our base case. That is based on the compelling signposts that have emerged in the last six months, including Biden's win in the US, net zero objectives announced by China, Japan and South Korea, and even greater policy support in Europe, including more aggressive timelines for internal combustion engine (ICE) vehicle bans.

The supply side of the oil industry has adjusted rapidly to the conditions that calendar 2020 presented. In the publicly listed arena, large and small firms alike have signaled large reductions in capex plans. According to consultancy Rystad, final investment decisions (FIDs) for greenfield projects have fallen back to 1950s levels. As of its October 2020 update, the IEA has predicted a one–third decline in upstream petroleum capex in calendar 2020[29] and a similar scale of decline in downstream and infrastructure. Combined, the petroleum value chain is set for its smallest real capital outlay in the history of the IEA's series, which goes back to 2010. In a sector subject to the perpetual tyranny of field decline, with (conservatively) a third of on–stream barrels needing to be replaced on a rolling ten–year cycle, that is also coming off a relatively unsuccessful decade for exploration, an investment and exploration crunch of this magnitude is expected to have major ramifications for supply for some time to come. The discussion above highlights that the attractiveness of oil as a commodity cannot be seen solely through a demand lens. (For our pre–Covid views on oil attractiveness, please go **here**.) Treated in isolation, the demand loss that COVID–19 has brought about is very likely to push back the timing of when the industry will need to induce the new deepwater projects that we expect to provide the marginal barrel in the long run. However, our ranges also incorporate plausible cases where today's capex ice age allows impaired supply to fully mitigate the demand shock in the medium term: and of course we range the demand shock itself.

Our base case is that demand will rise modestly above pre–COVID levels in the coming years, before reaching a plateau in the medium run. In the phase that precedes the plateau, the twin disruptive levers of efficiency and electrification that are operating on the road transport segment are more than offset, from a total liquids demand perspective, by the impact of rising living standards in the developing world.

But these circumstances will not last forever. Beyond the plateau, we foresee a steady erosion of demand as the disruptive forces gain ascendancy over the traditional economic development drivers, assisted by policy changes and, most importantly, technological progress. The ability of developing countries to leapfrog in their technology choices as cost relativities evolve (subject to infrastructure availability) is expected to ensure that their future pathways of oil use per head track somewhat lower than the historical pathways pursued by the major OECD economies. Future patterns of urban infrastructure design and country specific population density and agglomeration characteristics also play a role in this assessment.[30]

Bringing this bottom–up analysis of demand together with systematic decline rates of around 3 per cent per annum (global weighted average) that the supply side of the industry is subject to, points to an expected structural demand–supply gap through at least the mid–2030s. Considerable investment in conventional oil is going to be required to fill that gap. Our conservative views on both US onshore geology and the underlying shale productivity trend, which ultimately encouraged us to exit the shale business, are strongly held. The emphasis being placed on effective climate change action by the new administration in the United States could have a long–dated impact on both the demand and supply sides of the industry. We deem that deepwater assets are the most likely major supply segment to balance the market in the longer term. The price expectation required to trigger investment in new deepwater projects is believed to be significantly higher than the prices we face today.

Oil will be attractive, even under a plausible low case, for a considerable time to come.

Liquefied natural gas

The **Japan–Korea Marker (JKM) price for LNG** has been extraordinarily volatile over the last twelve months. Spot prices hit record lows as COVID–19 demand destruction hit a market already facing excess supply and large storage builds in the first half of calendar 2020. The market then reversed course sharply during the northern winter, printing record high prices in January 2021. The winter price squeeze came about due to disrupted supply, strong power and heating demand in North Asia, shipping congestion preventing Atlantic supply moving promptly into the Pacific as well as high freight rates. Prices averaged $5.81/MMbtu DES Japan in the half year just concluded, +101 per cent higher than the prior half, with the price ranging from $2.13 to $15.10/MMbtu. The record daily low was $1.83 (April 28 & 29 2020) and the record daily high was $32.50/MMbtu (January 13 & 14 2021).

The fundamental starting point for calendar 2021 features moderately constrained supply (planned and unplanned outages offsetting higher utilisation of export facilities in the US and spill–over effects from slower ramp–ups in calendar 2020), improving demand from both power and non–power sources in ex–China markets (abstracting from typical intra–year seasonality) and a much leaner inventory position (proxied by the level of European storage) than we have seen in some years.

Chinese and European imports (including storage) have been the two key demand sinks in recent years. Dating back to calendar 2016, these are the sequential annual percentage growth rates for Chinese imports: 36/44/42/14/10. That's how you lift demand 3.5–fold in half a decade! Europe has expanded 2.4–fold in the same period, with injections to storage a critical safety valve for the industry at times. After running close to physical limits in the first half of calendar 2020, stocks have been run down considerably in the 2020/21 winter, and were sitting below 61 per cent utilisation in January, slightly below the five–year average. Collectively, China and Europe have grown by ~58 per cent since 2015, while the rest of the market has increased in size by just ~6 per cent.[31]

Looking ahead, within our generally constructive outlook for LNG demand growth, the key uncertainties are energy mix and decarbonisation policies in Japan, China and Korea in the wake of their net zero pledges. At the national level, the scale of competing supply of indigenous and pipeline gas in (and into) China[32]; the level of investment in new gas infrastructure in India; and the timing and scale of nuclear restarts in Japan are also potential swing factors in the outlook. Outside Asia, the amount of Russian pipeline gas supplied to Europe, plus energy mix and decarbonisation policies in the EU are all material sources of uncertainty.

Despite the healthy LNG demand growth that we project, and even with only a single project reaching final–investment–decision (FID) in calendar 2020, such was the flurry of FID activity in 2019 that we expect current and committed capacity is likely to amply supply the market until the middle of this decade. Beyond the mid–2020s new projects are expected to be required in a global gas market where the marginal supply looks likely to come from North American LNG exports under a range of scenarios.

Five of the six new projects that produced first gas in calendar 2019 were US export facilities: as were four of the six projects that came online in calendar 2020.

With US supply able to swing between the two major consumer markets of Europe and Asia, thereby drawing them closer together, a greater US export presence is a supportive signpost for the hypothesis that regional gas hubs are on a path to harmonisation around a global benchmark.

With spot JKM DES prices falling well below US export break–evens during the Great Lockdown, US cargo cancellations also played an important role in rebalancing a (temporarily) grossly oversupplied market. 163 cargoes were cancelled between May and September, with the run–rate peaking at 45 in each of July and August.[33]

In the longer term, we see LNG as a commodity that has an opportunity to operate under inducement economics, at times, given the combination of systematic base decline and an attractive demand trajectory. Global gas is also a big market that is getting bigger, with LNG expected to almost double its share of that expanding pie. However, gas resource is abundant and liquefaction infrastructure comes with large upfront costs and extended pay backs. The answer to this complicated equation is that only assets that are advantaged by proximity to existing infrastructure, or customers, or both, are attractive to us. For a more detailed discussion of LNG attractiveness, please go **here**.

Eastern Australian gas

The fundamentals of East Australian (EA) natural gas continue to evolve. The rise of Queensland LNG projects fed by coal–bed methane resources and the maturation of conventional fields in Bass Strait and the Cooper Basin have combined to irrevocably alter the fundamentals of domestic price formation. Our firm assessment is that the EA market is likely to ultimately harmonise around LNG netback pricing. The likelihood of LNG imports being required as a seasonal source of incremental supply in the southern states has increased, with a number of potential projects presently under consideration by a range of parties. We expect that this development would accelerate the harmonisation process, as would improving the transparency and depth of domestic price discovery mechanisms.

Whilst there is industry consensus that there is an ample indigenous resource base to meet long term domestic demand, the future cost to extract and process this resource appears to be rising.

Further, constraints on onshore development hinder the efficiency with which the industry might otherwise operate. As traditional sources of supply fall off or plateau, new upstream investment will be required. To accommodate timely investment in competitive incremental supply, a clear and stable policy foundation is required.

We continue to believe that a more accommodative, state–based policy environment for onshore gas development – both conventional and unconventional – has the capacity to provide significant additional supply to the market at reasonable cost.

Energy coal

Energy coal prices were weak for much of the first half of financial year 2021, before rallying late in the period on strong winter power demand from North Asia.

The gCNewc 6000 kcal/kg FOB Newcastle index (hereafter 6000kcal) averaged around $59/t over the first half of financial 2021, down from around $62/t in the prior half. Prices ranged from a high of around $85/t to a low of around $48/t, with the high achieved in the final trading week of the second half of December. The low point of $48/t is below the 2015/16 trough in real terms. Based on the Wood Mackenzie operating cost curve, more than half of seaborne supply (comprising all grades of energy coal) was likely experiencing negative margins with 6000kcal prices in the high $40s or low $50s.

The 5500kcal index averaged around $40/t over the first half of financial 2021, with a high of around $58/t and a low of around $35/t. Similar to 6000kcal 5500kcal closed the half year near its highs.

The spread between the spot indexes for gCNewc 6000kcal and 5500kcal was volatile, driven by Chinese import uncertainty and rates of recovery in the rest of the world. On average, the spread widened to 32 per cent in the first half financial year 2021, versus an outcome close to the historical average of around 20 per cent in the prior half.

The seaborne energy coal trade flipped from over–supplied to very tight over the course of the December quarter of calendar 2020 on a combination of a very cold snap in the northern hemisphere winter, wet weather in exporting regions, a non–power demand recovery in India, a spike in LNG prices that incentivised coal generation, lower supply from Indonesia and Colombia and port disruptions in Newcastle (Australia).

Despite the improvement in prices in the *La Nina* northern winter, calendar 2020 will go down in the history books as a very challenging one for the industry. Seaborne imports declined by around –68 Mt (–6.8 per cent) from the calendar 2019 level. While China and Vietnam saw import volumes grow in calendar 2020, Japan, South Korea and India saw their collective imports fall –48.2 Mt. This placed considerable pressure on exporters. At the time of our full year results for financial year 2020, more than half of seaborne supply was likely earning negative margins. Major regions responded with lower shipments, with Australia (–12 Mt), Colombia (–21 Mt) and Indonesia (–56 Mt) absorbing much of that burden, although COVID–19, wet weather and infrastructure issues were arguably as important as discretionary economic curtailments.

Longer–term, we expect total primary energy derived from coal (power and non–power) to expand at a compound rate slower than that of global population growth. Coal power is expected to progressively lose competitiveness to renewables on a new build basis in the developed world and in China. On a conservative estimate, the cross over point should have occurred in each of these major markets by the end of this decade. However, coal power is expected to retain competitiveness in India, (where the coal fleet is only around 10 years old on average: one quarter of a normal lifetime), and other populous, developing nations, for a much longer time.

Potash

The three–year rally in muriate–of–potash (MOP) prices dating back to calendar 2016 came to an end in the middle of calendar 2019, with the peak being around US$270/t FOB.[34] The subsequent downswing, which predated COVID–19 (but was amplified by it) lasted roughly twelve months, with the trough around $186/t: a similar level to the calendar 2016 low. An uneven but solid recovery is now underway, with the Americas moving in advance of major Asian markets.

The proximate cause of the 2019/20 downturn, and the subsequent nascent upswing, has been volatility on the demand side of the industry. We estimate that shipments in calendar 2019 were –3 Mt YoY lower to around 64 Mt, with the weakness back–loaded to the second half of the calendar year. Spring demand in the US was poor due to heavy rain, palm oil prices were at multi–year lows and the depreciation of the rupee pushed up retail prices in India. China suspended imports in September 2019 until the settlement of new contracts. Several producers announced temporary curtailments in this period.

The weak demand environment extended into early calendar 2020, with COVID–19 contributing to a delay in the China contract. Port restrictions and factory shutdowns slowed imports in India, while migrant labour movement and plantation activity was curbed in South–East Asia. However, MOP production (including ramp–ups in Canada and Russia) was not disrupted in the same way and prices came under downward pressure into the June quarter of 2020. From that point, demand has strengthened materially. We estimate producer sales hit a record 19.7 Mt in the June quarter, well beyond the previous record of 17.5 Mt and equivalent to an annual run–rate of 79 Mt. Q3 results were also positive, with full–year demand predicted at 67–70 Mt.

Looking at price developments by region in the latest half–year, the timing and pace of gains has varied. The price of gMOP[35] into Brazil touched a low of $210/t CFR in April but had recovered to $250 CFR by October; gMOP into the United States (at NOLA) was slower to pick up, but overtook Brazil in November to end the half at $275/t FOB barge. In contrast, spot prices in South–East Asia were broadly stable in the $230–250/t CFR range, although trades have begun to edge higher in January 2021. Contract prices with China and India remained at $220/t CFR and $230/t CFR respectively through the half. In December 2020, the FOB Vancouver benchmark midpoint (including both sMOP and gMOP) was down by around –14 per cent YoY to $215/t.

Early in the new calendar year, US import prices continued to rally strongly, passing $300/t in early February. New offers extended by the Canadian major Nutrien in the week of February 8 pushed towards $375-380/t, with strong demand intersecting with tight seasonal supply in the North American logistics chain.[36] That is up around 64 per cent YoY. With that positive momentum in mind, it came as something of a surprise when the marketing arm of Belaruskali and Indian Potash Ltd settled a contract priced just $17/t above the previous one in late January, at $247/t CFR. This drew the ire of other exporters who had their sights set on something more substantial.[37] The announcement came in the same week that India released its Union Budget, which lowered the P & K (phosphate and potassium) fertiliser subsidy budget by –12 per cent. Belaruskali followed up by announcing on February 10th that it had matched the Indian settlement by reaching a $247/t CFR outcome in China, a $27/t uplift.

Turning to the major consumption regions, Brazil was one of few importers that didn't materially shrink in calendar 2019 and it returned to growth in calendar 2020 with import volumes (Jan–Dec) up nearly +7 per cent YoY. The surging soybean price has driven the barter ratio – the quantity of MOP that can be bought with a 60kg bag of soybeans – to decade long highs. Imports into China fell slightly from the near–record volume of 2019 (–3 per cent YoY, Jan–Dec) but India bounced back after a dip in 2019, buoyed by a good monsoon and a lower import price, recording a +26 per cent increase in imports (Jan–Nov). South–East Asia has continued to be a weak performer. After contracting in 2019, Indonesia (Jan–Nov) and Malaysia (Jan–Oct) saw imports decline by a further –7 per cent YoY and –5 per cent YoY respectively, although the smaller markets of Thailand and Vietnam have fared better.[38]

After broadly tracking flat to the calendar 2019 trajectory through the first half of calendar 2020, export volumes stepped up in the second half. Exports from the three major basins of Canada (Jan–Nov), Belarus (Jan–Nov) and Russia (Jan–Oct) have all increased by roughly +10 per cent YoY.

On the supply side of the industry, construction of greenfield mines continues, with projects from Belaruskali (Belarus) and EuroChem (Russia) reported to be scheduled for commissioning over the next twelve months, to be followed by Slavkali (Belarus) and Acron (Russia). Uralkali (Russia) has plans to replace two mines – one of which has flooded, the other is nearing depletion – by the mid–2020s.

Long–term demand for potash stands to benefit from the intersection of a number of global megatrends: rising population, changing diets and the need for the sustainable intensification of agriculture.

That latter point includes both the need to improve yields on existing land under cultivation, in the face of depleted native soil fertility, but to also begin factoring in the long run land–use implications of nature–based solutions to climate change. The Paris–aligned 1.5 degree technical pathway that we use in our scenario analysis calls for extensive afforestation efforts: 4 million square kilometres of land by 2050. To put that into context, that is more than half of the total Australian land mass, or the same total land area as India and Pakistan. If achieved, such a substantial shift in land use would put even greater pressure on global agriculture to produce more from less land. With prevailing practices today already diminishing soils' natural fertility, the appropriate use of potash to supply crops' potassium needs becomes yet more acute. The land use question thus provides some attractive upside for potash demand, over and above the already solid demand trajectory we expect from traditional drivers.

In the 2020s, we anticipate trend MOP demand growth of 1.5 to 2.0 Mt per year (between 2 and 3 per cent per annum) in our base case. The need for new supply to be induced is expected to arise once both the spare capacity held by incumbents and capacity additions that are under construction have been absorbed by this steady expansion of demand. We expect that the window for new supply will be open from the late 2020s or early 2030s.

Nickel

LME nickel prices ranged from $12,555/t to $17,650/t over the first half of the financial year, averaging $15,063/t. That is 21 per cent higher than the prior half. Taking period end–points, prices increased by 29 per cent, reflecting the consistent upward momentum through the half.

Base LME nickel prices have traced an almost symmetric V shape over last fifteen months or so, with the low point being April 2020, with the figurative "twin peaks" on either side being September 2019 and the present moment.

Nickel first–use is dominated by the stainless steel sector. It comprises more than two–thirds of primary demand today. Nevertheless, with a rapid and prolonged drive towards the **electrification of transport in prospect**, we contend that there are **plausible long run paths** where the battery supply chain and stainless steel will become equally important consumers of nickel, in a much bigger global market.

Nickel end–use is diverse, with broad sectoral exposure to construction, consumer durables and electronics, engineering, metal goods and transport, in addition to finished batteries. Recent developments in the EV market are covered **here**.

Global refined nickel consumption declined by –1.1 per cent in calendar 2020, with rapid growth in China (+7.3 per cent) offset by a collapse in the rest of the world (–11.9 per cent). The ~19 percentage point growth dispersion between Chinese and rest of world demand in calendar 2020 is thus much wider in nickel than in either steel (~14ppt) or copper (~9ppt). With supply expanding by 4 per cent YoY, led by a spectacular ramp–up of nickel pig iron (NPI) capacity in Indonesia, a considerable aggregate surplus of nickel units in excess of 100kt emerged. However, with the supply of class one[39] units falling, NPI (adjusted for Fe credits) traded at a discount to LME throughout the year. Our preliminary view of calendar 2021 is for a small deficit to emerge, with a rebound in rest of world demand the primary driver, given overall supply growth is expected to be solid once again.

There are three key questions for the nickel market in the longer run. The first is how fast will electric vehicles penetrate the auto fleet? *We have recently upgraded our already aggressive sales penetration rates to reflect higher and earlier decarbonisation ambitions across key economies than previously assumed.* The second is what mix of battery chemistries will power those vehicles? *We have observed an interesting response to lower subsidies in China: at the margin, some producers are going "cheap" on battery technology to stay competitive in the short run. Ternary nickel rich chemistries though remain the dominant choice.* The third is what will be the "steady state" marginal cost of converting the abundant global endowment of laterite ores to a high grade nickel product suitable for use in battery manufacturing? *Here we have not received any material new information, with the exception of the fact that deep–sea tailings "strategies" are correctly coming under greater regulatory and ESG scrutiny. Land based tailings options industry wide would steepen the cost curve.*

Maritime freight

The dry bulk maritime freight industry has concluded a three year 'era' where the major focus of ship–owners was on reestablishing profitability through operating cost competitiveness and discipline with respect to fleet growth. The new era will be about sustainability, as highlighted by the introduction of the IMO 2020 low Sulphur fuel regulations on January 1, 2020.

BHP is taking a leadership role. We are proud to have awarded the first ever LNG–fueled bulk shipping tender. This is a good idea on a standalone commercial basis: but it also has undeniable "public good" characteristics for the industry as a whole. Accordingly, we anticipate that this breakthrough will catalyse investments along the value chain in advance of the major fleet replacement that is due in the mid–2020s. This fleet replacement is a critical milestone on the global maritime industry's decarbonisation path, which the IMO has defined (for now) as a 40 per cent reduction in total GHG emissions by 2030 and 50 per cent by 2050 (versus a 2008 baseline).

Turning to the recent history of the bulk freight market, the key C5 WA–China route averaged $7.78/t in the first half of financial year 2021, a 41 per cent increase over the previous half. That is a little above the average achieved across the three calendar years prior to COVID–19. Excluding the prior half as an outlier, volatility was slightly higher than in recent history.

As we move into the middle and then latter half of the current decade, an intense period of fleet replacement is scheduled to occur. This is the 'demographic shadow' of the shipbuilding boom that coincided with the China–fuelled commodity super cycle. This replacement wave offers a unique opportunity to dramatically alter the technological and environmental profile of the dry bulk fleet within a little over half a decade. If the participants in the industry get this right, the steep task of halving shipping emissions by 2050 may not seem as far off as it does today.

LNG–fuelled dry bulk vessels are expected to be a major element in enhancing environmental sustainability for the next major turnover of the fleet, which will essentially determine progress towards the 2050 objective at the 2030 milestone.

We are committed to pioneering the use of LNG as a bulk vessel sustainable fuel. Introducing LNG fuelled vessels into BHP's iron ore value chain will help to reduce emissions by roughly one–third on a per voyage basis compared to conventional fuel.

Turning quickly back to recent industry developments, according to Maritime Strategies International, Capesize fleet growth is estimated to have been around 15 million dwt (mdwt) in calendar 2020, with around +25 mdwt in deliveries offset by approximately –10 mdwt in deletions. Deletions were back–loaded somewhat due to the easing of COVID–19 related labour availability constraints in South Asian ship breaking hubs.[40]

Looking ahead, the demand for bulk tonne–miles will remain uncertain whilst Brazilian exports of iron ore are constrained, and whilst natural trade flows in energy and metallurgical coal are distorted by Chinese import policy uncertainty.[41] On the supply side of the sector, which offers firm leading indicators on a two–year horizon, we anticipate fleet growth will moderate in calendar 2021. A relatively stable demolitions run–rate and a material slowdown in deliveries are expected. Deliveries are, at this early stage, expected to be quite weak in calendar 2022. Integrating that with our views on the growth in the bulk trade during this window, we expect that the cycle in utilisation rates will peak below the levels historically associated with steep increases in freight rates.

On a different note, we are passionate about ensuring the physical safety and mental well–being of the seafarers that pursue their livelihood on our chartered vessels. Data compiled by Cardiff University shows a troubling upward trend in seafarer fatalities since 2008. Increasing suicide rates are particularly troubling. The challenges being faced by crews under COVID–19, where changeovers for non–nationals in host ports are becoming increasingly rare, in addition to the unusually large number of coal vessels queued off the Chinese coast, are sharply amplifying well–being concerns and starkly illustrating the fundamental plight of the seafarer.

In this regard, we highly commend the Mission to Seafarers for the evidence base they provide through their Happiness Index, which can be accessed **here**. This is a unique information resource on the physical and mental wellbeing of this critical segment of the BHP value chain.

Inputs and inflation trends

Six months ago, we signaled that while the uncontrollable element of industry wide operating cost inflation in US dollar terms had moved significantly lower on average, reflecting the abrupt change in the macroeconomic operating environment under COVID–19, many commodity and inflation–linked costs, as well as our major exchange rates exposures, had already turned entering the 2021 financial year. We concluded that:

"Our high level assessment is that while the all–in levels of opex and capex costs are expected to track below pre–COVID plans for some years, period–on–period changes may be high at times as commodity–linked costs partially normalise."

Six months on, this sentiment holds true, notwithstanding considerable variation by category of spend.

The **Australian dollar** strengthened in the first half of financial year 2021, with a +10 per cent increase from the previous half year, on average, to around US72¢. Point–to–point over the half (end of June to end of December), the Australian dollar appreciated by +11.7 per cent to US77¢. The **Chilean peso** strengthened by +5.2 per cent on average and by +13.3 per cent point–to–point.

The Australian economy fell into a deep but relatively short–lived recession under COVID–19. Lockdowns hit the labour market very hard, but the speed and scale of policy support that was applied positioned the private sector to bounce back quickly as first wave restrictions were lifted. The state of play is that the recovery in the labour market has proceeded much more quickly than expected, with the level of employment now only –93 thousand jobs below the February 2020 level, versus a maximum loss of –872 thousand jobs. There are caveats here of course: part time jobs have led the way; and the various ratios (unemployment, underemployment, employment–to–population) have a long way to go yet. But the basic point stands: the labour market is much healthier than anyone anticipated in six months ago. For example, in its August 2020 *Statement on Monetary Policy*, the Reserve Bank of Australia (RBA) forecast the unemployment rate to peak at 10 per cent in December 2020 and recede only modestly to 8½ per cent in December 2021 and 7 per cent in December 2022.[42] Compare that to the reality of the unemployment rate peaking at 7.5 per cent in July and improving to 6.6 per cent in the latest figures. National level wages were edging along at just 1.4 per cent YoY in the September quarter of 2020 and consumer price inflation was tracking at just 0.9 per cent YoY in the December quarter of 2020. Mining wages have been growing at a rate slightly above the national average, reflecting the out–performance of the sector over the course of the 2020 calendar year.

The Chilean economy has faced difficult circumstances since October 2019. The downturn in economic activity and the job losses that emerged alongside the social protects left the economy highly vulnerable to a new shock. The unemployment rate increased from around 7 per cent (a level we described as “stubbornly high” 12 months ago) to above 13 per cent at the peak of COVID–19 stress in July 2020. There has been a tentative improvement since July, but the unemployment rate alone understates the alarming collapse in labour market opportunity, with the employment–to–population ratio down by around –7 per cent since the civil unrest began, and the participation rate down by around –6 per cent. Furloughed workers, who now represent around 8% of the workforce, increased by +21% (+111.5k) YoY in the December quarter 2020.

More broadly, and independent of COVID–19, Chile remains in a period of political, economic and social instability of indeterminate length. The impacts and likely success of the reforms to political and economic institutions that will be necessary to make Chile a more egalitarian society, without impacting the foundations of the nation’s international competitiveness, are still not clear.

The next few years remain highly uncertain. The process for arriving at a new Constitution is still a major item on the national agenda. This will introduce high levels of uncertainty into decision making in both the public and private spheres. The challenges of COVID–19 make these issues even more complex. In this regard, we note the laudable objective to inoculate 80 per cent of the workforce by the middle of calendar 2021.

A number of uncontrollable cost drivers across our worldwide minerals business such as diesel, explosives, acid, rubber and steel–linked products have been increasing in price as the most recent half has gone on, in most cases in line with movements in underlying commodity prices.

While this recovery has not always been strong enough, or early enough, to produce an uplift on average half–on–half, point–to–point over the half (end of June to end of December) some material increases have been registered.

Benchmark indices for **ammonium nitrate** (AN) – a proxy for explosives costs – decreased by –2 per cent over the first half of the 2021 financial year in Australia and –5 per cent in Chile, impacted by weaker global demand conditions and higher supply availability of ammonia. However, prices have recovered towards the end of the calendar year on stronger fertiliser demand in Asia and the Middle East, coupled with production curtailments announced in Trinidad and Tobago and Russia. Point–to–point over the half, the Australian AN benchmark was up +13 per cent. The Chilean AN benchmark increased by +14 per cent on the same basis.

Earth–moving tyre raw material costs (weighted) increased by +7.1 per cent in the first half of financial year, in line with higher natural rubber, oil and steel based raw material prices. Natural rubber prices have increased sharply due to supply constraints in South East Asia, partly due to a fungal outbreak harming tree plantations, partly due to COVID–19 impacting on the movement of migrant labour within the ASEAN peninsula.

Sulphuric acid prices for Chilean end–users decreased by –30 per cent over the first half of the 2021 financial year. Ample supply availability and logistics constraints in Asia and demand disruption across the mining and industrial sectors pushed sulphuric acid FOB prices to negative netbacks. Prices troughed in July 2020 and had almost tripled by December 2020. The rapid rebound reflected improved demand from downstream sectors in Asia, unexpected supply disruptions at Chilean smelters and higher sulphur feedstock costs. Point–to–point over the half, CFR Chile pricing was up a stunning 173 per cent.

Power prices have been something of an exception to the rule of considerable point–to–point inflation in commodity linked categories, reflecting subdued gas and energy coal prices for much of the period, as well as the disinflationary influence of higher renewables penetration. Across the first half of financial year 2021 **Chilean spot power prices** in the Northern grid declined by –25 per cent over the previous half year, while edging up +4 per cent point–to–point. Lower coal and gas costs and increased supply of renewable generation were major elements in the decline. **Australian NEM spot power prices** fell by –15 per cent in the first half of the 2021 financial year, while point–to–point prices fell a lesser –6 per cent. In addition to lower fossil input costs, another significant factor was the –2.2 per cent YoY on–grid demand decline brought about by stronger rooftop solar generation in addition to a decline in general power consumption.

The rate of increase in the US producer price index (PPI) for **mining machinery and equipment manufacturing** has moderated from the recent peak in financial year 2019 (+6.8 per cent on a 12–month smoothed basis) to +3.9 per cent in financial year 2020, to +2.2 per cent in the first half of financial year 2021.

The **heavy machinery sector** experienced a three year upswing from the 2015/16 cycle trough. The upswing crested in the first half of the 2019 calendar year, and was clearly starting to roll–over in advance of the COVID–19 lightning bolt. According to Parker Bay, deliveries of **surface trucks** were down by –37 per cent YoY in calendar 2020. This adds complexity to the task of estimating how the replacement cycle will play out this decade. On the one hand the industry as a whole has an ageing fleet, with Caterpillar noting that the global surface mining truck fleet is the oldest on record. On the other hand, based on historical lifetime and utilisation assumptions, the replacement cycle should have been completed already and the fleet should be trending younger. Third, the coal industry, which represents more than 40 per cent of material moved globally, and therefore is a major element of the global fleet, has been dealing with a large negative price shock, which we expect to precipitate a wave of cash preservation measures across the major production basins. That could be offset, partially, by more favourable cash flow conditions in iron ore and gold, with copper somewhere in the middle. Collectively, these three commodities represent about one–third of material movement – somewhat less than coal on its own. Fourth, a detailed study of historical deliveries by region shows that not all geographies peaked at the same time over the course of the super–cycle (some major regions peaked pre–GFC, some after), and therefore this must also be taken into account. Collectively, these three commodities represent about one–third of material movement – somewhat less than coal on its own. Fourth, a detailed study of historical deliveries by region shows that not all geographies peaked at the same time over the course of the super–cycle (some major regions peaked pre–GFC, some after), and therefore this must also be taken into account.

Bringing all of the above back to the replacement cycle, we believe it will be staggered across the entire first half of the 2020s, rather than compressed. The exact timing on a company basis will depend in large part upon the pace at which each producer converges upon the technical and cultural productivity frontiers. This drawn out process should put little pressure on OEM capacity.

There is a final point to note in this context and it is a profound one.

Just as the next major fleet turnover will be critical for the global maritime industry to meet its decarbonisation objectives, the desire to displace diesel, and the associated emissions, from mining operations also puts an incredible onus on decisions made on the replacement of the trucking fleet in the next half decade or so.

In the petroleum business, **deepwater capital costs** had barely recovered from cyclical lows at the end of calendar 2019. Even before COVID–19, we felt that it would take a considerable time for the spare capacity in the deepwater segment to be absorbed by a combination of increased activity and early retirements. With industry wide upstream capex budgets now slashed, cost pressures have gone from meek pre COVID–19 to outright deflationary in calendar 2020.

All–in deepwater costs have fallen back close to previous cycle lows in calendar 2020, and are not expected to budge from that approximate level in calendar 2021.

Vendor competition in the deepwater space was intense before COVID–19: and that was before greenfield deepwater FIDs fell back to levels last seen in the 1950s (as discussed in the crude oil section above). Under these stressed operating conditions many service firms have taken the Chapter 11 bankruptcy route, shedding debt and taking some physical excess capacity out of the system, including in the offshore market. Deepwater rig utilisation rates have seen a modest uplift on the back of capacity retirement. According to Bloomberg, over the first half of financial year 2021 the utilisation rate of global deepwater floaters had recovered from 48 per cent in July 2020 to 54 per cent in December 2020. On average though, the utilisation rate for the first half of financial year 2021 averaged at 51 per cent: –4 per cent lower than the average for financial year 2020. Major oil field services companies are cautiously optimistic that the September quarter of calendar 2020 was the bottom.

Going further back in the value chain, average utilisation rates across South Korean, Chinese and Singaporean fabrication yards remain roughly one–third and one–half of their peak levels respectively. COVID–19 outbreaks in worker dormitories have slowed progress on orders in some instances.

All told, our base case is that we expect deepwater capital costs to reclaim calendar year 2019 levels by the mid–2020s, with costs reaching about four–fifths of previous cycle highs by the end of the decade.

Electric vehicles (EVs)

While the collapse in auto sales activity under COVID–19 (from already low levels) also hit EVs, they bounced back hard in the second half of calendar 2020. Annual sales passed 3 million units for the first time, representing 37 per cent growth YoY. Europe and China both sold around 1.3 million units in 2020, although they got there from very different starting points. To hit the 1.3 million figure, Europe had to grow by 134 per cent, China by 10 per cent.

Six months ago we discussed the Chinese approach to running down EV subsidies, and the decision that was made to extend support for longer with the industry facing difficult operating conditions after the most recent subsidy reduction. An unintended consequence of the subsidy cuts has been to incentivise producers to look for ways to lower production costs to be more competitive with ICE vehicles. This has led to a larger than expected increase in the number of models using low cost LFP (Lithium–iron–phosphate) batteries, with the share increasing from 5% in calendar 2019 to 13% in calendar 2020. LFP chemistries offer pedestrian performance characteristics (at best), but they have advantages in terms of lower cost, decent cycle life and thermal stability. This is a competitive mix of characteristics for intra-city buses, where we have always had LFP playing an important role: less so for passenger cars. We will continue to monitor this trend. Our customer intelligence from the EV–battery eco–system implies strongly that this is a China–specific trend in a specific customer segment: not a “back to the future” moment for the EV revolution globally.

Policy signposts for rapid EV adoption were distinctly favourable over the course of the last twelve months. China reiterated its ambitious 20 per cent sales target for 2025, on the back of its prior commitment to build 5 million public charging units by the end of calendar 2020. President Xi's net zero 2060 pledge is also relevant in this broader context, as are the 2050 pledges of Japan and South Korea.

In Europe, France and Germany have both stepped up their support for EV take–up, while the UK brought forward its ICE–ban by 5 years to 2030. From the French and German perspective, policies launched in calendar 2020 can be viewed as part stimulus, part industrial policy and part climate action. We have highlighted the fact that the US Presidential and Congressional elections could also have long run implications for EVs. With the Democrats now controlling the White House and enjoying a (slim) majority in both houses of Congress, President Biden and his team have an opportunity to enact their ambitious green agenda, which includes accelerating EV take–up through building public charging infrastructure.

The above signposts have a cumulative force. We indicated six months ago that we would review our forecasts once we had greater clarity on US policy and we saw the contours of China's draft 14th Five Year plan. We have now conducted that review: and despite already being at the aggressive end of the spectrum on long run EV penetration, we have raised our range in milestone years and brought forward the timing of reaching 100 per cent sales shares in the various cases. In our central case, EVs are expected to constitute around 17 per cent of the light duty vehicle fleet by 2035 and around 41 per cent of annual sales. The 17 per cent fleet share we now project in 2035 translates to 314 million EVs on the road, versus 275 million previously.

You can investigate the reasoning behind our EV range forecasts **here** and our views on battery chemistry **here**.

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[1] Data and events referenced in this report are current as of February 2, 2021. All references to financial years are June–end, as per BHP reporting standards. For example "financial year 2021" is the period ending June 2021. The data is compiled from a wide range of publicly available and subscription sources, including Bloomberg, Platts, Wood Mackenzie, CRU, IEA, ILO, IMF, Refinitiv, Argus, CREIS, Fertecon, FastMarkets, SMM, Parker Bay, MySteel, LME, COMEX, SHFE, ICE, DCE, SGX, Kpler, Poten and Partners and I.H.S Markit, among others.

[2] Proprietary research surveying individuals in the US, China and the UK. The definition of Millennials is those born between 1981 and 1996 (aged 24 to 39 in 2020) and Gen Z are born after 1996.

[3] GDP is in nominal US dollars, on a base of $87 trillion in 2019, with changes being the absolute difference between the 2019 actual and the 2030 projection. Capital spending is estimated based on the share of gross capital formation (GCF) applied to this measure of GDP. In PPP terms, the GDP base is around $120 trillion.

[4] "Paris–aligned" means a societal pathway that is consistent with a global warming outcome of "well below 2 degrees Celsius" by 2100.

[5] This statement is based on the commodity demand and price impacts of a 1.5 degree technical pathway modelled on our behalf by Vivid Economics. There are other potential pathways that would have the same impact on emissions and temperature that would impact the portfolio differently. The demand figures derived from the pathway are shown on pages 19-20 of our Climate Change Report.

[6] The Edelman Trust Barometer for 2021 documents a material decline in the degree of societal levels of trust across a range of themes and in various institutions in 27 countries.

[7] The full–time equivalent estimate is based on a 48 hour working week that is weighted towards the rigours of informal employment in the developing world. If a 40 hour week were assumed, 306 million FTE jobs would be impacted. **https://www.ilo.org/wcmsp5/groups/public/@dgreports/@dcomm/documents/briefingnote/wcms_767028.pdf**

[8] Loan guarantees are excluded as they may or may not be drawn, and are therefore are difficult to value. Automatic stabilisers describe the decline in the fiscal position due to changes in revenue and expenditures reflecting the change in economic conditions (e.g. change in the number of people eligible for unemployment payments), not discretionary decisions (e.g. change in what you decide to pay to eligible claimants).

[9] Stimulus figures in this section are calculated from data provided by UBS.

[10] Source: US BEA personal income account. Excess savings are defined as the difference between actual savings in a period and the average rate of flow in 2018 and 2019.

[11] **https://www.ilo.org/wcmsp5/groups/public/–––dgreports/–––dcomm/documents/briefingnote/wcms_755910.pdf** Technical appendix 4.

[12] Hubei province, where Wuhan is located, contributes almost 9 per cent of Chinese auto production.

[13] Dual circulation refers to an inner domestic core "circuit" and an outer circuit comprising various avenues of international cooperation. The domestic core is where the future lies.

[14] China is a major sponsor of the RCEP (Regional Comprehensive Economic Partnership) and has recently expressed some interest in joining the CPTPP (Comprehensive and Progressive Trans–Pacific Partnership).

[15] Source: BNEF. Energy transition investments hit $501.3 billion globally in calendar 2020. The breakdown (rounded) was renewable power ($304bn, +2 per cent: solar +12 per cent YoY, wind –6 per cent), electrified transport ($139bn, up strongly on EV sales), electrified heat ($51bn, up strongly in EU), energy storage ($4bn, flat YoY), carbon capture and storage ($3bn, triple 2019 level) and hydrogen ($1.5bn, –20 per cent YoY).

[16] Average of Germany, France, Italy, Spain and the UK. Source: UBS.

[17] We acknowledge that the sovereign credit rating is a constraint on full freedom of movement.

[18] India formally pulled out of the RCEP negotiation in late 2019.

[19] We continue to see Chinese urbanisation as an opportunity rich trend for our Company. We are currently engaged with the Development Research Centre of China's State Council to deepen joint understanding of how urbanisation may evolve in the context of the three parallel revolutions underway in energy generation, transport and information technology.

[20] We previously estimated that the ratio was around 22 per cent, but the recent statistical rebasing of China's steel and pig iron production lowers the estimate to around 20 per cent.

[21] As highlighted here, the construction of plausible low cases for each of our commodities is a vital element of our **Capital Allocation Framework**.

[22] The abbreviations used in the metallurgical coal section are as follows – PLV: Premium Low–Volatile, MV64: Mid–Volatile 64, PCI: Pulverised Coal Injection, SSCC: Semi–soft Coking Coal, as published by Platts. All figures are rounded to the nearest dollar and are quoted in free–on–board (FOB) terms. The terms "coking" and "metallurgical" coal are used interchangeably throughout the text.

[23] A BF–BOF operation is an integrated process with "hot metal" (molten pig iron) produced in the BF then transferred to the blast oxygen furnace (BOF) for conversion into steel.

[24] These approximations are based on a sample of mills, not a census. Note a BF is relined every 20 years or so.

[25] A BF–BOF operation is an integrated process with "hot metal" (molten pig iron) produced in the BF then transferred to the blast oxygen furnace (BOF) for conversion into steel.

[26] LME Settlement basis. Daily closes and intra–day lows and highs may differ slightly.

[27] Chinese direct scrap usage decline in both calendar 2019 and 2020, a situation that is expected to reverse in 2021.

[28] MARS is a Gulf of Mexico (GOM) oil and gas asset owned by Shell and BP that has grades that are somewhat similar to our GOM assets. The 'commodity' contract for MARS barrels is the closest public domain analogue for our GOM pricing. Source: Bloomberg.

[29] The one–third decline hides considerable regional variation, with North American upstream expected to decline by more than –40 per cent and the Middle East decline limited to the high single digits.

[30] Our integrated view of the land transport system takes account of these factors when assessing how transport services will be provided in various regions/countries/cities. The future size of the vehicle fleet, EV penetration, ride sharing and autonomous mobility all depend to some extent on the physical realities of urban geography, in addition to technology and living standards.

[31] Source: Poten and Partners and Kpler.

[32] Pipeline gas imports are mainly from Central Asia and eastern Russia. Russian pipelines are more competitive (Shanghai city gate basis) than Turkmenistan, and have optionality to increase flow.

[33] Source: Platts.

[34] Unless otherwise specified, price references are estimated realised prices for 60 per cent K2O standard MOP FOB Vancouver–equivalent. Note that at the recent peak, import (CFR) prices to China (standard) and Brazil (granular) were US$290/t and US$350/t respectively.

[35] Fertilizer–grade MOP is commonly sold in powder ("standard") or compacted "granular" forms, abbreviated as sMOP and gMOP respectively. gMOP typically sells at a premium of US$10–25/t. Major markets for sMOP include China and India, while gMOP is prevalent in the Americas. Pricing data sourced from Fertiliser Week and public filings.

[36] Offers are not realised prices and will only impact indexes if transactions occur.

[37] **https://www.uralkali.com/press_center/press_releases/item43637/**

https://www.nutrien.com/investors/news–releases/2021–india–and–belarusian–potash–price–agreement–not–reflective–market

https://www.canpotex.com/news/canpotex–statement–reported–indian–potash–settlement

https://www.kpluss.com/en–us/press/press–releases/Supply–price–does–not–reflect–current–market–conditions/

[38] Trade data is from I.H.S Markit.

[49] Technically, what we refer to here as class one also includes class two supply that is neither Ferro–nickel (FeNi) or NPI.

[40] The ship breaking industries of India, Bangladesh and Pakistan are ranked #1, #2 and #4 globally.

[41] To simplify, if for example more South African energy coal and North American metallurgical coal is dragged out of the Atlantic trade into the Pacific, while Australia coal moves from the Pacific to the Atlantic, for the same volume of imports, the tonne–mile will be higher than under the optimised model that pertained prior to the altered import environment in China.

[42] Statement on Monetary Policy, August 2020, available from **https://www.rba.gov.au/publications/smp/2020/aug/pdf/forecast–table–2020–08.pdf**