

Metals & Mining Practice

High coking coal prices provide glimpse into steelmaking's future

Changes to coking coal and coke markets could lead to higher steel prices, an acceleration of the steel industry's green transition, and wider price differentials for low-grade iron ore.

by Friso De Clercq, Adrian Doyle, and Tom Voet



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Last year was a volatile one in global commodity markets. Demand for coking coal, an essential raw material in the production of steel, was extremely strong as the wider global economy recovered from its sharp contraction at the earlier height of the COVID-19 pandemic—even as supply chain issues constricted availability. Safety challenges and flooding affected domestic mines in China; border closures between Mongolia and China, as well as strikes in the United States, also curtailed trade. In addition, ongoing diplomatic tensions between China and Australia compounded the situation.

This confluence of events created tightness in the market and contributed to surging prices for coking coal. The price of hard coking coal (HCC) continued a rally that started in October 2020—reaching

record levels of \$600 per metric ton CFR China¹ before falling sharply in November and stabilizing at prices of around \$400 per metric ton CFR China (Exhibit 1). At October levels, coking coal accounted for over half of the cost of the raw materials needed to produce a metric ton of steel via a blast furnace—a rare occurrence by historical standards.

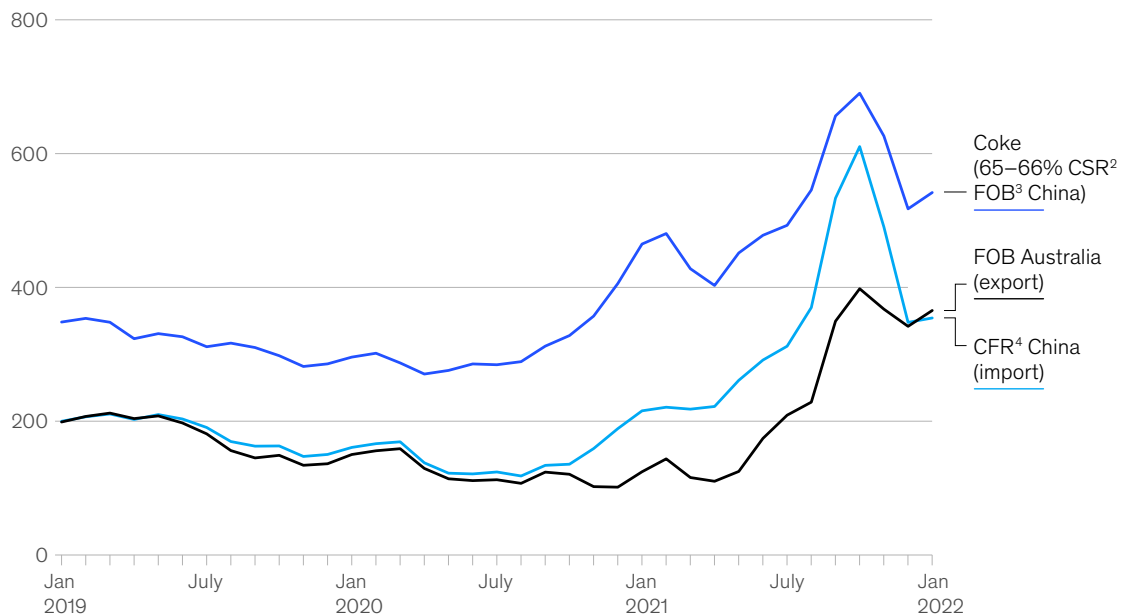
Conditions for sustained high coking coal prices

Prices for coking coal, as with other commodities, have experienced extreme increases in the past. The Queensland floods in 2010 and 2011 removed a significant portion of seaborne supply and resulted in prices that pushed past \$350 per metric ton Free on Board in Australia. Cyclone Debbie, in

Exhibit 1

Hard coking coal and coke prices rose to record levels in 2021.

Australia export and China import prime low volatile HCC,¹ and China export coke price evolution, \$ per metric ton



¹Hard coking coal.
²Coke strength after reaction.
³Free on Board.
⁴Cost and freight.
Source: S&P Global Platts

¹ Premium low-volatility HCC, cost and freight (CFR) China.

Any imbalance in the market could lead to a real, prolonged capacity squeeze in both the coking coal and coke markets, leading to elevated prices.

2017, also damaged infrastructure in Australia and resulted in another surge in prices. However, after these spikes, prices reverted to previous levels within several months.

In the future, similar events might again lead to price spikes, but there is an underlying long-term trend that could result in coking prices remaining elevated. Investment in both coking coal mines and coke batteries has been declining and is expected to continue to decline, given sustainability concerns.

Banks and governments continue to announce that they are halting future investments in new coal mines. Investors are also wary of the risk represented by the long working life of a coke battery—the series of ovens used to bake coal in the production of coke—given an expected gradual shift away from coke-powered blast furnaces toward more gas-based reduction of iron ore. If the supply of either coking coal or coke declines faster than demand, shortages of coke could develop and push prices higher as commodities in deficit command a higher premium above the industry cost curve than those in balanced markets, since steelmakers will be competing for smaller amounts of material.

Going forward, the availability and cost of hydrogen (and the renewable electricity used in its production) will play a role in determining how much steel will continue to be reliant on coke-based blast furnace production. Any imbalance in the market could lead to a real, prolonged capacity squeeze in both the

coking coal and coke markets, leading to elevated prices. As a result, alternative technologies would become economical earlier, which could potentially hasten the transition away from blast furnaces, reducing demand for metallurgical (met) coal at a faster rate, although met coal and coke will still have a significant role to play for some time to come. This transition will also be uneven as divergent regional dynamics related to differing decarbonization pressures and local coal and coke availability will continue to exert significant influence on overall demand for met coal.

Steelmakers should consider the effect of longer-term coal price increases as part of their scenario planning, actively evaluate the market for conditions that would support such a scenario, and adjust their plans as the implications evolve.

High prices would not affect only steel production, as metallurgical coke is also used in other industries. Knock-on effects would also be seen within ferroalloys, nickel pig iron, and foundries, among others. Typically, these end users purchase third-party merchant coke from batteries primarily serving steel mills, leaving them at the mercy of coke producers.

Implications of higher-priced coke for the steel and iron ore industries

Higher-priced coking coal is likely to affect the steel industry's transition to greener production

methods as well as the value-based pricing of iron ore. Higher-priced coking coal increases the cost of producing steel via blast furnaces, both in absolute terms and relative to other routes. This typically leads to higher steel prices as raw material prices are passed through. It would also accelerate the green transition in steelmaking as emerging green technologies, such as hydrogen reduction, would become more competitive compared with established production methods sooner (for instance, in Europe this is currently estimated to happen between 2030 and 2040). The need to reline or rebuild blast furnaces roughly every ten to 15 years at a cost that varies between \$100 million and \$300 million presents steelmakers with clear decision points, so that they will need to evaluate the cost of emerging technologies, such as hydrogen-

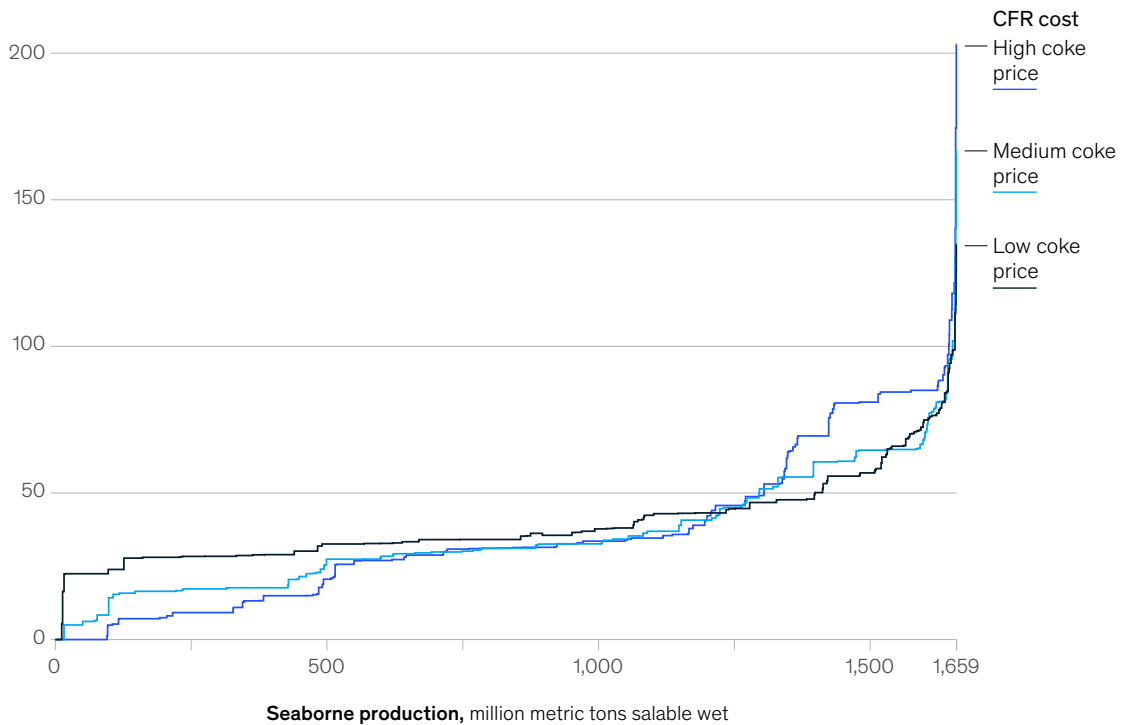
based direct reduced iron, and decide to replace their blast furnaces.

Increased coke prices would also affect the value-based pricing of iron ore. Prices for different qualities of iron ore products depend upon their iron content as well as their chemical (mainly phosphorus, alumina, and silica content) and physical composition (lumps versus fines versus pellets). Lower-quality iron ores require more energy to reduce, leading to higher coke rates in the blast furnace. Higher coking coal prices increase the cost penalty incurred by steelmakers, leading to higher price penalties for low-grade iron ores (Exhibit 2). This could affect overall iron ore price dynamics in two different ways, depending on the level of total iron ore demand. In one

Exhibit 2

Increased coke prices will have a strong impact on the iron ore cost curve.

CFR¹ China iron ore cost curve, including value-in-use, 2030 total annual costs, \$ per dry metric ton



¹Cost and freight. High: \$1,000/metric ton coke price and Fe penalty of \$10/metric ton per Fe %; medium: \$500/metric ton coke price and Fe penalty of \$6/metric ton per Fe %; low: \$250/metric ton coke price and Fe penalty of \$2.5/metric ton per Fe %.

scenario, if total demand for iron ore can be met solely with high-grade iron ores, it is likely that benchmark (that is, 62 percent fines CFR China) iron ore prices will remain steady. However, price discounts for lower-grade ore would increase significantly, potentially pushing producers of this material out of the market. In an alternative scenario, if low-grade ore is needed to meet overall demand, both benchmark iron ore prices and discounts could increase significantly, so that low-grade producers would remain in the market as the marginal suppliers.

Both iron ore scenarios would shift the value pools in the iron ore industry toward high-grade producers. In addition, the second scenario would put additional cost pressure on blast furnace steelmakers as iron ore prices are kept elevated. Since the iron ore market is expected to remain tight for the next five to ten years, the second scenario is more likely to occur in the short and medium term

as low-grade ore will continue to be required to meet demand. In the long term, however, a transition toward the first scenario is expected as most iron ore projects in the MineSpans database, which provides a comprehensive supply-side view of the iron ore industry, will produce high-grade material. In addition, seaborne iron ore demand is expected to moderate toward the end of the decade, leaving less overall demand to fulfill.

The recent increase in coking coal prices has been caused by a set of unique events. However, that doesn't mean they don't provide useful insights into the steel and iron ore industries of the future. Persistently high coking coal prices would accelerate the steel industry's transition to greener alternatives while also radically altering iron ore price dynamics. Companies involved in these markets should plan for a possible scenario in which elevated coking coal prices could become the norm rather than the exception.

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