The super-cycle hangover: the rising threat of substitution

Mining & Metals
Substitution comes in many forms and can have a dramatic and market-altering impact on an organization. No example is starker than the switching of shale gas for coal in the United States where coal’s share of power generation stood at about a third and natural gas accounted for approximately 30% in 2012, compared with 50% and 18%, respectively, in 2002.

The prolonged existence of large scarcity premiums in many metals during the super-cycle provided the economic incentive for metals consumers to look for alternatives; the greater the scarcity, the more urgent the hunt. This can be seen in the pricing of rare earth metal, dysprosium – it climbed from US$15/kg in 2003 to an average of US$286/kg in 2010 and then dramatically increased to $1,454/kg in 2011. Moving to protect their margins, in 2012, General Motors announced it had found substitutes to reduce its demand for dysprosium in the Chevy Volt, and Toshiba announced that samarium-cobalt magnets would replace dysprosium/neodymium magnets.

Those most at risk are single-commodity organizations, or organizations where one commodity dominates the product mix/profit share. Although substitution appears to have taken some by surprise, close monitoring of its major drivers can be used as an early warning system. These drivers include:

- Regulatory change
- Market drivers – market mismatches between metals allowing arbitrage or so-called price-driven substitution as seen in the substitution of palladium for platinum
- Products with low-profit margins and less dependence on quality and performance
- Environmental concerns
- Advances in technology
- Reduction in dependency on imported material

Shale gas for coal substitution

An increase in gas production, an associated fall in gas prices driven by the technological breakthroughs allowing large-scale shale gas production, and a change in regulations have created the perfect environment for large-scale coal-to-gas switching in the US. The big drop in US gas prices occurred in 2Q 2012 when prices dropped below US$2/MMBtu, the catalyst that triggered coal-to-gas switching. Natural gas prices dropped by about 40% between 1Q 2010 and 2Q 2013 (averaging US$4.01/MMBtu during the quarter), while coal spot and coal heat rate prices remained steady over the same period. The abundant supply and lower pricing consequently made natural gas an attractive alternative to coal.

Further encouragement came in the form of government regulations, such as the US Environmental Protection Agency (EPA)’s Mercury and Air Toxics Standards rule (finalized on 16 December 2011 and updated on 28 March 2013). Then, in June 2013, President Obama put forward a climate change strategy to reduce greenhouse gas (GHG) emissions. The strategy has directed the EPA to complete carbon pollution standards for both new and existing power plants. Investors can expect natural gas to play a large part in this strategy and in the transition of the US to a low-carbon economy.

Top risks for coal in 2013-14

Resource nationalism
= Threat of substitutes
- Margin protection and productivity improvement

Source: Business risks in mining and metals 2013-2014, EY.

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1 The shale revolution, Credit Suisse, 13 December 2012.
4 “Toshiba Develops Dysprosium-free Samarium-Cobalt Magnet,” Toshiba, 16 August 2012.
5 “The president’s climate action plan,” Executive office of the president, June 2013.
What you see and what you don’t

Thermal coal producers have long known that oil, gas, nuclear and renewables represent alternative fuel sources. In fact, coal has been a substituted beneficiary from oil in previous oil price shocks. While the threat from renewables was understood, it was believed that the coal sector had a decade or more to adjust with such initiatives as carbon capture and storage.

However, in this case, the commercialization of horizontal drilling and fracking of shale beds was far swifter than anyone anticipated and business models, debt levels, risk management strategies and cost structures were all found to be inappropriate for the sudden new reality, and incapable of quick modification.

If you can’t beat them, join them

The resultant drop in coal demand has seen the closure of more than 50 mines in the US over the last two years. To survive, a number of coal producers are diversifying out of just thermal coal into metallurgical coal and gas:

• Long-time coal producer Consol Energy is reducing its 2013 planned capital expenditure by about 11.5% to between US$1.29 billion and US$1.5 billion, with US$835–US$935 million of this amount earmarked for the expansion of the company’s natural gas operations.6


• BHP Billiton has invested US$4.75 billion in the acquisition of an interest in the Fayetteville region of Arkansas from Chesapeake Energy in early 2011 and US$15 billion in the acquisition of Petrohawk Energy.7

7 “BHP Billiton announces acquisition of Chesapeake Energy Corporation’s Fayetteville USA, Shale Assets,” BHP Billiton, 22 February 2011.

• Freeport-McMoRan Copper & Gold completed the final step of its three-way combination with Plains Exploration & Production Company and McMoRan Exploration Co., which added a high quality portfolio of oil and gas assets to its global mining business.8


• Glencore, a commodity trading major, has started trading in natural gas by setting up teams in London and Singapore.9

9 “UPDATE 2-Glencore muscles in on energy majors’ LNG turf,” Reuters, 6 June 2013.

North American coal and shale gas: finding new markets

The shale gas boom in the US is beginning to have a large knock-on effect around the world. The US Powder River Basin (PRB) is seen as a massive source of cheap coal supply. But, the declining competitiveness of coal as a fuel for electricity generation in the US leaves PRB coal looking for more robust markets, such as China and India. If port and rail constraints are removed and demand from Asia continues to grow, PRB exports to Asia could surpass those of South Africa but will still remain shy of export totals from Indonesia and Australia.10

10 Mark Thurber, Associate Director of the Program on Energy and Sustainable Development at Stanford University, interviewed by The National Bureau of Asian Research, Coal in Asia and the impact of the shale gas revolution, 21 March 2013.
US coal has increasingly found its way into European markets, where it has displaced more expensive gas as a feedstock for power stations. This has seen utilities increase their use of coal, despite EU environmental policies designed to curb polluting fossil fuels in the energy mix. But many experts believe coal's European revival will be short-lived, and in the long term, coal's comeback will inevitably fall foul of EU environmental policy. This policy calls for a 20% reduction in carbon emissions from 1990 levels by 2020 and a growing role for solar, wind and biomass in electricity generation.\footnote{11 “Shale gas boom sparks EU coal revival,” FT.com, 3 February 2013.}

Due to the shale gas revolution and the lack of material natural gas export capacity, natural gas pricing in North America has become disconnected from other regions of the world. Henry Hub prices now stand at about US$3.55/MMBtu, far lower than in Europe or Asia.\footnote{12 As on 26 July 2013.}

Over the past year, the disparity between Henry Hub prices and European or Asian prices has encouraged North American natural gas producers to consider exporting LNG to access overseas markets. The impact this could have on natural gas prices elsewhere in the world has attracted interest.\footnote{13 “A volatile mix,” Utilities unbundled: Issue 13, EY, December 2012.} In the short term, Asian buyers are motivated by this price differential. However, if they successfully lock in North American gas prices, they will be making a significant change to the risk profile of their LNG supplies. They will swap the oil price risk (reflecting the possibility of conflict in the Middle East, OPEC production quotas and the like) for the Henry Hub risk. The latter is much more about US gas supply/demand and longevity of the shale gas revolution. The export of gas will likely raise US gas prices and lower those for the rest of the world. This will make gas more competitive against coal elsewhere in the world. And while gas prices are unlikely to be as low as those in the US, prices are expected to be far lower than the pricing in 2013. How prepared is the seaborne coal trade for this eventuality?

In the near term, coal is likely to remain vital to the energy requirements of many nations. There will be a rebalancing of coal in time, with most nations reducing their reliance on it. The biggest impact is unlikely to be felt until after 2020, with China's potential ability to follow the US's lead and effectively utilize its large-scale shale gas resources being the key swing variable. Some say that from 2020 onward, gas's dethroning of coal looks increasingly inevitable, as China and India move to diversify their energy mix.\footnote{14 The shale revolution, Credit Suisse, 13 December 2012.} Until such time, US coal producers are likely to remain under pressure in their domestic market, but export opportunities should offer them some comfort.

**Developing shale gas market: a slow burner**

China will account for 26% of global growth in gas demand by 2035.\footnote{15 Business Pulse: Exploring dual perspectives on the top 10 risks and opportunities in 2013 and beyond: global report, EY, 2013.} With gas set to become an increasingly important component of China's energy mix, concerns about its growing dependence on imported natural gas are driving a push to bring large quantities of domestic shale gas online quickly. The US Energy Information Administration (EIA) (see the table on page 5) estimates that China holds the world's largest technically recoverable shale gas resources. However, China’s geology is unique, and the technology developed for North American shale cannot be directly applied; technological innovation will play a key role in developing this resource.

With the Chinese shale gas industry in its infancy, the processes involved will be extensive and include conducting vast, detailed exploratory surveys, training the labor force, drilling thousands of wells and building the necessary infrastructure to transport large volumes of gas from remote areas. Driven by Government policy and strategy, Chinese natural gas demand could more than double between 2012 and 2020.\footnote{16 Global LNG: Will new demand and new supply mean new pricing?, EY, 2013.}
The recent endorsement of a plan by China’s State Council to cap coal use at 4,000Mt/y by 2015 is just one of the many signs of Beijing’s determination to place restraints on coal’s share of the energy mix. China’s coal consumption is estimated to grow 18% during 2011–15, down from 46% growth over 2006–10. However, it is anticipated that coal will still account for about 55% of China’s energy by 2020, albeit down from 66% a decade earlier.17

The shale gas success story in the US has resulted in heightened speculation over the potential for shale gas to transform energy markets in other regions. In Europe, exploration is under way in a number of countries; however, supply and infrastructure issues mean that the experience in the US may not be easily replicated in Europe. The petro-physical properties of the shale vary from one rock formation to another across regions. Many more wells will need to be drilled before the resource potential can be gauged more accurately. In many cases, the quantities are unlikely to be economic at present. Furthermore, shale gas will need to compete with existing energy supplies in Europe where investments in

Chinese natural gas supply/demand balance

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<thead>
<tr>
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<td>135</td>
<td>163</td>
<td>182</td>
<td>204</td>
<td>229</td>
<td>256</td>
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<td>322</td>
<td>360</td>
<td>403</td>
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<tr>
<td>Supply</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Conventional</td>
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<td>100</td>
<td>117</td>
<td>119</td>
<td>129</td>
<td>138</td>
<td>144</td>
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<td>155</td>
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<td></td>
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<td>3</td>
<td>5</td>
<td>8</td>
<td>11</td>
<td>13</td>
<td>16</td>
<td>18</td>
<td>20</td>
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<td>Subtotal</td>
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<td>103</td>
<td>122</td>
<td>129</td>
<td>144</td>
<td>158</td>
<td>170</td>
<td>185</td>
<td>201</td>
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<td>Pipeline imports</td>
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<td>Turkmen 1</td>
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<td>21</td>
<td>25</td>
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<td>30</td>
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<td>30</td>
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<td>Myanmar</td>
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<td>3</td>
<td>8</td>
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<td>12</td>
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<td>12</td>
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<td>12</td>
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<td>12</td>
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<td>6</td>
<td>15</td>
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<td>30</td>
<td>30</td>
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<tr>
<td>Subtotal</td>
<td>4</td>
<td>14</td>
<td>21</td>
<td>28</td>
<td>38</td>
<td>42</td>
<td>48</td>
<td>57</td>
<td>72</td>
<td>72</td>
<td>72</td>
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<td>LNG imports to balance</td>
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<td>22</td>
<td>29</td>
<td>39</td>
<td>45</td>
<td>49</td>
<td>67</td>
<td>81</td>
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<tr>
<td>LNG imports (mtpa)</td>
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<td>12</td>
<td>15</td>
<td>18</td>
<td>16</td>
<td>21</td>
<td>28</td>
<td>33</td>
<td>36</td>
<td>49</td>
<td>60</td>
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<td>LNG contracted (mtpa)</td>
<td>9</td>
<td>12</td>
<td>15</td>
<td>18</td>
<td>22</td>
<td>26</td>
<td>32</td>
<td>37</td>
<td>37</td>
<td>37</td>
<td>37</td>
</tr>
<tr>
<td>Regas capacity* (mtpa)</td>
<td>12</td>
<td>16</td>
<td>21</td>
<td>28</td>
<td>41</td>
<td>45</td>
<td>54</td>
<td>61</td>
<td>65</td>
<td>67</td>
<td>70</td>
</tr>
</tbody>
</table>

*Approved or proposed


infrastructure have already been made. Consequently, we expect a different phasing of shale gas development in Europe and the impact will be less transformational than in the US.

The impact of shale gas development could prove to be significant for individual countries as it will help reduce their dependence on imports. European countries with sizeable shale gas resources are closely monitoring the impact of shale gas development in other countries. Early results from the wells drilled in Poland have been disappointing, leading to a number of companies exiting the country’s shale gas market. Most European countries are adopting a wait-and-see approach. They are seeking firm evidence of the safety of the hydraulic fracturing process before allowing development to commence. Many of the issues used by opponents to demand restrictions on shale gas development are not exclusive to shale gas activity but are environmental concerns that call for strengthening of the regulatory regime governing shale gas development.¹⁸

Other countries in the early stages of developing their shale resources include the UK, Australia and Argentina. In Mexico, the Barnett and Eagle Ford shale formations that are currently being exploited in Southern Texas extend deep into the Northern parts of Mexico; this is thought to be highly commercial and could be piped either East or West to markets for LNG supply. There are also additional resources that are thought to be available on the east coast of Northern Mexico. However, differences in the geological and operating environment there mean that new technological innovations will be necessary.

There are prospective shale formations in a group of 41 countries (as indicated on the map) that demonstrate some level of near-term promise and have a sufficient amount of geologic data for a resource assessment.

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Top 10 countries with technically recoverable shale gas resources

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
<th>Shale gas (trillion cubic feet) – EIA estimates</th>
<th>Shale gas (trillion cubic feet) – ARI estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>China</td>
<td>1,115</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>Argentina</td>
<td>802</td>
<td>N/A</td>
</tr>
<tr>
<td>3</td>
<td>Algeria</td>
<td>707</td>
<td>N/A</td>
</tr>
<tr>
<td>4</td>
<td>US*</td>
<td>665</td>
<td>1,161</td>
</tr>
<tr>
<td>5</td>
<td>Canada</td>
<td>573</td>
<td>N/A</td>
</tr>
<tr>
<td>6</td>
<td>Mexico</td>
<td>545</td>
<td>N/A</td>
</tr>
<tr>
<td>7</td>
<td>Australia</td>
<td>437</td>
<td>N/A</td>
</tr>
<tr>
<td>8</td>
<td>South Africa</td>
<td>390</td>
<td>N/A</td>
</tr>
<tr>
<td>9</td>
<td>Russia</td>
<td>285</td>
<td>N/A</td>
</tr>
<tr>
<td>10</td>
<td>Brazil</td>
<td>245</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>World Total</td>
<td>7,299</td>
<td>7,795</td>
</tr>
</tbody>
</table>

Source: Technically recoverable shale oil and shale gas resources: an assessment of 137 shale formations in 41 countries outside the United States, US Energy Information Administration, June 2013.
*EIA estimates for ranking order.

Top eight EY country attractiveness indices: appetite for shale gas and nuclear

<table>
<thead>
<tr>
<th>Shale gas</th>
<th>Nuclear</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technologically recoverable reserves (Trillion cubic feet)</td>
<td>Appetite indicator</td>
</tr>
<tr>
<td>China</td>
<td>1,275</td>
</tr>
<tr>
<td>Germany</td>
<td>8</td>
</tr>
<tr>
<td>US</td>
<td>482</td>
</tr>
<tr>
<td>India</td>
<td>63</td>
</tr>
<tr>
<td>France</td>
<td>180</td>
</tr>
<tr>
<td>UK</td>
<td>20</td>
</tr>
<tr>
<td>Canada</td>
<td>388</td>
</tr>
<tr>
<td>Japan*</td>
<td>Negligible</td>
</tr>
</tbody>
</table>


Despite being in the early stage of development, natural gas is gaining traction in steelmaking as another alternative for lowering carbon costs. Gas can be used as an alternative to pulverized coal injection and in the production of the direct reduction of iron, a substitute for scrap metal in electric arc furnace. The abundance of shale gas in the US and its increased usage in steelmaking would negatively affect US-focused metallurgical coal producers. This really is a question of long-term gas prices – if gas is under US$7/MMBtu, then direct reduction of iron (DRI) plants will more likely be economic. Above that price, DRI will have difficulty competing with the manufacture of pig iron in the blast and the use of scrap steel in electric arc furnace steel production.

Aluminium for steel

Government policy can influence the move toward substitution. For example, the US Government’s new emissions standards, which have challenged manufacturers to make cars more fuel efficient by making them lighter. This has led to a steel-for-aluminium substitution, with the steel producers turning to high-tech steel products as a means of defending their market share.

The amount of aluminium, which is more expensive but has a third of the weight of conventional steel, in autos has increased, tripling in North American and European cars over the last two to three decades. Producers, such as Volkswagen, Ford and Nissan, have opted for high-strength steel in some of their models. However, Ford has announced plans to substitute steel for aluminium in its Ford F-150 model. The new Ford truck should come to market in 2014 and is expected to be capable of hitting the increasing fuel economy standards through 2020, equating to roughly a 25% improvement in the fuel economy.20

Stakes are high for both materials. The aluminium sector, weighed down by overproduction, surpluses and weak prices, views autos as a key growth area. More extensive use of aluminium in North America is also due to the way emissions regulations have been crafted. The US and Canada base emissions criteria on size, which benefits aluminium, while the rest of the world uses weight, giving an advantage to high-strength steels. The two sides are also tussling over how to measure emissions as governments consider assessing not only what comes out of the exhaust pipe but also the GHGs emitted during the production process. The steel industry believes it would benefit from life-cycle measurement because production of energy-intensive aluminium creates about six times as much GHGs as steel. However, that life-cycle measurement would probably not take place until 2020. The aluminium camp says its material is comparable in life-cycle emissions if end-of-life recycling is taken into account. Both sides accept future cars will contain both traditional and exotic materials, including magnesium and carbon fiber.21

The graph shows an interesting forecast of the composition of these “mixed-material” cars of the future.

Changing Composition of light vehicles by material, 1977–2035

<table>
<thead>
<tr>
<th>Year</th>
<th>Conventional steel</th>
<th>Hi/med strength steel</th>
<th>Polymer/composite</th>
</tr>
</thead>
<tbody>
<tr>
<td>1977</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2010</td>
<td>50</td>
<td>50</td>
<td>0</td>
</tr>
<tr>
<td>2035</td>
<td>20</td>
<td>80</td>
<td>0</td>
</tr>
</tbody>
</table>


Beyond production cost, technological and manufacturing challenges have to be addressed before steel, aluminum and a host of more exotic materials can be blended smoothly together. Aluminium, magnesium, carbon fiber and composites are all being looked at as replacements for steel structures. However, steel will not be completely replaced; it will only become less dominant than it is now. The car of the future will likely make up a combination of all of these materials, becoming a multi-material or mixed-material vehicle.22

Aluminium is set for gains over the next decade as the US slashes the weight of pick-up trucks and SUVs, while high-strength steel grades are likely to dominate in Europe.

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21 “New steels fight aluminium to oust heavy metal from cars,” Reuters, 12 March 2013.
22 “Steel vs aluminium in automotive lightweighting,” Insight, May 2013.
Aluminium, plastics, fiber optics or steel and graphene for copper

With a scarcity premium still present in its price, copper is at significant risk of substitution in roofing, plumbing tubes, refrigeration, air-conditioning and computer chip interconnects. Owing to substitution, copper demand has reduced by 400,000–500,000 tonnes annually in the last few years. One of the most prevalent substitutes, aluminium, has largely replaced copper in automotive precision tubing to reduce vehicle weight. It is also threatening copper tubing in refrigeration and air-conditioning.

As technology advances, copper’s usage in computer chip interconnects is also being challenged. New-generation computer chips continue to shrink in size, so do the copper pathways that transport electricity and information around transistors and components. When these interconnects grow smaller, they become less efficient and consume more power. To overcome this hurdle, industry and academia are vigorously researching new candidates to succeed traditional copper. Graphene could potentially replace copper in interconnects, eventually replacing them in most electronics. However, graphene is more likely to be used in conjunction with copper in several applications rather than replacing it entirely, given that this new discovery comes with many uncertainties related to supply, production technology, costs and safety.

Aluminium is also increasingly being used as a copper substitute both in China and globally. Rising investment demand has strengthened copper’s financial attribute, which has caused more volatility in its high prices and more research into the possibilities of substitution. A major step in this direction was taken by a Chinese company, Hebei Xinyi Cable, when it started production of aluminium power cables with rare earth and steel elements.

Price differential is the main driver for copper substitution. Aluminium’s increasing price advantage is reflected in the current copper/aluminium price ratio of 4:1 compared with the historic ratio of between 2:1 and 3:1. Aluminium has been trading at about US$1,860/tonne since the beginning of April 2013 — a quarter of the prevailing copper price. Once this ratio crosses 3:1, substitution between the metals typically gathers pace. Structural overcapacity issues for aluminium have been a significant cause for this ratio increase and is likely to remain for the short-to-medium term. By then, the damage to copper could be done.

<table>
<thead>
<tr>
<th>Price range (US$/tonne)</th>
<th>Industry response</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;5,000</td>
<td>Some substitution from technological and performance improvements</td>
</tr>
<tr>
<td>5,000–8,000</td>
<td>Push for R&amp;D initiatives but end-users/manufacturers hesitate to put results into commercial production (unless prices sustain at higher level of range)</td>
</tr>
<tr>
<td>8,000–10,000</td>
<td>Additional substitution occurs and advanced companies undertake fundamental research to develop new materials</td>
</tr>
<tr>
<td>&gt;10,000</td>
<td>Fabricators and users begin to cooperate on R&amp;D to find new materials</td>
</tr>
</tbody>
</table>

Despite the recent slump in pricing, copper remains at historically high levels of US$7,500–US$8,500/tonne over the 2012–early 2013 period, encouraging consumers to shift to cheaper alternatives. Nearly 50% of copper demand cannot be substituted in applications highly reliant on copper’s conductivity, such as building wire, power-generation infrastructure and electrical connectors. However, if prices remain at these levels, the balance of total end-use copper demand could be lost to substitution in the medium-to-long term.

Copper price vs. aluminium price

Source: International Copper Study Group (ICSG).

23 “Record Copper Prices Prompt Switch To Aluminium,” The Wall Street Journal, 17 March 2011.
Palladium for platinum

Related to the automotive industry is the substitution of palladium for platinum in gasoline and diesel catalytic converters. Platinum group metals (PGMs) are characterized by high and volatile costs, leading consumers to consider substitutes. Major substitution by these industries, without alternative uses being found for PGM, would negatively impact PGM producers’ revenues and profitability. Palladium demand is intensifying globally as a result of more stringent government emissions regulation. The demand drivers are as follows:

- Price-driven substitution
- Platinum to palladium interchangeability
- Palladium-based technology
- Available palladium supply

Palladium can now be substituted for platinum on a one-for-one, ounce-for-ounce basis, which has strengthened the market for palladium in gasoline catalytic converters. Platinum prices are currently at about US$1,546/Oz compared to US$747/Oz for palladium. Substitution demand has supported palladium prices with its prices falling just about 3% y-o-y as compared to about 16% y-o-y fall for platinum. The cost of importing low-grade nickel-bearing iron ore from Indonesia and the Philippines, on which the NPI production process depends, varies with the price and grade of nickel in the ore. However, the high-energy consumption involved in NPI production can make the process cost prohibitive at times of weak nickel prices and sluggish demand from the stainless steel industry. The threat of the Indonesian ban on nickel ore exports could eventually force the NPI industry to migrate from China and move closer to the ore in Indonesia and the Philippines (both countries produced their first NPI in 2012).

Pig iron for nickel

Chinese nickel pig iron (NPI) production – China’s answer to avoiding nickel imports – remains a major issue for global nickel supply. Although this market is very sensitive to price fluctuations, its present overcapacity provides a ceiling for nickel prices.

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Potential rare earths substitution

In the last few years, rare earths have gained global attention as China, which produces more than 90% of global supply, repeatedly clamped down on exports, causing prices of the individual oxides, alloys and metals to soar. Given the associated challenges of availability and security of supply, automakers, clean tech developers and rare-earth substitute makers are looking for alternatives to reduce their exposure to these expensive raw materials.
How are companies responding?

There is generally high awareness of possible substitutes, but historic price relationships, regulations and technologies tend to reinforce thinking that the status quo will be preserved. It is precisely this thinking that causes the risk to be underplayed in enterprise risk management activity, where the likelihood of substitution is often considered remote, hence adaptive planning is not seen as a priority. What this approach misses is the likelihood of any individual disruptive event giving momentum to a substitute. While this may seem improbable, the current environment (the super-cycle) has raised the risk of all events (e.g., technology, regulation, market dislocation), and the likelihood of one or more of these risks occurring is now much higher and probable.

Therefore, with an increased probability of substitution and the acceleration of how quickly substitution will occur, prudent mining and metals companies are considering the following:

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<td><strong>1.</strong></td>
<td><strong>Diversifying</strong> – essentially by taking an option on the rise of a potential substitute to buy “insurance” while the “premiums” are inexpensive and understanding commodity switching in the long-term capital budgeting process</td>
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<td><strong>2.</strong></td>
<td><strong>Improving business intelligence</strong> – buying time through early warning to increase the potential of adaptive strategies being effective</td>
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<td><strong>3.</strong></td>
<td><strong>Matching risk management with investment time horizons</strong> – as investment in mining and metals is a long-term prospect, so is the period over which risk management needs to be effective</td>
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<td><strong>4.</strong></td>
<td><strong>Becoming the lowest quartile producer</strong> – greater asset quality, productivity and cost competitiveness will generally assure business continuity and provide longer buffers for adaptation</td>
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<td><strong>5.</strong></td>
<td><strong>Using derivatives in risk management</strong> – if playing for time is necessary for adaptation, the derivatives market can increasingly provide lower-cost, temporary insurance</td>
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<td><strong>6.</strong></td>
<td><strong>Investing in research and development</strong> – broadening the usage base of products or examining the superiority (and higher economic value) of the product vs. the substitute</td>
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<td><strong>7.</strong></td>
<td><strong>Lobbying governments to remove unfair incentives</strong> – substitutes that arise from unequal treatment in regulation require early identification and need to be brought into the political debate</td>
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<td><strong>8.</strong></td>
<td><strong>Developing coping mechanisms where relative price performance is only temporary</strong> – some substitution may only be temporary, but producers need to be able to survive to prosper once again</td>
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<td><strong>9.</strong></td>
<td><strong>Revisiting the optimal capital structure to compete</strong> – considering whether historic debt and gearing levels are appropriate for a lower-margin environment</td>
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<td><strong>10.</strong></td>
<td><strong>Divesting businesses and products at most risk</strong> – acting early and decisively before market sentiment changes and asset prices fall</td>
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About EY’s Global Mining & Metals Center

With a volatile outlook for mining and metals, the global sector is focused on cost optimization and productivity improvement, while poised for value-based growth opportunities as they arise. The sector also faces the increased challenges of changing expectations in the maintenance of its social license to operate, skills shortages, effectively executing capital projects and meeting government revenue expectations.

EY’s Global Mining & Metals Center brings together a worldwide team of professionals to help you succeed – a team with deep technical experience in providing assurance, tax, transactions and advisory services to the mining and metals sector. The Center is where people and ideas come together to help mining and metals companies meet the issues of today and anticipate those of tomorrow. Ultimately it enables us to help you meet your goals and compete more effectively.

Area contacts

Global Mining & Metals Leader
Mike Elliott
Tel: +61 2 9248 4588
michael.elliott@au.ey.com

Oceania
Scott Grimley
Tel: +61 3 9655 2509
scott.grimley@au.ey.com

China and Mongolia
Peter Markey
Tel: +86 21 2228 2616
peter.markey@cn.ey.com

Japan
Andrew Cowell
Tel: +81 3 3503 3435
cowell-ndrw@shinnihon.or.jp

Europe, Middle East, India and Africa Leader
Mick Bardella
Tel: +44 20 795 16486
mbardella@uk.ey.com

Americas and United States Leader
Andy Miller
Tel: +1 314 290 1205
andy.miller@ey.com

Canada
Bruce Sprague
Tel: +1 604 891 8415
bruce.f.sprague@ca.ey.com

France and Luxemburg
Christian Mion
Tel: +33 1 46 93 65 47
christian.mion@fr.ey.com

India
Anjani Agrawal
Tel: +91 982 061 4141
anjani.agrawal@in.ey.com

United Kingdom & Ireland
Lee Downham
Tel: +44 20 7951 2178
ldownham@uk.ey.com

Americas and United States Leader
Andy Miller
Tel: +1 314 290 1205
andy.miller@ey.com

Canada
Bruce Sprague
Tel: +1 604 891 8415
bruce.f.sprague@ca.ey.com

North America and Brazil Leader
Carlos Assis
Tel: +55 21 3263 7212
Carlos.assis@br.ey.com

South America and Brazil Leader
Carlos Assis
Tel: +55 21 3263 7212
Carlos.assis@br.ey.com

Europe, Middle East, India and Africa Leader
Mick Bardella
Tel: +44 20 795 16486
Mbardella@uk.ey.com

Americas and United States Leader
Andy Miller
Tel: +1 314 290 1205
andy.miller@ey.com

Canada
Bruce Sprague
Tel: +1 604 891 8415
bruce.f.sprague@ca.ey.com

France and Luxemburg
Christian Mion
Tel: +33 1 46 93 65 47
christian.mion@fr.ey.com

India
Anjani Agrawal
Tel: +91 982 061 4141
anjani.agrawal@in.ey.com

United Kingdom & Ireland
Lee Downham
Tel: +44 20 7951 2178
ldownham@uk.ey.com

Americas and United States Leader
Andy Miller
Tel: +1 314 290 1205
andy.miller@ey.com

Canada
Bruce Sprague
Tel: +1 604 891 8415
bruce.f.sprague@ca.ey.com

France and Luxemburg
Christian Mion
Tel: +33 1 46 93 65 47
christian.mion@fr.ey.com

India
Anjani Agrawal
Tel: +91 982 061 4141
anjani.agrawal@in.ey.com

United Kingdom & Ireland
Lee Downham
Tel: +44 20 7951 2178
ldownham@uk.ey.com

Service line contacts

Global Advisory Leader
Paul Mitchell
Tel: +86 21 2228 2300
paul.mitchell@cn.ey.com

Global Assurance Leader
Tom Whelan
Tel: +1 604 891 8381
tom.s.whelan@ca.ey.com

Global IFRS Leader
Tracey Waring
Tel: +61 3 9288 8638
tracey.waring@au.ey.com

Global Tax Leader
Andy Miller
Tel: +1 314 290 1205
andy.miller@ey.com

Global Transactions Leader
Lee Downham
Tel: +44 20 7951 2178
ldownham@uk.ey.com

About EY

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EYG no. ER0100
CSG/GSC2013/1139105
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