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Cover photo courtesy of Newmont - Underground heavy machinery workshop - Tanami

SEPTEMBER 2011

A Vast Nation of Abundant Opportunities

A brief introduction to Australia's mining industry

Conveyors at Newmont Boddington Gold Mine (photo courtesy of Newmont)

Australia, the sixth largest country in the world, stands out for vastness and the abundance of its natural resources. Its territory contains 28 billion mt of demonstrated iron ore resources. Australia is the world's largest coal exporter, the world's second largest producer of gold and nickel and the third largest supplier of uranium. Copper, silver, bauxite and zinc are also found in great quantities in Australia's rich geology. This profusion of mineral resources has shaped the history and the economy of the country.

Yet it now seems that Australian mining is reaching a turning point in its history. While the country is benefiting from a mining boom that is tangible in most aspects of the economy, the industry has to fight new struggles in order to remain internationally competitive. As skilled labor has become scarce, the remunerations in the mining sector have soared, leading to a steep increase in project costs. At the same time, the upheaval created by the attempt to introduce a Resource Super Profits Tax (RSPT) showed certain fragility in the relationship between the mining sector and the Australian federal government.

A Resource-based Economy

Australia is the 13th largest economy in the world as of 2009/10 and boasted an impressive 17 years of consecutive GDP growth prior to the global economic crisis. Even during the global financial crisis, Australia only suffered a mere quarter of negative growth, before a commodity exports-driven recovery produced 1.2% growth in 2009, outperforming all other OECD countries.

The resources sector is the driving force behind this recovery and is the country's largest export sector. According to Michael Roarty , a member of Australia's parliament, in 2008-09, the resources sector accounted for more than 80% of total commodity exports, contributing A$160 million to export earnings. From global industry-leading players like BHP Billiton and Rio Tinto to mid-tier miners and junior companies, the Australian Securities Exchange (ASX) lists more than 600 mining companies.

The boom that Australia is currently experiencing is expected to continue for several years. Australia is enviously positioned to capitalize on the ever-increasing demand from China and India. Mining and energy exports are expected to rise by 16% to A$215 billion in 2011-12 and Ric Battelino, deputy governor of the Reserve Bank, forecasts an estimated 6% GDP growth in mining investments over the next three years.

According to the Fraser Institute, Australia has now started recovering from the blow that the RSPT struck to the industry. Although Canada is still lauded as a model in terms of mining investment, Australia is in the process of blotting out the regulatory uncertainty. With mining companies representing about a third of all ASX-listed companies, building investor confidence is a priority. The ASX is internationally renowned as a source of exploration-to-development investment, a continuity appreciated by exploration companies since they need steady funding in order to make significant discoveries.

From contractors and suppliers to mining consultancies, the network of services available to mining houses based in Australia is extensive and at the cutting edge of technology. Anne Nolan, former director general of the Western Australia Department of State Development, underlines the region is world-leading in terms of mining software and design and sees this as a key route to ensure wider economic benefit from commodity exports. "We have become very good at the services that make a mining industry work. If you feed the mining industry, and ensure a diverse portfolio of development, key synergies start to evolve," she said.

As emerging mining hubs around the world increase their competitive stakes, these are challenging times for the Australian mining sector, but the majority of participants we interviewed for this report were optimistic the conjunction of an incredibly rich geology with a world-leading expertise will allow the nation's industry to overcome these specific issues and to remain at the forefront of the global mining scene. As services companies invest substantially in R&D, innovation has become the cornerstone of the sector and earned the country a reputation for technical excellence that will doubtlessly boost the industry in the years to come.

Investment Risk Profile

The attraction of mining investment to any nation ultimately comes down to its unique investment risk profile. In some nations, that risk is obvious. Unstable governments, vague mining codes and disapproving communities are obvious factors. These considerations do not, however, keep Australian miners awake at night.

It is this security that appeals to many of Australia's most successful resource devel-

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Matthew Hogan, MD Venus Metals

opers. Matthew Hogan, managing director, Venus Metals. transitioned from a career as a stockbroker to identifying pro- jects for his own investment and development. His first company, United Minerals Corp. was sold to BHP Billiton for more than US$200 million and Hogan now continues to seek opportunities within Western Australia. "I like to stay here because it is a place I understand. Australia is supportive of mineral investment with appropriate regulatory controls. We operate in a democratic society, the rule of law applies. Titles are assured and on this basis long term capital can be attracted to worthy developments," said Hogan, who is now managing director of Venus Metals Corp., a company that is developing a series of multi-commodity pro-jects across the state.

Elusive Discoveries

However, as the cost of exploration has greatly increased, the risk associated with exploring a nation, where land untouched by modern exploration techniques is increasingly rare, has become significant. Australia's mining industry growth depends heavily upon exploration, and as Australia is now considered as a mature market, there is a call within the industry for further state involvement to ensure that the enormous resources being developed and exported are replaced through new discovery.

Australia's mining executives are under no illusions as to the country's strengths and weaknesses. "We typically have lower prospectivity compared to other places in the world today, but we do have a higher degree of certainty in terms of skilled labor, infrastructure and government and fiscal policy," said Dave Hatch, CEO of gold mining company Navigator Resources.

Despite the long history of mining that the country boasts, it seems that many companies continue to see opportunities. "It's a mature mining play, but that does not preclude major mineral discoveries. There are evolutions in geological thinking all the time and new discoveries are being made every year. As long as there is access to land on a reasonable basis from all stake holders, then there is good opportunity for continuing exploration success," said Mike Rosenstreich, managing director of Bass Metals, a company that is undergoing intense exploration for a range of commodities in Tasmania.

Some miners believe the focus for exploration needs to be realigned with green field in order to remain a relevant mining jurisdiction. "Globally, the industry has been focusing back toward mature, brown-fields exploration. But if we want to be supplying metals to an expanding China and India over the next 50 years, those incremental expansions are not going to get the job done. There needs to be major new discoveries to replace the major ore bodies that, in this country, were mostly found between 20 and 30 years ago," said Will Robinson, CEO at Encounter Resources, a junior mining house that has had exploration success across a range of commodities.

Robinson is concerned the success of a few headline commodities is obscuring the serious declines in discoveries of other sectors of the Australian mining industry. "We are apparently going through one of the greatest mining booms of the past 100

years, but if you look at the copper, nickel and gold production, it is either steady or on the decline, and if you look on a global basis, Australia's market share is declining," he said. However, Robinson sees plenty of exploration opportunities. "There are a number of things that need to be done to turn that around. About 60%-70% of Australia hasn't seen effective modern exploration, and so I don't agree with people who say that Australia is a mature exploration field."

Taxing Times

The Australian mining industry's latest major crisis, one that may turn out to have long-lasting effects, was last year's twists and turns of the Resource Super Profit Tax. As has been described in E&MJ (See August 2010, "Australia: Mining Taxes Remain on the Agenda"), Australia made headlines around the world last year after the then Prime Minister, Kevin Rudd, announced his proposed Resources Super Profits Tax (RSPT). The RSPT proposed a 40% tax on mining companies' profits and was to be applied to all extractive industries.

Australia has spent many years building a reputation as a jurisdiction with absolute sovereign security in order to compete globally. The announcement was met with shock and horror within the Australian mining industry, but was celebrated in other international jurisdictions competing for exploration investment.

Some contend that the root cause for the taxation announcement was a political rouse aimed at scoring points with the dense voter centers of the east coast that have enjoyed less of the benefits of the mining boom. "The government of the day thought that they could play a class war of the worker of New South Wales and Victoria against the highly paid miners of Western Australia and Queensland," said Campbell Baird, CEO of Focus Minerals, an emergent gold mining player in Western Australia. "The country as a whole said they didn't buy into that."

Clive Palmer, the developer of a number of enormous resource projects in Australia, believes the tax was partly an effort to cool the industry in order to prevent a two tier economy developing. "If something is doing well and you want to encourage it, you don't tax it. You tax people to stop them smoking or drinking. By putting a tax on our resource development the government is saying they want to slow it down and limit it when it is providing all the revenue for the government anyway. It is a sad reflection of the real intentions of the government when it comes to the resource industry," he said.

Karl Simich is CEO of Sandfire Resources

Karl Simich, CEO, Sandfire

NL, a junior mining house that has made one of the most significant base metal discoveries of the decade at its Degrussa project. The company was badly impeded in its ability to access finance due to the negative investor feedback caused by the taxation issue. He was one of many mining executives furious about the new tax. "It was ill conceived, badly timed and atrociously executed. The two versions the Federal Government has proposed have both failed and are making an increasing mess. When it comes to taxation, people just want transparency, consistency and simplicity. Someone can open a bank and make the same amount

Russell Scrimshaw, Director, Fortescue

of profit as me and pay half the amount of tax I'm paying. I don't understand the logic behind that," said Simich.

Aftermath

In response to the RSPT announcements, the Australian mining industry did not remain silent. Across Australia, industry groups such as the Association of Mining and Exploration Companies (AMEC) experienced an enormous increase in membership as large players and small tried to correct the misconceptions that had developed.

It is generally understood that the failure of the RSPT led to Kevin Rudd's Labor party's decision to replace him as party leader and Prime Minister with Julia Gillard, due to the fear that the issue might seriously damage their re-election campaign.

"Democracy worked beautifully and the government almost became unelected because of this tax. It was so misconceived and not properly thought through and it caused a huge uproar from all sectors," said Russell Scrimshaw, director at Fortescue Metals Group, the company that represents perhaps the greatest iron ore success story in Australia of recent times.

Once in power, Gillard announced a revision of the policy and set up a Policy Transition Group (PTG) made up of a number of leading industry figures and also entered into negotiations with a selection of leading companies.

On July 2, 2010, the Australian Government announced its intention to introduce a new Minerals Resource Rent Tax (MRRT). This has been greeted with a greater level of acceptance from the industry. It represents a 30% tax, limited to iron ore and coal mining companies, that is to be introduced in July 2012.

However, both the new design of the tax reform and the manner in which it was created continue to draw criticism from some quarters. The PTG was led by the former BHP Billiton Chairman, Don Argus, and was felt to contain only representatives of Australia's long established majors. This has led to criticism from those that believe Australia's major mining companies already wield excessive power among policy makers.

Fortescue's executives have been a leading voice in these criticisms. "The way that it was renegotiated through consultancy with only a few major players is fundamentally wrong. We'll keep fighting this as hard as we can and we have a formidable team here that are able to communicate and defend our position," said Scrimshaw.

It remains to be seen whether the MRRT will enter into law, but it does seem to attract significantly less criticism than its earlier embodiment. The immediate impact of last year's investment scare was not felt greatly in this year's mineral output.

The real cost of 2010's policy hiccup may be felt much further along the line. It was junior explorers and early developers that felt the brunt of investor backlash. It may be impossible to tell how great a loss that represented for the country. The sector can only hope that the Australian government has learnt a lesson from the impact that such ill-considered tax grabs can have.

The Carbon Tax

On July 9, 2011, after months of speculation and pre-emptive debate, Australian Prime Minister Julia Gillard unveiled details of a plan to price carbon emissions. The carbon price aims to push Australia toward a clean energy future by reducing carbon emissions by 160 million mt/y by 2020 and encouraging investment in less polluting energy generation methods. Though a substantially different piece of legislation to the RSPT, the carbon tax has evoked a furor that, on the surface at least, is reminiscent of Kevin Rudd's 2010 proposition.

If the carbon tax is passed through parliament - for which the Labour government would require the support of the Greens and independents - a flat charge of A$23 per mt of carbon emissions will be levied on Australia's top 500 polluters. In 2015, the tax will be replaced with a market-driven Emissions Trading Scheme. Fuel suppliers and distributors, and companies emitting synthetic greenhouse gases, including the refrigeration and air-conditioning industries, are exempt. The mining sector will be especially affected by the off-road diesel fuel rebate being pared back by $0.06/liter, which the industry says is a 16% increase in the fuel tax.

Mitch Jakeman, CEO of Carabella Resources, a Queensland coal player with interests at Mabbin Creek, says that for a long time the coal industry had broadly acknowledged that something needed to be done to address carbon emissions. "The Australian Coal Association actually moved a long way towards the government to say that you need to give us some signals and allow us to invest in the heavy technology, to raise R&D to 150%."

Though the carbon tax makes provisions for a A$1.3 billion assistance package to aid the industry, this represents just 10% of the A$18 billion that the Australian coal industry will face over the next nine years according to Anglo American, whose CEO Seamus French has come out in strong opposition to the tax.

"All of this technology is high-cost and high-risk. We're prepared to spend, but the money needs to go back into those sorts of things, not just renewables," said Jakeman.

In May 2011, Xstrata announced plans to shut down its smelting facility at Mount Isa by 2016. While Xstrata CEO, Steve de Kruijff, has previously stated that the company had taken the decision on the basis of its inability to compete with lower cost processing operations in China and not due to the looming carbon tax, Michael Roche told Australia's *ABC News* in January that the closure demonstrated how tough the market was becoming for Australian companies. "This just shows you just how vulnerable [the industry] can be to additional cost imposts, which is why of course we're trying to fend off the worst of the carbon tax at the moment. Without our competitors also having some sort of carbon pricing mechanism, it's just going to get harder and harder for us to compete," said Roche.

Gillard acknowledges the introduction of a carbon tax was a hard call to make, but maintains that cutting carbon emissions in such a way is necessary for Australia's future. Treasurer Wayne Swan has said Australia's low unemployment, record trade and a strong investment pipeline made the introduction of a carbon tax feasible in the face of global economic uncertainty. One of the main points of contention in the resources industry is that without other jurisdictions limiting their carbon emissions, Australia will lose market share to its competitors, particularly in the coal space, without necessarily contributing to a reduction in global carbon emissions. "Any mt of coal that doesn't get sold here will get sold from somewhere else. It will be less clean than the Australian coal, therefore the actual amount of CO^2 will be greater," said Rob Neale, CEO of New Hope Coal.

If passed through parliament, the carbon tax will take effect July 1, 2012. The debate continues.

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Accessing Australia's Resources

Navigating a sea of green and red tape

Ore stockpile at Newmont's Boddington mine (photograph courtesy of Newmont)

Australia is a nation blessed with a unique environment and ecosystem rich with flora and fauna found nowhere else on the planet, largely due to its long history of isolation. Australians take great pride in the unique beauty of this environment and, as such, great pains are taken to ensure that Australia boasts a highly responsible mining industry that protects this environment. "The convergence of first world living standards, high-population growth and lots of resource availability means we've got an environmental framework that is probably ahead of the rest of the world," said John Douglas, managing director of Coffey International, one of the world's foremost geo-scientific consultancy companies.

In addition, Australia's colonial past has left a legacy of complex relations between the country's cosmopolitan population of immigrant descendants and the island's original aboriginal communities. After generations of poor and, in some cases, deplorable treatment of the country's indigenous population, modern Australia is keen to protect and advance its Aboriginal and Torre Strait Islander communities and the sites that contain historical or spiritual significance to their indigenous cultures.

Together, these noble intentions translate into a sea of green and red tape that must be navigated by any prospector, explorer or developer hoping to deliver a project on time and on budget in any corner of the vast Australian Outback. However, there are those that see this is as an eventual strength of Australian projects. "There are perhaps more regulatory hurdles to get through than in other markets, but often that's also a good thing. In some emerging mining hubs it is easier to get approvals, but there is also less certainty that those approvals can be relied upon. It's a trade-off between ease of access and the fact that rights are more tenuous," said Andrew Caruso, CEO, Crosslands, a company developing a large iron ore mine in the Mid-west region.

For mining consultancy companies operating in other jurisdictions, experience in negotiating the notoriously rigorous environmental regulatory framework in Australia provides a firm foundation for undertaking complex projects overseas. "[Australia] has been a good market to cut our teeth," said Douglas.

Although this solid footing on which to build projects can be considered a strength, it is unnecessary delays or duplication among government approval offices that most irritates explorers, developers and producers alike. It is an issue policy makers are aware of and are working on improving. "We appreciate there is a window of opportunity to resource projects and we need to ensure that our approvals process can enable that," said Nolan.

Paul Mulder & Gina Rinehart
MD & Chairman, Hancock Coal

In Queensland, the approvals process is regarded as particularly complex. "When you look at a mega-project, there are up to 1,800 permits and approvals to go through. It's ridiculous. We're all about doing what's right for the environment, but there comes a point where you need to stop road blocking and start facilitating," said Paul Mulder, managing director of Hancock Coal.

Changes in legislation pertaining to land access have been especially criticized by the mining industry. While miners broadly accept that landowners need to be compensated, many are unhappy with the ambiguity of the legislation introduced by the state government on the back of landowner pressure, and according to Mitch Jakeman, managing director at Carabella Resources, the failure of that legislation to distinguish between coal seam gas and coal exploration. "The government put in legislation that left a lot of grey areas for interpretation. The fact is that they didn't risk assess upstream and downstream, and they didn't examine the impact that the legislation was going to have on treasury. It will have a whole range of downstream implications in terms of revenue coming to the government. The legislation created new land rights for landowners that it wasn't supposed to. It also conflicted the exploration direction the government wanted," said Jakeman.

Rob Neale, CEO of New Hope Coal, which has open cut coal mines in Queensland's

Darling Downs and Ipswich regions, and a long history of operations in Queensland, believes that the biggest potential limitation on growth in the state is government regulation, both with regard to taxation and also access to land. "Even though mining occupies less than 0.4% of the surface area of Australia, they are trying to constrain it," said Neale.

Recognizing a lack of clarity and systematic inefficiencies in the approvals process were impeding the development of resources projects in the state, the Queensland government began a process of reforming approvals for mining and petroleum projects on the back of a report it released in November 2009. The reforms range from legislative amendments through to moving to an integrated, electronic document management system aimed at streamlining and improving the efficiency of information sharing by agencies involved in the approvals process.

While both the government and private industry acknowledge there is a significant amount of work still to be done, the reforms have largely been met with approval from miners. "The new minister has been great. He understands there is a problem and is working on it. They acknowledge that things can be streamlined and they're working with the industry to do that. The proof will be in the pudding: it's still in its infancy," said Paul Mulder, managing director at Hancock Coal. Communication between industry and government has been integral to the success of such initiatives. In Queensland this is usually, though not exclusively, facilitated by the Queensland Resources Council, the industry's peak body whose board of directors includes executives from BHP Billiton, Xstrata, Rio Tinto and Anglo American, among others.

As Australia's most significant mining jurisdiction, Western Australia is also leading the way in the push to improve regulatory efficiency. "I have project managers and project teams attached to the major projects to ensure that these processes move as efficiently as possible. It does not mean that our regulatory process or framework has changed, but has meant that the culture has changed. In addition, we are also pursuing legislative changes to steam-line procedures and that continues to evolve. However, many companies can benefit from gaining a better understanding of the procedures and improving communicating with the regulatory bodies," said Nolan.

This recommendation, of maintaining communication, is echoed from the private sector. Mike Young is CEO of BC Iron, a Western Australian iron ore developer. He explained how, when going through the process of gaining a program of work for exploration, they benefited from taking the time to meet with their case officer and discuss the best way of filling their application. "This meant that it took only six weeks to get through the process, while it is often much longer for other companies. We then began the whole process of consulting with all of the stakeholders in the department, particularly to get our feasibility study and mining proposal through. By the time that they received the proposal, they knew what was coming. We had very good relationships with the chiefs of staff, and they were extremely willing to help. I am amazed at the number of companies that do not consult with the government before putting their proposals in. Maintaining that level of communication has been critical to the project's success," said Young. BC Iron is now producing and exporting from the Pilbara iron ore mine.

In Queensland, Cape Alumina's ambitious Bauxite project at Pisolite Hills was halted on environmental grounds when the project fell afoul of the government's commitment to protecting wild rivers in the state. Cape Alumina is now in the process of developing a second bauxite project, Bauxite Hills, at Cape York, which it considers even more

Jeff Huspeni, Senior Vice President, Newmont Mining

prospective than Pisolite Hills. According to Cape Alumina CEO, Neville Conway, the company is going to great pains to ensure its planning is meticulous in terms of community impact. "We are front-end loading our permitting right now to make sure that all people are supportive of our endeavors. Our strategy is simple; to build a coalition of support for the project and enable everyone to enjoy the social and economic benefits it will bring and to ensure we maintain our high standards to environmental protection and rehabilitation and mitigation," he said.

The emphasis Australia places on the protection of its natural environment presents a wealth of opportunities for consultancy companies, particularly those who have been entrenched in the country long enough to develop expertise. "It is going to get tougher and tougher to get resources consented. The community is increasingly holding mining companies to very high standards, probably as it should be. For us, [environmental approvals are] a very strong growth area. The parts of the mining cycle that we service are the complex ones. Getting someone who has deep experience with the local legislation and has credibility is vital when it comes to environmental approvals," said Douglas.

Mining in Australia has frequently led to conflict with indigenous groups over ownership of land and resources. Much of Australia's mining takes place in remote areas, including the Outback, where aboriginal people form a high percentage of the population. Aboriginal people have protested against mining activity that disturbs or destroys sacred sites, causes environmental damage, or negatively affects the customs of aboriginal communities.

In reference to social issues associated with Australia's aboriginal communities, many companies recommend a proactive approach. At Newmont, for example, Jeff Huspeni, senior vice president for Asia Pacific operations, takes great pride in its Corporate Social Responsibility (CSR) department. "We regard CSR as one of our competitive advantages. We have a culture of active involvement in the communities in which we operate. We have an Aboriginal Partnership Strategy which drives the company's approach and actions for greater Aboriginal participation at our operating sites, regional office and other locations where we have exploration interests and closed sites. The strategy is built around four key pillars of empowerment, engagement, employment and enterprise development," he said.

More than employment alone, it is the training that Huspeni sees as most important. "It enables individuals to move into increasing roles of responsibility within the company."

At Bauxite Hills, Cape Alumina is working closely with the community surrounding Cape York in determining how the anticipated A$1 billion of economic net benefit the project is expected to generate will effect citizens. "The people of Western Cape York are coming off a very low base economically. The aboriginal peoples of Western Cape York are among some of the most socially and economically disadvantaged in our country. We work closely with the local communities to ensure that they understand the parameters of our project and both the benefits it can bring and its limitations with regard to wealth generation. 89% of the aboriginal residents of Mapoon wanted to work on our Pisolite Hills project," said Neville Conway, CEO of Cape Alumina.

These examples show the keen emphasis Australian miners need to place on both environmental and community issues. It is also an issue that only seems to be gaining in importance as stakeholders are supported by increasingly powerful global NGO groups. However, the benefit is that Australian miners gain a profound understanding of these issues that reduce investment risk and equip them for projects in other environmentally sensitive areas or jurisdictions with complicated community issues.

Rio Tinto, for example, is the largest non-governmental employer of aboriginal people in Australia. According to John McGagh, head of innovation at Rio Tinto, sensitivity to the needs of local populations permeates the company's work overseas. "Further afield, when we move into a new jurisdiction we make fundamental agreements that we will not break. We create local jobs, networks and feeder systems," he said.

Almost universally throughout Australia's mining industry, aspects of mining operations that were formerly regarded as soft skills; community engagement and environmental best practice,-are becoming integral to win a license to operate. Most successful Australian miners have developed sophisticated CSR initiatives to ensure that in conjunction with taking resources out of a given community, they are putting something substantial back in return. Sonoma Mine Management, for example, who operate the Sonoma coal mine in Queensland's Bowen basin, have worked hard to contribute to the community of Collinsville, 6 km north of the mine site. "We've developed a community grants program whereby members of the community are able to receive support from Sonoma Mine Management for the various projects that they wish to get up and running. We process applications for that grant program every month and are pleased to be contributing where we can to what the community is seeking to do. Sonoma Mine Management has also engaged a local tourism group to bring more tourism into our immediate community area. Our impact on the local environment is important to us so we work very hard to ensure that we are addressing issues or concerns that the community may raise," said Chris Millard, general manager at Sonoma Mine Management.

Community engagement is not the sole preserve of miners. Australia's leading contractors and sub-contractors also regard establishing good relationships with the community as integral to the success of their business. Queensland's FK Gardener has a strong heritage in civil infrastructure construction and has recently moved into the coal seam gas space with projects for players such as Santos. Through its plant division EzyQuip Hire, based in Brisbane, Toowoomba, Mackay, Roma and Cairns, FK Gardener supply equipment hire solutions to mines across Queensland and expect to become increasingly involved in mine development infrastructure in the future.

FK Gardener conventionally purchases housing for its employees in the towns in which the company operates rather than setting up worker camps. The company also ensures local people are provisioning its team. "With all the growth that's happening [in western Queensland] it's important that the local community gets value out from that. That's why we have invested in the local towns, it's important to be closely connected to the local community," said Gary Gardner, managing director at FK Gardener.

To cement this relationship, FK Gardener provides all staff with an allowance for joining local gyms or sports teams, ensuring that that they become active participants in the communities in which they reside.

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State-by-State Competitiveness

A review of mining policy across the country

An example of an excellent navigation through the development phase in Queensland, Hancock Coal, headed by Mrs. Gina Rinehart, daughter of the late Lang Hancock – a true visionary and one of Australian icons in mining. Hancock Coal made it look easy, proving the capabilities of the excellent team of management and suppliers. (photo courtesy of Hancock Coal)

Under the Australian constitution, each Australian state and province owns the resources within their state borders and the power to legislate remains within the state government. Therefore, while the Commonwealth Parliament's powers encompass matters relevant to mining operations, each state and province has developed different levels of control and different incentive frameworks for the industry.

Western Australia

Western Australia is the driving force of Australia's mining industry. It accounts for 55% of the nation's total mining investment and Perth, the state capital, is one of the greatest mining industry hubs of the world. It is the nation's largest state by land area, but with 2.3 million inhabitants it accounts for only 10% of the population. The state's resources industry, which also includes a burgeoning oil and gas sector, is by far the greatest contributor to the state economy, representing 30% of Gross State Product.

Western Australia is one of the great mineral provinces of the world. According to the Western Australian Department of Mines and Petroleum, in 2009 it hosted an impressive 540 commercial mineral projects, embracing 968 commercial mine-sites that produce more than 50 different minerals. It is estimated that one in five people in Western Australia is directly or indirectly employed by the resource sector.

As such, the industry dominates local business news and politics. Colin Barnett has been the Premier of Western Australia since 2008, leading a Liberal Party that is generally considered a pro-business, mining- friendly leader, and, as such, he spoke out strongly against the super tax proposals.

Norman Moore is the minister for Mines and Petroleum under Barnett. His department has been making enormous efforts to facilitate investment and reduce regulatory constraints on the industry.

"The Western Australian economy is almost totally dominated by the resources industry and we see enormous potential for further growth. There is a perception among many that Western Australia is mostly exploring and everyone knows where all of the resources are. That's not correct. Despite the mining history and mineral output that already exists, the state is largely underexplored," said Moore.

The state is making particular efforts to assist the many very large projects that are currently in development. In 2009 the Department of State Development was established. "Our role is helping all of these projects get off the ground by working between the industry, community and government," said Anne Nolan, former director general of the Department.

Minister Norman Moore,
Department of Mines and Petroleum

Within the mining sphere, iron ore investments remain most significant. "Western Australia has been a world leader in the export of iron ore for the past 30 years and the entire state has benefited from developing on the back of that industry," said Nolan. Nolan sees no reason for the current boom in investment in the state to diminish: "Our economic planets are aligned. We have great resource potential, not only in terms of iron ore and LNG, but through a diverse range of commodities that are exported. We have a highly skilled workforce, a first world economy with certainty regarding institutional arrangements and doing business."

In response to the increasing importance that mining has played and in order to sustain its growth, the state government has introduced a number of efficiency increasing policies and incentives for increased exploration and development. One such policy is the agreement to refund up to half of direct drilling costs in order to facilitate green field, regional drilling that would otherwise have been a difficult commercial decision. "The West Australian government has a competitive process to apply for funds to help you drill test, and South Australia also has some co-funded drilling program. I think that's a great incentive, especially for

junior companies that might have trouble convincing the investors that they want to drill a particular hole that is not going to give instant gratification," said Allan Kelly, managing director of Doray Minerals, a gold mining junior that was one of the best performing IPOs on the ASX during 2010.

"It has been a terrific initiative," said Will Robinson, managing director of Encounter Resources, a company that has benefited from this policy. "We've been fortunate to receive funding for our drilling in the past and for our next stage of drilling. That drilling was crucial to our copper discovery. It's been a vital process to get people into the green-fields areas and drill some of these high risk holes that are significantly increasing the geological knowledge of new areas."

Queensland

Alongside Western Australia, the state of Queensland is considered one of Australia's mining powerhouses. Queensland is perhaps most well known for its abundance of metallurgical and thermal coal deposits. In the year ending March 2010, Queensland exported 175 million mt of coal, dispatched through five different ports.

Central Queensland is home to the giant Bowen basin, to the west of the Bowen lies the highly prospective Galilee, and to the south east, the Surat, which tails down into the Clarence-Moreton basin bridging the Queensland/New South Wales border. A number of smaller basins: the Calidee, Muligidie, Maryborough, Tarong and Ipswich are dotted across the state.

Beyond coal, Queensland's recoverable resources are as diverse as they are vast. The state is the world's second largest producer of lead, third largest producer of zinc and sixth largest producer of silver. It also houses significant copper, gold, nickel, tin, bauxite and uranium deposits. In the Gulf country region of Queensland, the discovery of lead, silver, copper and zinc lead to the foundation of Mount Isa Mines, one of the most productive single mines in world history, and spawned the city of Mount Isa.

In June 2010, the Queensland government announced it was investing A$18 million over four years in the Greenfields 2020 program, targeted at establishing Queensland as Australia's greenfield exploration capital by the year 2020. "Greenfields 2020 is aimed at attracting the necessary explorers and investors to Queensland so that new discoveries of mineral, petroleum and geothermal resources can occur. There is potential for new discoveries of metals like copper, lead, zinc, silver and gold and also for strategic minerals such as lithium, rare earth elements, scandium, tantalum and

platinum," said Queensland Treasurer and Minister for Economic Development and Employment Andrew Fraser.

The initiatives for 2010-2014 center around collecting data from field studies targeted at under-explored regions in the state. The data will be derived from mineral systems studies, isotopic studies, 3-D modeling of alteraction footprints of mineralization, terrane scale geodynamic synthesis, and collaborative research projects. The Geological Survey of Queensland (GSQ), a division of the state Department of Employment, Economic Development and Innovation, will make this research and all data from its historic exploration reports from the past 50 years available to explorers for free in digital form. "What we really do is open up new areas for explorers, reducing their risks, costs and time frames," said David Mason, general manager of GSQ.

Areas identified for greenfield exploration include north and north-western Queensland (the northern economic triangle) and the Thompson/Lachlan region of western Queensland. As part of its commitment to exploration, the Queensland government also runs a drilling initiative providing funding of up to A$150,000 per proposal to encourage junior explorers to investigate prospective sites. "The push is necessary because, although people think that Queensland is a mature and well-explored mining region, there is still a lot of potential for those who can recognize it," said Mason.

While the current Greenfields 2020 plan is certainly ambitious, it is not a standalone initiative. Greenfields 2020 builds on the success of the Bligh government's 'Smart Mining – Future Prosperity and Smart Exploration' programs, which combined increased exploration spending in the state from A$244 million in 2004 to a record A$751 million in 2009.

Other factors that make Queensland business environment particularly appealing include the concentration of mining technology and service companies in the state, the presence of top-class academic institutions, and a considerable skilled labor force. Nearly 3,000 graduates from engineering courses in the state entered the Australian workforce in 2010 and Queensland boasts the lowest payroll tax of any Australian state or territory.

Northern Territories

The Northern Territories are also keen to establish their credentials as a resource-rich, investment-friendly jurisdiction. Although output is on a much lower scale than that of Western Australia and Queensland, the Northern Territories mining industry is a very significant contributor to the jurisdiction's economy. Mining accounts for A$2.5 billion in revenue and directly employs more than 4,600 people, according to the Northern Territory government.

This importance is demonstrated by the four year, A$12 million program called Bringing Forward Discovery, launched in 2007 and extended in 2011 by three years with a further A$11.4 million investment. The initiative aims to promote prospecting through the supply of geo-scientific data, support for companies applying for exploration licenses and mining titles and assistance and advice in indigenous liaison and land access issues.

The government's efforts towards the mining industry are widely recognized, and the Northern Territories representatives are praised for being particularly approachable. Rob Bills, the managing director of Emmerson Resources, has gained experience from a number of jurisdictions when he was a commodity specialist for BHP, yet he lauds the Northern Territory as a great place to explore. "The Northern Territory is the most business-friendly jurisdiction that I have ever worked in and it is a fantastic place for business. They are trying to grow the economy through exploration and mining. We have a very good relationship with decision makers in the government, who are always available and keen to sort out any problems that we may encounter," he said.

Andrew Drummond, MD, Minemakers

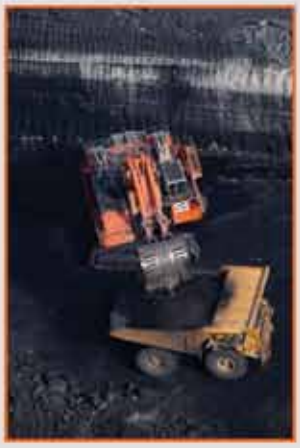
In addition to these initiatives, the Northern Territories also has the power to grant a 'Major Project Status' on those that it deems of great significance in order to streamline and accelerate their approvals process. This status was given to Minemakers' Wonarah rock phosphate project in mid-2008. The company's CEO, Andrew Drummond, feels this has been of considerable use to the company. "Being bestowed the 'Major Project Status' by the Northern Territories government has been excellent for us. We now report to the chief minister's office and have a designated senior public servant that smoothes the way for us."

Drummond feels that this government attitude helps everyone, considering the economic importance of the project to the Territory. "They have been tremendously supportive. The Territory needs mines like this; it's one of the five biggest in the state and possibly the one with the longest mine life," he said.

Wonarah, the most advanced rock phosphates project for Minemakers in Australia's Northern Territory Bulk Sampling pit (photo courtesy of Minemakers)

New South Wales

New South Wales' long history of coal mining started in 1828. In the early 19th century, New South Wales accounted for about 90% of Australia's coal production, and maintained its dominance until the mid-1980s. Queensland eventually out-produced New South Wales, but the region still accounts for 40% of Australia's total coal exports according to the New South Wales'



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Minerals Council. The state was also Australia's second largest gold producing state in 2010, and produced a record 188.8 million mt of raw coal in 2009-10.

Yet, in spite of this impressive record, New South Wales is still designated as a state which has an under recognized potential for major resources.

Rimas Kairaitis, the managing director of YTC Resources, has been working in New South Wales for more than a decade, and was first in line to experience significant changes in the state's incentives towards exploration companies.

"The state has had a very different history to the other resources states. Prior to 1992, New South Wales had a very restrictive mining act, that allowed the state to refuse minerals explorers the access to land. The Mining Act was changed in 1992 to assist with mineral exploration, but there was no exploration activity in the state until the late nineties. New South Wales only started to unlock some real exploration expenditure in 2001-2002."

Newcrest's Cadia Hill, one of Australia's largest open-pit gold-copper mines, located in the Orange district, certainly improved the state's reputation since its discovery in 1992. Its stature as a world class operation contributes towards a wider recognition of NSW's potential as a mining state.

Tasmania

Another lesser known Australian mining region, which still possesses high prospectivity in its challenging mountainous regions, is the island state of Tasmania. The west coast of Tasmania is one of the most heavily mineralized regions in Australia and its mineral industry has played a significant part in economic and cultural development for more than150 years.

In addition, the state government has received high praise from mining developers. "The state government has been exemplary in their support. I have never experienced support from a government as good as Tasmania," said Hamish Halliday, managing director of Venture Minerals, a company that is developing one of the world's largest undeveloped tin projects in the northwest of the island.

"There are some challenges, as Tasmania is a steep country environment with lots of rainfall, but it also has fantastic ore bodies, and there are huge opportunities for those who are tenacious enough," Halliday said. "We are engaged in a joint venture with Bass Metals, and we are always looking at further opportunities in Tasmania," he said.

South Australia

South Australia has traditionally not been considered a mining state, but, with new developments including BHP Billiton's world scale Olympic Dam, Iluka Resources' major mineral sands project and OZ Minerals copper mine at Prominent Hill, this perception is changing.

Dr. Derek Fischer, CEO of Molymines, attributes this transformation to a state government that was proactive in encouraging exploration. "Fifteen years ago they had virtually no mining industry. The government flew a lot of aerial magnetic and gave that information away. That led to Dominion Mining's Challenger discovery and a lot of other good projects," he said. Molymines is developing a molybdenum mine in Western Australia. This form of government program generates an enormous amount of junior activity. "I'm a massive believer in the ability of junior companies to spend exploration dollars a lot more efficiently than large mining companies. Juniors spend a lot less of the exploration dollar, but come up with a much larger proportion of the discoveries," Fischer said.

The state government is confident that the mines under development will become a significant contributor to the jurisdiction's economy and continued mine industry development was a key consideration in the state's recent Strategic Plan and Economic Statement. This view is shared by Duncan McBain, managing director of IMX Resources, a diversified mining company that has successfully begun exporting from its Cairn Hill magnetite iron ore project. "I think South Australia is probably an easier place to explore than Western Australia, and the government tries to be supportive in terms of approvals," he said. IMX is shipping magnetite from its South Australian mine.

However, McBain feels the state now needs to invest in its infrastructure in order to take its resources industry to the next level. "South Australia desperately needs a deepwater port, and this is probably the biggest issue that the South Australian government has to focus on."

For the smaller mining operations that are typically developed in South Australia, infrastructure costs can represent up to 50% of the total capital cost of the mining operation. Additional rail infrastructure, a deep water sea port to accommodate cape size vessels, intermodal facilities and import-export facilities close to mine activity would clearly provide a commercial advantages for the sector.

Australia's Majors

Interview with Doug Richie, chief executive, Rio Tinto Energy

Locomotives and wagons operating in the Pilbara region of Western Australia (photograph courtesy of Rio Tinto Iron Ore)

Can you give us an overview of Rio Tinto's contribution to Australian industry and society?

Rio Tinto has been in Australia for more than a hundred years. We make a significant contribution to the Australian economy and community through employment, investment, and supporting the communities where we operate. We employ more than 20,000 Australians and are the largest private sector employer of indigenous Australians, with 8% of our workforce being indigenous. In 2010, we invested approximately A$100 million on community programs in Australia, and we will be supporting the Australian Team through a partner level sponsorship with the Australian Olympic Committee. Rio Tinto's overall tax and royalty payments in Australia/New Zealand in 2010 were US$3.7 billion.

How successful has Rio Tinto been in managing the cost pressures associated with the strong Australian dollar?

While we are seeing the impacts of adverse exchange rates and some input cost pressures, Rio Tinto has a strong record of completing projects on time and within budget. In the Pilbara, where most of our significant expansion has been in recent times, our projects are on time and on budget although exposed to the Australian dollar volatility.

Rio Tinto recently tied up a joint venture agreement with Chinalco to explore China. How does this development reflect Rio Tinto's current relationship with China?

Chinalco and Rio Tinto will explore mainland China for world-class mineral deposits under a joint venture which, subject to Chinese regulatory approvals and establishment, will operate under the name Chinalco Rio Tinto Exploration Co. Ltd. (CRTX).

The formalization of this exploration JV reflects the importance that Rio Tinto places on developing a mutually beneficial relationship with China, the country that is Rio Tinto's biggest customer and the home of its biggest shareholder.

Given that mainland China is highly prospective, the JV has the potential to create valuable opportunities for both Rio Tinto and Chinalco.

Australia has experienced declining discovery rates and exploration share. What steps need to be taken for Australia to become a more attractive destination for those vital exploration dollars?

Australia has a long history as an attractive destination for investment. Since July 2010 we have announced additional investments in Australia of about A$9 billion. We want to keep in investing in Australia.

For Australia to continue to be an attractive destination for investment, it must ensure that the global investment community regards it as a stable fiscal environment for long term investment.

How urgent is the need for investment in rail and port infrastructure in order to respond to export demand?

Coal export supply chains in New South Wales and Queensland depend on multi-user and mostly third party owned infrastructure assets to export coal.

In both New South Wales and Queensland, port and rail expansions – both planned and under way – should support our growth plans, although the ability of rail infrastructure to keep pace remains the critical factor in the Hunter Valley coal chain.

What can be done to better involve Australia's indigenous population in the resource sector?

Rio Tinto is the largest private sector employer of indigenous Australians.

We recognize however that there is a lot more work to do, and our businesses are setting higher targets and working with traditional owner groups and local communities to find ways to increase the number of Aboriginal Australians employed by Rio Tinto.

In June of this year, Rio Tinto launched the Rio Tinto Reconciliation Action Plan, developed in partnership with Reconciliation Australia. The plan aims to build even closer ties between business and Indigenous communities.

Our Iron Ore business has comprehensive land use agreements with five indigenous groups across the Pilbara region of Western Australia, securing the current and future operations of Rio Tinto's iron ore business while ensuring the full engagement and participation of the region's traditional owners.

These agreements are a historic acknowledgement of mutual recognition and respect between Rio Tinto and the Traditional Owners.

Our coal, aluminum and diamonds businesses in Australia also have indigenous land use agreements in place.

Interview with Ricus Grimbeek, head of health, safety, environment and community at BHP Billiton

Ricus Grimbeek, BHP Billiton

To what extent does BHP Billiton support the carbon tax in its current form?

BHP Billiton has held the view for some time that tackling climate change requires a carbon price signal that can change behavior and ensure choices are made that favor low carbon alternatives. We know broadly what we are facing with the Australian government's proposed policy, but we still need more clarity around transitional arrangements, such as those promised for the coal sector, before we can make a precise assessment of the long term cost impact.

What kind of technology is BHP Billiton planning to roll out to ensure that its Pilbara iron-ore expansion is as environmentally responsible as possible?

BHP Billiton's Western Australian iron ore operations have a pipeline of proposed expansion projects and with this large scale growth comes the opportunity for the company to develop long term environmental outcomes that will have the potential to benefit future generations. We are working closely with government agencies to ensure appropriate management strategies are implemented during the construction and operation of these developments.

With the company's proposed Outer Harbour Development in Port Hedland, we have made more than 500 commitments towards environmental management activities. These commitments form part of the comprehensive Environmental Impact Assessment and management plans. The marine habitat and the fauna the plans support are important and will be managed through ongoing monitoring of marine mammals, sea-grasses and corals, water quality, migratory birds and mangroves.

We have also partnered with local environmental groups such as Care for Hedland, and engaged with environmental specialist consultants to undertake this ongoing monitoring and to develop appropriate management controls.

Similarly, what measures will BHP Billiton take to ensure that the proposed Olympic Dam expansion project is managed in a sustainable way?

In our Environmental Impact Statement for the proposed expansion of Olympic Dam, we have made more than 450 specific commitments about the planning, construction and ongoing operation of the expanded mine to ensure we continue to manage our operations in a sustainable way.

Some of these commitments include setting aside 128,278 ha of land for conservation purposes (which is almost eight times more than the land disturbance necessary to construct the expanded project), reducing greenhouse gas emissions by 60% by 2050, operating the desalination plant without detriment to the marine environment and powering the plant and associated pumping stations with 100% renewable energy and ongoing monitoring of social indicators and working with the South Australian government to reduce social impacts and enhance benefits for local communities.

Are there any BHP Billiton innovations that particularly exemplify the company's commitment to advancing environmentally responsible mining?

There are a couple of examples of innovation that we are particularly proud of at BHP Billiton.

A project team at BHP Billiton Mozal aluminum smelter in southern Mozambique was challenged to devise a start-up procedure designed to improve the smelting process and reduce perfluorocarbon (powerful greenhouse gas) emissions. The process traditionally used by the site involved a pot start-up procedure that included an 'anode effect' which emitted perfluorocarbons. The project team studied the process by evaluating technical papers on 'anode effect-free' start-up procedures, benchmarking smaller smelters using the technique and brainstorming ideas from physical measurement and trials during traditional start-ups.

The result was a proposed start-up technique that involved tapping liquid bath from neighbor pots and adding it to the preheated pot that is being started. At the same time that liquid bath is added to the pot, the anodes are pulled up, increasing the distance between anodes and cathode, in order to generate enough heat to achieve a steady state operation. The procedure proved successful in eliminating the 'anode effect' thus reducing overall perfluorocarbon emissions. With the implementation of the new start-up procedure, a safer system has been created with fewer emissions and much less heat dissipation. There has been a 20% reduction in perfluorocarbon gas emissions, corresponding to a 3% reduction in total carbon dioxide equivalent emissions in the potlines, not including emissions associated with electricity generation. The new procedure has also resulted in the elimination of manual processes, which has helped to create a safer working environment.

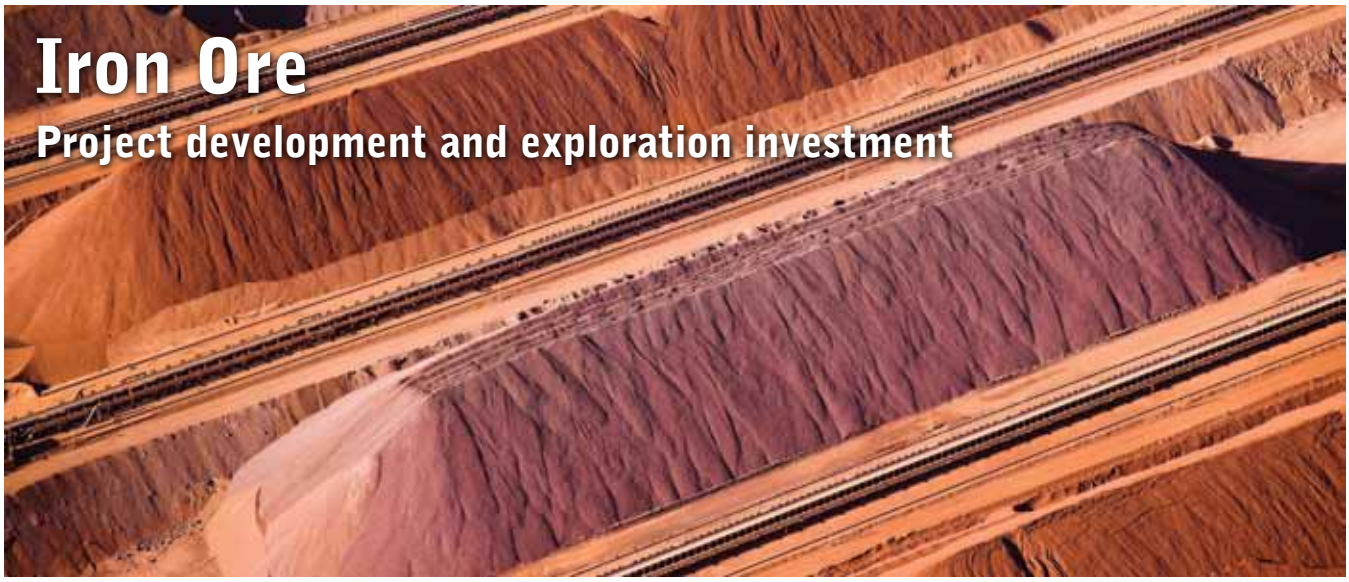
In September 2007, BHP Billiton completed the West Cliff Ventilation Air Methane Project (WestVAMP). Situated at BHP Billiton Illawarra Coal's West Cliff mine (NSW), the project is the first demonstration of commercial power generation solely from mine ventilation air containing dilute methane. It follows seven years of collaboration with Swedish emission control specialist, MEGTEC Systems AB.

The A$30 million plant generates approximately 6 megawatts of electricity per hour and reduces greenhouse gas emissions by 250,000 mt of carbon dioxide equivalent per year.

The technology works by merging two conventional technologies – emission control technology and a steam cycle power plant. The process is based on flameless, single bed, regenerative oxidation in a unit called the VOCSIDIZER©. High efficiency exchangers recover the thermal energy released to produce high quality steam. The steam is then used to drive a conventional steam turbine, generating electricity for use within the mine.

Iron Ore

Project development and exploration investment



Iron ore stockpiles at Parker Point Loading Facility, Western Australia, (photo courtesy of Rio Tinto)

Legend has it that on a rainy day in November 1952, Lang Hancock and his wife Hope were flying south through the Pilbara when, forced by cloud cover to fly low through gorges, he noticed what he described as "walls of solid iron.".

This is considered the first recognition of the vast iron ore mining potential held in the Pilbara. At that time, Australia's iron ore resource was believed to be scarce and it took a decade of lobbying, led by Hancock, in order to gain approval for the development of iron ore mines for the purpose of export.

Since that time, iron ore exports have become a backbone of the state, and the nation's, economy. Australia is now the world's third largest exporter of iron ore and, although iron ore resources occur in all the Australian states and territories, almost 93% of identified resources (totaling 64 billion mt) occur in Western Australia.

According to Geoscience Australia, in 2009, Australia produced 394 million mt of iron ore of which 362 million mt was exported at a value of A$30 billion.

Australia's iron ore industry has enjoyed phenomenal growth in recent times and is perhaps the purest embodiment of the China driven resource boom the country has enjoyed over the past decade.

For many years, Australian iron ore production was monopolized by Rio Tinto and BHP Billiton, however, although these players remain dominant and are expanding fast, a number of new investment opportunities have emerged in Australia's iron ore sector.

Major Expansion in the Pilbara

The Pilbara is perhaps one of the most famous iron ore provinces in the world. With the unprecedented levels of demand from China for this resource, it has been the greatest focus of investment in Australian iron ore mine development. According to the government of Western Australia's Department of Mines and Petroleum, the area of the Pilbara covered by iron ore tenements in 2002 was a little over 22,000 km. By the end of 2009, this had increased 600% to almost 132,000 km.

Rio Tinto and BHP Billiton account for around 87% of output from the region. In 2009, these players began to explore a tie up of their Pilbara operations. It would have represented an A$120 billion deal; the largest in Australian history. That proposed joint venture could have radically changed the future of developments and perhaps consolidated the dominance of these players in controlling the inland and port infrastructure of the region.

However, this plan, which would have created enormous savings for both companies, was hatched in the midst of the global financial crisis. As each company recovered from the crisis in different ways and at different paces, the deal became more difficult. But, finally, the downfall of the deal was blamed on regulators from around the world that were opposed to elements of the companies' union (See E&MJ, "Regulators Thwart Rio Tinto/BHP Billiton Plans for JV").

As it stands, the breakdown of those plans has spurred each to announce enormous, separate expansion plans (See E&MJ, "Rio Tinto Adds Two More Iron Ore Projects" and "BHP Billiton Adds to Australian Iron Ore and Met Coal Spending"). While these expansion plans represent massive investments for the region, they should not obscure the other significant iron ore developments that are under way and that are rapidly changing the power dynamics of the province's mining market.

Fortescue's Arrival

Outside of Rio Tinto and BHP Billiton, mining juniors have been attempting to get small and medium scale projects up and running for decades. No player has been as successful as Fortescue Metals Group. Chairman Andrew Forrest has been propelled to the Australia's rich list and is never far from the local press headlines.

Fortescue currently operate two mines; the Chichester Range Cloud Break and Christmas Creek mines. The company has been producing since May 2008 and transports ore along its 260 km multi-user railway to their open-access Herb Elliott port in Port Hedland. Some believe it was the company's early ambition, at creating a mining operation of sufficient scale to justify its own infrastructure that catalyzed its success.

Russell Scrimshaw, another of the company's founding members and current director, believes an understanding of the Asian boom led to these large scale designs.

"Early on, we decided that we really had to move to take advantage of what was going on around Asia. We wanted to be a significant player, not a niche player, and decided to grow as fast as we can. In iron ore, location is just as important as it is in real estate. We have the closest high grade supplier of hematite iron ore to Asia's massive development story," said Scrimshaw.

The story of Fortescue is one that has captivated the world's mining community. Now established as a major in Australian

iron ore, the company is not resting on its laurels, but is investing in a massive expansion of its Pilbara operations. Current Director Graeme Rowley believes there remains enormous potential for further development in the Pilbara. "Up until now, the Pilbara has been cherry-picked. The easy stuff has been taken, the mountains have gone and the opportunities are now underground. It takes a little more skill, geological science and entrepreneurial endeavor to find it," he said.

As Forrest continues to be a controversial figure, engaged in law suits over market reporting during Fortescue's salad days, the company is keen to promote its depth and ability to continue growth with or without its early svengali. "The company now has an A$20 billion market value and we're shipping A$6 billion worth of iron ore each year at a healthy margin. Our customers like what we produce and that demand is not going away. The company is on solid ground and we have strong leadership in development, operations, government relations, native titles, finance and links across Asia," said Scrimshaw.

Beyond their Pilbara iron ore expansion, Fortescue have also been associated with bids on Mongolian coal deposits and have been rumored to be associated with other commodity and geographic diversification. However, Scrimshaw insists that while it is looking at expansion under other banners, a Fortescue investment will remain a Pilbara hematite play. "Being the scale that we are, we are approached by many people looking for our participation in projects. While we can see the Fortescue name and knowledge-base being applied to other commodities and in other jurisdictions, those opportunities will come up, but not inside the parent. Where we see interesting opportunities outside of Pilbara hematite, we plan to develop them and then push them outside of the parent company balance sheet," he said.

However, Graeme Rowley, another company director that was involved with Fortescue since the entire company was operated from Forrest's dining table, believes nothing is impossible for Fortescue. "If you had asked me in May 2003 how we were going to create this company, I wouldn't have been able to answer. But I knew that we were going to make it happen. It was a day by day progress. Andrew was able to imagine the blue sky opportunity, but he was sensible enough to have with him pragmatists that gave the evidence that they could make it happen."

Room for More

The arrival of Fortescue as a major player and with infrastructure that it has always maintained would be made available to others, has led to a number of other projects now taking off. Two such examples are Atlas Iron and BC Iron, both of whom have negotiated a deal to make use of the Fortescue infrastructure.

Mike Young, managing director of BC Iron, cites the availability of this infrastructure as critical to his company's project. "When we stared drilling in April 2007, I knew immediately that we had a mine, but we kept exploring and it became clear that it would be fairly simple. I started talking to FMG about infrastructure and by July we announced a memorandum of understanding with them. The two key elements to get started were having a deposit early and engaging with FMG about the infrastructure."

Plans are already in place to expand this output of this operation. "Once our own road is complete we can use trucks that can carry up to 360 mt, while road trains can only carry up to 100 mt. At that point, we will be able to ramp up to 3 million mt/y. We will then only need to buy a few more trucks and more mining equipment in order to ramp up to 5 million mt/y. That should happen in 2012, as soon as FMG's port extension is completed." Young has big plans for


Mike Young, MD, BC Iron


Andrew Caruso, CEO, Crosslands

the development of the company. "I hope that BC Iron will reach 20 to 25 million mt/y, either through increased access to Fortescue's infrastructure or through other expansion."

As described earlier, the mining potential of the region is believed to have first been discovered by Lang Hancock. His company, Hancock Prospecting, entered into joint agreements with Rio Tinto in its early history that have led to enormous iron ore outputs from mines such as Hope Downs. This relationship survives to today as, in conjunction with Rio Tinto Iron Ore, Hancock Prospecting is constructing its third mine, Hope 4, whose tonnage will be in excess of 45 million mt/y. However, Hancock Prospecting is also now developing significant mines alone. The company is in the financing stage for its Roy Hill rail and infrastructure project with planned production at 55 million mt/y. Hancock Prospecting is now chaired by Lang Hancock's daughter, Gina Rinehart, and continues to be a major player in the region. She cites the Pilbara's location as a key competitive advantage for their mines. "Our projects are located in the Pilbara and have the benefit of large size plus we have the benefit of infrastructure access," she said.

Movement in Magnetite

For the past 40 years, inclusive of the projects previously mentioned, all iron ore mined in Western Australia has been hematite ore or direct shipped ore (DSO). However, the state has massive resources of magnetite ore. Hematite has the advantage of not requiring costly concentration to bring it to market, but the resource of magnetite is nevertheless difficult to ignore.

The first major magnetite project that was announced in Australia was the Cape Preston Sino iron project. CITIC Pacific, the largest specialist steelmaker in China, acquired the mining rights from Clive Palmer's Mineralogy for 2 billion mt of magnetite iron ore with rights and options for a further 4 billion mt.

CITIC Pacific Mining began developing this project in 2006 and started site construction activities in 2008. To date, they have spent more than A$6 billion and the construction is very close to completion. The first line was commissioned in 2011 and five further lines will be brought into production over the following two years, taking its eventual output to 80 million mt/y.

Many industry players believe Sino Iron could act as catalyst to a great deal of further magnetite projects. "Our project will have a huge impact because investors are watching us very closely. No other major project is so close to commission. This is the biggest magnetite project and largest foreign investment in Australia," said Dr. Dongyi Hua, executive chairman, CITIC Pacific Mining (CP Mining).

Another developer that sees great opportunities in magnetite is Andrew Caruso, CEO of Crosslands Resources. "China has been successfully using magnetite for the past 100 years and 50% of the world's steel production comes from magnetite," said Andrew Caruso, CEO of Crosslands Resources.

Crosslands is a 50:50 joint venture between Murchison Metals and Mitsubishi Development in order to develop the Jack Hills mine, located in Western Australia's Mid-west region.

Despite the additional costs, Caruso believes Chinese demand means magnetite development is inevitable. "The large scale hematite direct-ship deposits are simply not sufficient to meet demand and over the past 25 years the average grade of iron ore shipped from Australia has dropped by around 5%. Therefore, buyers are looking for substitutes for that lump fine market that Australia has delivered for 40 years," he said.

Crossland's Jack Hills mine currently exports around 2 million mt/y of premium grade iron ore lump and fines since its first shipments in 2007. They are well advanced in the feasibility studies for the Jack Hills Expansion project that aims to increase production to more than 35 million mt/y with an extended mine life of over 25 years.

Not all of Australian magnetite projects are of such a great scale. IMX Resources have had great success on much more modest project sizes. Their Cairn Hill project has a JORC inferred and indicated resource of 11.4 million mt resource of 49.5% Fe, with a mineable resource of just under 8 million mt. However, the mine was brought into production in record time and the operation's unit cost is currently around A$46/mt and was achieved at a low capital cost of A$20 million.

"The reason for our success is simple; we have an ore body to die for. It is extremely high grade and we mine it without any beneficiation. All we do on-site is mine the ore body, crush it and ship it. All the processing is done in China for our first phase," said Duncan

McBain, IMX Resources' managing director.

The operation is still ramping up and IMX Resources is now looking to broaden their Australian operation with further value adding. "For our second phase, we will do a small amount of upgrading using Chinese technology," explained. McBain.

Thousands of kilometers south of the renowned Pilbara region, Magnetic Resources' executive directors opted for an original exploration strategy that allowed them to generate multiple projects in various commodities, before focusing on iron ore. "Magnetic has focused on the iron ore sector, both hematite and magnetite. Its strategy was to look at areas that we thought were prospective, in regions that had not been previously explored for iron ore. As a result of that strategy, Magnetic acquired 4,500 sq km of mining tenements exploration licenses in the Wheatbelt region of Western Australia, an area that has not traditionally been explored for iron ore and which is not fashionable like the Pilbara, but which has good infrastructure," said Roger Thomson, executive director of magnetic.

The proximity of and access to infrastructure is the company's key advantage, as it removes the strain of construction costs and makes even small deposits profitable. Magnetic's Jubuk project is located a mere 20 km from the multi-user railway, which is capable of carrying 1 to 2 million mt/y; a capacity that is satisfying with respect to the scale of the project. The resource at Jubuk is yet to be defined, but Thomson is looking at proving an initial 50 million mt resource.

Jubuk boasts a very high quality magnetite ore that would be of interest not only for China, but possibly also for the Middle East, opening the possibility of new export markets. "We have a coarse grained, high quality magnetite that produces a 70% concentrate with very low silica and phosphorus. Many of the Chinese steel mills are still dependent on magnetite rather than hematite, and there is a lot of interest for our project. Although the more likely option would be China, we have seen some interest from operators in the Middle East, whose steel facilities are particularly suited to this high quality concentrate," Thomson said.

However, not all players see magnetite as a first priority. Fortescue, for example, possess enormous magnetite deposits, but have no plans to develop them, said director Russell Scrimshaw. "For us, it is key to be within the lowest delivered cost deciles. We have already had a perfect, real life case study of this importance from the global financial crisis. The price went from A$90/mt delivered to A$52 /mt delivered in a short period of time. The producers that were left standing were those with very low cost mechanisms. Magnetite miners may look great in this climate and might make a lot of money, but when the inevitable down cycle comes, they will find it very hard to stay on their feet," he said.

Mid-west Crossroads

Although the Pilbara is better known, the first exports of iron ore from Western Australia was actually made from the Mid-west's Geraldton Port. Although it contains extremely rich reserves of both hematite and magnetite, many of its best mining prospects have been stranded due to a lack of inland infrastructure.

Duncan McBain, MD, IMX

However, developers are working to open the Mid-west in order to create a second major iron ore exporting province for Western Australia. Plans are afoot for a major infrastructure development that bucks the trend of the single user model employed in Pilbara. The Oakagee Port and Rail (OPR) project is the great hope for this region.

The OPR project is an A$4.37 billion investment in a deepwater port and rail infrastructure to connect the many mining projects proposed across the region. Oakajee Port and Rail was established in September 2007 as a joint venture between Murchison Metals, Mitsubishi Development and Crosslands Resources.

The project has the full support of the government of Western Australia. However, OPR has been beset by delays, but many contend that it is just a matter of timing. OPR now hopes that phase one of the project will provide for 45 million mt/y of iron ore exports by 2016.

Another opportunity for the Mid-west is to raise the export cap at Geraldton port. The port in Geraldton is currently exporting 12 million mt/y, but has the capacity to go to 20 million mt/y. There is a cap until Oakajee comes online, but it would greatly assist the regions iron ore mining development if that cap was lifted.

One company that hopes to make a use of this infrastructure is Gindalbie Metals, whose Karara Iron Ore project (KIOP) has proven resources that total 2.5 billion mt, with a reserve of 977 million mt. "The Mid-west region has real untapped potential. To date, we spent about A$700 million on the development of the project. KIOP is to be developed in two stages. Stage one is a hematite project, based on the mining of direct shipping ore at an initial rate of 2 million mt/y and subsequently increasing to 4 million mt/y. Stage two will involve a magnetite concentrate/pellet project targeting produc-

Citic Pacific Mining - The Sino Iron project is one of China's most significant investments in the Australian resources sector and is the largest magnetite mining and processing operation under construction in Australia. As the first major magnetite mining and processing project in Australia, CPM is taking the lead in bringing a new approach to delivering large-scale downstream processing.

tion of 8 million mt/y of magnetite concentrate is also dependent on infrastructure upgrades," said Michael Weir, corporate affairs and investor relations manager at Gindalbie Metals.

Some see the early phase of development of the Mid-west as an advantage. "The Mid-west iron ore province is a developing region and the beauty of the area is that, as opposed to the Pilbara, where no one can get access to the infrastructure, there is a chance to be involved with the OPR developments from the beginning," said Matthew Hogan, managing director of Venus Metals.

Venus Metals Group is developing the Yalgoo iron ore project which is located 200km to the east of Geraldton in the Mid-west region. Its tenement contains an ore body that is of a similar origin to the Karara ore body and of the same grade. Venus has an inferred JORC magnetite resource of around 43 million mt, running 33% iron. The scoping study concluded that the ore is amenable to conventional treatment with magnetic separation and reverse sulfur flotation. The concentrator capital costs are estimated at around A$1 billion with processing costs estimated at A$7.37/mt of ore treated.

Optiro is an advisory services firm that specializes in the mining and exploration sector that are working with some of the Mid-west developers that plan to use the OPR infrastructure. Mark Warren, director at Optiro explains the difficulties of bringing together a multi-user infrastructure project such as this. "It becomes quite tricky because of the number of parties involved, and the counterpart risk is often overlooked in this kind of arrangement," he said.

Warren feels that the Western Australian government has opted for the correct level of involvement in the project. "There needs to be a role for the government, but not in the ownership of the assets. The West Australian model of privately-owned assets is far more successful than Queensland's state-owned assets model. Queensland's ability to deliver upgrades on assets is always a lot slower and their operating efficiency seems to be questionable. Yet, the government needs to work quicker on some regulatory hurdles," he said.

Small Project Potential

Outside of the larger headline attracting iron ore developments, a number of companies have been able to achieve phenomenal cash flows from launching small scale iron ore projects.

Molymines was developing a molybdenum mine in the north of the Pilbara when

a chance iron ore discovery dramatically altered the company's fortunes. "Iron ore was discovered by our geologists very close to the proposed molybdenum mine site and within the approved mining lease. We started to drill in mid-2008 and uncovered a deposit of around 5 million mt resource (7 million mt of measured and inferred) of 59% DSO. Once we understood the scope of the resource, it took us six months to put it into production and our first shipment of 55,000 mt left in December 2010," said Dr. Derek Fischer, the company CEO.

The mine is currently producing around 1 million mt/y at a three times strip ratio that Molymines is keen to push up to around 2 million mt/y. "The real cost of taking this to production was around A$18 million. Our first shipment cost A$85/mt to get it to port. Freight rates were around A$12/mt and it was sold in China for A$160/mt. I think we'll be able to get our costs down to under A$60/mt," said Fischer.

The phenomenal speed with which Molymines was able to get this up and running has been an enormous coup. "It is set to provide beautiful cash flow for the company and is a great story as to what can be done with a small iron ore deposit. I think we'll end up mining 7 to 10 million mt out of this area. It's a very simple operation and we have off-take agreements in place for the entire mine life. It is an extraordinarily profitable little operation for 1 million mt/y. It's a peanut operation that will make A$70-A$80 million/y and it shows that you don't need a giant iron ore deposit to do very well," Fischer said.

Dr Derek Fischer, CEO, Moly Mines

Manganese

Manganese is a commodity that historically follows the iron ore price curve as it represents a small percentage in the total cost of steel production. As iron ore has returned to pre-2008 levels and the manganese market typically lags iron ore, many are anticipating a bull run in this often misunderstood commodity.

According to Geoscience Australia, the nation has 13% of the world's economic demonstrated resources of manganese. One of the country's largest miners of manganese is OM Manganese, part of OM Holdings, who own and operate the Bootu Creek project. The Bootu Creek manganese mine is located 110 km north of Tennant Creek in the Northern Territory of Australia, where exploration and development commenced in September 2001. Mining operations commenced in November 2005 and its first shipment of ore was made in June 2006. Production capacity is 1 million mt/y and there is currently a 13 year mine life.

The opportunities in manganese, as demand has been increasing due to a decline in supply in China, did not miss the attention of Justin Brown, managing director of Montezuma Mining. "As we had a major shareholding in a manganese company, I became more aware of how attractive and profitable the manganese business is," he said. Montezuma Mining started looking for manganese opportunities, picked up the license for the Butcher Bird tenement and proceeded to do the standard grassroots exploration. "Within the drilling stage, we drilled out six deposits and we confirmed that the Butcher Bird project is a new manganese province," said Brown.

The main tenement at Butcher Bird is about 200 sq km, and with the three other tenements, it totals about 800 sq km. The company is undertaking an aggressive exploration process to see if there is a star deposit in the province.

In the past, Montezuma has been fairly diverse in terms of its prospectivity, focusing on gold, copper and other commodities. Brown sees the company's future most likely being an increased focus on manganese.

"I think Montezuma is likely to rationalize some of its non-core assets and evolve into a pure manganese player," Brown said.

The massive Sino Iron project is being developed at Cape Preston, 100 kilometres south west of Karratha in Western Australia's Pilbara region.

Gold

Project development and exploration investment

Norseman Gold in the Norseman region - Phoenix Treatment Plant Two - Photo Courtesy of Darren Graham

Gold mining has been integral in the history of Australia's development. Successive waves of gold rushes, beginning in the mid-19th century, drew thousands of immigrants to Australia and led to the establishment of some of the country's oldest settlements. It was gold that first brought people to Ballarat and Bendigo in Victoria, and Coolgardie and Kalgoorlie in Western Australia. The gold mining industry built towns, roads, infrastructure and communications further inland than had previously been possible. Geoscience Australia states that the nation possesses 10% of the world's economic gold resources and was listed by industry consultants Surbiton Associates as the world's second largest producer of the precious metal in 2010.

The levels of gold mining have fluctuated over the years, but in the light of the recent global economic crisis and continued currency stability concerns, gold mining plays remain extremely popular among investors. The role of gold as a safe haven investment during the global financial crisis's volatile global currency markets meant that gold projects were among the few able to continue development over the past three years and, as such, many are now coming online.

Gold is still trading at record highs in line with this effect, but gold players in Australia have optimism based on a variety of trends. "In the medium to long term I think that the price drivers are going to be the supply demand situation. On the supply side I think that there is an emerging crisis and on the demand side you've got emergent middle classes in India and China who have culturally very strong links to gold. So, while the short term is very difficult to predict, I think that the future is very bright in the longer term," said Chris Cairns, managing director of Integra Mining, a newcomer to Australia's mid-tier gold players.

Major Gold Discovery at Tropicana

The greatest Australian gold discovery of the last decade was made by Independence Group, the innovative explorers of multiple commodities. Independence first identified the target from Western Diamond Company's (WMC) exploration database. "When we founded Independence, we acquired a database from the WMC that had about 22,000 samples in it that had had very little analysis done on them. There were a number of gold nickel and copper anomalies with no known ore body nearby to explain the occurrence. As WMC were looking for nickel in the late 1970s, their data shows a huge gold anomaly, but they decided not to pursue it. One of those indirectly led to the Tropicana discovery," said Chris Bonwick, CEO of Independence Group's.

Independence pegged it in the early 2000s, but only had A$3.5 million to explore a number of promising opportunities. Independence decided to joint venture Tropicana out to Anglo Gold Ashanti in 2002, as the larger player could provide far greater exploration finance. "It was a huge area and we thought we had better projects. We now have exposure to more than 1 million oz and they are finding more and more. I wouldn't be surprised if Tropicana itself ends up being a 10 million oz mine," Bonwick said.

Long Live Boddington

Australia is home to many of the world's largest gold mining players. One of the largest gold investments currently under way, and by a global gold leader, is the Boddington gold mine, situated around 100 km south of Perth and owned by Newmont Mining.

"The gold industry is generally characterised by short life mines. By contrast, Boddington is a cost-competitive, expandable asset, with a long mine-life. The reserves at Boddington, without taking into account the

Navigator Resources, a mid-tier Western Australian gold producer – gold production at its flagship 100%-owned Bronzewing operations

resources, currently support a 24 year mine life. We believe there is considerable further upside for Boddington and we're already looking at these options as we move forward. At Boddington, we celebrated 1 million oz this year, approximately 18 months after commencing production. This achievement testifies to the size and scale of this flagship operation. We are looking at a range of optimisation opportunities including the conveying system in the dry-grinding circuit and we are looking at maximising the mill throughput," said Jeff Huspeni, senior vice president for Newmont Asia Pacific.

The high cost environment of Australia has forced an emphasis on cost reduction and efficiency that has given rise to certain innovations. "At Boddington, we have installed High Pressure Grinding Rolls (HPGR); we are the second gold-mining company in the world to do that. It is a low energy mechanism for breaking up very hard rock. There was some speculation in the market that this would be a troublesome part of the Boddington flowsheet, but it turned out to be totally trouble-free and operates easily beyond its capacity, with the result that this form of crushing is now becoming employed widely across the mining industry," said Huspeni.

This emphasis on efficiency is replicated across Newcrest's global operations and is producing real results. "We have always focused on energy efficiency, making the generating plants work efficiently, and we are probably using 5% to 10% less energy than we were using a couple of years ago, and there are a lot of continuous improvement processes that we have in place," said Huspeni.

Consolidating History

One of the most famous gold mines in the world is the Super Pit. The Super Pit and the Golden Mile were quite unique in that historically people could take a parcel of land, sink a shaft and start mining. But individually none of these operations were making money. Pulling them all together has made the project viable and has reinvigorated the entire town. It has created a huge amount of economic growth for Kalgoorlie, for Western Australia and for the whole of Australia.

Gary Halverson, Reg. President, Barrick

Chris Bonwick, MD, Independence Group

The Super Pit is now jointly owned by Barrick Gold and Newmont, with Kalgoorlie Consolidated Gold Mines (KCGM) acting as the operating party and is run as a separate entity. "This has worked very well and the project has performed excellently in its production levels and efficiencies. The operation is very important for Newmont and ourselves and still produces more than 6,000 oz/y. There was an uptick in the grade at the mine last year and we have given the okay to do the Golden Grade cutback, which adds a few years of mining life," said Gary Halverson, regional vice president for Barrick Gold.

One of the unique features of KCGM is how the mine-site works hand in hand with the community. "There are not many places where an open pit of that scale sits right next to a community of more than 30,000 people. The guys do a fantastic job of engaging the community through the Super Pit Shop which allows people to interact with the mine and learn about the mine," said Halverson.

Other mining houses have found success through consolidating the field, though to lesser extents. One such is Focus Minerals, who are the largest tenement owner in the Coolgardie region, an area that has been mined for more than 100 years. "The history of Coolgardie is that it has been mostly operated by a large number of small independent operators. Consolidating these small operations has been our great competitive advantage," said Campbell Baird, CEO, Focus Mineral.

This control has led to the company significantly adding to the regions gold resource: "We now control more than 22 million oz of gold resources and have been producing profitably from these operations for more than three years. Having the entire field, we are able to produce from multiple mines. To be honest, I'm very confident that there is another 100 years of production left in this region," said Baird.

The company also draws benefit from being so close to such an established mining center. "It's a huge competitive advantage. Being 20 minutes out of Kalgoorlie gives us a wonderful and stable workforce that can to go home each night to be with their families. Also, all of the service industries are right on your doorstep. We don't have to wait for a day for a mechanic to come up. Most suppliers have a set of stores in town. It makes life so much simpler," said Baird.

Metals X is Australia's largest tin producer producing approximately 2.5% of the global supply of tin from its Mt Bischoff and Renison mines and processing plant in Tasmania. (photo courtesy of Metals X Limited)

Breathing New Life into Old Discoveries

One outcome of the recent popularity of gold investment has been the rejuvenation of some of Australia's many gold mines that have lain in care and maintenance for some time. Many Australian companies actively pursue retired or abandoned gold projects that they are confident of turning around. "Throughout my career, I've developed experience of going into mines that were poorly performing and turning them around. To do that you always need a good ore body, and

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then it's generally either a management, drilling or a development issue," said Barry Cahill, managing director of Norseman Gold.

With that in mind, Cahill and his associates didn't hesitate to take on the historically well known, but long mothballed, Norseman mining project. "I identified Norseman with the help of some people I knew in the industry and started a recovery plan for how to get it back up and running. The problem at that time was that the project was badly run down, but we knew what we were going into," said Cahill. They spent the first 12 months refurbishing the treatment plant and restarted diamond drilling after a hiatus of 18 months. "We did that with two mines operating and the treatment plant at 50% capacity. Within two years we had produced 80,000 oz and made A$20 million," said Cahill.

The next stage of the company's strategy is to get the treatment plant to full capacity. It had 15 named resource projects, without looking at any green-field resources. "We picked the best three, two of which have now been turned into mines. After filling that mill, the long term strategy is to get life and reserve, expand our mill and become a really robust, strong cash producer. Maintaining a healthy number of active mines is vital to stabilizing the production profile and the level of cash flow," Cahill said.

This story is not unique. Catalpa Resources is developing the Edna May project which is located in the Westonia region. It was first discovered in 1911, underground mining since that time has produced around 430,000 oz and open-pit mining there has produced around 200,000 oz. Catalpa Resources have been active there for two years. "It is really a story of an older mine becoming economical once again based on the current gold price and the application of a different mining and processing strategy to the ore body," said Bruce McFadzean, managing director, Catalpa Resources.

Catalpa are mining the halo around the existing mine as an open-pit and then exploring underground where the ore body continues below the presently understood resource. "Our strategy is to be robust on the existing low grade feeds and then feed in higher grade from beneath the open pit operation and from the regional opportunities in our large land holding," McFadzean said.

The project has a 2.8 million mt/y mill, a recovery rate that is averaging 91.6% and a low strip ratio that complements the project grade. The company's long term projection for unit cost is US$700-US$750/oz and it hopes to produce on average 100,000 oz from its open-pit over a mine life of more than 10 years. By 2013, it also hopes to 50,000 oz/year from underground activity and another 15,000-20,000 oz through toll treating other regional miners' material.

New Angles on Old Mines

Doray Minerals made a big impression in 2010, as one of the best performing IPOs on the ASX that year. That float was based on its Andy Well project, which was discovered in 1995 and has since passed through a number of hands.

"We thought that if we could put together a 5g open pit ore body, and truck it to an existing mill; we would have a very profitable gold mine with no capital expenditure. We went out there four weeks after we listed, and with three drill holes we hit the Wilber Lode. We put out our maiden resource two weeks ago of 200,000 mt at about 25 g, which is a very high-grade deposit," said Allan Kelly, managing director, Doray Minerals.

This has given the company around 175,000 oz to start with, but Kelly believes it is just the beginning: "The reason we like the project is that there are multiple mineralized structures that we are just starting to test. We're expecting to get about 400 to 500,000 oz of reserves," he predicted. This success has led the company to consider

Chris Cairns, MD, Integra Mining Ltd.

building their own mill: "We have looked for existing mills, but once we've weighed up the cost of purchase, the cost of refurbishment and the transport cost, we think it might be more interesting to build our own mill."

For a mill that can deal with 300,000 to 500,000 mt/y, the company is looking at a A$40-A$50 million CAPEX.

This is not an unusual turn around in Australia. "The upward movement in the gold price has allowed companies to go back and revisit many old mines that have already been worked," said David Hatch, managing director of Navigator Resources.

The company acquired the Bronze-wing deposit in 2009, another mine that has passed hands a number of times without reaching production. "We acquired the Bronzewing project at the end of September 2009, completed our fund raising, started mining and poured our first gold inside seven months."

Production from the mine is around 100,000 oz/y, and it is set to operate initially for around five years.

Beyond this achievement, the company also showed the ability to multi-task developments. Before acquiring Bronzewing, the company's flagship project was at Leonora. "At the same time as the Bronzewing developments, we conducted a trial mining program at Leonora and poured first gold on the same day at both projects. Since that time, we've been ramping up production at Bronzewing to our 100,000 oz/y capacity and been out to tender for a milling facility at Leonora while continuing exploration on a couple more targets that indicate high grade mineralization at surface," Hatch said.

Both of these projects are located in Kalgoorlie, a region that has been scoured for gold since the rushes of the nineteenth century. Despite this, Hatch and other explorers are optimistic concerning the upside potential of the area.

"I think that much of the previous exploration of the Kalgoorlie region has been to fairly shallow depths. The focus has been between surface and 100 m and very little below 100 m," said Chris Cairns, managing director of Integra Mining, who can speak with such confidence due to his own exploration success in the region.

Integra Mining's Randalls gold project went into production last year. The company achieved the incredible feat of taking just three years to transition from discovery into production during a global financial meltdown. "The discovery was announced in May 2007. It took us around two years to go from the first drill hole to feasibility. We continued drilling throughout the crisis with four rigs, as we had been quite conservative and found ourselves with A$8 million in cash when the crisis hit," said Cairns.

The project incorporates three zones of mineralization that together represent over 1.8 million oz of gold. "The CAPEX was estimated to be A$64 million, which included a 42 km power line, 8 million mt pre-strip off the pit, the mining camp, bore field and the whole processing plant. In the end, we delivered the project for A$63 million. We were able to push through with the view that the market would turn and cash would be available," Cairns said.

The project is currently producing around 800,000 oz/y, extracting high grade material from its open-pit, and its true cash costs are expected to be below US$500/oz. In the current gold price environment this is providing around a US$900 /oz margin. The company has now paid off a lot of its debt, which is allowing it to spend over A$20 million this year in exploration.

"We have a strong track record, having made two discoveries in the past three years and believe we have some very good opportunities in front of us. We are also considering expanding our processing plant by 25%, to an output of around 140,000 oz, simply by installing a second ball mill from the open pit input alone," said Cairns.

Employing New Exploration Techniques

Cairns believes it is a more educated approach to exploration that pays dividends. "The first year or two will be taken up on our targeting. For example, at the Aldous project we have been involved with the CSIRO, Australia's national science agency, to develop a model which replicates the fluid flows during the main gold event. We can explain why the main deposits are where they are located and in doing so we have identified a couple of additional targets that

had not been fully explored previously. Over the next two years, we anticipate following up on the targets that we have to date to hopefully lead ourselves into another major discovery."

"We tend to look at exploration project areas on quite a big scale. For example, at the Aldous project we are looking at an area that's about 80 km long by 20 km wide. Within that area we wanted to become clever about how we focused the exploration effort. It has ultimately narrowed us down to an area that's 10 km by 2 km. Once we have that sort of a target we don't hold back, we absolutely smash it with drilling. If you have confidence in the manner that you identify targets you have to follow that up with a commitment to drill with conviction and deep pockets," Cairns said.

Australian exploration companies are at the forefront of advanced mineral exploration technologies. The remote nature of many of Australia's mineral deposits requires finely tuned exploration techniques. Consequently, Australian geologists have developed sophisticated and technologically advanced systems that enable them to explore and develop mineral deposits in a more cost effective manner.

In the Northern Territory, Rob Bills is aggressively exploring Emmerson's tenements in the historic Tennant Creek mineral field, which he describes as "the highest grade goldfield in Australia." The company's strategy was to rejuvenate historic mines through the use of modern exploration technologies. "Emmerson has decided to apply new technologies to that field in order to try and find deposits that have not been found by previous explorers. They are the hardest ones to find, because they are undercover. We have used a combination of ground and airborne surveys, and we have just finished a HELITEM survey, which is the most powerful electro-magnetic system in the world. We are very excited by the HELITEM survey results that allow us to see 600 m down through the surface. We are always looking for new technologies, and very keen to try them," said Bills.

Together with its joint venture partner, Ivanhoe Mines, Emmerson is in the process of defining the economic viability of its assets on its vast 4,000 sq km tenements. The company is also the owner of the only carbon-in-pulp gold plant in the region; the Warrego gold plant, that has a maximum throughput capacity of 300,000 mt/y.

Another company that has enjoyed success is Silver Lake Resources, which has won numerous awards for its expertise in exploration. Since November 2007, the company has grown their resource base from 830,000 oz to 3 million oz and targets 5 million oz within the next two years. "Silver Lake aims to be a mid tier gold producer. We would love to be the next half a million oz producer. We look at identifying the highest ranking targets where we can add to the resource. The systematic approach consists in defining a target, doing the drilling, getting the results, doing the geological modeling and re-rank again. For example, the Magic deposit has probably the best intersection: 11 m at 59.4 g/t. This has the potential to be 1 million oz deposit. While a lot of investors and other miners would drill it very quickly, we stick to the systematic approach. We have a system that has been rewarding to date, and we will continue with it, regardless of externalities," said Les Davis, managing director.

The Bullabulling Gold Project, Part of Yilgarn Craton, home to in excess of 160 gold deposits, 65 km from Kalgoorlie WA - Flagship project for Auzex Resources, which is fast tracking the project development phase

An Explorer's Mentality

Before founding Auzex, John Lawton enjoyed early career success with Ross Mining, a gold mining company whose assets in the Solomon Islands had to be closed following political instability in 2000. In its heyday, by employing a unique approach to exploration and the subsequent mining of gold, Ross Mining paid dividends to its shareholders and was one of the lowest cost Australian producers.

Lawton credits the low metal prices when he was starting Ross Mining in 1986 and the subsequent recession of the early nineties as contributing factors in the cultivation of an innovative low cost approach to exploration and mining. But there is a more esoteric factor, according to Lawton, that makes for great discoveries in Australia. "Exploration geology is very much a mind game; you're going over ground that's been gone over before, especially in Australia where the industry is very tight. It's literally a way of thinking—you're bringing something out of nothing."

This type of innovative thinking would be integral to the foundation of Auzex and its subsequent exploration activities. Lawton was looking for new opportunities overseas when his attention was drawn to large granite related gold systems in Australia; typically very large deposits of often more than 3 million oz.

To further explore these deposits, Lawton created Auzex in 2003 and funded it himself until the company listed in 2005. "There was nowhere near enough exploration of this type going on in Australia. The majors are never going to be able to do it; they're only going to get there by acquiring juniors."

Auzex used computerized data mapping to produce prospectivity rankings for deposits at a variety of locations on the east

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coast of Australia and west coast of New Zealand. This enabled the company to reduce exploration risk dramatically and narrow down to three regions: North Queensland, which includes the Lynbrook tenements and the tin-tungsten Khartoum project; molybdenum, bismuth and tungsten projects in New England in New South Wales, and the Lyell gold prospect on the west coast of the northern island of New Zealand. These were true greenfield sites, which, once explored, proved to be very rich.

"Our geologists were very economically minded and we are interested in the profitability of a mine rather than its size," Lawton said. Auzex's most advanced project is situated at Bullabulling in Western Australia. Located in the highly prospective Eastern Goldfields, 65 km south west of Kalgoorlie, Bullabulling has more than 1.98 million oz of gold in JORC inferred resource. In June 2011, Auzex commenced a diamond drilling program at Bullabulling to intersect known mineralization over a 2.5 km portion of the Bullabulling trend between the Bacchus and Phoenix pits and an upgrade of the deposit. Seven drill holes are planned totaling 1,432 m and will provide detailed structural information related to grade and allow detailed geological data to be collected from the hanging wall through to the footwall of the approximately 500 m wide Bullabulling shear zone.

Unlike projects such as Tropicana, little infrastructure investment is required at Bullabulling since most of the necessities are already in place. While the scale of the project is such that drilling could probably continue for the next 20 years, Lawton is keen understand the resource properly and get the project into operation.

"We're looking at a 5 million mt/y base case. Designs are being drawn up - we need to decide on the throughput rate at which to deliver; somewhere between 3.5 and 10 million mt/y. This is a big operation and it's vital that we get this exactly right," said Lawton.

High Grades at Wattle Dam

Not all current development is of lower grade. Ramelius Resources is a company that is developing a gold mine that boasts over 20 g/mt. "Wattle Dam is a very high grade gold deposit for Western Australia. It is probably double the grade of any other gold mine in the state, and about four times the grade of the average underground mine in the state," said Managing Director Ian Gordon.

However, the mine has suffered a poor reputation in the past due to underestimations of its resource. "This deposit is extremely difficult to drill and get a full appreciation of the available deposit, and so it has always been underestimated when it was drilled. To date, when going into production, one tends to produce at least twice as much gold as was anticipated from the drilling results," said Gordon.

"The majority of the gold is located within 20 to 30 m depth in the middle of the ore body. It plunges steeply, and it is very difficult to drill from the surface and hit the target, although in the last six months, we had some good success with drilling holes about 120m below the current mine," Gordon said.

It has thus taken Ramelius a number of years to move its position on the market based on the actual results from mining. For these reasons, Gordon believes it is difficult for the market to understand the project. Yet, in the last 12 months, Wattle Dam has shown its potential in terms of its production profile. "In 2009, we produced about 92,000 oz from the mine, at a low total cost of about US$450/oz. In 2010, we made a margin of nearly US$1,000/oz. We are at the lower end of the cost curve for production. If the gold price went down to US$1,000, we would still have a very good margin. Having a high grade gold mine is the best position to be in. This produces a lot of cash flow for the company, much more than most of the Western Australian mines, and allows us to look at other opportunities," he said.

Base Metals

Project development and exploration investment

Poseidon Nickel Limited is developing the largest high grade nickel sulphide deposits of any exploration and development company in Australia. The company is focussed on producing its first concentrate from the Mt Windarra mine in 2013. (photo courtesy of Poseidon Nickel)

Nickel

Australia has substantial nickel resources and is one of the world's major nickel producers. Most nickel products are exported, mainly to Europe, Japan and the United States, providing Australia with an important source of export income. Currently, all of Australia's nickel production is from Western Australia.

According to Geoscience Australia, most of Australia's identified nickel resources are contained in laterites (about 68%). However, the development of laterite deposits has not been easy, and projects, such as the Ravensthorpe development in Western Australia that was abandoned by Brazilian mining giant Vale, has created cynicism among some investors about laterite project viability. Despite this, the nickel price recovery, the dearth of available undeveloped nickel phosphate projects and engineering breakthroughs in laterite treatment have led developers to look again at Australia's laterite opportunities.

"Previously, 70% of the world's nickel was produced from sulfide nickel deposits, which is a straightforward, well-understood process, carried out by hundreds of plants around the world. But 80% of the world's future resources in nickel are in nickel laterites, which have a very high initial capital cost (the capital intensity per annual ton of nickel produced is four or five times as high as in the nickel sulfide). Every single laterite nickel project in the world has had significant difficulties and cost overruns. Therefore, investors are getting nervous about putting more money into nickel laterite plants," said David Singleton, CEO at Poseidon Nickel.

However, this failure and the long lead times associated with future projects, has created very promising market conditions. No one looks to benefit more from this than those that have access to those rare nickel sulfide deposits and Poseidon Nickel today, has the biggest undeveloped nickel sulfide resource in Australia. The project is located in Western Australia's North East Goldfields, surrounded by infrastructure and the company aims to go into production in the next five or six years. They have spent A$30 million joining up 100,000 mt of resource.

"At the end of December, we announced that we had achieved an A$20 million funding. We are now funded to complete the underground refurbishment. When this is done, we will be in a position to mine. The question now facing the company is whether to mine ore and sell it, or whether we build a concentrator, which would cost A$30 to A$35 million," said Singleton.

However, Singleton said this option does not constrain current plans for development. "Nickel prices being strong as they are today, it would be economic for us to ship ore. When nickel is US$13/lb, bringing forward production is much more relevant than increasing cost, and you still have this option of building the concentrator."

David Singleton, MD & CEO Poseidon Nickel

The Appliance of Science

Independence Group, the company that are jointly developing the massive Tropicana gold mine with AngloGold, has also had great success rejuvenating a nickel sulfide mine that was once considered well beyond its best. According to the company, one of its core values as being the appliance of scientific techniques.

"Transient Electro Magnetism (TEM) introduces a current that magnetizes the nickel sulfides which can be measured after the current has been turned off. It's like a large metal detector that can be dropped down a drill hole. We recognized that the ore bodies there were very conductive. The EM systems around in those days were not very powerful and couldn't see very far away from drill holes. We were working with Curtin University to develop a better transmitter, which we called our Mark 1. That was ten times more powerful than anything else at the time. The miners were very skeptical in the early days, until Mark 1 found our Marandah ore body that has around A$750 million worth of nickel in it," said Chris Bonwick, CEO of Independence Group.

"Consequently, we've been developing better machines in-house with an ex-navy geophysical technician that has rich experience. The Mark 2 machine could see up to 200 m from the drill hole and found Murran, which is around A$1 billion worth of nickel.

We're now building Mark 3, which is a 400 amp unit, 40 times the power when we started and that we hope can see even further. With this, you save dollars drilling and it has applications both in regional exploration under cover at finding the depth of extension of our known ore bodies.

"This technology is used in other mines, but they haven't achieved the sensitivity and the power that we have. This has given us a competitive advantage in a number of joint ventures. It's only good for massive nickel sulfide mines, but they're the high value ones and the ones the world is running out of. We think that with our technology we can keep finding more ore bodies and we have had a lot of interest in this technology from regions such as Canada. We now are going overseas; we have just taken all of our equipment to Sweden in order to do a large EM Survey over a lake where a prospector found boulders of rock containing lots of nickel sulfide deposited from glaciers. From the initial surveying, we have got a kilometer long target at around 400 m down plunge. Our technology and technique is what has given that opportunity," he said.

Metals X is an emerging diversified resource group that is developing the Wingellina nickel-cobalt project. Wingellina holds 180 mt of 1% nickel and 0.07% cobalt, but what distinguishes it from other operating nickel laterite deposits is that it is a limonite or tropical laterite, having an iron oxide content averaging 47% and magnesium content of less than 2%. These characteristics make the deposit ideal for the High Pressure Acid Leach (HPAL) processing method. This means that Wingellina will be a very low acid consumer, which will greatly reduce the eventual operating costs.

"The CAPEX for this project is more than A$2 billion, but 20% of that cost can be saved by using Chinese manufacturing and engineering. The project will generate A$3.4 billion of revenue and A$600 or A$700 million of cash flow a year once it is operating. It has a payback of less than five years, an operating cost of $3.34/lb," said Warren Hallam, CEO at Metals X.

Metals X – Underground diamond drilling at the Renison mine (photo courtesy of Metals X Limited)

Hallam feels that the full potential has not yet been fully understood by investors. "In Australia, many analysts don't necessarily understand the difference between a laterite and a limonite, whereas in North America or Japan, that difference is very clear. The limonite is perfectly suited for HPAL because of the low magnesium and because it has been leached before. This is a very long term project, of 40 plus years and to find a large long-life low cost asset is very difficult nowadays, especially in base metals."

Copper

Copper is widely distributed in Australia in rocks of the Precambrian and Paleozoic age (more than 250 million years old). Australia's main copper mining centers are in the Mount Isa/Cloncurry region of Queensland and at Olympic Dam in South Australia. Australia has about 6% of the world's economic copper resources and is ranked third after Chile (25%) and the U.S. (16%). In production, Australia is ranked fifth after Chile, the U.S., Indonesia and Canada.

The most exciting copper discovery in recent history was made by exploration junior Sandfire Resources. "Sandfire was brought together 10 years ago by three individuals; myself, Graeme Hutton and Miles Kennedy. The aim was to find something meaningful, that had legacy and that we could add value to. We had spent a lot of time in Africa and Canada, but being based in Perth we were very well connected in Australia. We said 'let's go chase an elephant.' Our business model was to look for world-class discoveries. Others said that this was not possible in Australia, but we thought otherwise," said Karl Simich, CEO of Sandfire.

The discovery currently includes six lenses that have been drilled to around a 600 m depth. Sandfire has released incredible results of 10.67 million mt at 5.6% copper, 1.9 g/mt gold and 15 g/mt silver, containing 600,000 mt of copper, 660,000 oz of gold and 5.1 million oz of silver. Directly above this deposit, the company has also discovered a chalcocite zone that contains 151,000 mt of directly shippable material that can be very quickly mined as an open pit in order to facilitate rapid cash flow.

"We're digging a separate open cut and underground mine. We're very advanced in the funding for capital and pre-production costs. We expect to see payable ore out the open cut by Q4 2011 and to start selling product in Q1 2012. We see production from underground beginning Q3/Q4 2012," said Simich.

This combined output will stay at a steady rate for 8 years at close to 70,000 mt/y of copper at a very competitive unit cost. "It's not often that people come across projects of this scale and potential profitability," said Simich.

He believes this greenfield success may breathe new life into exploration in the region and across the country. "Great new finds, like ours and others, can cause people to throw out their perceptions of the Australian exploration market. It's nice to see that rejuvenation occur." However, his focus obviously remains on his own company's next steps: "We're very excited about the future of the company. It will culminate in the moment when we can deliver our project. That will represent an incredible achievement and an amazing springboard from which to grow the company."

Other exciting copper deposits can be found outside of Queensland and South Australia. Exploration junior YTC Resources grasped the opportunity presented by the global financial crisis to acquire distressed assets in the Cobar basin of New South Wales, a historically prospective region for gold, copper and lead-zinc. For a long time, the Cobar basin was controlled by two major companies – Pasminco and Consolidated Zinc CRA – preventing junior activity until the late nineties. Juniors finally stepped into the basin, observing exciting opportunities. "There is a precedent for very large systems,

that can extend well below 1.5 km of depth and that generate very long life mines," said YTC's Managing Director, Rimas Kairaitis, said. These precedents prompt optimism and explain why YTC Resources is rapidly progressing on its Nymagee copper project. The Nymagee copper mine has a historic production of 422,000 mt at 5.8% copper. "We think it could evolve into a very large copper system within the next six months and we are therefore conducting a very large and aggressive drilling program," Kairaitis said.

Copper production would be the company's secondary focus after an initial production of gold out of the Hera deposit. The resource at Hera has been estimated to 677,200 oz of gold at 8.6 g/mt, and YTC is expecting to establish the Hera district as a highly prospective area.

Tin

The world's economic resources of tin total approximately 7 million mt, of which Australia has approximately 1.3%. The reduction of production out of Indonesia and a lack of exploration explain that there is a gap in tin supply. Moreover, substitution is very unlikely as it is a highly inelastic commodity, consumed mainly by the electronics industry. "Ever since I started working in tin in 1997, it has been clear to me that this LME commodity has been forgotten about. Trying to get people to understand this commodity has been a real struggle over the past three years, in all of the world's resource investment centers. People are either totally unfamiliar with tin or still hold preconceptions over its past. It has taken 30 years for tin to be considered as a mainstream metal again after the unsuccessful efforts to establish a production cartel in the 1980s," said Wayne Bramwell, managing director of Kasbah Resources.

ASX-listed, Kasbah is currently developing a large tin project in Morocco. Bramwell is very excited about the market dynamics.

"There has been a sustained period of severe under-investment by the major players and it is now time for them to 'pay the piper.' Tin projects tend to take six to seven years from discovery to production. A list of new starters in the tin world can probably be limited to three. If all three of those projects came online, it would probably amount to a total addition in tin production of 10,000 mt/y. The shortfall in production for this year is forecast to be between 15-25,000 mt and so there is a beautiful divergence between demand and supply. This is only accelerating as producers are being forced to reduce production due to maturing mines," he said.

Drilling results from Sandfire Resources, already famous for their April 2009 discovery, the high-grade DeGrussa VMS (volcanogenic massive sulphide) copper-gold deposit in the north-eastern part of the Doolgunna tenement package.

Kasbah is developing the Achmmach project, which Bramwell describes as a is a straight tin oxide ore body. The company is now moving from its scoping study towards a definitive feasibility study.

The scoping study identified a modest total CAPEX requirement of A$85 million for the mill, plant and surface infrastructure. The aim is to discovery a resource of 10 million mt, of which 4 million mt would need indicated classification, to justify this investment.

"Currently, we have 7 million mt of total resource of which 2.2 million mt is indicated. We have now gone to a three drill rig operation in order to expand and infill the underground resource," said Bramwell.

However, Kasbah is also exploring a second option that would bring forward production and reduce the upfront costs. "At the same time we are also testing the potential to add an initial open-pit feed project from a shallow zone in order to push forward operations and reduce the start up cost and technical risk to repay the debt very quickly. This open pit phased approach could reduce the initial CAPEX requirements to as little as A$60 million," said Bramwell.

In-country, Australia also boasts a number of tin investment opportunities.

More than 85% of Australia's economic tin resources are located at the Renison Bell deposit in Tasmania, a primary carbonate replacement deposit which supports one of the world's largest underground tin mines.

"Renison was, and still is, one of the world's premier tin mines, with one of the highest grade ore bodies in tin," said Warren Hallam, managing director of Metals X, the company that operates the mine. Renison's production is moving toward 8,000 mt/y of tin at an operating cost of around US$10-11,000/mt. That leaves a very envious current margin of around US$20,000/mt of tin produced. The current resource has a 10 year mine life, while there is also 3.5 years of reserves, and Metals X have doubled the resource in the last two years.

"Tin has had a challenging history in the past and it has been difficult for the investment community to take it seriously," said Hamish Halliday, managing director of Venture Minerals. "For companies like Venture, this is a huge opportunity, because tin is the only base metal where no exploration has been done for the past 25 years outside of China."

"When we started in the tin industry, China produced about 100,000 mt and exported about 40,000 mt. It now produces 110,000 mt, a very small increase, and it has shifted to becoming a net importer of tin. This has changed the market radically," said Metal X's Hallam.

Halliday sees a long term opportunity in these conditions. "These dynamics are not going to change in the next 10 years. The market can definitely handle a price increase. We have not seen a significant reduction in demand, and we don't see it happening in the foreseeable future, considering the structure of the electronics industry. At US$30,000/mt, the demand is still strong," said Halliday.

Venture Minerals has recently completed the pre-feasibility study on its Mt. Lindsay project, and it has delivered some impressive numbers which have been the basis to go into a full bankable feasibility study.

It is scheduled for completion in the first quarter of 2011, and the company is targeting to enter production towards the end of 2013.

"We are very fortunate in terms of infrastructure, which is one of the reasons why we focused on the area in the first place. It has a 120 year history of mining. The roads and power lines go straight past Mt Lindsay, the rail lines are 23 km away, and the highway goes straight to Port Burnie, on the north coast, where there is plenty of capacity for export. There is almost no capital cost dedicated to infrastructure; all we need to do is to build is the plant, which takes up most of the A$162 million CAPEX," said Halliday.

The project also has a world class tungsten element, another commodity that is enjoying great gains due to diminishing Chinese exports.

"There is also a significant tungsten deposit that would represent 3% of the world's supply in full production. We would therefore be a massive non-Chinese producer and control around one fifth of the seaborne trade. This will provide multiple strings of revenue. They reduce significantly our cash cost per mt and they provide opportunities for another commodity price-run," said Halliday.

Coal

Project development and exploration investment

Vale's headquarters for its global coal division is in Brisbane, Queensland. Vale believes that maximising growth of the coal business is one of the key strategies for growth of Vale as a global company, and seeks to produce 40 million tonnes per year by 2016. - In Queensland Vale operates the Carborough Downs underground longwall mine near Moranbah. (photo courtesy of Vale)

The Queensland Floods and the Coal Industry

In early 2011, an unprecedented intense wet season heaped devastation on Queensland. Flash floods and subsequent river flooding resulted in the loss of 35 lives and forced the evacuation of hundreds of thousands of people from their homes. Infrastructure was destroyed and thousands of residences, businesses and commercial premises were inundated.

The flooding affected much of Queensland, including the Surat basin and the Bowen basin, where open-cut coking coal mines were flooded and transportation networks stymied. "The floods will have a long term effect on the state's coal industry," said Queensland Premier Anna Bligh, in January. "We have three quarters of our coal fields unable to operate and unable to supply markets. There's likely to be a significant long term effect from that, not only nationally but internationally. The mining companies and the mining communities are playing their role in helping the recovery effort ... but they face a long slow climb back into full production."

According to Michael Roche, CEO of the Queensland Resources Council, the floods cost the state 40 million mt of coal, or A$7 billion worth of production in the last financial year. "Mines are getting back into some semblance of more normal production, but it has been a slow process and there will be a continued impact in the next year," said Roche. At the beginning of June, Roche said the coal industry was running at about 80% capacity.

Photo courtesy of Walter Mining – The Night Miner, in Queensland

The Queensland floods and the resulting coal supply shortage precipitated a rise in global thermal and, particularly, metallurgical coal prices. Such price increases, however, have only partially offset the revenue losses suffered by most coal producers in the state.

Among other producers, BMA (BHP Billiton, Mitsubishi Alliance), Rio Tinto, Anglo American, Macarthur Coal, Aquilla Resources, New Hope Coal, Peabody Energy, and Westfarmers, all declared force majeure, on at least some of their deliveries.

At the time of writing, long after the rains had stopped, many flooded Queensland mines still faced logistical and environmental hurdles.

In many cases, the skills and strategic planning of Queensland coal players mitigated the impact of delays caused by the adverse weather conditions. "We predicted that we would have a wet summer so we had additional pumps in place. Within 10days we had all mines operating. I did not slow down production," said Rob Neale, CEO of New Hope Coal, whose mines did not flood.

Neale cites the strong relationships he has built with the company's end-customers as integral to ensuring the business was compromised as little as possible. "Our close relationships with our customers enabled us to arrange to bring forward some sales and postpone others. We only had one ship pulled up in force majeure."

According to David Mason of the Queensland Geological Survey, while the floods naturally slowed exploration, they did not have much impact on exploration investment. "Companies did not go broke and the

huge interest is still there, especially from Chinese, Indian, Korean, Japanese and Taiwanese firms, in coal and also copper and other metals. It is an extremely competitive market," said Mason.

Some of the state's most innovate explorers overcame project delays by employing incipient local technology.

"During the wet weather, we couldn't use 2-D Seismic, so there's another technology that I was able to trial with an Australian company called Groundprobe. They provided remote sensing data using airborne geo-physical techniques that are based on electromagnetic conductivity differences, basically looking for basalt and water and tertiary minerals. We try to use those technologies to refine our drilling programs," said Mitch Jakeman, CEO of Carabella Resources.

Opening the Galilee Basin

In the heart of the Galilee in late June, the first coal was excavated from Hancock Coal's Alpha mine test pit, transported to the processing plant in Jellinbah and then shipped to Korea. "Our chairman's vision and her commitment to the development of the Galilee basin have been instrumental. If you look at everyone in the Galilee basin, we've been committed the longest, since the 1970s. We had the choice to select the best and shallowest ground," said Paul Mulder, managing director of Hancock Coal.

Described as the jewel in the crown of the Galilee, the Alpha coal project, also known as Tad's Corner in honor of Hancock Prospecting director Tad Watroba, is the most extensively delineated resource in the Galilee basin and will eventually comprise a 30 million mt/y open-cut coal mine. With the potential for the future development of significant underground reserves, Alpha has JORC compliant resources to extend the project well beyond its 30 year projected lifespan. The Alpha coal project and nearby Kevin's Corner, a 30 million mt/y underground mine coming on behind Alpha and utilizing much of its infrastructure, will have a combined resource of 7.9 billion mt of JORC compliant thermal coal.

Though Hancock have long held the land, development of the Alpha mine has occurred remarkably quickly relative to that of its peers in the Galilee basin. At the time of writing, nobody else in the vicinity has a rail declaration, a port allocation at Abbot point and a guaranteed water and power supply.

Hancock recently completed the bankable feasibility study on Alpha and the team is already engaged in early works and

groundbreaking activity for construction along the rail line with a production target of 2014. "This sort of thing doesn't happen overnight. We go down to the very base level of detail to ensure we can deliver. Anybody can draw a line on a map and say 'this is what we're going to do,' but it comes down to substance," said Hancock Coal Managing Director Paul Mulder, who was brought in to commence the project in September 2007.

Hancock's Galilee projects, unlike other projects on the infrastructure constrained east coast, are being developed in conjunction with an integrated supply chain. Coal from Alpha, and Hancock's second Galilee mine Kevin's Corner, will be delivered to Hancock's own port system at Abbot Point through a single railhead. This makes scheduling much easier to manage. "The key for us is to understand the market. If you can understand the ship-mix, vessel size, and the frequency, then you can move all the way back to the size of the stockyard, the frequency and turnaround times of your trains, and then back in through your process plant to the mine," said Mulder.

In addition to providing greater security of supply for Hancock Coal's end customers, the unique development of an integrated supply chain for coal on the east coast, along with a number of other facets, has been integral to attracting expertise to the Hancock team.

Cokal Limited (Cokal) is an emerging ASX listed coal company, based out of Brisbane, Queensland, with high margin metallurgical coal as its key focus.

Hancock is not the only major with an interest in the Galilee: Clive Palmer, China's Meijin Energy, India's Adani and Brazil's Vale are all planning 20 million mt/y-plus projects in the area.

However, according to Hancock sources, early entry into the region by Mrs. Rinehart and her late father Lang Hancock enabled the company to secure the most premium deposits.

Given the size and quality of Hancock's thermal coal deposits, speculation about the possible acquisition of Alpha and Kevin's Corner has abounded. In July 2011, *The Australian* reported that Gina Rinehart, chairman of Hancock, and Sanjay Reddy, vice chairman of GVK, had signed an initial agreement for India's GVK Power and Infrastructure to purchase Alpha and Kevin's Corner for around US$2.4 billion. In spite of the takeover talk, work continues in earnest at Alpha and Kevin's corner, according to Mulder.

"We're running the company according to

the same philosophy we always have. The entire management team that comes under my direction is executing the project with a sense of urgency and ever increasing pace. If investors were to come in, they'd want to see a return on that investment as soon as possible. We're keen to demonstrate that we're going to stick to the timeline, subject to government and financial approvals; we're not changing course," he said.

At the inauguration of Alpha, in recognition of Mulder's considerable contribution to the project, Rinehart announced Hancock Coal's third project in the Galilee basin, formerly known as Alpha West, would in future be referred to as Paul's Corner. "Watch the Galilee basin. Watch Hancock. And watch the efficiency of an integrated supply chain into the Asian market. It's something that is new. It's more efficient than the past and we are creating history," said Mulder.

Another player that is looking to participate in the opening of Galilee basin is Bandanna Energy. With the largest thermal coal inventory of any exploration company in Australia, Bandanna Energy has exposure to both the Bowen and Galilee basins.

Of the significant Galilee developers, it is the only ASX-listed company and, as such, is employing a different path to its neighbors. "Our model is different to the likes of Hancock and Clive Palmer's Waratah, where they have spent a lot of time developing astronomical numbers of coal – from 5 to 6 billion mt of coal. When it comes to very large sized mines, people will primarily value the company based on its cash flow," said Dr. Ray Shaw, managing director of Bandanna Energy.

However, despite these differences, Dr. Shaw is keen to emphasize the needs for these players to work together. "We have frequent discussions with both Clive Palmer and Gina Rinehart. The Queensland Government has encouraged a whole basin approach to the development of the Galilee basin.

There is virtually no infrastructure and the key proponents of development in that basin have an opportunity to develop in a harmonious, rather than a competitive fashion."

At the moment there is a lot of competition as to where the new rail corridor might be. The Queensland government has made it clear that there will only be one rail corridor and that other infrastructure, such as power or water, will need to have a common access component. The government doesn't want one private enterprise to stifle competitors and restrict their potential revenue stream from royalties.

Despite these challenges, with approximately 1.4 billion mt of JORC complaint coal resource Dr. Shaw sees an optimistic future for the company. The recent allocation of 4 million mt/y in stage one of the Wiggins Island Coal Export Terminal development will see Bandanna able to ship first coal from approximately February 2014. The company is now looking for strategic partners in order to continue its growth.

"We are looking for, particularly end users who want to utilize coal and who have a genuine requirement for the product. We are seeing more end users like GVK moving upstream to obtain that security of supply. They are coming in at an exploration, even at a junior level because they know that it is the only way that they will be able to secure the quantities of coal that they are going to need in the future," Dr. Shaw said.

Coal-to-Liquids

While Queensland's infrastructure constraints are often regarded as the bane of the coal industry, in some cases they have provoked innovative entrepreneurs to derive new ways of exporting their products to Asian markets.

When Edek Choros founded Ambre Energy in mid-2005, he found that the Austra-

Cannon and operating staff for Superior Coal, specialized in coal waste management solutions. The vast majority of their projects have been located in the rich coal belts of the Hunter Valley in New South Wales and Bowen Basin in Queensland. (photo courtesy of Superior Coal Limited)

lian coal business was already overheated. Choros set up an office in Salt Lake City and began looking for more viable acquisitions in the United States. Today, Ambre Energy's subsidiary, Ambre Energy North America, controls three coal mines in the U.S., and is in the process of developing three export terminals in Washington, Texas and Oregon.

In Australia, Ambre Energy acquired prime coal tenements in the Surat and Moreton basins; however, with the city of Brisbane sitting between the mine and the port, there were some significant infrastructure constraints to conventional bulk export. To overcome these barriers, Edek Choros has come up with a novel solution. "We are proposing to build a coal to liquids plant on site, which would involve building an open-cut mine with a coal gasification plant, a methanol plant and a methanol to gasoline plant," said Choros.

Ambre Energy's Australian coal is probably the most suitable in the country for gasification and conversion to liquid, according to Choros. It is very reactive with very high hydrogen content. "We sent 3,000 mt of coal to China for gasification and got carbon conversion of 98%-99% - almost perfect," said Choros.

The coal-to-liquid facility will take about four years to complete; one year for the bankable feasibility study, one for financing and two for construction. From a relatively small plant, Ambre Energy will be able to gasify 4.5 million mt of coal and produce about a billion litres of unleaded petrol – about 20% of Queensland's demand. In addition to overcoming infrastructure constraints, Ambre Energy's project will address one of the most significant bottlenecks in Australia. "Australia has a serious shortage of fuel. Up until about 2000, it was self-sufficient in crude oil, but, since then, there has been a significant fall in production and we are now only covering about 50% of demand. Last year the cost of importing fuel products was about $15 billion; by 2050 we will reach the $30 billion mark," said Choros.

Ambre Energy will list on the ASX in November 2011 and expect to be in the top 200 companies on the exchange. Choros believes the company will climb much higher over the next four years.

Interview with Decio Amaral, Global CEO for Vale Coal

Decio Amaral, Global CEO, Vale

What is Vale's strategy for growth?

By leveraging current and future opportunities, Vale aims to be the second largest global producer of seaborne metallurgical coal and one of the top four producers of seaborne met coal in Australia by 2021.

Organic growth is Vale's focus. Our commitment to organic growth has been demonstrated through the Moatize Coal Project in Mozambique; advanced coal exploration projects in Australia (Ellensfield, Eagle Downs, Integra expansion) and mineral exploration in several countries.

In respect to Vale's local coal mining operations, are they performing comparatively well?

Revenue from coal in 2009 represented only 2% of Vale's total revenue, but Vale is committing 7% of the capex to coal.

How is Vale managing the major geological, environmental, technical and sustainability issues that mining operations face?

Vale aims to stay ahead of the curve in terms of technology. By employing experts and sharing knowledge, we are ensuring our sites are sustainable and efficient.

We have mineral technology specialists, based in Perth, and a technical services division based in Brisbane. They are examining all the ways we mine and seeking out more efficient solutions, working closely with the coal miners and exploration teams to give Vale a leading edge.

We are building our technical services department in Australia and have recently recruited a new general manager of technical services, Adriaan Benson, who will oversee this department for Vale in Australia.

In December 2010, we signed a five-year, A$2.5 million agreement with the University of Queensland to establish the Vale-UQ Coal Geosciences lab, specializing in coal geosciences technology.

We're also working with academic institutions in cooperative agreements to ensure we have access to the right people and the best available intelligence to continue to develop Vale in Australia. Right now we are working with the CSIRO to develop better long wall automation technology that will improve underground operational processes to ensure better safety and greater efficiency.

How will the skills shortage impact Vale's plans for growth?

A shortage of skilled and unskilled people is an issue faced by all in the industry and other thriving industries in Australia. We are continuing to work with government, industry and education providers to help address this issue that will keep us globally competitive.

Vale prides itself on attracting and training the best people. Our talented employees are crucial to the success of the business. The recent appointment of Steve Badenhorst as director, Australia Coal Operations is further evidence of the reputation and strength of our coal business. As a former BHP senior executive and consummate mining professional, Steve will bring a huge degree of impetus to our coal business in Australia.

Vale is well-known for its projects in Brazil, Canada, Columbia and Africa, but does it really have long-term plans to be a major player in the local market?

We have spent around A$2 billion in Australia since entering the market. Vale is fully committed to its coal operations in Australia and understands that its success and achievements for its global coal business will not be possible without a strong local presence.

What was Vale's financial performance in 2010?

Vale experienced record annual net earnings of US$17.3 billion, the largest ever in the mining industry.

Vale's investment in 2010 reached US$19.4 billion, again the largest in the world's mining industry.

Record capital expenditures, excluding acquisitions, of US$12.7 billion in 2010, were also the largest CAPEX in the global mining industry.

What major project does Vale believe has the potential to make a significant impact on the company's coal revenue?

It's not simply one project that Vale is pinning its hopes on. In fact, Vale has a 61% stake in Integra Coal in the Hunter Valley which we are expanding; an 80% stake in Carborough Downs Coal near Moranbah; a 50% stake in Isaac Plains Coal near Moranbah; 100% of the Ellensfield Coal Project near Moranbah; a 50% stake in the Eagle Downs coal project; and a 75.5% stake in Belvedere Coal which is likely to grow.

In addition, Vale has a strong pipeline of 'greenfield' exploration projects in Australia including: Degula in the Galilee basin, Red Hill and Broadlea West in the Bowen basin, and has tenements in copper, iron ore and fertilizers, as well as coal.

We have an exploration office in Kalgoorlie, Perth and Brisbane and more than 30 people working for us in exploration alone.

Australia has a well-developed mining industry with some of the world's largest and most complex mining operations. Do you think there is the potential for further major discoveries in Australia? How is this being impacted by more modern exploration techniques?

It is fair to say the majority of the most accessible mine sites have been developed in Australia, however this does not mean there is not potential for further major discoveries.

Vale's portfolio in Australia is an example of this. Vale holds a number of high potential, yet technical mining tenements that will require expertise in underground mining. Vale is investing heavily in geotechnical technologies to improve explorations techniques to overcome the challenging geology of Australia's mining conditions.

Industrial Minerals

Project development and exploration investment

Gunson Resources, a Perth based mineral exploration company, drilling at the Mount Gunson project in South Australia. Strategic location in the best endowed copper belt in Australia, the Olympic Copper-Gold Province . This belt is over 500 km long and contains about 75% of the known copper resources in Australia. (photo courtesy of Gunson Resources)

Globally, fertilizers have become a hot commodity. BHP Billiton made headlines last year in its high profile courting of Canadian Potash Corp, and Vale have publicly earmarked the sector as one of its key growth areas. Australia has the resources to also participate in this commodity boom.

The major fertilizer project under way in the country is that of Minemakers, a developing world scale rock phosphate mine in the Northern Territories. Minemakers has been ahead of the curve on the rock phosphate bull-run. Managing director Andrew Drummond describes how they identified the opportunity. "Part of the ethos for the founding of Minemakers in 2003 felt that there was going to be a mineral price super cycle and that we wanted to acquire projects, preferably in Australia, where there are known deposits of pretty much any commodity or major known ore fields, which at that time were not economic. As a result of that, we acquired the Wonarah phosphate project. It was a philosophy of minerals acquisition rather than specifically looking at phosphate at that time. When the price of phosphate took off, as ordained by Morocco at the end of 2007, we went into orbit. We were the top performing share on the ASX, as our share price increased fourteen fold. At this point we began to focus entirely on rock phosphate and our Wonarah project, where we have now spent around A$35 million," he said.

The company took the bold step of deciding against an entirely direct shipping project and has instead plumped for an investment in extensive treatment that will turn the company into a considerable fertilizer industry player. "I use the analogy that if you're a farmer you can have good years or bad years, but the baker always makes money. By that analogy, if we are simply mining rock phosphate and Morocco decides to drop the price we could be left with an uneconomic mine. If we get into downstream processing, that is where the real money is being made," said Drummond.

The project has the advantage of not only having the rock phosphate, but access to natural gas being developed at Darwin that will allow them to beneficiate at the mine-site and produce a consistent product without contaminants.

Like phosphate, potash is a fertilizer feedstock that follows identical supply and demand trends. It is a fairly unique commodity in that the market is dominated by a few producers split among three main countries: Russia, Germany, and Canada, that possesses one of the world's largest deposits in the Saskatchewan province.

Although these potash giants make little space for newcomers, South Boulder Mines is gradually entering the market with an outstanding, shallow deposit in Eritrea. The Colluli project, that currently displays a 500,000 mt initial resource, is extremely promising and centralizes the company's efforts. Lorry Hughes, South Boulder's managing director, foresees a bright future for his company. "We will have the cheapest potash mining cost in the world, because no one else in the industry has an open cut mine, since 90% of the world's production comes from deep underground mines. We are planning to start with a modest production of 1 to 2 million mt/y in the first two years, and get know in the industry. It will allow us to keep our capital costs down, until we expand to 8 million mt/y, which corresponds to about A$3 billion of revenue."

With a view of getting into production in mid-2016, the next important milestone will involve the completion of a bankable feasibility study, which will give the green light for the beginning of negotiations with the

South Boulder Mines, a new sensation in potash - drill core showing rock salt and sylvite mineralisaton, at the Colluli Potash Project located in the Danakil Depression region of Eritrea (Africa) approximately 200 km south east of the Capital Asmara covering 906 km^2. (photo courtesy of South Boulder Mines)

Lorry Hughes, MD,
South Boulder Mines

David Robb, MD & CEO,
Iluka Resources Ltd.

Eritrean government. The government is entitled to a 10% interest in the project and has the right to purchase a further 30% interest. This participation could seriously boost South Boulder according to Hughes. "South Boulder will potentially be the largest mining project in Eritrea. Ultimately we will be responsible for a significant contribution of the country's GDP."

Yet Hughes deplores the fact that, in spite of its strategic role in global food production, potash remains a misunderstood commodity in Australia. "Although potash is imported by 170 countries around the world, it isn't as well understood as other commodities. In Australia, we have an excellent expertise in gold and iron ore, but investors do not know much about potash. They tend to invest in something they are familiar with, and there is no potash production in Australia."

Mineral Sands

Mineral sands are an abundant commodity on the earth's surface, but rarely in economically viable deposits. Australia has the world's largest economic resources of mineral sands, a resource that may become strategic as China's construction market is booming, calling for an increased consumption of zircon, for example. David Harley, the managing director of Gunson Resources, reminds us of the importance of zircon in a range of industries. "In China, there is not enough zircon, and yet, the Chinese government is building 10 million new homes that all need tiles, toilets and hand basins. In every square meter of tile, zircon represents about 3% of the cost. Other industries consume zircon, such as glass or chemicals. One of the biggest uses of zircon in chemicals is making cars rust proof," said David Harley, managing director of Gunson Resources.

Australian-based Iluka is the world's largest producer of mineral sands and has been undergoing a transformation in recent years under the stewardship of CEO David Robb.

"In terms of our assets, we have transitioned away from our traditional heartland here in Western Australia, where operations were challenged by decreasing grades, to newer provinces in South Australia's Eucla Basin and the Marray Basin in Victoria/New South Wales. We've had exploration success, but perhaps most importantly, we've delivered two large projects on-time and on-budget. This is not that common an occurrence. In addition, our marketing reach and focus has shifted to the markets of the future. We used to sell largely to large buyers in North America and Europe and ship in large lots. We now supply a much broader range of customers, particularly in zircon, and our emphasis includes emerging as well as traditional markets," said Robb.

However, in addition to its own internal transition, the company is well aware of its role as a leader of the entire mineral sands

Gunson Resources – The Coburn Mineral Sands Project in Western Australia, May 2011 - This project covers 1200 square km of a fossil coastline which has the potential to host a world class heavy mineral sand field. The Definitive Feasibility Study released in January 2010, revealed that Amy Zone can support a high volume, low cost, long life mining operation producing quality mineral products.

industry. "We've also been mindful, as we've gone about our internal changes that we needed to encourage change in the industry as a whole. It is rare that you get a company that is unbelievably successful in a poorly performing industry. For example, we have strived to give our customers and their customers downstream of us, time to adjust to the price increases that are now flowing through. We want our customers to be able to manage these changes in a way that maintains their success," said Robb.

A substantial price increase in zircon and titanium minerals was achieved in 2010. Robb is optimistic about this scenario continuing. "We think it will be a sustained situation. We run inducement analysis on our industry and model every mining project that is under consideration and by our own analysis prices have to grow a lot before most of what is on the table makes economic sense. Therefore the current price trend will probably be sustained," he said.

In order to extract maximum value, the company is also employing R&D to lead the industry into new uses of its products or more efficient use of the mining by-products. "The resource to reserve conversion can not only be a function of price, but can also be relative to technology and finding new ways of creating a saleable product from something that has to date been considered a waste stream," Robb said.

Due to the company's scale of operations, a small increase in efficiency could represent an incredible profit. "We are upping our investment in product and technical development areas as I am very optimistic that we will be able to create new products out of our existing resource base, which will provide new opportunities for Iuka and for our industry. The benefit for our shareholders is enormous if we can pull that off. Across our whole resource base it could be a very meaningful tonnage," said Robb.

Rare Earths

Rare earth elements are present in most items that are constituent of our modern life. They can be found in most high-tech equipment, from mobile phones to laptops, and their use in hybrid vehicles or in wind turbines makes them essential to the development of renewable energy. As the production of electrical devices has been soaring in the past decade, it is only logical that the consumption of rare earths should be rock-

eting too, essentially supplied by China, that accounts for more than 95% of the world's production. But China's recent efforts to protect its domestic consumption, through the imposition of exports quotas, have led to a dramatic increase in rare earths prices. Yet the current prices are not sustainable, according to Alastair Hunter, chairman of Peak Resources, a company focusing on becoming a pure rare earths player. "I think the rare earths market is overheated, and I believe the prices are going to retreat. But they will still be very lucrative, and the demand will continue to increase. The Chinese have a limited supply. They are growing their economy and they have to protect their domestic consumption. In many ways, they have done the world a huge favor, because they have highlighted the need to look for these commodities. Five or 10 years ago, nobody would have thought about rare earths, but their use is becoming increasingly recognized," he said.

Luckily, Australia has vast reserves of rare earth elements and this wealth is perhaps best represented by the Lynas Corp., an ASX-100 listed company that owns one of the world's richest rare earths deposits; Mount Weld in Western Australia.

In Hunter's opinion, the future demand could be influenced by the fact that not all rare earths explorers will be able to reach the stage of development. Many rare earths projects are characterized by a high concentration of radioactive elements – thorium and uranium – that must be removed, therefore implying important storage issues. Peak's Ngualla project in Tanzania does not suffer from such issues.

"In our central core project, the indications show there is a very low level of thorium and uranium, which we consider as a great advantage. The nature of the mineralization at Ngualla is potentially less complex than in other projects. While there is still risk associated with this project, we believe that it has a potential to be a world-class project, and a company-maker," said Hunter.

Not far from Tanzania, in nearby Mozambique, another Australian company has established a presence. Nagrom, a company that is involved in metallurgical work and mineral beneficiation, offers overseas explorers a special expertise in rare earth oxides, as well as iron ore, manganese and base metals. Rick Murphy, who has been heading the company for more than 30 years, insists on the importance of their overseas clients. "Australian companies with overseas operations represent an important part of our clientele, especially with the rare earths. We are currently conducting test work on rare earths oxides from Mongolia, Brazil, Africa, South America, Canada and the United States."

Rick Murphy, CEO, Nagrom

For Murphy, the key to establishing Nagrom as a trustworthy, innovative company lies in its people. A small family company, Nagrom is free from heavy hierarchy processes and benefits from a vibrant company culture. "We cultivate a great working atmosphere, and we encourage fresh thinking, which helps us find success where other companies have failed."

Australians Exploring New Frontiers

International mine development

Coffey International, one of the most innovative Australian global consultancy players – the research begins on the ground.

For a period, Australia's mining industry was considered quite insular. Australian investors had been burnt in off-shore forays and it seemed that in very few other places were there as rich pickings as those that could be found at home. This situation has now changed significantly. You can visit very few mine sites around the world without hearing an Australian accent somewhere amongst the team. The Australian pioneer spirit, perhaps honed from decades of exploring the nation's vast interior wilderness, is now employed across the globe.

One Australian mine developer that has been at the forefront of this trend and successful in a number of deals has been Tony Sage, chairman of Cape Lambert. Sage has a well-developed strategy of acquiring and selling projects, developed from his background in brokerage. "One of the things that I've found is that the most growth in any mining stock price is from the period of discovery to pre-feasibility. Up to that point a company's value will zoom, and then it will flatten during the four or five years between pre-feasibility and mining," he said.

In this way, Cape Lambert rarely stays with a project beyond first discovery. "Our philosophy is to acquire a company with a land holding, drill it, make a discovery and then sell it to somebody that wants to mine it or monetize it in some other way (i.e. sell-down or bring in a project partner). In this way you capture that growth, you return a lot to the shareholders and you use those funds to find other ground and repeat the model, while continuing to maintain a more passive exposure to the asset."

Cape Lambert has now employed this strategy four or five times and has outperformed the ASX 200 fourfold since 2006. The company's first success, and the key enabler to future deals, was the sale to MMC of the Cape Lambert project, which provided A$320 million in the bank, with A$80 million to be received.

Straight away the company used almost A$150 million of that to purchase the CopperCo assets, which delivered a myriad of projects located all around the world.

Sage emphasizes the key to its model is having a pipeline of projects coming through. "During the global financial crisis, everyone was short of funds. We invested in a lot of companies that had good projects, but no money and we've ended up turning those companies around and so for the next two to four years we have projects coming through that can do the same thing. I think our acquisition model still works even in this climate. Even though times are good, a lot of companies still are mismanaged and still go into receivership. But, there are a lot of assets we bought in 2008 that we haven't dusted off yet. We have plenty of projects in our portfolio that will keep us busy over the next three years," he said.

The shock of the global financial crisis has been turned into an opportunity for other Australian players looking to exploit global opportunities. One such is Chalice Gold. "We sold a number of assets in Australia and cashed out just before the global financial crisis hit. That left us with around A$10 million. This left us in a different position to many junior companies that went into the

Tony Sage, Exec Chair, Cape Lambert

Doug Jones, MD, Chalice Gold Mines

global financial crisis with good projects, but without any capital."

East Africa

One of the companies Chalice acquired was an Australian junior called Sub-Sahara Resources, who had been active in Tanzania and in Eritrea for a long time.

"We approached them realizing that they were in trouble, and merged with them in August 2009. We decided to go into the project because it was an exciting one, with a high-grade ore body in an open-pit situation. We don't see these opportunities in Australia anymore, which is why many companies go to Africa," said Doug Jones, managing director of Chalice Gold Mines.

He emphasizes the fact that although offshore projects may have less stable governments, this does not mean that the investment risk is any greater than within Australia.

"When going overseas, we are swapping one set of risks with another set of risks. The country risk comes down to the perception of the country. In Eritrea, perception is probably worse than reality," said Jones.

Jones' incline toward Eritrea is such that it was he who introduced Lorry Hughes from South Boulder to the opportunities in this country a few years ago, highlighting the absence of corruption and the support foreign companies would receive from the government.

The prospectivity is indeed exceptional. Eritrea is practically a virgin territory in terms of potash mining, since the rare attempts to exploit the deposits were interrupted by the Eritrean war of independence that took place from 1998 to 2000.

"In the early 1900s, the Italians were the first to identify the potential of potash. There was some minor exploitation of potash and rock salts," said Hughes.

"From 1958 to 1968, there was an intense period of "modern" exploration, but the independence war between Ethiopia and Eritrea finally put an end to potash mining. We arrived at the perfect time. We were the first miners in 42 years and our first drill hole allowed us to find potash," he said.

South Boulder also benefits from their presence in Eritrea from a geographical point of view and Hughes benefits from the relative proximity to the Asian continent for the company's future potash exports.

"We are targeting Asia, and the areas where we have an economic advantage, because of our location. In Eritrea, we are very close to the ports and the major shipping routes into the whole of Asia. This includes

Dr. Paul Kitto, MD & CEO, Ampella Mining

Korea, China, Indonesia, India and Australia," Hughes said.

West Africa

One has limited chances of finding Dr. Paul Kitto in his Perth office in order to pay him an unexpected visit. The former Africa exploration manager for Gold Fields Ltd, who is now heading Ampella Mining Ltd, makes it a point to spend as much time as possible on the field in Burkina Faso, where his projects are located.

Having lived several years in Africa, Dr. Kitto joined Ampella as the CEO with the conviction that he could make a significant difference to the future of the company.

He has indeed honored his commitments, as he today supervises the promising Batie West prospect. Dr. Kitto draws a parallel between Burkina and Western Australia. "West Africa's geology is very similar to Western Australia's. Although the geological formations have different ages of deposition, the Yilgarn in Western Australia and the Birimian in West Africa are almost identical in every other respect. All we have to do is take our West Australian knowledge and experience and implant it into West Africa," he said.

As a sign of his confidence that Burkina Faso has potential for world-class deposits, Kitto has budgeted A$32 million for exploration in 2011, therefore increasing to 2.2 million oz the resource estimation for the Konkera prospect within the Batie West gold project. Kitto hopes that this exiting year will pave the way for the near future, and anticipates having a three mt/y plant, producing more than 200,000 oz/y of gold from early 2014.

The Batie West project luckily benefits from an excellent infrastructure, and even has access to a power grid, which is usually the biggest issue for mining operations in West Africa. "In Burkina Faso, and at Batie in particular, we benefit from good infrastructure. We have a sealed highway from the capital to the top of our tenements, excellent communication networks, and a stable water supply. There is a major power grid in Ghana, about 20 km away from us, and we are investigating potential links to this grid."

There are currently six operating gold mines in Burkina Faso, and each of them has gone through a fast, efficient approvals system. Kitto appreciates the ease with which it is possible to start a mining operation in the country. "[Burkina Faso] is a highly prospective country, the government is pro-mining, and the permitting process, although very rigorous, is there to assist companies to go forward. *Resource Stocks* ranked Burkina Faso sixth out of 52 African countries on a social and political scale. Recently the Fraser Institute released a survey about exploration potential world-wide and Burkina Faso was listed among the top six countries in the world in which to explore. The country has a good social and political environment, and great prospectivity related to its mineral wealth. The mining future for Burkina Faso looks very good indeed."

Wayne Norris, managing director of junior Noble Mineral Resources, displays a similarly communicable enthusiasm towards Ghana, where his flagship Bibiani project is located. "In terms of prospectivity, Ghana is like Kalgoorlie a 100 years ago. Bibiani is exemplary of those deposits that are very exciting with today's gold prices."

Australian, North American and European companies started entering the country in the eighties, and are today enjoying the full support of the Ghanaian authorities. Noble Mineral's Bibiani project, that has a current JORC-compliant mineral inventory of 2 million oz of resources, is due to begin production in September, and targeting a 150,000 oz/y production by 2012.

Central Arica

Central Africa contains some of the most challenging jurisdictions in the world. However, Australian mining companies have been operating in this troubled region for more than a decade and a number of mine developers have achieved great success in Central Africa's incredibly resource rich mineral belts.

One such company is Tiger Resources, a producing copper/cobalt company with a portfolio of projects in the Democratic Republic of Congo's Katanga copper belt. The company began producing at their flagship Kipoi project in April 2011 and will have an annual production of 35,000 mt of copper.

"Kipoi currently holds 841,000 mt of

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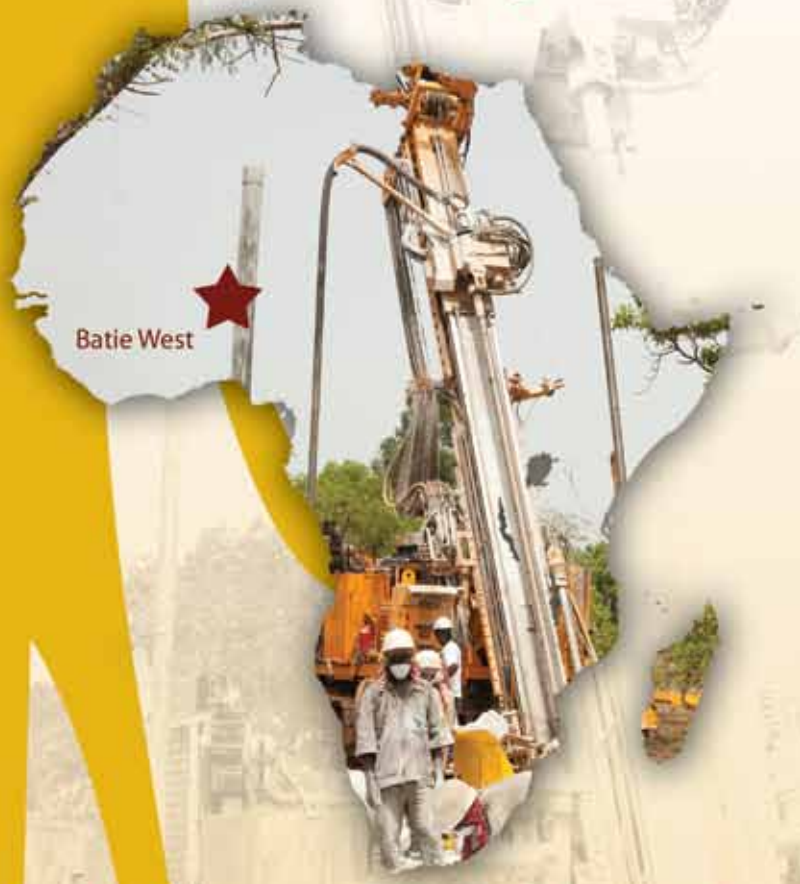

Batie West – **a new gold province**

- Identified a "New Gold Province"
- Locked up 110km long gold- bearing shear
- Interim 2.2M oz Au JORC compliant resource (4.9km)
- Konkera Resource upgrade expected in Q4 2011
- Initiated Prefeasibility at Konkera due for release Q1 2012
- 15 new virgin Au targets with significant drill intercepts
- Fully funded (A$34M)
- Focused aggressive exploration programs
- Dedicated to our corporate citizenship in Burkina Faso

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www.ampella.com.au

Exploration drilling at Koka Deposit, the flagship project for Chalice Gold, an East African-focused company developing the high grade 840,000 ounce Koka Gold Deposit, part of the Zara Project in Eritrea. Chalice has recently completed a Feasibility Study, with development targeted to commence in 2011. (photo courtesy of Chalice Gold)

copper. The mineralization is spread over 12 km, and we have yet to conduct drilling across the extent of this mineralization, since we have only drilled about 2.4 km. We therefore have a substantial exploration upside, and we expect to find more than 1.5 million mt of copper," said Bradley Marwood, managing director at Tiger Resources.

The technical challenges of this project have been limited, because the grade of the deposit is extremely high, 2.86 mt at 8.1% copper, and therefore relatively straightforward in terms of technical risks. The main challenges lie in the fact that the project is based in the Democratic Republic of Congo, a nation that has been blighted by violence and instability for generations.

Marwood believes the situation is improving and experienced players can operate securely. "There have been new laws implemented during the last six years, and that creates opportunities for commission-based state revenue collectors to work within the holes in the legal framework. We have lawyers who help us work through this legal transition leading to the implementation of OHADO legal framework in 2012," he said.

Marwood emphasizes the importance of experience and the relationships that are established along the way.

"We have developed relationships with the local communities as well as with the public sector: governor's office, Ministry of Mines and Electricity Authority. In developing these relationships, we have created stability, and we have committed to utilizing local services when possible, although it comes at a cost because some taxes are higher for domestic services than for offshore services," he said.

He feels that, with the introduction of the MRRT, Australia has shown that, even in supposedly secure markets, risks to investors exist and so going to jurisdictions with the highest prospectivity in preferable.

"I have been involved in Africa for 26 years, and I have seen Australians move in and out of the African continent. The current movement into Africa has in part resulted from recognition that the Australian government is quite as capable as any other government in the world in reviewing their grab of the revenue stream from mineral exploitation through the rent tax. A number of companies, as well as investors and institu-

tions, have recognized that there are equal or superior opportunities by going outside of Australia," he said.

Russia

In February 2011, Meridian Metals used capital garnered from the sale of their Leonard Shelf Australian asset to purchase a 75% share in Petropavlovsk's Omchak, including the highly prospective Aliya gold project. According to Managing Director Jeremy Read, overcoming investor trepidation was a big factor in guaranteeing the success of the project. "The biggest issue for us is just the market's perception of Russia. That's a matter of choosing the right jurisdiction to do our marketing in and we're having a lot of success in the UK in that respect," said Read.

To mitigate some of the risk associated with mining in Russia, Meridian Metals arranged for Petropavlovsk, based out of London, to retain a 25% share in the project. According to Read, however, negotiating the Russian regulatory framework has not been significantly more challenging than going through the process in Australia. "I actually don't think it's that different. In terms of the things that you've got to do: construction permits, work program approvals, mining approvals, they are similar. I'm still getting to grips with the Russian process, but I don't see huge differences in the amount of time and effort that you've got to put into it. The perception is that Russia is bureaucratic and slow, but ultimately, if you look at the timeframe of what the Omchak guys are trying to do with Aliya compared to what we're trying to do with the Leonard Shelf project, it's not that different. In Australia we tend to think that the system we have is the best, but it has its challenges too," said Read.

Mongolia: Exploring Off the Beaten Track

Mongolia is currently undergoing a tremendous mining boom. Gold, copper and coal are largely present in the Mongol soil. The recent investment agreement between Ivanhoe Mines and the Mongolian government over the Oyu Tolgoi copper-gold mine greatly boosted the publicity of Mongolia's mining potential.

Through this agreement, the Mongolian government acquired a 34% interest in the Oyu Tolgoi project that is due to start production in 2013. Oyu Tolgoi, like many other projects, is located in the south Gobi region near the Chinese border.

Aspire Mining, which is a Mongolian-Australian partnership, differs from other companies in that all of its ground holdings are located in the north of the country. "We are located 60 km from the Russian border, whereas all of the Mongolian coal stories are usually in the south of the country, near China. We are isolated and the key part of our strategy is the building of a rail line to access our project. We have a first mover advantage in being able to pick the best projects, because at the moment, all the competition is in the south. Once we build a rail line, the value of all these assets will increase substantially," said Managing Director David Paull.

The company therefore initiated the Northern Mongolian Rail Alliance (NMRA), a grouping of interested parties whose purpose is to define the economic benefits of the construction of said rail line. The consulted experts confirmed the feasibility of the rail path and highlighted its benefits for the local population.

"The rail line will enable the farmers to sell their products more efficiently and at a higher price. The Mongolian government also made me aware of the fact that this rail development would connect two large population centers (the second and fourth largest towns of the country)," Paull said.

The presence of Australian mining companies in Mongolia is critical with respect to the progressive substitution trend that is

transforming the coal market. "There has been a significant substitution of Australian coal for Mongolian coking coal. Wood MacKenzie, a global coal market consultant, has predicted that by 2015, 51% of coking coal imports into China will come from Mongolia. This is a remarkable turnaround in five years. Mongolia has a natural advantage in supplying coal cheaper because of its location," Paull said.

This rapid shift will doubtlessly benefit Aspire Mining that intends to focus on their high quality assets in Mongolia.

Scandinavia

Not all Australian miners operating overseas have targeted developing and higher risk jurisdictions. ASX-listed Dragon Mining is developing a series of gold mines across Scandinavia. "The main attraction is the fiscal regime in Scandinavia in that the corporate tax rate is 26% in both Sweden and Finland and there is no royalty's payable on any commodities," said Peter Cordin, executive chairman, Dragon Mining.

At Svartliden in Sweden, Dragon Mining expects to mine 35,000 oz gold in an open cut method and treated in a 30,000 mt/y heap leach facility.

In Finland, the company operates the Vamalla production center, a 300,000 mt/y crushing, milling and flotation facility which was successfully recommissioned in June 2007.

Exploration at Kuusamo, Juomasuo. Photo courtesy of Dragon Mining, who recently announced a spectacular intercept of 31.90m @ 45.67 g/t gold from Kuusamo North, Finland.

Cordin is clear about the future path for the company. "Gold is a business we know and we see a lot of opportunities are still available to us in the gold industry and have no compelling reason to go outside of gold. We have also had no compelling reason to go outside of Scandinavia. Our work force is totally local, both in Sweden and Finland," he said.

Andrew Munckton, Avalon Minerals' managing director, is also experiencing the challenges of life near the Arctic Circle. He jokingly says that it is interesting for an Australian mining company to be dealing with packs of reindeers rather than kangaroos at his Viscaria copper-magnetite project in northern Sweden. But although Sweden presents some extreme weather conditions, its mineral wealth and favorable risk profile make it an attractive country for miners. "The prospectivity in Sweden is outstanding. It probably is one of the least explored parts of the world that I have personally come across in terms of small to medium size ore bodies. The regulatory framework is very similar to Australia's, there is a well established mining law, and mining companies can manage their own tenure and approvals risks. The Swedish approvals process is a little less cumbersome than some in Australia," said Munckton.

Lower Hanging Fruit at Kalimantan

Indonesia and not Australia will lead global growth in thermal coal exports in the next decade, according to energy consultancy Wood Mackenzie. Already the world's largest thermal coal exporter, Indonesia is projected to take 39% of global increases in coal exports, with Australia accounting for 36% of export growth. Paul Mulder, managing director at Hancock Coal attributes this partially to a lack of infrastructure development in Australia. "In coal, we've lost market share hand over fist to Indonesia over the last couple of years because we've been lacking the infrastructure to realize the

wealth of this nation." It is Australia's infrastructural constraints, at least in part, that have led to one pioneering Australian junior turning its attention to Indonesia, Australia's greatest competitor in the supply of coal to Asian markets. When Peter Lynch left Waratah Coal in 2010, he began investigating opportunities in the coal space in Australia, however realizing much of the premium ground had already been pegged, Lynch, with his company Cokal, decided to look for lower hanging fruit overseas. By the end of June 2011, Cokal had confirmed high quality premium metallurgical coal at its Bumi Barito Mineral (BBM) project, a site covering approximately 20,000 ha in the Indonesian territory of Central Kallimantan. "This company is now ahead of the game and therefore offers investors a significant opportunity, while our competitors are falling over each other trying to get coal to Australian ports at horrendous cost," said Lynch.

Cokal is increasing drilling capacity at BBM to provide a coal resource estimate by the end of the third quarter of this year, according to CEO Jim Middleton. "Central Kalimantan is a brand new region, with only one other producer at present. It could contain up to 10 billion mt, making it the third largest seaborne trading coal basin in the world."

When we interviewed him in June 2011, Lynch was bullish about the possibilities for Kalimantan. "In four to five years' time, we could be producing more than 5 million mt/y of metallurgical coal - that would make us a A$6 billion company - and could then grow even bigger."

The notion of exchanging exploration risk for political risk often prefaces discussions of Australian explorers who venture beyond the red earth of Western Australia or the brown basins of Queensland. According to Lynch, the scales are no longer balanced in favor of Australia. "I found some very attractive assets in Indonesia, a country whose risk profile, while not perfect, had improved dramatically in the same time that Australia's had worsened." To further mitigate what Lynch perceives as an already significantly reduced risk profile, Cokal is engaged in exploration activities through joint ventures in Mozambique and Tanzania.

In relation to lagging infrastructure in Australia's coal provinces, Indonesia presents rich pickings. "Operating costs [at Kalimantan] are very competitive with the Bowen basin. The site is around 500 km from the mouth of the river by barge, with the cost of this transportation at A$14/mt - cheaper than a train journey from Gordonstone to Gladstone - in addition to A$3-4 trans-shipping costs. Although there are still initial mining approval procedures, resolving downstream infrastructure difficulties is far simpler. To implement additional capacity, you simply have to phone up one of the barge companies and set up a contract with them, with no lead time," said Lynch.


Peter Lynch, Executive Chairman, COKAL

When production ramps up, BBM will benefit from significantly reduced mining costs. Indonesian fuel and labor costs are significantly cheaper than in Australia and the coal seams at Kalimantan are all outcropping, in contrast to most in Australia that are sub-cropping under around twenty meters of cover.

Community Engagement Away from Home

In terms of community uplift, mining can be something of a paradox. The establishment of a mining project in a remote jurisdiction can bring jobs, training, education and economic flow-on to a community otherwise estranged from the material benefits of big business. Australia's PanAust, for example, through its Phu-Kham copper-gold operation, has made a massive contribution to the Laos's economy, investing around US$700 million and accounting for approximately 10% of the nation's estimated GDP. When PanAust's silver-gold project Ban Houayxai comes into production in 2012, the contribution could be even greater. On the other side, however, mining can pose a threat to local flora and fauna, displace residents, create wealth inequalities and disrupt traditional livelihoods and culture. "In central Kalimantan there is not great access to things that we take for granted, such as education, health and infrastructure," said Lynch. "Our company is heavily involved in training the local communities in mining, as opposed to bringing in people from Java, which may have been easier. We certainly do not intend to bring in Australian contractors. We are all about providing employment and economic opportunity to the locals."

Though mining can have an extraordinarily positive impact on the communities in which it takes place, engagement with the local population is by no means a given. In January 2011, the Philippines newspaper *The Inquirer* reported that the Commission on Human Rights (CHR) in the Philippines had released a resolution report suggesting that OceanaGold, a major Pacific Rim gold producer based out of Melbourne and listed on the TSX, has had its mining contract at its Dipidio project in northern Luzon, Philippines, revoked. The report said that the CHR cited claims that in 2008, OceanaGold "had illegally and violently demolished some 187 houses in Dipidio."

OceanaGold subsequently refuted the allegations in a press release and insisted that the company had maintained its obligations under the leasehold agreement and was operating in accordance with the Philippine Mining Act in partnership with the Philippine Government and with local community stakeholders. OceanaGold said that it had been compliant with all the laws and regulations associated with operating as a foreign company in the Philippines and was committed to ethical, responsible and sustainable mineral development. "There has been some unrest in the area where the project is located, and our relationship with the local communities is not as good as it could have been, although the allegations against the company proved to be false. It is difficult to maintain a strong relationship with the community in these circumstances," said OceanaGold CEO and Managing Director Mike Wilkes.

"I have had a lot of experience building projects in poorer countries. I spent 10 years in Papua New Guinea and five years in Laos, building the first western-standard mining operation in the country. I therefore have a deep understanding of social license to operate and the principles are the same in every country. Local people need to be stakeholders and beneficiaries of the development of the project," he said. To this end, OceanaGold have developed clean-water programs, medical missions and scholarships that have put about 50 local students through university. "OceanaGold pays for about 25% of the teachers in the local schools. We are also embarking on business development opportunities," said Wilkes.

For some companies, interactions with the communities can take different routes, and should not only involve regional aid actions. Listing on the local stock exchange is another way to instigate financial dynamism and to create a long-lasting impact on the country's economy.

Dragon's strategy in the short to medium term is for production growth from the development of two centres. (photo courtesy of Dragon Mining)

"We are considering a listing on the Tanzanian stock exchange, which is a small exchange with very little liquidity. It would show our commitment to the country, and open up opportunities for the Tanzanians to participate in the project. We are looking beyond the exploration to see how we can positively impact the country and the economy. While we would be the first Australian company to list on the Tanzanian stock exchange, some Australian companies have listed on the Botswana stock exchange for social reasons, and I think it is a good thing that has a potential to help create wealth," said Alastair Hunter of Peak Resources.

The ASX

Australian access to finance

Australian Securities Exchange lobby in Sydney - ASX Group (ASX) offers a diverse range of market service activities linked by a common commitment to provide the infrastructure Australia needs to create a globally competitive capital market and a vibrant, robust economy.

A crucial element in the development of Australia's overseas mining industry has been the ASX and the Australian mine investment community as a source of finance for projects. The Australian Stock Exchange (ASX), based in Sydney, has long been closely associated with the mining industry. Mining dominated the market for most of the exchange's history, but diversification of the economy over the past 15 years has reduced the bourse's dependence on the sector.

That being said, metals and mining remains the largest industry sector by number of companies represented on the exchange. Mining houses have relied on equity markets for cash flow in the capital intensive early development stage and the Australian investment community, therefore, has a long history of participating in this manner of investment.

It is well known the exchange lacks the deep pockets of its equivalents in Toronto or in London, but many believe it remains relevant due to the understanding of mining risk found in Australia and the support shown to mining juniors by the ASX itself.

Richard Murphy, general manager of equities at the ASX, sees the role of the exchange as being in transition. "Traditionally, the three main markets for mining finance are Canada, London and Australia. Australia itself is a significant resource country and more recently Australia has become a capital market for projects around the world. There are now 200 companies listed on the ASX with projects in Africa, for example," he said.

The exchange is working hard to encourage this new reputation as a source of capital for projects around the world.

"Domestically, we run face to face investor road shows for junior companies to introduce them to potential investors in Australia and run courses to educate smaller companies on the importance of investor relations and how best to achieve this. The exchange also works to showcase our mid-cap companies to global investors through events that we run around the world, including seminars, presentations and one-on-one meetings between companies and investors," Murphy said.

Richard Murphy, GM, ASX

Many see the exchange as being most useful for those vital early exploration dollars. "Australia understands risks and has some of the most risk-tolerant investors around the world. The ASX is very heavily weighted towards resources, and there is an affinity to the junior resource base. For a junior company it is significantly easier to raise capital here than offshore," said Jason Brewer, a director of Continental Coal, a company developing coal assets in South Africa.

Brewer sees this as the key benefit of the Australian market: it allows risk capital for junior resources companies. "There are many examples of junior Australian companies going to Africa or South America and getting capital out of a very strong retail and broker market here in Australia and receiving a significant return," he said.

Continental Coal went to South Africa in January 2009, when it acquired an initial

portfolio, but took the approach of raising capital in Australia, Asia and in London. "It allowed us to deal with neighboring parties, consolidate grounds and acquire an existing unlisted South African company."

However, due to the company's development into producer, they now plan to list in AIM. "As producer, we are going up the value curve, and in London there is a strong affinity to funding projects in Africa and there is a significant amount of institutional money for companies like Continental Coal. Our principal challenge at the moment is to move away from the retail shareholding base towards a more institutional holding," said Brewer.

In the past, the Australian investment community was less comfortable investing in offshore companies, yet now, Australian companies, built on Australian capital, are leading the Africa story. Some companies though, still feel the investment community in Australia remains too conservative for parts of the Africa story.

Although West Africa is now very desirable, some believe that newer and lesser reported mining hotspots don't gain full price in Australia. This is a view shared by Doug Jones, managing director of Chalice Gold Mines. "The Australian investment community has taken time to understand

Duncan Calder, Partner, Corporate Finance, KPMG & President, Australia China Business Council WA

Africa. They are now quite comfortable with West Africa, but there still isn't a great understanding of the potential in Middle Eastern and Northern Africa."

He also sees Toronto as a preferable source of finance. "The depth and the sophistication of the TSX are definitely more important than on the ASX. There is a much better understanding of the risk involved and they understand that although Australia is a great place in which to operate, the chances of finding something significant are much lower, while the costs are going through the roof," he said.

A new competitor for the ASX has emerged from the north. The predominance of Chinese sourced investment has placed an increasing importance on Chinese relations. As such, more and more miners are looking to access the Chinese retail investment market. As currently the Shanghai and Beijing exchanges do not allow foreign companies to list, Hong Kong is emerging as a potential new center for mining capital.

However, Duncan Calder, a partner at KPMG, believes this is perhaps not a viable option for all mining juniors.

"I think in the short term, there may be increasing interest in listing on the Hong Kong stock exchange, but because it is not an inexpensive exercise, you really need to be looking at raisings of over US$300 million. There is also increasing talk of Chinese stock exchanges becoming available to overseas listings. But I can see miners look more towards Asia and our customers markets because the China story and indeed the India story, has a long way to go yet. They also have limited opportunity to invest in that growth through their local exchanges and so if we can provide that in the right way then there are a lot of benefits for Australian mining companies to pursue avenues like the HK and Singapore and potentially Chinese stock exchanges," he said.

Sino-Australian Relations

The role of China in Australian mining

The Sino Iron project is a result of China's rapid economic and industrial expansion that has altered international trade, investment and production patterns at regional and global levels. Australia is well placed to gain from China's rapid industrial expansion because of its flexibility, dynamism and because of the complementarities between the two economies. (photo courtesy of Citic Pacific Mining)

The Australian resource industry has always relied on offshore investment in order to meet its goals of development. In its colonial past, it was British investment. This was followed by U.S. participation and later a heavy involvement from the Japanese. In the current global economic climate China has emerged as the most significant trading partner.

No one seems to be under any illusion as to the importance of maintaining this relationship. "We missed the recession and that is only because of the Chinese support of the Australian economy. People should remember that," said Clive Palmer, one of Australia's most ambitious resource developers.

"The relationship between Australia and China is going down the right track. The relationship was mainly established because of the resources here in Australia and the demand back in China. As long as the supply and demand exist, the relationship exists," said Dio Wang of Australasian Resources.

A number of companies promote the fact that they are savvy at dealing in China and consider the basis of those relationships to be a unique selling point for their companies. "Relationships in China do not develop overnight and take was hard work and commitment to build trust. It took us four years to build a deep relationship, but I do think they are an essential ingredient," said Duncan McBain, managing director of IMX Resources, a mining house that has recently successfully developed a small but very profitable magnetite export project from South Australia.

Fortescue, the greatest iron ore growth story in recent history, also attributes its success to an early appreciation of China's growth potential. "I think we saw where China was heading before many others. It was clear that China was going to get bigger and stronger. We realized before many others was that this demand could be the foundation for a major iron ore project. Therefore, this is where we focused our marketing, as opposed to the more mature steel market places of Japan, Korea and Europe," said Russell Scrimshaw, one of the company's founding directors.

Despite the obvious joint benefits of increased trade, China's commercial ties with Australia have been marred by some controversy. Australian voters and policy makers have demonstrated concern that too much control of Australia's strategic resources are being transferred into the hands of entities that have ties to a foreign government.

Some executives believe that the scrutiny of Chinese investment is inappropriate. "The level of Chinese investment still lags behind U.S. and European investment in Australia. About a year or two ago, several deals were made with Chinese investors, but it became a political debate and raised some public fear. At that time, there were ten times more U.S. investments than Chinese investments in Australia," said Michael Weir, director of Gindalbie, a company that is developing a magnetite iron ore mine in the midwest with Chinese partners.

This is a view shared by Duncan Clader, a partner at KPMG and president of the Western Australian arm of the Australia China Business Council. "If you were to ask most Australians who was the largest investor in Australia last year and who was the largest investor overall in Australia I suspect most people would say China. But even last year when investment from China was at its peak, they were massively outspent by the Americans. Even though China has become increasingly active, it has come from a very low base," he said.

Calder does not have great optimism for this exaggerated concern to lessen, partly due to a conservative local press. "I think that mining investments are seen to be sensitive and the Australian media are hungry for sensationalist headlines that sometimes border on the xenophobic. That's not helpful."

This concern is shared by Palmer. "Really it is very racist. I can be a member of the Klu Klux Klan, beat my wife and be a released sex offender and still invest a billion dollars in Australia without any sort of approval. If I'm Chinese, I can't invest in Australia without a rigorous process of approval. It is because I am from a country that people don't know much about and they're scared of it."

In 2009, the China Australia Business Council completed a study on the benefits to Australian households of the trade with China. They concluded that the benefits were just under A$4,000 per household per year. That study has been updated in 2011 and the estimate has been increased to a benefit of A$10,500 per household per year from the trade and investment relationship with China.

Calder also believes the lack of direct investment from the Chinese may constrain Australia's economic goals. "At the moment, there is no correlation between the enormous trade relationship and comparatively tiny investment relationship. That is not well understood and I think that the danger that

we have as a country is that if we do not establish the ballast to the trade relationship by having an investment relationship to underpin that, it gives China no reason to stick with us during the hard times. In those hard times, China may only trade in those markets that it has equity interests at the expense of that its investment ties are weaker," he said.

Many feel that these issues are merely part of learning curve. "Chinese companies have done a lot of deals in third-world countries, but less so in first world countries. In the first round of investments there will be mistakes and mistakes have been made, but I think that has to be seen as part of the learning curve. Next time round, less mistakes will be made and they will be more profitable. The success of Sino Iron and Karara will have an impact on future investment, but China is going to continue to have an appetite for magnetite and Australia will continue to have it in abundance," said Calder.

"The way of doing business in Australia is more straightforward, whereas the bureaucracy in China is much heavier. But now that China has started moving to Australia, people start to understand Chinese culture more and more and I think the gap is closing," said Dio Wang of Australasian Resources.

Given that China is now a dominant world power, some feel the earnest is on Australia to become more accommodating. "Some people say China has to get smarter, but it is the second biggest economy in the world. It's grown faster than anyone else and it provided a faster increased living standard for its people than anyone else in the world. So why does it have to get smarter? It doesn't have unemployment, it doesn't have a recession, and it has growth rates of 10% a year," said Palmer.

Despite these issues, a number of deals have been successful. One example is the Sino Iron project, which represented a US$5 billion investment by CITIC Pacific.

Calder cites this project as an excellent example of how Australian and Chinese workers can integrate. "In many ways, that company is an excellent model of how China should operate in the Western world. There is a very close inter-relationship and use of Australian labor to match Chinese labor. There is an excellent morale and joint functions that have achieved remarkable integration."

Palmer is the man who first envisioned this project and brought together the players in order to make it happen. The Sino Iron deal was done through his company, Mineralogy. He is now focused on a number of other major deals with Chinese companies, including a coal and iron ore deal in Queensland that is being done through his

Citic Pacific has invested in ensuring the size of equipment matches the desired capacity of the project. Possibly the largest machinery in Australia are present on site of the Sino Project.

Sino Project features a significant investment in dedicated infrastructure including a magnetite concentrator, 450 Megawatt combined cycle gas fired power station, a 51 gigalitre desalination plant and a new port facility. (photo courtesy of Citic Pacific Mining)

vehicle ResourceHouse. "ResourceHouse is a company formed to bring resources to China. It will be based in HK and the projects will all be funded by the Chinese government or state owned enterprises. We'll have all the capital, markets, technical expertise of China, but we'll do it worldwide. We have a lot of partners, MCC, China Railways, China Power, SinoCoal Export Import Bank of China and more generally the State Council of China," he said.

Palmer also has big hopes for this enterprise. "The project in Queensland is only the beginning. ResourceHouse could become another Rio Tinto or BHP Billiton. We can do an A$5 billion project every year without any problem and within 15 years have 20 or 30 projects. We keep a low profile as much as we can. You don't want people to know what you're doing because then it makes it that much harder to achieve."

Australia's Service Companies Line Up for the Chinese

The augmentation of China as a key trading partner for Australia has heralded the arrival of a number of Chinese mining players in the Australian market, primarily through M&A activity such as in the aforementioned case of CITIC Pacific and Chinese resources trading giant Minmetal's acquisition of Oz Minerals' Australian assets.

Chinese miners have encountered difficulties in the past in mobilizing operations overseas. When attempting to explain multibillion dollar cost overruns and delays on the Cape Lambert iron ore mine in 2010, for example, a CITIC Pacific executive triggered a backlash in Western Australia for criticizing the work ethic of Australians. Chinese players in Angola, Peru and Vietnam have faced severe problems with community relations in the respective regions. Chinese investments in Australia are likely to be subject to controversy.

Consultancies that have cultivated an understanding of Chinese business practices in parallel with a long standing engagement with Australian regulatory, labor, environmental and community conditions present an option for Chinese companies looking to mitigate the risks of entering Australia. "For in-bound investment, particularly in markets where we have depth like Australia, South America and Africa, we are very well positioned to service Chinese clients. Five years ago we were quite passive about it, these days we regularly go to China and explain our services to people. We regularly work for in-bound Chinese investors, and that sometimes translates into work in China," said John Douglas, managing director at Coffey International.

Golder Associates, a global ground engineering and environmental consultancy, is also well placed to service Chinese and Indian clients; both in-country, and those investing in Australia. "The Asia-

Pacific region is the world's fastest growing region. We see Australia as having a key role in our continued growth in this dynamic area over the long term, using our skill base within Australia to ensure world-best practice can be delivered to the region," said Darren Watt, managing director of Golder Associates in Australia.

Golder Associates has an expanding team of local specialists based in key centers across India and China, as well as in other parts of Asia. Golder's presence in India was boosted with the establishment of a strategic office in New Delhi several years ago; in China, Golder has offices in Beijing and Shanghai.

David Luscombe, GHD, Global Market Leader, Energy & Resources

The company has developed partnerships with Chinese design institutes to ensure a seamless delivery of services to Chinese clients. "Golder has focused on developing our reputation in China through delivery of successful studies for mining projects within China and India, and externally for out-bound investments sourced from these countries. This gives us credibility and is backed up by our commitment to open local offices and employ local engineers," said Watt.

Through working on contracts in China, often as clients of multinational blue-chips, some of Australia's leading EPCMs are already attuned to Chinese business practices and culture, placing them in an advantageous position when it comes to servicing Chinese players in Australia.

GHD, an international network of engineers, architects and environmental scientists has 350 staff in China, the vast majority of which are Chinese nationals. GHD also has more than 70 Chinese professionals working for the company in Australia. "We are extremely successful in capturing Chinese clients that are investing in Australia. They are comfortable with GHD and know that we understand Chinese culture very well. We aim to help them understand the regulatory and investment climate in Australian mining so that they can adapt smoothly here. Our Chinese clients want to be involved in the delivery of projects and have their own design institutes that we are very open to working with. They also expect us to provide innovative solutions and, so far, we have been successful in this," said David Luscombe, global leader of energy and resources at GHD.

Australia's geographic location and the increasing orientation of its resources industry towards Asian markets also makes the country an ideal launching pad for EPCMs looking to springboard into the Asia-Pacific region, and particularly into China's boisterous market.

Hatch, a global leader in developing complex projects, is one such company that is managing Asian operations from Asia. "We're driving our initiatives in India, China, Indonesia and Vietnam from Australia. I think our biggest growth areas will be in China and India. If any of our existing clients go to Asia, we want to be able to serve them in those markets, but we'd also like to work for in-country clients. We're doing that in China now and we're working for Chinese clients here in Australia," said Eric Kolatchew, managing director at Hatch Australasia.

Hatch, however, is an exceptional case. Few EPCMs are in a position to take on complex projects in China at this stage. China is not a market to enter into lightly and, while the rewards are potentially great, fierce local competition and lack of brand traction may deter all but the most ambitious Australian players.

Hatch has pursued a strategy of mitigating risk and broadening the services that they are able to offer to the Chinese market through undertaking joint ventures with local players. "We've got a joint venture with a Chinese institute in the iron and steel area. We're looking more at those sorts of associations because they bring a technology aspect with them, plus a way of working in that country and getting some quick credibility," said Kolatchew.

This strategy is aligned with that of Australia's blue-chips pioneering new ground in China. In June 2011, for example, Rio Tinto formalized a joint venture with China's Chinalco through which it will undertake exploration in the region.

Procuring from China

In Australia, materials are scarce and costly, a key contributing factor to the project delays and cost blowouts that have occurred across the country. EPCM's that are able to skillfully procure from lower cost regions, and particularly from China, are at a distinct advantage when it comes to competitively pricing Australian projects.

Sedgman, a leading Australian provider of mineral processing and associated infrastructure solutions, is among a number of established Australian players setting up a major supply hub in China. "We will recruit a larger engineering capability with the aim that the office provides support to Mongolia and back to Australia. Our plan is to expand our knowledge base in China, procure to Australian standards and supply those products back to Australia," said Nick Jukes, CEO and managing director at Sedgman.

Cape Lambert

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Cape Lambert Resources is a highly successful resources investment company with a diverse portfolio, including exposure to more than 25 mining and exploration companies and assets.

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Cape Lambert Resources Ltd

Though not as fraught with risk as taking on projects, procuring reliable and properly priced equipment and materials from China requires considerable expertise. Companies such as Hatch, who have a long established presence in China, have been able to leverage their on-the-ground knowledge of the country to provide procurement advice and consultancy for their clients.

"Many clients do not know where to go and what is available in China and we do a lot of advisory work. We want to increase work sharing between our Australian and Asian offices, where there's a lot of expertise, and we've got the tools to enable us to do it properly," said Kolatchew.

In procuring from China, Australian contractors would be aligning their strategies with some of the key majors in the country.

"Our procurement strategy in China has evolved considerably since 2003, and we now manage an annual spend of over US$1 billion in raw materials, marine freight, operational and capital goods in this region," said Doug Ritchie, chief executive of energy at Rio Tinto.

In the future, procurement from China may encompass skills as well as equipment. Though training is an issue and many EPCMs maintain that China has some way to go in terms of educating its graduate engineers to an Australian standard, the number of graduates coming from China relative to those available in Australia gives pause for thought.


Douglas Luscombe, Vice President, SNC Lavalin

"We graduate 6,000 engineers in Australia, in places like Singapore it's 60,000 and China 600,000. That's where the resources are, that's where the technical expertise is and it will only get better," said Douglas Luscombe, vice president and general manager of SNC Lavalin Brisbane.

Throughout the mining supply chain, companies are looking at partnering with their Chinese counterparts.

PDC Consulting is a recognized world leader in design, detailing and building information modeling.

Managing Director, Martyn Weir, said that working with Chinese partners is an increasing part of their business. "Our biggest project at the moment is Gindalbie's Karara Mining magnetite project, where we are working with a Chinese designer in Beijing, which has had a significant learning curve. China has a large involvement in Australia, and we have partnered with a Chinese company to expand our capability," he said.

However, Weir points out that a key concern in building business and partnerships in China is whether intellectual property will be protected.

"From PDC's perspective, one of our biggest costs as a service company is software and intellectual property, and we have to provide evidence of fully legitimate licenses for our software and it makes it hard to compete against overseas companies that do not enforce this," he said.

While as much a political as an industry issue, sourcing expertise from China and building partnerships is a solution some have mooted for Australia's nationwide skills shortage.

Australia's Evaporating Labor Pool

Strategies to overcome workforce shortages

Newmont - Land inspections at the Tanami gold mine (photo courtesy of Newmont Mining, Australia)

In these times of plenty, when many commodities are at record highs and a new project enters development every week, one issue that keeps Australian CEOs awake at night is where they are going to find the employees in order to maintain this development.

"Along with access to capital, I think that labor is one of the significant rate determining issues in Australia. Experienced labor pools are becoming curtailed in both quantity and in the availability of certain skills at the same time as their services are increasingly in demand. You cannot invent technical skills, and certainly not with the experience that is generally required," said Kevin Wealand, managing director of Downing Teal, a Perth-based recruitment company that specialize in the mining industry.

This is a view shared by Peter Cordin, executive chairman of Dragon Mining, an Australian company focusing on opportunities in Scandinavia. "The shortage of technical people in Australia is one of the greatest concerns that I would have. With the Australian dollar where it is, people here are incredibly expensive. I would need a lot of convincing to invest here now, mostly because of concerns over the ability to man-up a mine cost effectively."

John Davidson, managing director at Brisbane based recruitment specialists John Davidson Associates, attests the Australian skilled labor shortages are already impacting significantly on the running of Australia's mines. "We have clients in places such as Kalgoorlie, Broken Hill and Mt Isa - the hardest places to get people to move to - who do not expect to hire any Australians at all," said Davidson.

While mining companies have made the effort to use soft issues to attract the right staff, Wealand observes that it generally comes down to salary. "At all levels, companies have been forced to become smarter and pay increased attention to employee engagement and retention policies. The entire industry has improved work and living standards, rosters, health care and connection to family left at home in fly-in, fly-out arrangements, and so to a large extent, it often comes down to money."

Working in this sector daily, Wealand is very aware of the emerging trends. "Professional salaries have increased between 50%-60% in the last five years. This is clearly linked to supply and demand. Established companies, having a need to continue and expand existing operations, have a deep understanding of what they need and can afford, and so set the salary standards. The rest of the industry necessarily, follows."

This trend has also been noticed by Steve Heather, managing director of Mining People International, another of Australia's leading recruitment firms. "In the exploration geologist market, I would estimate that, over the past five years, salaries have increased by around 40%. In the heady days of mid-2008, you would see a junior geologist command A$700-A$900 a day on contract. That stopped during the global financial crisis and we're not back there yet, but we've seen that a geologist with three to five years experience can now get A$700-A$750 a day," said Steve Heather, managing director of Mining People International, another of Australia's leading recruitment firms.

During the commodities boom of 2005, demand for mining labor reached a fever pitch. The global financial crisis and associated decline in project development reversed this trend. Yet some feel that the crisis felt in Australia wasn't long enough or hard enough. "Our economy probably needed far more of a shake up. There is no doubt there's pressure on both areas and they need to be very closely managed. If they spiral too far out of control, then investment will obviously suffer from it," said Michael Weir of Gindalbie, that's developing a Midwest iron ore project.

Wealand feels the contracting companies could currently be the worse placed. "The established operators, with established mines continued development and expansion through the global financial crisis and, generally, retained their skilled workforce, leaving them better placed than the contracting companies, labor wise, who need to re-build after downsizing. If the contracting companies can't access good people they may be reluctant to commit to projects, which, in turn, could limit the speed at which the operating companies are able to bring their projects on-line," he said.

Australia's EPCMs have been hit especially hard by the labor shortage. "The area that will become hard is going to be site la-

bor for construction work. It is important for all engineering companies when they are doing their design to reduce the amount of onsite labor. There will be more pressure on the Government to allow overseas workers to come into the country," said Nick Jukes, CEO and managing director at Sedgman.

A concern has been expressed in other parts of the world that Australian recruiters are now going to be found luring skilled workers from across the globe, particularly in English-speaking regions such as Canada. The recruiters we spoke to deny that this is a strategy. "North American sourcing remains a minor part of our business because the global resource industry is doing very well. Resource executives in Canada and the other mining hubs are being paid very well and aren't likely to want to migrate for marginally better salaries. It is not as easy as some make out. It is certainly happening, but not at the degree that some might imagine. It is more likely that the developing regions with good education systems are an increasing source of professional and skilled labor for Australia; places such as Latin America and Eastern Europe. This is an important and growing consideration for many of our clients," said Wealand.

Even without the relative equivalency of salaries in Canada and Australia, recruiting from traditional mining hubs would not necessarily go far towards easing Australia's labor pains. According to Phil Smart, managing director at WorkPac, it's not Australia that has a skills problem, but the Western world as a whole. "The Western world is competing with the Third world for skilled labor. If you go somewhere like the Philippines, you have to put an offer on the table: here is the reason you should come to Australia, to Canada, or the Middle East," said Smart.

Phil Smart, MD, Workpac

Recruiting from jurisdictions such as the Philippines, Indonesia and Papua New Guinea, even before visa issues have been considered, is not a simple matter. John Davidson, who, prior to setting up JDA spent more than 10 years in Papua New Guinea and has extensive experience in Indonesia, explained skilled labor leaving such countries is creating gaps in their respective domestic economies. "Even the Philippines, whose largest export is people, is running out of mining professionals, as is Indonesia. We are now looking at developing relationships with heads of departments at universities to see if they can supply us with people - it won't be a lot, but anything will be helpful," said Davidson.

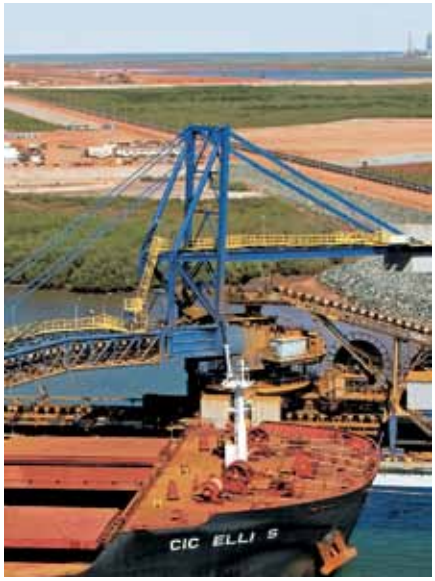
With recruiting from overseas subject to visa constrains and not always a viable option, other companies are looking to the east coast in order to tap the labor pools that have so far perhaps been underutilized.

"The east coast of Australia doesn't have the level of development that the west coast currently does. Consequently, we find that these areas are fertile for quality people. We also now find that, because of the Australian dollar and the economic situation in North America and Europe, a lot of skilled professionals from overseas are willing to migrate. We are getting more and more people that bring different skill sets that want to come to Australia and join the growth story we are building," said Russell Scrimshaw of Fortescue.

However, Steve Heather feels if mining companies are to solve this issue, they must concentrate on how to attract the best of the next generation. “Smart kids are looking at what they want to do with their careers and when they look at the mining industry they see a business that is purely digging it and ship it. At career fairs the mining companies often use a truck or loader carrying dirt as their defining image, when in fact, the Australian mining industry is one of the most sophisticated cutting edge global leaders in so many areas. The industry needs to find a way to appeal to the best minds. This is not going to solve every problem, but it would give us a better chunk of Australia’s best.”

When it comes to appealing to the best graduates, high wages alone may not be enough to attract the brightest students in an increasingly international market place. “The incentives aren’t just monetary, it’s about career enhancement,” said Phil Smart, whose company WorkPac prides itself on its ability to help people find the right jobs to optimize their work lives.

Contractors who consistently operate at the forefront of innovation are advantaged in attracting talented graduates and, as such, are likely to be less exposed to the impact of Australia’s skilled labor shortages. When we spoke to Hatch, for example, recently incumbent managing director Kolatchew explained that building the team would be one of the primary focuses of his tenure. “The work that we do is always interesting and technically challenging. We give new graduates the opportunity to stretch themselves. We can offer a career path that goes



Fortescue Metals Group’s Pilbara Iron Ore and Infrastructure Project - Shiploader at Anderson Point Berth, one of many projects that WorleyParsons contributed to in Australia.

from design right through to project management and business management. We give our people a lot of empowerment. On our side, we have to demonstrate good leadership and engagement with our people so that they feel like they're important to us."

Les Davis, MD, Silver Lake

The Fly-in Fly-out Debate

Perth airport at 6AM on a Monday morning is an incredible sight. Thousands of mine workers wearing their uniforms fill the building as workers are exchanged for shifts. Australia was largely built upon the frontier mentality whereby it was miners that often opened new parts of the country to development. However, the current trend in mining is for fly-in fly-out (FIFO) employment.

"There are 70, Boeing 737 flights to Karratha every week, which is a town of 25,000 people. They are really all mining services related," said Mark Shelton, CEO of Skywest, a local airline that specializes in fly- in fly-out services.

He feels that this is the logical solution for the industry. "There is not the infrastructure in the regions to handle people living there. The government has tried to create development in Port Hedland and Karratha, but that will only grow to a certain level. There is a huge ramp up in the number of people required during the construction phase and a huge reduction during the operation phase. A project can go from 4,000 to 400 people. The infrastructure you would need for the construction ramp up would be way over the top of what you would need on an ongoing basis. These towns' infrastructure then becomes difficult and costly to maintain. Inevitably therefore there is going to be a large FIFO requirement."

FIFO represents more than 50% of Skywest's business. The airline operate a fleet of 18 planes, including nine F100 jets that are predominantly used for FIFO charter and a recently acquired A320 Airbus that flies back and forth from Fortescue's Cloudbreak mine in the Pilbara twice a day, five days a week.

Shelton believes that, due to the mining industry's reliance on FIFO services, more communication and planning is needed to ensure that sufficient capacity is in place to accommodate the sector's expansion plans. "This is something their risk managers really need to get their heads around. There does need to be a bit more interaction between providers, like ourselves, and the major players in terms of planning. The spend on having stand-by facilities would be relatively insignificant against the cost of delaying a project due to the lack of stand-by facilities."

Les Davis, managing director of Silverlake, a gold mining company that has had phenomenal exploration success in the Kalgoorlie region, is well aware of the issue. "With the current employment bubble, it's very hard to find the right skills in the mining sector. The industry struggles to source good geologists and engineers. There is a limit to attracting skills as there are varying salaries across the sector."

However, like other mining houses, he aims to use soft comforts in order to attract and retain staff. "Being in Kalgoorlie works perfectly, because all of our people are local residents. There are no fly-in fly-out issues, and everyone is happy to be working in Kalgoorlie. Fly-in fly-out is not as attractive as it used to be for workers, and it is a big cost to a project."

Mining Services and Technology

Expertise built on demanding experience

At the face, underground at Jundee, courtesy of Newmont Australia.

Due to the labor constraints of Australia, its mining industry has been a world leader in the development and innovation of services and technology that increase efficiency, safety and automation. In adapting to some of the world's most remote and harsh operating environments, the Australian mining industry has become highly innovative, productive and efficient. Its mining technology is world leading and its mining services are an increasingly significant export.

Outwardly focused, around 50% of Australian companies in this sector are engaged in international business. Many mining companies see the existence of this hub of services as being one of Australia's key competitive advantages and one that allows Australian based mining houses to be developing projects around the globe.

Mark Warren, director of Perth-based consultancy Optiro that spun off of Snowden Consulting a few years ago, is adamant about Australia's superiority on the international mining scene. "We have seen the United States lose their domination in mining. In my view, when it comes to technology, the U.S. no longer is a dominant force. I think people would see Australia as a far more advanced place in terms of mining. As a consequence, services companies are becoming far more internationalized," he said.

Perth is perhaps the greatest of Australia mining services hubs and Campbell Baird, managing director of Focus Minerals, sees this as one of the city's best features for mining companies. "The competitive advantage of Perth is that the Western Australian mining entrepreneur is able to source consultancy services of all things; from capital raising, bank finance, technical services, engineering design right down to suppliers. You can drive 20 minutes in any direction and put together a mine anywhere in the world with the expertise that you meet. This whole industry has coalesced here in Perth and that skill set is then able to eject people off into the wider world," he said.

"We are renowned for our services and our expertise and we have built a community that is truly supportive of the resources sector. The main centers for growth in the world economy are Asia and India and our synergies with these regions are so strong that I think it provides for a truly optimistic future," said Anne Nolan, who was until recently director general for Western Australia's Department of State Development.

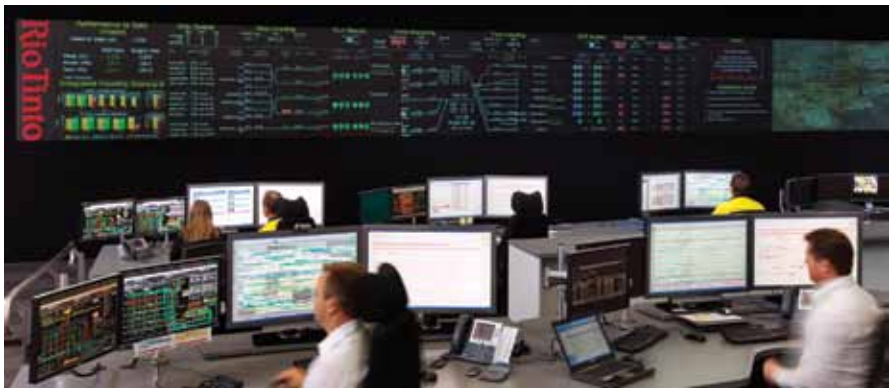
"If you take West Perth's mining service industry it's really the Silicon Valley of mining," said Neil Warburton, managing director of leading regional contractor Barminco. "We have some of the best brains in mining in the world. That's why, as Australian miners go into new markets, they always come back to use the consultants and contractors that are based here. We also have a very hands-on approach that is greatly appreciated by partners around the world."

Mark Warren, Director, Optiro

On the east coast, Brisbane rivals Perth as a technology hub. The Queensland government is active in promoting the state as a mining technology hub. In 2008-09 mining equipment, technology and services export sales grew to A$2.8 billion, supporting 9,450 workers.

Queensland is home to Australia's Sustainable Mineral Institute and the Queensland Centre for Advanced Technologies, Australia's largest integrated research and development precinct for the resources and associated advanced technology industries. CRC Mining, part of Australia's Cooperative Research Centre initiative, aids in the commercialization of promising technology. Queensland is also able to leverage off the presence of University of Queensland, one of the country's premier research institutions. "Boasting a collection of world-class R&D facilities and a range of mining technology providers, Queensland is rapidly becoming the Silicon Valley of mining, technology and services for the Asia-Pacific Region," said John McGagh, head of innovation at Rio Tinto.

Such government support has been instrumental in getting some of Queensland's most innovative mining technology companies off the ground. "We have had very good support from the Queensland government. We are considered one of Queensland's shining stars in the mining technology sector and have received marketing development support to expose our capabilities to the world market," said Dr. David Noon,



Rio Tinto's "mine of the future". The interior of the Operations Centre in Perth from where trucks are operated remotely. (Photograph courtesy of Rio Tinto).

chief commercial officer at GroundProbe, the company behind the Slope Stability Radar and Work Area Monitoring mine safety systems.

Peter Wade was about to retire in 1999, when he had the occasion to join Mineral Resources, embarking on a journey that recently brought the company into the very exclusive club of the ASX 200. Mineral Resources initially developed three separate mining services businesses – CSI, PIHA and PMI – before it started to process and export iron ore and manganese. PIHA is now the largest manufacturer of polyethylene pipe fittings in Australia, and Crushing Services International is the country's largest specialist contract crushing company. "Mineral Resources is a combined business with the mining services on one hand, which is the core business of the company, and the manganese and iron ore business on the other hand. Our strength is that we are able to operate much smaller tenements than any other mining company, since we own and operate all of our crushing and processing equipment," Wade said.

This business model allows Mineral Resources to utilize their services skills in order to add value to the commodity side of the business, and exemplifies the resourcefulness of Australian services companies.

An Innovation Playground

At his office on the banks of the Brisbane River, John McGagh, head of innovation at Rio Tinto turns the pages of the tome on his desktop. It is a well-worn volume, within which annotated woodcut prints of smelters, water mills, hoists and pulleys and winches sit beside descriptions of mining practices from the 16th Century. The De Re Metallica, Latin for On the Nature of Metals, would remain the authoritative text on mining 180 years after the books original publication. Many senior executives at Rio Tinto, according to McGagh, keep a copy of Georg Bauer's seminal work in their offices: it depicts the superlative European mining practices of the past. Today though, in Australia, Rio Tinto is engaged in creating the mine of the future, "I must ask, what can't we do today that if we could do tomorrow would fundamentally change the business?" asked McGagh.

Though innovation is ubiquitous amongst forward-looking mining companies, Rio Tinto has interpreted the notion of innovation in a completely novel form through its Mine of The Future concept. "In 2006, the Rio Tinto board said it should be possible to develop step-change technologies not across a wide spectrum, but in specific fields that

you can leverage, keep internal to the business and its partners, and generate a superior return on investment," said McGagh.

By early 2008, Rio Tinto had unveiled their Mine of The Future concept, focused around the company's Pilbara operations. The program set out to advance next generation mining technologies that would result in greater efficiency and safety, reduced environmental footprint, lower production costs and improved conditions for workers.

Towards the end of 2008, Rio Tinto commissioned the A Pit test mine, which has since showcased a number of foundation technologies: the Rio Tinto autonomous drill rig platform, the Komatsu FrontRunner autonomous haul truck system—which employs artificial intelligence to learn the layout of a mine, recognize other vehicles and obstacles, and establish the most efficient route to ferry loads from the loading face to the dump—and semi-autonomous smart explosive loading have all been rolled out. In 2010, Rio Tinto expanded its Mine of the Future™ program to develop new equipment and systems for deep underground mines. Aker Wirth and Atlas Copco will individually work with Rio Tinto to develop two new tunneling concepts and Herrenknecht will work with the Group on the development of a new shaft-boring machine.

Coffey International - Mine Site Operations Trucks Working (photo courtesy of Coffey)

Integral to the Mine of the Future concept is the Remote Operations Centre. As the industry moves toward greater automation, employees are able to remotely operate and supervise automated production drills, loaders and haul trucks in the Pilbara from the operations center in Perth.

From the outside, Mine of the Future may appear an embodiment of the idea of an Australian innovation playground; however the trajectory of ideas through the mine is complex. Innovations must have a practical bent, and outcomes and risk are meticulously assessed. "Of every hundred ideas that come into the system, less than two will make it to pilot plant. At this next stage, I take investment proposals to London, which I expect to be judged with the same amount of rigor as anything else, and they decide whether or not they are worth taking. I have a group dedicated to killing off bad ideas quickly, because you do not want dead ducks to run on," said McGagh.

Though the innovations developed by Rio Tinto in Australia will eventually be rolled out globally, a convergence of factors that McGagh describes as a perfect storm formed the ideal climate for investment in Mine of The Future in 2006 in Australia. "Judging from history, labor shortages in this world,

David Noon, CCO, Ground Probe

John McGagh,
Head of Innovation, Rio Tinto

which exist in Australia today, will spur on technological investment. This is a country with a good education system that has maintained its mining and technology schools. It also has lots of good mining companies and in order to carry out this kind of investment you have got to have scale."

Rio Tinto works with a host of academic institutions to develop its technology, including the Australian Centre for Field Robotics at the University of Sydney, Imperial College London, Curtin University in Western Australia and University of Queensland through the Julius Kruttschnitt Mineral Research Center in Brisbane. McGagh also cites the emergence of new technology networks able to temper the tyranny of distance in precipitating new demand for remote technology in mining.

Innovation and the Environment

The connection between the mining industry and flatback turtles may not be an obvious one, yet it shows how innovation in the mining sector can help protect the environment. Miners are frequently criticized for the impact their activity has on the nearby fauna and flora, but innovative companies can also come up with fantastic ideas to protect the environment from harmful side effects. Paul Sowerby, sales and marketing director at Allight Sykes, is confident that the mining industry will place greater emphasis on environmental protection in the near future.

Allight Sykes manufactures lightning solutions for the mining industry, and has progressively added power, air and de-watering solutions to its offering, maintaining innovation as the company's driving force. When it heard the lightning system of Chevron's Gorgon gas project on Barrow Island was devastating the population of flatback turtles, they rapidly developed a solution that would satisfy the conservationists and preserve the turtles, without being detrimental to the operation. "We took a sodium vapor lamp, which is used in coal mining, and provides a much softer, yellow light, designed to cut through the coal blanket. We re-engineered our urban lighting tower, and fitted it with this new sodium vapor lamp. It was accredited by Barrow Island's conservationists, and became the 'turtle tower', the only lighting tower accredited for use on Barrow Island," said Sowerby.

Allight Sykes' R&D team can also be credited for the design of a spillage containment tray, that is fitted as standard on the lightning towers, and Sowerby lists greater environmental awareness as a key element of competitivity for companies in his line of business.

If the carbon tax functions according to the government's intentions, the coming years should herald increased investment in clean-coal technologies and in particular, in carbon capture and storage (CCS). One aspect of clean coal, however, that is often neglected in

such environmental initiatives is the re-mining of tailings and the rehabilitation of mine sites.

"Not a lot of emphasis was ever put on tailings - it is a by-product, which you can put in the ground. It has always been considered the rubbish end of the coal chain," said Ross Garling, managing director at Superior Coal.

Set up in 2004, Superior Coal has worked on tailings management solutions for Xstrata, Vale, Rio Tinto, BMA and Anglo American among other players. "Historically, tailings deposits and reject dumps were contained and then forgotten about," said Garling.

This resulted in significant long-term rehabilitation challenges. In processing coal recovered from tailings deposits and reject dumps, Superior Coal are able to both produce a saleable product and reduce waste: extending the output of a mine while reducing its environmental impact. In addition to the overall sustainability of the operation, independent research has shown that almost 80% less CO_2 emissions are generated in recovering a ton of coal from tailings, compared to traditional mining methods.

The benefits that Superior Coal is able to offer are not solely environmental, working closely with their clients, the company is able to elicit greater yield from coal mines. "It is cost-effective to recover tailings, and is in the mine's interest. What we do is win-win: it is just a case of getting across cultural misconceptions," said Garling.

Reducing energy consumption is another factor that not only protects emissions, but can also significantly enhance a project's profitability. There is, therefore, a large appetite in Australia for any technological investments that can meet these goals.

ThyssenKrupp's Polysius subsidiary has been in Australia for about two decades. The company specialize in high pressure grinding rolls (HPGR) and command a 65% market share globally. "HPGR technology is at the tip of the evolution of energy efficient grinding equipment. As energy consumption and carbon tax are becoming more and more into focus, we are quite well positioned with our HPGR technology, because it allows users to save energy compared to conventional crushing and grinding equipment. It is more efficient, and it improves operating costs significantly," said Stephan Kirsch, managing director of Polysius Australia.

Polysius' Australian operations used to be run from an office in Melbourne. However, as Perth is Australia's' center of gravity for the mining industry, and the proximity to its clients is paramount, it was decided in 2006 to relocate the business to Perth and construct a

The state-of-the-art service center in Perth for Polysius Australia, part of the ThyssenKrupp group, servicing the mining majors in Australia and the region, as part of its customer-proximity global strategy.

Slope Stability Radar (SSR) is the world's best practice to measure and monitor the stability of rock walls in open-cut mine sites. GroundProbe was the first to introduce the slope stability radar to the mining industry and it combines the strengths of both radar and visual information to provide the full picture of slope movements. The SSR uses radar to remotely measure the movement of all wall surfaces and uses visual images to confirm and display the result. (photo provided by GroundProbe)

service center hub for their operations. The service center was completed in 2009 and includes full workshop facilities, laboratory and pilot equipment for R&D.

It is the thirst for best available technology that makes their investment in Australia viable. "In terms of mining/processing technology Australia requires very high standards. HPGR technology plays its role in this regard. With our service center and workshop we are well positioned in this market environment," Kirsch said.

Bridging the Corporate and the Collegiate

In September 1930, American Julius Kruttschnitt was appointed as general manager of Mount Isa Mines in Queensland. 'To my consternation I found on my arrival a condition bordering on bankruptcy, with creditors being importuned to await a none-too-certain influx of capital,' Kruttshnitt wrote.

By July of the next year, the mine and smelters were producing their first lead bullion; Mount Isa Mines went on to become one of the most productive single mines in world history.

The Julius Kruttschnitt Mineral Research Centre (JKMRC) at University of Queensland was developed in the late 1960s with the intention of having universities relocate their work from laboratories into the mines. By the mid-1980s, research had become more applied, leading to conflicts between researchers and miners. As a solution, JKTech was established in 1986 as a commercial arm of the JKMRC.

JKTech's main business is in developing new software to advance the mining industry, however the company also provides support, training and consultancy to Australia's miners.

"Our researchers are about five years ahead of the industry. We take risks, usually in partnerships, in areas that the mining industry has not picked up on. The most senior minds in mineral extraction meet with researchers every six months. The researchers present their recent work and are given the opportunity to respond to firms' problems," said Dr. Dan Alexander, CEO of JKTech.

Recently, for example, JKTech has been giving floatation seminars in response to the widespread problem of high-energy costs for miners facing harder and deeper ores.

JKTech also commercializes technology for a range of mining applications. "A good example of a successful commercialization was the Mineral Liberation Analyzer, a scanning electron microscope that took images of the rocks and the particles beneath and determined how to break and separate those. Almost every mining company now uses the technology, provided by Philips, our partner for the project," said Alexander.

Going forward a major area of focus for JKTech will be training. "We are looking at setting up programs to take young professionals to higher skill levels, which is particularly important today when there is generally not enough on-site experience. We are being asked to set up an international centre of excellence for mining in different hubs around the world, and emerging mining nations. China, Mongolia, India, Peru and Colombia are asking us to train their professionals in sustainable minerals practices, reflecting the fact that Australians are amongst world leaders in such issues," said Alexander.

Scanalyse was born from in 2005, a collaboration between the American aluminum giant Alcoa and Curtin University, in an attempt to transfer a new laser scanning technology into the mining industry. "Scanalyse is a really good and unusual story of a university working together with the mining industry to solve a problem that companies were having," said Scanalyse CEO, Peter Clarke.

The team of researchers successfully developed a solution that would allow miners to make the grinding process more efficient by gathering substantial information about what is happening inside the mills and the crushers. "If you don't use MillMapper, you have to physically go inside the mill and take about 10 measurements. We place our scanner inside the mill and get millions of different data points. We allow (our customers) to save money, to get more product through the mill, and to avoid the penalty of a catastrophic failure. There is also a safety aspect to MillMapper, as people don't have to go into the mill anymore," said Clarke.

A winner of the Inventor of the Year award in 2007, Scanalyse emphasizes innovation as its key strength, and is addressing new issues. MillMapper could be used to maximize the energy use for mineral production.

Founded in 1981 in Adelaide, Scantech, who provide process control solutions for bulk materials and service some of the industry's biggest players, grew on the back of the company's successful commercialization of scientific instrumentation developed by the University of Queensland and CSIRO.

Scantech brought the Coalscan range of real time-coal analyzers to the industry and have since dedicated their in-house research and development to refining the equipment and diversifying its applications in the areas of concrete and mineral analysis.

Scantech's success can, in part, be attributed to the patented non-contact system, applied to the company's major elemental analyzers, the Coalscan 9500X and Geoscan. "We've removed all the maintenance requirements that impact on the plant. That's given us a huge advantage," said David Lindeberg, managing director of Scantech.

Every machine that Scantech produces is fitted with a computer and IP address

A Scantech solution at work. Scantech is the world leader in providing process control solutions for bulk materials.

The Work Area Monitor (WAM™) is the innovative safety tool developed by GroundProbe, an Australian leader in this segment. WAM is deployed in less than a minute. When movement is detected, the crew working in the area is alerted immediately via sirens, flashing colored lights and personal alerts (PALs). (photo courtesy of GroundProbe)

to enable remote after-sales support and eradicate the need for conveyor downtime. "The customers use the equipment as an input to their control system. In a lot of cases the customers already have a control system with a control philosophy. Instead of manually collecting information by taking samples and having them analyzed, they put in an analyzer that makes the process easier to monitor because it provides continuous information. The benefit of the technology is really in providing real-time information," said Henry Kurth, Scantech's sales and marketing manager.

Another advantage of the Scantech system is the company is able to provide assurances of the machines benefits to prospective customers before they make a purchase. "A proposal starts with the customer sending us samples and our marketing starts by giving customers a technical report, saying this is what our machine can offer. At that point we also give them guarantees, so they have an insurance policy even before they buy it," Lindeburg said.

Transmin is another Australian company that places a strong emphasis on the incorporation of innovation. The company is a leader in engineered solutions for bulk materials which has been serving the Western Australian gold mining sector since 1987. According to Ross Nunn, managing director at Transmin, it is the close relationship with its clients that has led to many of the company's innovations. "A huge amount of our work is, in fact, R&D. We have managed to be innovative by trying to customize our products to suit clients' specific needs, and our focus has been on these customized products. From this work, we have developed completely new products like the rock breaker booms and the low profile feeder and we have developed innovation in the area of automation with CSIRO, Newcrest, Rio Tinto and other big players."

From its Western Australian roots, Transmin are now increasingly focusing on expanding overseas and diversifying the commodities that they serve. The company subcontracts all of its manufacturing and machining and instead uses their focus on innovation as a competitive edge.

"As we go forward, we want people to identify Transmin as a producer of intellectual property. Our target markets are Brazil and various African countries. In the last five or six years, we have become very iron ore focused, and that should last for a long time. When we started, the company

was focused on gold, but iron ore suits our growth strategy as it involves bigger players and equipment," said Nunn.

Safe and Efficient Mining

Australia is widely regarded as having one of the strongest safety cultures in the international mining industry. On Australian mine sites the inductions, training, and specs for personal protective equipment are probably the strictest in the world.

MineARC Systems is a company that started at the turn of the millennium building scrubbers, and rapidly expanded into the construction of emergency refuge chambers for the mining industry. The 2006 Sago mine disaster, during which 12 people lost their lives, prompted it to develop a chamber that would fit in the specific requirements of a coal mine and that would be built to U.S. standards.

MineARC's managing director Geoff Whitaker remembers the genesis of their CoalSafe chamber. "Since Sago in 2006, and other mining accidents, refuge chambers have become increasingly important and there has been a growing focus from governments for the whole range of mine safety standards. Our hard rock business had been quite successful worldwide when in 2006 we started developing CoalSafe.

Neil Warburton, CEO, Barminco

As it was to be used in an explosive atmosphere, we couldn't use electricity to run refrigeration. We developed an air conditioning scrubbing system that is powerless and uses no electricity whatsoever."

The only chamber on the market to benefit from this innovative design, the CoalSafe technology has received its certification for the Chinese market, where the coal industry is made up of a tremendous, particularly vulnerable 6 million people.

Barminco is one of the leading underground contractors in Australia, they command around 35% of the domestic market for underground contracting and, as open pit operations are increasingly going underground and underground operations are going deeper, they see a great deal of growth opportunity for the future.

Along with its record for increasing productivity at client operations, the company's Managing Director, Neil Warburton, feels it is the emphasis on safety that differentiates its operations. "Our safety performance is regarded as the best in the industry. When compared with both other contractors and owner-operated mines our safety is second to none. We pride ourselves on that and instigate a lot of safety improvement programs within the industry right down to the coal face. We're driven from the bottom up in this regard, so that the guys working underground have an integral part in our safety policies."

Like so many of Australia's successful service companies, that have cut their teeth in one of the world's most demanding markets. Barminco are now putting a focus on taking their operations overseas. "It began from our Australian based international clients asking us to come over. In the early 2000s, we started going over to projects in South Africa and other parts of the world. We were able to bring our mechanized mining methods to West Africa and replicate our safety and productivity per-

formance. We are very aware of the need to instill our company's values throughout our operations wherever in the world they are. We absolutely cannot compromise our safety and productivity performance," said Warburton. But safety culture extends far beyond the mine sites, back into the R&D laboratories of a number of dedicated Australian mining technology companies. While in other jurisdictions, safety best practice is sometimes regarded as an adherence to time-tested methods, Australian miners are quick to trial new technologies and adapt them into their operations systems. Anglo American in Australia, for example, is an early adopter of the CRC backed SmartCap, a device that provides real time measurements of a vehicle operators brain waves to determine fatigue levels. Even before it has undergone full commercialization, the SmartCap is now featured on almost all of Anglo American's mine sites globally.

Arguably the two most fundamental drivers for innovation in mining; improvements in mine safety and improvements to process efficiency, are inextricably linked. At the most basic level, safety improvements reduce mine downtime and worker absence through injury; efficiency improvements mean less fatigued workers and processes that are simpler to manage. Australian

One of the bases for FK Gardner & Sons Group (FKG), a group that provides Commercial Construction, Civil, Development, Plant Hire and Plumbing Services. The FKG Group have managed successful projects throughout Queensland and NSW.

OHS specialist Industrea, for example, sells in-seam methane gas drainage systems, flameproof long-wall removing equipment and personnel carriers, and open-cut mine collision avoidance systems extensively into the domestic market, and, increasingly, overseas. "In Australia, our clients buy our products to improve safety and receive productivity gains, while in China, they buy them to improve productivity and receive safety gains. It is very easy to sell internationally the products and methods that make mining in Australia world-beating," said Robin Levison CEO at Industrea.

When Groundprobe developed their game changing Slope Stability Radar (SSR), the technology was originally intended to improve the safety of open-pit operations. Before the introduction of the SSR, the conventional way of determining slope stability was survey methods. Surveys would measure the movements of selected prisms installed on mine walls. Such surveys might have been conducted once a day, once a week, or once every couple of weeks. The SSR enables the movement of an entire wall to be monitored in real time with updates on slope stability every minute. By improving the safety of open cut mines, the SSR enabled mines to go deeper with steeper

walls. "Risk equals probability multiplied by consequences. As you go deeper and steeper, the probability is higher, but with monitoring the consequence is reduced. Overall, [with the SSR] the risk is on-par or lowered, but the profitability of an operation is significantly higher because of deeper pits and steeper walls," said David Noon, chief commercial officer at GroundProbe.

Groundprobe SSR systems is now in 19 countries around the world and, according to Noon, the company has about 75% of market share in the global slope stability radar systems market. While Australia is traditionally an early adopter of new safety technology, some jurisdictions like to see a technology being used widely before they use it. "There is a strong education component in taking a product that is technologically focused into the global market. We overcame that by focusing on global mining companies that had safety and technology innovation as their core values. We were able to leverage from these early adopters to become the best practice in the main market," said Noon.

In 2011, Groundprobe will release the Work Area Monitor (WAM). While the SSR monitors the entire wall slopes of a mine to determine the overall safety of its operation, the WAM uses similar technology to specifically protect the actual operators: the drillers, blast crews and shovel operators that frequently work up against the mine face. The WAM is a much simpler system and provides an alarm directly to the operator if a rock movement is detected. "I think WAM will exceed SSR in terms of numbers and value to the mining industry. Right now, there are people working up against rock faces and there is no monitoring at all. The WAM is a tool they can have, which is like their personal protective equipment: their hard-hat, their boots, and their WAM when they're working close to any wall," said Noon.

Another company that has taken a potential mining danger out of the mine site is Immersive Technologies. Mine sites across the world now utilize some of the largest, most sophisticated most expensive and potentially dangerous equipment known to any sector. Given the high turnover of employees being experienced across Australia as the work force constraints bite, training new operators is a constant concern. Immersive have developed equipment simulators, in partnership with the OEMs, to filter and then train the operators required to the highest skill level.

The simulator provides a unique environment that is cost effective, safe and in-

sulated from the influence of other existing operators. Selected operational and emergency scenarios can be rehearsed repeatedly to improve operators' skills. Every action that is made on the simulator is recorded on the computer for detailed reporting and review. This gives senior management a very clear picture of what its workforce is going to deliver and where it needs to improve to drive the safety improvements and reduce reactive maintenance costs.

"Our first commercial sale of the simulator was in Indonesia. We then achieved sales in South Africa, Canada, the United States and then Australia. Although our first customers were not from Australia, we now have a very large customer base here. We really had to prove ourselves overseas. Currently, Australia represents around 25% of our sales revenue and the rest is spread over 30 countries around the world. Over the years, we have had great support from Austrade in reaching those overseas markets," said Peter Salfinger, managing director of Immersive Technologies.

Fugro Airborne Surveys - (photo courtesy of Fugro)

Australian Mining Software

Australian designed and developed software has set the benchmark for the mining industry worldwide. Australian mining software is innovative, flexible and user-friendly, and extensively used by companies the world over. At least 60% of the world's mines are now operating with Australian-made and designed software.

Andrew Jesset, CEO of MineWare, a Queensland-based provider of dragline and shovel monitoring systems for the surface mining industry who won the Emerging Export Award at the 2010 Premier of Queensland's Export Awards, feels Australia's key differentiator as a mining nation lies in its provision of mining technology services. "In Australia, I think we want to be known more for our export of mining technologies rather than our resources that come out of the ground. To me that is where our competitive advantage lies as a county. We have this nucleus of innovation," said Jesset. "Wherever you go there is a certain amount of kudos and respect that you receive for being an Australian technology provider," said Adam Forsyth, CEO of APS Mining, which provides industry leading machine management solutions for mining applications including Machine Guidance, Condition Monitoring, Fleet Management and Information Management services. In addition to the prestige associated with being a successful Australian mining technology company, APS Mining has leveraged its experience of operating in regional Queensland to ensure the applicability of its products overseas. "One advantage that is specific to South-East Asia is that being based in Queensland we come from one of the only strong mining regions in the world that shares similar weather patterns, such as the recent floods that we have experience dealing with," said Forsyth.

"Mining technology is Australia's only world's best-practice industry," said Graeme Tuder, managing director of Micromine, a leading innovator in this field. He feels that the importance of this field should not be underestimated. "It is a globally significant business. Depending on what parameters you use, mining technology is a US$7 billion per year industry."

Tuder's company has now expanded into a number of international markets and feels that the Australian brand in software is so strong that it opens a lot of doors for the company. "We use the Australian roots of the company in new markets as everyone recognizes the brand of Australian made technology. Australia has the reputation of being the centre of mining technology in the software industry because it is the only place doing R&D. However, many good

Graeme Tuder, MD, Micromine

companies have been acquired by overseas entities."

Gemcom is an amalgam of four different companies that are headquartered in Vancouver and, since 2007, has been privately owned by three private equity firms. One of the companies that formed the amalgamation was started in Perth in the early eighties and was initially developed by a university engineer that saw the need for mining software and started to adapt software from the civil engineering industry.

Andrew Pyne, managing director, also sees Australia as a very competitive market. "All of our competitors are here. Because it is quite a mature market, customers tend to buy technology primarily based on what they've already used and what they know. We don't do a lot of technical shoot-outs here anymore as people tend to know what the technology can do. These days someone will buy the product because of the brand and because they are comfortable with our products. Largely the market has decided what product it will use, regardless of whether it is the best product or not."

"It is quite a mature market in terms of people's knowledge of the available service offerings. In certain developing markets some companies are not aware of the full suite of competitor products. But this does limit our growth potential, whilst we have phenomenal growth here. You would think that it is mature, but our Canadian colleagues are surprised that we are able to grow as much as we are," said Rebecca Kellum, account director at Gemcom.

Computer technology has paved the way for tremendous improvements in mine efficiency, leading to increased revenue for mining companies. Discrete Event Simulation (DES) emulates real world operations in order to analyze and improve them. TSG Consulting uses simulation modeling in the early stages of a mine development, in order to assess the infrastructure design. Their early intervention, in a triangular arrangement with the mining companies and the engineers, can have a significant impact. Rod Houston, TSG's recently appointed executive general manager, insists on the huge return on investment for his clients. "If you spend a million with us, you can save $100 million. We can offer our clients, before they build anything, the ability to quantify the risk and to assess whether there is a better way to build the infrastructure that reduces the risk. We help them to understand the whole logistical chain and the interaction of those systems."

DES allows clients to make more informed decisions; for example, it can help an operator decide to defer the purchase of a A$50 million iron ore train for six months, therefore allowing an important cost saving.

The company's experience of big-scale projects, through their work with BHP and Rio Tinto, gives them an unrivalled expertise that is confirmed by a 90% market share in Western Australia.

"TSG benefits from the Pilbara experience, since Rio Tinto and BHP's Pilbara operations are held in high regard internationally. Every major expansion decision that BHP and Rio have made in the past few years have been tested in our models," said Michael Dallimore, director.

Lycopodium

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Engineering and Construction

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An example of PDC's contribution to the success of the large mining projects in Australia. Rio Tinto Brockman 4 Project – Secondary Crushing. PDC Consultants is a recognised global leader in the areas of design, modelling and detailing. PDC has one of the world's largest and most experienced engineering design, detailing and 3D Building Information Modelling (BIM) teams.

Australian companies have developed engineering skills and technologies that address all aspects of mining infrastructure. From installations at the ore body, through processing and beneficiation plants to transport facilities, rail, roads and ship loading, Australian companies have across the board experience in most mineral commodities, in remote areas and in harsh conditions.

Engineering on big projects in Australia's challenging environment, within which processes must be conducted as efficiently as possible to counter high labor and material costs and able to bare extreme weather conditions while being exceptionally sensitive to local ecologies and communities, has fostered innovations that are especially appreciated in the global marketplace. Engineering company and environmental specialist GHD, for example, have a history of rolling out novel solutions from their Australian offices. "A lot of our current clients have been affected by the recent natural disasters in Queensland, and our dealings with them will provide us with extremely valuable learning for future projects," said David Luscombe, GHD's global market leader, energy and resources.

GHD is currently pioneering a system of Climate Resilient Infrastructure on the back of such learning. In 2006, the company won Australia's Engineering Excellence Award for developing the world's quietest Caterpillar truck for Westrac.

This unique Australian environment has led to the emergence of many companies specializing in turnkey solutions for brown field and green field projects. Many of these companies have a renowned reputation for high levels of diligence and integrity at the planning stages, ensuring that contractual and organizational criteria are fully addressed.

"It is recognized in the engineering sphere that Australian companies will be of a high standard. A lot of international mining houses will come all the way to Perth to have their project designed by Australian resident engineers. It is common to see North Americans getting work done out of Australia," said Rod Leonard, managing director of Lycopodium, a Perth-based engineering and project delivery firm. The mineral sector represents around 90% of its business.

Leonard believes there is a unique mentality to Australian mine engineers that makes them internationally competitive. "There is a can-do attitude here. It's a very hands-on 'make it happen' work philosophy. I'm from the U.S., but that was one of the things that struck me when I first came here. When you see Australians in the various communities they go to, they also have a strong community focus. There is a big demand in the industry to be as cognitive of the soft issues as of the actual project implementation and I think that is a positive," he said.

Rod Leonard, MD, Lycopodium

Peter De Leo is Leonard's colleague and managing director of Lycopodium Minerals, Lycopodium's subsidiary that specializes specifically on minerals processing, materials handling and infrastructure projects. He believes that the high demands of Australian miners have led to the development of the nation's high engineering expertise. "The ore bodies now being developed would have been considered very marginal in the past. You need to be pushing the boundaries in order to develop them effectively. In the early days it was that and the similarities between the style of mining and processing that took Australian miners into Africa."

Many of Australia's leading multinational EPCMs have sophisticated systems for mobilizing staff and transferring expertise between their international offices. In this way, knowledge gleaned in Australia can easily be made available overseas. Similarly, Australian operations are able to benefit from experiences gained elsewhere. World-renowned engineering and construction player SNC Lavalin has taken this one step further in developing a global procurement system. "If I want to go and buy a machine, I could refer to the database and find all the machines that we'd bought in the last projects, where they were bought from, what the quality was like, the risks involved etc. It helps us to price projects very accurately, and also to source equipment," said Luscombe.

Eric Kolatchew, MD, Hatch

Though Australia's engineering prowess is widely acknowledged, EPCMs with a strong overseas presence have been able to bolster less well-developed aspects of the Australian contracting value-chain. Headquartered in Canada, multinational Hatch has a strong heritage in aspects of mineral processing that are less commonplace in Australia. "Australia traditionally had a dig-it-out-of-the ground culture; there wasn't a lot of secondary processing in the past, whereas in North America that was not the case . A lot of the skills we've been able to bring to Australia come from our background with some of those more difficult processes, hydrometallurgy, pyrometallurgy and so on," said Eric Kolatchew, managing director of Hatch in Australasia.

The large number of big projects coming on-stream in Australia has served as something of a calling card for foreign EPCM's with specialist skills. In 2008, Canadian firm Redpath Mining entered the Australian market through its acquisition of Queensland underground mining and tunneling contractor, Eroc. "Redpath are global players and have offices in Canada, the U.S., Mongolia, Indonesia and South Africa, but in the mining contracting sense, the Australian market is one of the largest," said Rob Nichols, CEO at Redpath Mining Australia.

Since Redpath acquired Eroc, the company has grown by 30%-40% in terms of turnover. This can, in part, be attributed to the financial clout and extensive client network that the Canadian company brought to Eroc's business. "The balance sheet support and introduction to clients from Redpath has enabled us to introduce the skills that we already had to more clients. We have more equipment and manpower for larger projects and a lot more corporate support," said Nichols.

Redpath Mining has also brought in a range of specialist skills, such as raise boring, shaft sinking, and technical engineering, to augment Eroc's already strong reputation in the underground space. Though Redpath Mining is not currently engaged in shaft sinking, raise boring now accounts for 15% of the company's business in Australia. Raise drilling is currently in operation at four mines in Western Australia and is a strong growth area for Redpath Mining. "We aim to provide a whole range of services to our clients that other contractors can't offer," said Nichols.

Since 1969 Hofmann Engineering has provided specialist engineering services to Australia's industry leaders. They are today one of the most outstanding global manufacturers in their segment.

Como Engineers initially started as a contracting company, but the fierce competition led it to look for niches in the engineering business where it could have a distinct

advantage. The modular stripping plant, launched in 1982, was its first product, and Como has focused its expertise on building equipment that would fit in sea containers in order to be shipped all over the world. Overseas activity has become an important part of Como's business. "Australian services are highly regarded across the world, because of their excellent quality. Our standards are a lot higher than most countries. Currently, a third of our activity comes from overseas, and we would like to take it up to 50%. We have worked in Indonesia for years, and we consider it a good place to open an office. We have recently been in Morocco, in Finland and in Sweden to deliver a modular plant to a new gold miner," said CEO Richard Ladyman.

Como has evolved into providing complete turnkey solutions to its customers, offering consulting services that include feasibility studies and design and construction. "We take projects all the way through from concept to completion, which means we start with the studies, and go all the way through to build and commission of the plants," Ladyman said.

The history of AMEC Minproc's development is indicative of the transformations that the Australian mining industry has gone through. Minproc was originally an engineering services company and focused its expertise on the gold sector. Over the years, Minproc diversified into a range of commodities and became involved in a number of projects worldwide. In 2009, it became part of the larger AMEC organization, welcoming AMEC's expertise in heap-leaching technology and tailings management.

GHD is one of the world's leading engineering, architecture and environmental consulting companies. Whilst they excel in all areas of their services, the transportation systems have become fundamental to the prosperity of the mining community in Australia.(photo courtesy of GHD)

Dr. Stuart Ratcliffe, general manager of development for AMEC Minproc, foresees new trends for the company to focus on. "The global demand for iron ore has increased, especially from China and, as a result, there has been huge growth in iron ore development. There are numerous new clients and projects that are being developed in Western Australia and other parts of the world, both in DSO and iron ore which requires mineral processing. A lot of the current work is related to magnetite developments and that requires large scale mineral processing capabilities, so we are able to apply the skills that we have developed over the years in other commodities to the iron ore industry. In central and western parts of Africa, our focus will be increasingly on iron ore as time goes by. With plants that are able to process 75 million mt/y, AMEC Minproc is determined to maintain their iron ore beneficiation and processing expertise.

Established in 2003, DT HiLoad is an innovative Australian company specialising in the design and manufacture of the Hercules dump truck body. The Hercules is a uniquely engineered tray for off road, rear tipping, mining and quarry trucks. DT manufactures and supplies haul truck bodies for mine sites and contractors globally. (photo courtesy of DT Hiload)

A Union of Subcontractors

The plethora of new projects coming online may provide a wealth of opportunities for Australia's large EPCMs, however, for the country's smaller specialist sub-contractors, tighter regulation, rising costs and increased competition from overseas players are making industry conditions tougher and tougher. "The barriers to entry keep increasing with legislation and company requirements. The bar keeps being lifted for subcontractors," said Terry Young, managing director of Diversified Mining Services Group (DMS).

Before Brisbane-based DMS burst onto the Queensland scene with six rapid acquisitions of service companies across the underground and open-cut spaces in 2009, the company undertook extensive research into market conditions for Australia's subcontractors. "We noticed there was a lot of imminent retirement from the baby-boomer generation in the mining services sector, and also that all of the major miners were outsourcing most of their traditional services to contractors. On the mine site there are thousands of vendors or subcontractors. At the same time, the major miners are looking to narrow or specialize their vendors, in some cases from 5,000 to 50."

According to Young, the increased barriers to entry that these conditions precipitated meant that managers and owners of subcontracting companies, most of who started off as entrepreneurs, were having to spend the majority of their time dealing with lawyers and bankers instead of focusing on their employees and customers. "A common complaint that we heard at industry meetings was that there was too much red tape. We say to the owners go back to doing the entrepreneurial thing that made you successful," said Young.

DMS Group's service office in Brisbane supports the operational activities of the initial six and two subsequent businesses that the company acquired. The Brisbane office carries out all of the HR and business development strategy and the company have also integrated all non-mine performance activities: safety, quality, and marketing and sales campaigns, and IT systems.

All of the managers from the businesses DMS has acquired have stayed with the company since acquisition. Unifying subcontractors in this way has saved DMS's constituent companies money on finance and insurance - by having one bank rather than eight banks, for example. However, the most fundamental impact has been on profit margins. "Because the entrepreneurs get released from all of their administrative and

corporate duties, they naturally go back to doing what they did best: improving sales. Since we formed the company, we've gone from A$70million in sales, to this year's forecast of A$190 million. We started with 350 employees and last week we paid 605," said Young.

Having one point of contact also makes things simpler for clients. "We think we replace anywhere from 10 to 20 different smaller subcontractors, which means one safety protocol, one point of contact, and one invoice. We're able to standardize across numerous sites for our clients. On shutdowns we achieve safer performances result because you don't have the interfaces between people working at different levels and on different aspects of the process," said Young.

Contracting Through the Global Financial Crisis

When Managing Director Fred Vidaic started Queensland-based Global Cranes in 2005, the company underwent a period of rapid growth. On the back of planned infrastructure work for Brisbane City in 2006, Global Cranes purchased Millers Cranes and Transport to keep pace with demand. This was followed by the acquisition of Nebo Cranes in 2008. The prognosis for Global Cranes was great. And then the global financial crisis hit.

Many small Australian contracting firms endured a torrid time through the global financial crisis and some went under completely. For Vidaic, employing a lean management strategy was the key to survival. When work began to dry up, Global Cranes adopted a strategy of dry-hiring a portion of their fleet to ensure that the company was able to generate as much revenue as possible. "All we've done is tighten our belt, our revenue stayed the same, but the profitability last year was minimal because of all of the overheads. Our profitability now is much better," said Vidaic.

Coming out of the global financial crisis, Global Cranes find themselves well placed to serve Queensland's booming resources sector. To augment their current operations, the company is now looking at possible acquisitions in the Surat Basin, with work in the Galilee also mooted for the future.

Global Cranes has a fleet of around 210 vehicles: rough terrain cranes, all terrain cranes up to 220T, frannas, and crawlers; with jobs completed for the likes of Sedgman, Leightons, Hatch and Bechtel.

Vidaic attributes the company's success to the reliability and service they have been able to offer their clients, even through the turbulence of the global financial crisis. "We've got a relatively modern fleet, our 220's are 2010 models. Service really differentiates us: when we say we'll be there, we'll be there," said Vidaic.

Erich Hofmann, MD, Hofmann Engineering

The Last Breath of Australian Manufacturing?

The conjunction of a formidable Chinese competition and the extremely high cost of labor in Australia have turned manufacturing into an increasingly difficult challenge, and for many, it is already a distant memory.

Erich Hofmann, managing director of the family company Hofmann Engineering, founded by his father, is the first to acknowledge that "manufacturing is dying

in Australia." To try and remedy the issue, Hofmann joined the Government Innovation Council, made up of leaders from the unions and from some of the leading manufacturing companies. They meet on a regular basis in order to address these daunting issues and suggest solutions. Hofmann takes a leaf out of Germany's book and maintains a positive outlook of the future of Australia's manufacturing. "We particularly benchmark ourselves against Germany, because they have similar standards of living, with similar tax rates and hourly rates. Last year, Germany still had the largest manufacturing exports in the world, thanks to its technology. As a company, we are looking at getting the latest technology in order to manufacture our production much more efficiently. Even though Australia has one of the highest labor rates in the world, we can still be competitive."

Thanks to an inspiring A$36 million a year investment in R&D, Hofmann Engineering remains at the cutting edge of innovation and is able to develop its exports, which represent half of the company's activity.

Hofmann's key differentiator is its initial expertise in extremely sophisticated aircraft parts. They are able to transfer their aerospace competencies into the manufacturing of mining equipment that is comparatively easy to make. "As we are at the extreme end of technology , we use our aerospace know-how in mining. Our aerospace expertise led us to a new way of manufacturing. Traditionally, in the manufacturing industry, everything is made to drawings. But the aerospace industry uses 3-D models instead of drawings. We have now adopted the 3-D models and we acquired a new machine that is used to make gears as well as aircraft parts," said Hofmann. This uncommon expertise has so far allowed Hofmann Engineering to gain and retain the trust of its no less than 5,000 customers around the globe, providing them with the world's largest gears, as well as the world's largest ball and SAG mill shells. Through a continuous process of re-engineering and product improvement, they manage to anticipate customers' demands and to pioneer new areas of expertise, such as forged steel gearing, that, after having been running for 22 years, "are still going strong."

Leading the Drive to Automated Operations

Around the world, mining companies are looking to reduce operational costs and increase safety. One of the most effective methods for achieving these twin goals in any business is the incorporation of automated operations.

Darryl Stevens, CEO Essa Australia (at the time of the interview), Peter Sandager, GM Global Business Development, Automation - FLSmidth and Peter Harrig Nielsen, GM Products and Marketing, Automation – FLSmidth

Australia has become a hub for these developments. In addition to Rio Tinto's Mine of the Future, other players have worked to incorporate automated elements wherever possible. Fortescue director, Russell Scrimshaw, believes this should be a paramount concern for everyone in the sector. "It is key that our next stage of development also uses technology to its greatest extent and that wherever possible our operations are automated. The mining sector absolutely needs to embrace this."

Scrimshaw feels this drive has arisen in Australia due to the particularly high cost pressures being felt across the country. "The biggest cost to mining companies is people and salaries here are much higher than other countries across the world. We must overcome that disadvantage by being smarter and using our brains instead of our cheque book."

This demand for automation has not gone unnoticed by Australia's mining service industry, which has developed world leading expertise in this field.

Essa Australia has roots in the construction of sample equipment for the gold mining industry. The company's history saw it expand its service offering across the sample preparation business, until this year, when it was acquired by FLSmidth.

It was the demand for automation across the sector that led Essa into discussions with FLSmidth. "Mining companies are looking to automation to reduce labor reliance and increase the quality of their operations. That's how we first came in contact with FLSmidth. We knew that was the market we wanted to be in, but we aren't a software company. They had the software which was already in use in a vast number of cement laboratories," said Darryl Stevens, CEO of Essa Australia.

On FLSmidth's part, Essa Australia represented and opportunity to translate its expertise in sampling automation from the cement industry into the mineral sector, as Peter Sandager, general manager global business development for automation at FLSmidth explains. "It was a natural development for FLSmidth, as we had begun to make a series of acquisitions in the mineral space in the 2000's. It was logical for the automation division to look at bringing the value-add that we bring to cement in process and quality control, to the mineral industry," Sandager said.

Sandager acknowledges it might take time for automation to become as accepted in mining as it has in the cement trade. "In the cement business, it took time for automation to penetrate, so we expect that this will be the case in the minerals industry as well, but we were surprised to see the lack of automation and the understanding of what process control and optimization could do for the minerals industry."

However, Sandager thinks the eventual benefits of this acceptance to miners could far exceed those seen by cement makers. "The volumes involved in the cement business are smaller in relation to those in mining and so the benefits of our products are also magnified when applied in the minerals industry. If you, for example, save 0.5% of your energy costs, the cost of investment is returned within a measure of hours. Therefore we see a huge potential, but we also recognize that it takes time for automation to penetrate. Having the sampling expertise is crucial because an optimization system relies on the quality of information that is fed in and now we have both."

Stevens feels Australia is the perfect place for this drive to flourish. "Australian mining has been so successful because it has been innovative and mining houses have been prepared to trial new technology. Equipment doesn't change unless it is driven by something, sometimes it's a necessity, but sometimes it can also come from just looking at opportunities to advance."

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FLSmidth

Brand Australia

In 1985, in Tawoomba, Queensland, engineer John Russel set up a business aimed at designing and manufacturing world-class mineral processing equipment. In those early days, Russel was the sole employee of his own company.

Today, still operating from the small town of Tawoomba, Russell Mineral Equipment Pty Ltd. (RME) is recognized as the world's leading designer, manufacturer and supplier of mineral grinding Mill Relining Machines and has sold its products in more than 50 countries.

While the Australian manufacturing industry as a whole endures a turbulent time, from meager beginnings John Russel's company is now thriving. Like Hoffman Engineering unparalleled engineering expertise has been the key to RME's success. Also like Hoffman, John Russel cites Germany as an apt basis of comparison for Australia's specialist manufacturing capabilities.

"Australia in general isn't well recognized as a manufacturing hub, but in the specific mining and technology services sector, brand Australia is very strong. I see the potential for Australia to be a little Germany in that regard," said Russel.

In keeping with the spirit of innovation that RME was founded on, the company invests about 4% of its yearly turnover back into R&D. "If you look at the mill lining machines we were doing 10 years ago, you can see that we've been continually refining and simplifying: they look better, they're cheaper to make and they're more reliable," said John Russel.

Although each machine is unique in that it must be made to fit the individual specifications of a given mill, the company also produces one or two special custom machines per year, such as the Alcoa High Reach Descaling Machine. For this project, RME won Alcoa's Australia wide competition for developing a solution to descale problems experienced in red mud settling tanks.

RME developed a special, remote controlled device that included a 4WD vehicle with electronic traction control and a powered tool incorporating hydraulic hammering with a high-pressure water jet. According to Russel, engaging in these types of special projects enables the company's R&D department to spread its wings. "The design team battle hard because if you build a special machine, then you're forced into being brave. This makes it easy to make a definitive change in design."

Innovation at RME, however, is not restricted to product design. RME has partnered with the Southern Queensland Institute of TAFE to offer a training course and subsequent qualification for operating its mill relining machines. The company has also recently begun applying LEAN, a system designed to eliminate waste expenditure and inefficiencies, to its manufacturing process. Through these initiatives, Russel has been able to mitigate the effects of two of the Australian manufacturing industry's most pressing concerns: the skilled labor shortages and decreased cost competitiveness.

For Shane Dunstan, executive vice president at Aran International, who design and manufacture specialist mixing plants for the mining and construction industry worldwide, the strength of Brand Australia is a key factor in maintaining an Australian base, in spite of the fact that 80% of the company's business now comes from overseas markets. "The real reason we keep our core base in Australia is the excellent perception of Australian engineering. Australia and New Zealand are the Antipodes we have come to be resourceful," said Dunstan.

Rapid national and then global expansion, primarily on the back of construction for road-based materials, enabled Aran to develop awareness of its brand on the international market, but it wasn't until the late 1980s the company entered the mining

Superior Coal – proving that coal waste is not a liability - it can deliver premium coal at a cost effective price, while reducing a mine's environmental footprint. (photo courtesy of Superior Coal)

space. "As gold mining in particular began to recover, a lot of underground miners were looking for better recovery. Two things that were holding them back were structures to prevent the mines from collapsing and tailings including substances such as cyanide. We first worked with AMC to use our road equipment in mining on a gold project in Western Australia. Mixing the tailings with cement to fill up underground voids, we found ourselves in a new niche market," said Dunstan.

Labor laws and inflated costs forced Aran to close the last of its Australian manufacturing facilities in 2010. The company now manufactures its products entirely in Asia. "We do not feel it impedes on our brand or our ability to market. We continue to market ourselves as an Australian brand, albeit one that, like many others, outsources production to cost-advantage regions," said Dunstan.

Not every manufacturer, however, is deserting Australia in favor of lower cost environments. While it may be cheaper to mass-manufacture in Asia, Australia remains strong in the manufacturing of complex bespoke products.

"Our products have a high assembly component and a high level of complexity involving combining fabricated steel. We can offer engineering companies flexibility by allowing them to change their minds throughout the process. We can accommodate minor flaws right up until the shipping date," said Grant Steward, whose company Consep is the number one supplier of slurry samplers in mineral processing for base metals and specializes in manufacturing and distributing a range of concentration and separation equipment for the mining and mineral processing industries.

Steward attributes Consep's ability to remain competitive in Australia's high-cost manufacturing environment to the high value and level of customization of his products. "You cannot control your costs if every time there is a change then a third-party is involved," he said.

Conclusion

Australia has been blessed with incredible resources that have allowed its economy to flourish. The mining industry that has developed has had to fight for its success through exploring and developing mines in some of the harshest terrains that the world has to offer. Most players that we spoke to while researching for this report have survived numerous commodity super cycles and, as such, see the current high caused by the Chinese demand boom as a fleeting opportunity.

Whether this time the demand will truly prove to be 'stronger for longer' remains to be seen, but what seems clear is that Australia has an industry equipped, through its adherence to best practice and innovation, to not only extract maximum value from the enormous resources that no doubt remains to be uncovered within its borders, but also to participate in the development of mines across the globe.

Despite these strengths, the challenges that have been outlined are not insignificant and industry leaders and policy makers must work closer together through improved communication to maintain Australia's reputation as a mining investment hub. The government demonstrated a naivety that is unlikely to be forgotten by international investors quickly and regaining the reputation for stability will now necessarily take time.

Despite their complaints, most Australian mining executives will quietly admit this is one of the most exciting times the industry has ever seen.

Most issues are focused on how to extract maximum value from this moment, always a preferred consideration to concerns of mere survival.

The opportunities available to Australian miners and service providers, both at home and abroad, seem so great and so diverse it seems highly probable that a great many more success stories will register on the international market from this region in the coming years.


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