



MINERALS COUNCIL OF AUSTRALIA
SUBMISSION TO SENATE SELECT COMMITTEE ON
THE FUTURE OF WORK AND WORKERS INQUIRY

JANUARY 2018

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1. EXECUTIVE SUMMARY

The Minerals Council of Australia (MCA) welcomes the opportunity to contribute to the Senate Select Committee on the Future of Work and Workers Inquiry.

The minerals industry is a fundamental source of Australia's comparative advantage in the global economy and a major contributor to the nation's innovation effort. Notwithstanding the recent downturn in commodity prices, mining remains Australia's second largest industry and Australia's largest export earner by a very wide margin. Australia's mining capital stock is now almost four times what it was at the start of the mining boom.

Innovation is central to maintaining Australia's comparative advantage in minerals and energy by supporting more competitive, safer and more environmentally sustainable operations. The mining sector spends nearly \$3 billion a year on research and development (R&D) and is an exemplar of collaboration with research bodies.

A high level of innovation in the sector has traditionally been the means by which the mining industry has sought to overcome so-called 'depletion effects'. It has also been part of the industry's response to the sharp contraction in commodity prices since 2012. In a survey of MCA member companies, 70 per cent of respondents cited 'R&D and adoption of new technologies' as important or very important to achieving future improvements in productivity. A separate study indicates that globally 69 per cent of mining companies are looking at introducing remote operations and monitoring centres, 29 per cent robotics and 27 per cent unmanned drones, with technologies enabling work to be moved to locations which can better support a more diverse and inclusive workforce, including primary carers and people with physical disabilities.

Critically, the minerals industry's contribution to Australian innovation depends upon high-value, high-wage jobs in a diversity of professions, including engineers, environmental scientists, geologists, geophysicists, mathematicians and financial officers. Mining produces more gross value added per employee than any other industry (double the finance sector) and pays Australia's highest wages. Mining also accounts for the largest industry share of micro start-up businesses and is one of the largest contributors to job creation by these businesses.

The MCA has invested over \$50 million into minerals higher education since 2000, and in partnership with universities across the country, has developed a world-class minerals education sector that is delivering the skills needed in the industry today. However, the sector must also provide future graduates with the skills the minerals industry will need in the decades to come.

The Australian Government should continue to address the structural weaknesses within the minerals higher education sector through reforms that ensure strong safeguards to secure the viability of traditionally low student enrolment and high cost to universities (including minerals-related disciplines) to ensure that Australian's have access to meaningful education opportunities to participate in the future minerals workforce. Safeguards should include stronger accountability mechanisms to ensure increased university fee revenue is devoted to teaching and student services.

Additionally, workplace relations reforms that modernise workplaces and embrace innovation and changing work practices as a result of technology are vital to the competitiveness of the Australian mining industry.

2. AUSTRALIA'S MINERALS INDUSTRY IS A WORLD-LEADING INNOVATOR

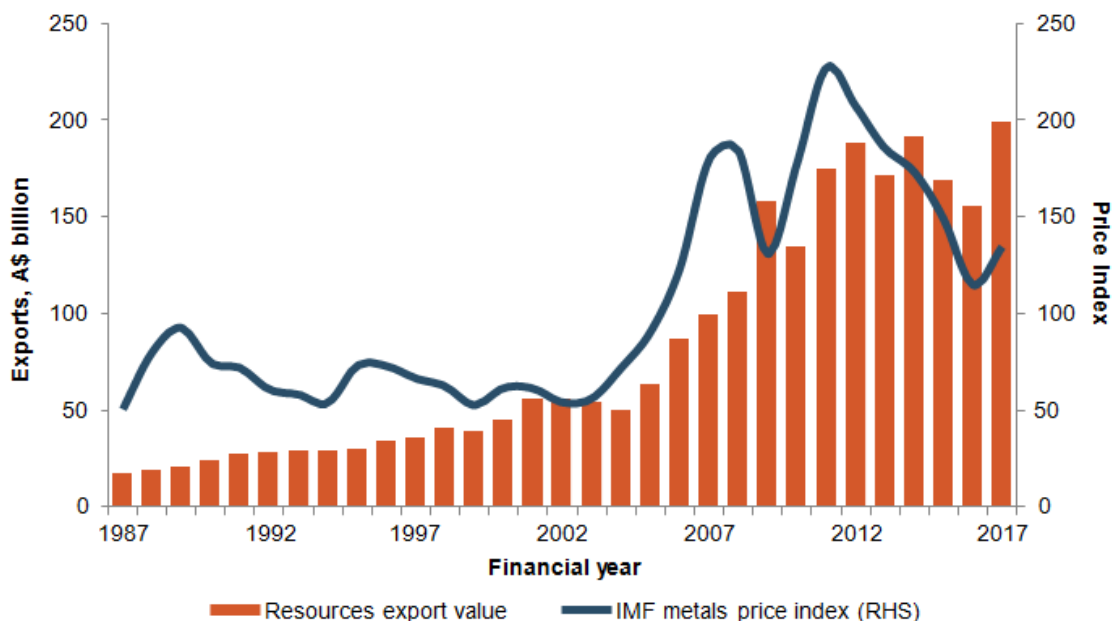
- Mining is the leading industry in the Australian economy. Australia's largest source of export revenue, a key employer in regional areas and a world leader in innovation.
- The Australian minerals industry is a world leader in developing and adopting transformative technology and spends nearly \$3 billion on R&D annually, or nearly \$1 in \$6 of all business R&D spending in Australia.
- The adoption of new technologies is important to achieving future improvements in productivity and is affecting the skills and capabilities of the future minerals workforce.

Mining represents a growing share of the economy

Mining is a leading industry in the Australian economy. It is Australia's largest source of export revenue, a key employer in regional areas and a world leader in innovation. According to the Australian Bureau of Statistics (ABS), mining accounted for 6 per cent of GDP in 2016-17 making it the fourth largest contributor to the Australian economy. When the broader economic contribution of the mining equipment, technology and services (METS) sector is included, this share of the Australian economy increases to over 15 per cent.

In 2016-17 resources exports were a record high of \$198 billion and accounted for 54 per cent of Australia's total export revenues. As shown in Chart 1, commodity prices rebounded in 2016-17 but remained well below the highest levels of the price phase of the mining boom. The surge in Australia's resources export revenue was instead driven mainly by higher production of key mineral and energy commodities.

Chart 1: Australia's resources exports



Sources: Australian Bureau of Statistics, [International Trade in Goods and Services](#) ABS Cat No. 5368 Table 3; International Monetary Fund, 13 December 2017

Compared to the peak of the commodity price cycle in 2011-12, Australia is now producing significantly higher volumes of its key mineral exports. The transition to the production stage of the mining boom comes after a period of significant investment in the mining industry in which over \$400 billion of mining, energy and infrastructure projects were developed in Australia.

This investment has led to production increases over the last five years of 73 per cent for iron ore, 20 per cent for coal, 16 per cent for bauxite and 13 per cent for gold. Investment has also occurred in mines that are producing the materials used in modern technologies such as electronics, renewable energy systems and electric vehicles. As a result, Australia is already the world's largest lithium producer and one of the only countries in the world to produce rare earth elements.

The mining industry continues to be a significant employer in the production phase of the boom. According to Australian Bureau of Statistics the mining industry workforce was approximately 218,000 throughout 2016-17 and many of these jobs are located in regional areas.¹ When the broader METS supply chain is considered, this workforce exceeds 1.1 million people and accounts for 10 per cent of jobs in Australia.²

While the benefits of mining and METS activities are distributed across Australia, there are a number of regional areas where the sector makes a particularly significant economic contribution:

- The Pilbara region (WA), with a total economic contribution of \$37.8 billion (88 per cent of total regional economic activity) and 93,800 jobs (direct and indirect)
- The Bowen-Surat region (Queensland), with a total economic contribution of \$18.6 billion (63 per cent of total regional economic activity) and 99,700 jobs (direct and indirect)
- The Hunter region (NSW), with a total economic contribution of \$15.2 billion (34 per cent of total regional economic activity) and 93,600 jobs (direct and indirect).

In addition, Deloitte Access Economics has estimated the total economic contribution of mining and METS to Victoria, South Australia and the Northern Territory in 2015-16:

- Victoria – \$13.6 billion in value added (4 per cent of total state activity) and 121,700 jobs
- South Australia – \$8.9 billion in value added (8 per cent of total state activity) and 69,800 jobs
- Northern Territory – \$3.2 billion (10 per cent of total Territory activity) and 23,500 jobs.

The Productivity Commission confirmed that Australian regions continue to benefit substantially from the resources sector in its report *Transitioning Regional Economies*.³ The Commission refuted conjecture the Australian economy is transitioning away from mining and notes that the large resource base of many resource regions, combined with the expansion of capacity generated during the mining investment boom, is likely to provide economic and employment opportunities for decades to come.

The mining industry workforce has benefitted from the substantial investments made over the past decade that have expanded the industry's capital stock. The net capital stock of the mining industry has increased by 502 per cent since 2000-01 and totalled \$876 billion in 2016-17. Over the same period industry average weekly earnings increased 93 per cent to \$2,659 – the highest of any industry in Australia and 66 per cent higher than the average for other industries.

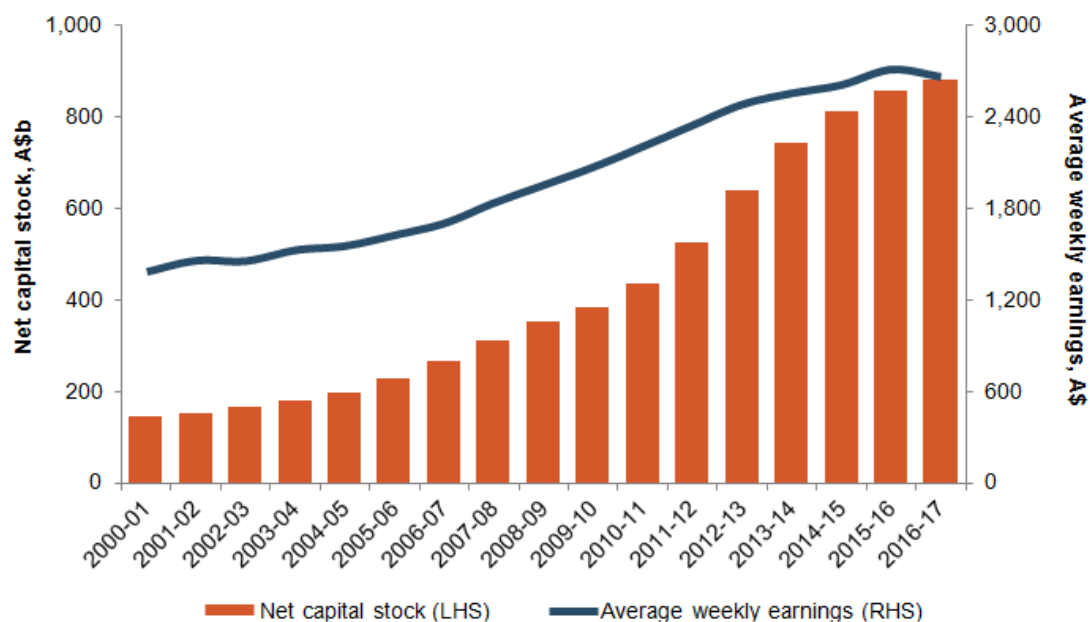
However, as shown in Chart 2, growth in the mining industry's capital stock has slowed in recent years and average weekly earnings consequently declined in 2016-17. Government policies must address the range of factors that are holding back further investment in mining in order to support growth in employment and higher wages.

¹ Australian Bureau of Statistics, [Labour Force, Australia, Detailed, Quarterly, Nov 2017](#), ABS cat no. 6291.055.003

² Deloitte Access Economics, [Mining and METS: engines of economic growth and prosperity for Australians](#), 29 March 2017.

³ Productivity Commission, [Transitioning Regional Economies: Initial Report](#), 20 April 2017.

Chart 2: Australia’s exports of goods and services (shares of total)



Source: Australian Bureau of Statistics; [Cat No. 5204 Australian System of National Accounts](#), [Cat No. 6302 Average Weekly Earnings, Australia](#)

While global demand for resources has grown, and is expected to continue growing in the long term, so has global supply of all key mineral and energy resources. The price of most commodities peaked in or before 2012 and experienced a prolonged downwards trend thereafter to increased competition in commodity markets associated with new sources of supply coming online. The Australian mining industry is not immune from this increased competition with several mining operations have closed or curtailed production in response to lower prices. These production cuts have been part of the global supply response that is now supporting a moderate rebound in commodity prices.

Higher prices cannot be grounds for complacency. Australian mining companies continue to face strong competition from new emerging mining regions in Africa and South America in both commodity supply and competition for funding from capital markets. As global competition rises, government policies must reset to support Australian companies in their efforts to increase productivity and cut costs.

Innovation underpins Australia’s comparative advantage in minerals

Innovation refers to a change in the method of supplying goods or services, whether through new products, new processes for producing existing products, new forms or work organisation, improved handling of material or the opening up of new markets or sources of supply.

From the perspective of firms (and the economies in which they reside) innovation is not an end in itself but a means of gaining a competitive advantage or adapting to changing market conditions. Firms that fail to keep up the pace of innovation eventually collapse under the pressure of shrinking markets or high costs.⁴

It is worth emphasising that innovation is ‘purely a matter of business behavior’, internal to the competitive process.⁵ A successful innovation policy must proceed from the fact that market competition – not government fiat – ultimately determines which new combinations of inputs become

⁴ Joseph Schumpeter, *Business Cycles: A Theoretical, Historical, and Statistical Analysis of the Capitalist Process, Volume 1*, Martino Publishers, 1939, pp. 84, 91, 94f.

⁵ Joseph Schumpeter, *Business Cycles: A Theoretical, Historical, and Statistical Analysis of the Capitalist Process, Volume 1*, Martino Publishers, 1939, p. 86.

successful innovations. The appropriate role of government is to encourage innovation across the economy, not to promote particular innovations or favoured industries.

Australia's minerals exports have risen from around one-third of Australia's total exports of goods and services in 2004-05 to 54 per cent in 2017-18.⁶ Yet it is not widely appreciated that Australia's comparative advantage in minerals is maintained and enhanced through continual innovation.

Official data suggest that the mining sector spends nearly \$3 billion on R&D annually, or nearly \$1 in \$6 of all business R&D spending in Australia.⁷ Similarly, expenditure on minerals exploration – an operating expense analogous to market research – was \$1.7 billion in 2016-17.⁸

The Australian minerals industry is a world leader in developing and adopting transformative technology – from the commercialisation of the 'froth flotation' process for minerals recovery in the 1860s in Broken Hill to the introduction of remote-controlled trucks for moving iron ore in the Pilbara in the 2000s. As the Department of Industry, Innovation and Science points out:

Australia's innovation and economic performance of the past decade has been dominated by the mining sector, which has ... exploited its comparative advantage to generate enormous growth in investment, output and exports.⁹

Similarly, the CSIRO notes that: 'Innovation has been instrumental in the development of energy and minerals resources'.¹⁰

The mining sector is a prolific inventor and developer of specialised technologies, with a total of 6539 Australian mining inventions filed for patent between 1994 and 2011 by operating miners, the Mining Equipment, Technology and Services (METS) sector, and publicly funded entities like CSIRO. Australian mining technology is exported globally, with patent filings overseas showing major markets include the United States, Canada, China, Japan, Europe, Russia, Brazil and Mexico.¹¹ The Australian Government's newly established METS and National Energy Resources Australia Growth Centres will add further innovative capacity to Australian mining.

To maintain this level of invention the mining sector recognises the limitations of the 'invent-it-ourselves' model and regularly connects with high growth start-ups across Australia.¹² These agile teams offer mining companies cutting-edge technologies or answers to complex business problems not readily available within the industry. Government analysis shows mining accounts for the largest industry share of micro start-up businesses and has been one of the largest contributors to job creation by these businesses over the past decade or so (chart 3).¹³

⁶ Department of Industry, Innovation and Science, [Resources and Energy Quarterly publication series](#).

⁷ Australian Bureau of Statistics, [Research and Experimental Development, Businesses, Australia, 2013-14](#), catalogue number 8104.0, ABS, released on 4 September 2015.

⁸ Australian Bureau of Statistics, [Minerals and Petroleum Exploration, Australia, September 2017](#), ABS, released on 4 December 2017.

⁹ Department of Industry, Innovation and Science, [Australian Innovation System Report](#), 2015, p.11.

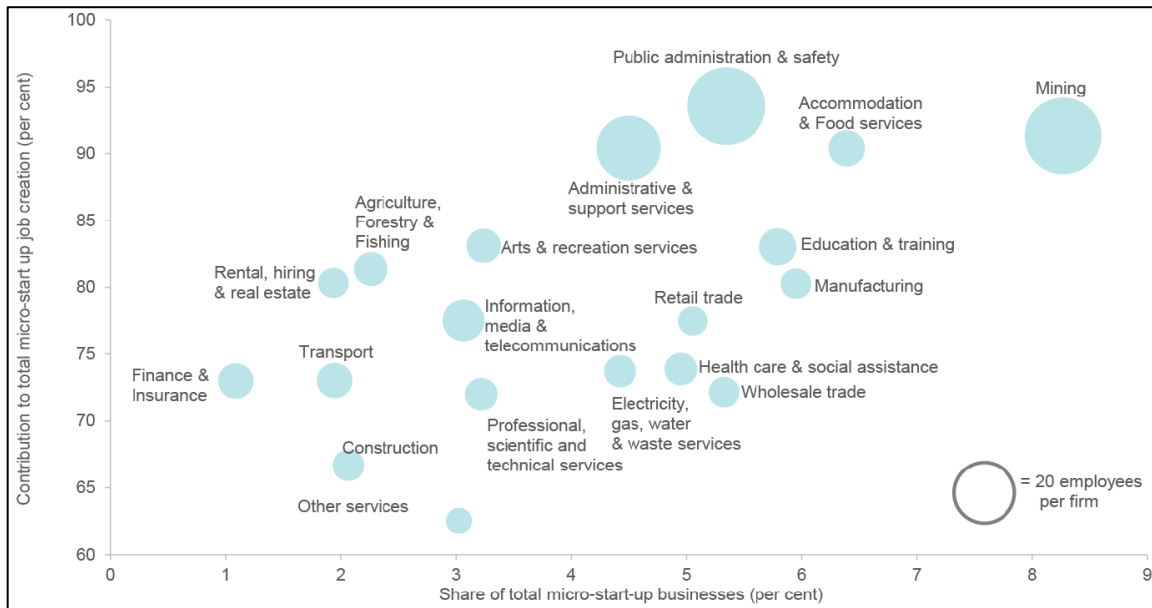
¹⁰ CSIRO, [Unlocking Australia's resource potential](#), 2015, p.4.

¹¹ Emma Francis, [The Australian Mining Industry: More than Just Shovels and Being the Lucky Country](#), IP Australia, 2 June 2015, pp. 6, 22, 30.

¹² Larry Huston and Nabil Sakkab, [Connect and Develop: Inside Procter and Gamble's New Model for Innovation](#), Harvard Business Review, Vol. 84, No. 3, March 2006.

¹³ Luke Hendrickson, Innovation Research, Department of Industry, Innovation and Science, [Where does employment growth come from?](#) Presentation to the Industry Innovation Workshop 2015, 15 September 2015, p. 8.

Chart 3: High-growth start-ups: industry shares and contributions to job creation



Source: Department of Industry, Innovation and Science

A high level of innovation in the sector has traditionally been the means by which the mining industry has sought to overcome so-called ‘depletion effects’. These effects include the natural depletion of resource deposits, increased effort required to process saleable ores from extracted material, the adoption of more complex methods of extraction in expanded mines and the extraction of deposits that are further away or deeper in the ground.

In a survey of MCA member companies, 70 per cent of respondents cited ‘R&D and adoption of new technologies’ as important or very important to achieving future improvements in productivity. This has a significant impact in the skills and capabilities which the industry requires into the future which will impact on the current and future workforce.

3. AUSTRALIA'S MINERALS WORKFORCE TODAY AND TOMORROW

- The Australian minerals industry employs around 218,000 people – many in regional areas – in high-value, high-wage, high-skilled jobs with the highest national average weekly earnings of \$2,659 per week.
- The pace of innovation and technological change within the industry is changing workforce needs at speed requiring new approaches to skilling and educating the future minerals workforce.

A highly skilled, high wage workforce

Mining in Australia is a sophisticated and technologically advanced enterprise that requires a highly skilled and adaptable workforce. The Australian resources sector employs around 218,000 people in high-value, high-wage, high-skilled jobs, mostly in remote and regional Australia. Average weekly earnings (full-time adult) in the resources sector are \$2,659 per week, more than 66 per cent higher than the national average of \$1,606 per week.¹⁴

Australia's resources workforce covers a range of scientific fields and professional occupations. The resources sector is the largest total employer of:

- Mining engineers (10,530)
- Geologists and geophysicists (6,470)
- Industrial, mechanical and production engineers (10,400)
- Production managers (6,600)
- Metallurgists and physicists (2,700).¹⁵

Mining is also the third-biggest employer of environmental scientists, employing more than 13,600 directly and indirectly.¹⁶

Technological innovation will continue to change the nature of work in mining and therefore skills requirements. In some parts of the industry, increasing automation of mining and logistics is moving workers from mine sites to remote operational centres. Not only does this innovation move workers from mine sites to safer environments, it also requires them to enhance their skills. As BAEconomics explains:

While robots used in other industrial processes generally remain stationary and perform tasks on products or components conveyed to them, mining and logistics robots must move around, often in complex environments. Automated technologies are therefore only made possible by increased computing power; new algorithms for signal processing, perception and control; and new sensing technology for monitoring landscape geometry, including GPS, radar and laser systems. The requirements to develop and operate these technologies are correspondingly complex and rely on high-level interdisciplinary skills.¹⁷

¹⁴ Australian Bureau of Statistics, [Labour Force, Australia, Detailed, Quarterly, Nov 2017](#), ABS cat. no. 6291.0.55.003, released on 21 December 2017. [Average Weekly Earnings, Australia, May 2017](#), ABS cat. no. 6302.0, released on 17 August 2017.

¹⁵ Department of Employment, [Job Outlook](#); MCA calculations, viewed 16 January 2018. NB these figures are estimates of the total number of workers directly and indirectly employed by the resources sector.

¹⁶ Ibid.

¹⁷ Anna L. Matysek and Brian S. Fisher. [Productivity and Innovation in the Mining Industry](#), BAEconomics Research Report 2016.1, 8 April 2016, p. 31.

BAEconomics argues that workers who support automated processes benefit from upskilling and higher quality jobs, and points out that the alternative – retaining old labour practices – would reduce labour productivity and ultimately put jobs at risk.¹⁸

Deloitte research indicates that globally 69 per cent of mining companies are looking at introducing remote operations and monitoring centres, 29 per cent robotics and 27 per cent unmanned drones, with technologies enabling work to be moved to locations which can support a more diverse and inclusive workforce, including primary carers and people with physical disabilities.¹⁹

Deloitte further explains that shared services centres and centres of expertise will employ a mix of on-shore, off-shore and robotic workforce, with increased human-machine interaction and new and different skills with both work and equipment being redesigned. A diverse, distributed and connected workforce will consider problems and opportunities in new and unique ways, using creativity and diversity of thinking to deliver innovative solutions.²⁰

Industry's workforce of the future

The minerals industry is proactively assessing the composition of the future minerals workforce and the skills requirements considering the increasing role of automation, robotics and artificial intelligence that will see Australian mining continue to be at the forefront of innovation in the creation of new jobs.

The mining industry is an important source of employment in Western Australia, Queensland and New South Wales. Together these states account for 80 per cent of mining employment.²¹ Mining employment is also critically important to many regional and remote communities in Australia, with mining accounting for up to 50 per cent of employment in some regional centres.²²

A large proportion of the workforce is highly skilled; 63 per cent hold a Certificate III level qualification or higher, above the national average. Five per cent of the workforce is currently apprentices and trainees.²³ One in five workers also hold a bachelor degree or higher.²⁴ The level of education within the workforce reflects the importance and value of trade and professional occupations to the mining industry.

Looking ahead, the industry's future prosperity will continue to depend on a professional and semi-professional class of highly skilled and technology-literate technical experts, including operators, engineers, environmental scientists, geologists, geophysicists, mathematicians and financial officers. Various technologies are already changing the future shape of Australia's workforce (e.g. cloud, software and analytics) and are already being used by the industry.

The technology changes present opportunities for the existing workforce to upskill and take on more challenging roles. It also presents opportunities for highly skilled specialists from non-traditional occupations to use their skills in a dynamic and highly integrated workplace. As the Committee for Economic Development of Australia (CEDA) point out:

Technological change has frequently created losers, but when job losses have been caused by productivity-enhancing technologies, they have tended to create demand via higher incomes and lower prices, which have generated new jobs economy-wide.²⁵

¹⁸ *ibid.*, p. 42.

¹⁹ Deloitte. [The digital revolution – Mining starts to reinvent the future](#), February 2017.

²⁰ *ibid.*

²¹ Australian Bureau of Statistics, [Labour Force, Australia, Detailed, Quarterly, Nov 2017](#), ABS cat. no. 6291.0.55.003, released on 21 December 2017

²² Australian Workforce and Productivity Agency, *Resources sector skills needs 2013: Report to the Australian Government*, Australian Government, AWPA, Canberra, 2013.

²³ Minerals Council of Australia, [Miners at Work](#), Canberra, 2016.

²⁴ Department of Education, [Industry Outlook: Mining](#), Canberra, 2014.

²⁵ *ibid.*, p.8.

When Rio Tinto introduced driverless trucks at its Hope Downs 4 iron ore mine in 2014, it required entirely new roles, such as controllers who control and monitor the automated vehicles; pit controllers who manage how the vehicle operates on site; and specialists in communication and systems engineering (new entrants), who provide detailed fault diagnostics.²⁶ Driver labour did reduce, but more challenging and interesting roles were created for existing staff and new entrants to support the automated technology.

A Rio Tinto case study on automation and what it means for Australia's future workforce highlights the importance for students to look beyond narrowly focussed discipline streams:

As we move forwards with automation systems, we will need specialists in computing, systems and diagnosis, and the upskilling of maintenance people to service and maintain the technology. These 'employees of the future' will have good operational knowledge and detailed systems knowledge of the automated system. This will enable them to trouble shoot, conduct investigations, generate meaningful corrective actions, manage continuous improvement, and contribute to operational procedures and training materials.²⁷

The case study further points to the future skillsets that will need to successfully integrate into an automated work environment:

- A shift to more specialisation, where employees will need specialist skills in 'computing, systems and diagnostics'.
- Strong core discipline knowledge, as well as good operational knowledge, and literacy of the automation system.
- Programming and analytical skills, by which employees will validate and analyse data to increase efficiency in operations and within system behaviours.
- Engineers and scientists will require very strong technical skills across a range of areas that will help improve the operational performance in areas that include, but will not be limited to, process control, advanced mathematics and modelling, and interpersonal skills.
- Strong collaboration and interpersonal skills.²⁸

The Australian minerals industry's latest advertisement as part of the *Making the Future Possible* campaign, promotes its use of innovation including drone technology.²⁹ The advertisement showcases the role of drones as used by Rio Tinto and how these are being utilised to contribute to the minerals sector's environmental, social safety and productivity performance including:

- conducting site environmental surveys and monitoring impacts on wildlife such as turtle nesting sites
- improving road safety by monitoring traffic, road conditions and hazards and inspecting overhead cranes, towers and roofs of tall buildings to avoid working at height
- making it faster to gather more information about mine sites, saving millions of dollars when compared with using planes for survey work
- mapping and digitally recording areas of Indigenous cultural heritage.

Australia's higher education sector together with modernised workplace relations will play a vital role in ensuring the future workforce is equipped with the necessary skills for the mining jobs of the future.

²⁶ Michael Gollschewski, 'Case study: Automation and Australia's future workforce', in CEDA (Eds) [Australia's future workforce?](#), Melbourne, 2015, p. 73.

²⁷ Michael Gollschewski, 'Case study: Automation and Australia's future workforce', in CEDA (Eds) [Australia's future workforce?](#), Melbourne, 2015, p. 71.

²⁸ *ibid*, pp.70-72.

²⁹ Minerals Council of Australia, [Making the Future Possible](#), Canberra, 12 January 2018.

4. INDUSTRY INVESTMENT IN EDUCATION AND TRAINING

- The minerals industry supports sensible higher education reform that combines fee deregulation with strong safeguards to protect the viability of minerals-related disciplines. Safeguards should include stronger accountability mechanisms to ensure increased university fee revenue is devoted to teaching and student services.
- The government should adopt the Productivity Commission's recommendation of focusing on skills formation to develop an open, high quality education system for the future workforce.
- Labour mobility is essential to existing operations and new projects in the mining industry. Government should consider the effectiveness of the recent changes to the temporary skilled migration scheme to age limits and the skilled occupations lists.

Leveraging investment in higher education and training

The Australian minerals industry spends more on training per employee than most industry sectors (5.5 per cent of payroll).³⁰ The industry is also a strong user of the vocational education and training system. In 2017, 30 per cent of mining employers used accredited training (the third largest user) and 60.5 per cent of mining employers used non-accredited training (the fourth largest).³¹

In 2017 mining employers reported a 70.3 per cent satisfaction rating that accredited training was meeting their skills needs with a 97 per cent satisfaction rating for non-accredited. This shows a discrepancy in industry confidence that accredited training is responsive and industry-led to provide its skilling needs.

In addition, the minerals industry makes a significant financial contribution to Australia's higher education sector to ensure a high quality supply of Australian graduates. Through the Minerals Tertiary Education Council (MTEC), the MCA supports collaborative initiatives at 17 universities across Australia.

Through MTEC MCA members have invested more than \$50 million of unencumbered funds over the past decade in these programs, benefiting more than 4,500 graduates. Companies also provide paid vacation work and structured practical experience for undergraduate students, and award professorial chairs to leaders in industry-relevant research. A survey of four MCA members revealed that in 2013-14 \$16.1 million was directly invested in supporting universities in addition to contributions through MTEC.

However the minerals industry is concerned about the marked decline in participation in science, mathematics, engineering and technology (STEM) subjects in schools over the past decade. In response, the industry has created a national portal for high quality teaching materials on minerals-related topics.³² The future minerals workforce depends on young Australians participating in STEM. The MCA, through its 2014 *Gender Diversity White Paper* strategy, developed targeted and industry-appropriate initiatives to increase the number of women in the workforce (currently approximately 13 per cent) in order to deliver both skills and diversity benefits.³³

³⁰ NCVER, [Training and education activity in the minerals sector](#), 20 March 2013.

³¹ NCVER, [Employers' Use and Views of the Vocational Education and Training \(VET\) System](#), 26 October 2017.

³² See [Oresome Resources](#), viewed on 19 January 2018.

³³ Minerals Council of Australia, [Gender Diversity White Paper](#), MCA, March 2014.

Future minerals workforce

The Productivity Commission rightly identifies skills formation as a Government priority because technology adoption, use and diffusion (the long-run drivers of productivity) require people with the right skills.³⁴

There is additional value in improving skills formation from foundational to advanced as it supports better job security, income and job satisfaction. These effects are not well measured in the official statistics, but have major implications for prosperity and quality of life more broadly. The Productivity Commission confirms that

...the current skills system has fractures that put at risk its capacity to deal with the future labour market changes. There are deteriorating results among school students. The VET system is in a mess, and is struggling to deliver relevant competency-based qualifications sought by industry. Leading segments of the university sector are more focused on producing research than improving student outcomes through higher-quality teaching.

The minerals industry is actively engaged in considering the future minerals workforce and the skills requirements considering the increasing role of automation, robotics and artificial intelligence that will see Australian mining continue to be at the forefront of innovation. Central to this work is the development of a sector capability framework identifying priority areas for skilling and upskilling related to technological advances to ready the current and future workforce for these opportunities.

Accordingly, the industry supports the recommendations of the Productivity Commission for reform across the Australian education system to meet future workforce requirements for the industry and Australia. These reforms support skills formation linked to an open, high quality education system to prepare people with the right skills for technology adoption, use and diffusion.³⁵

Structural weaknesses in higher education resurfacing

Australia is a world leader in minerals higher education. Australia's minerals education system has morphed from a system on the brink in 2000 to a unique, innovative and powerful model of collaboration with industry that produces world-class graduates.

In February 1998 the Minerals Council of Australia (MCA) commissioned a major report into the state of minerals higher education in Australia. The report, 'Back from the Brink – Reshaping Minerals Tertiary Education' identified a system beleaguered by acute shortages of talented academic staff, small student numbers and high relative costs, and under-resourcing of minerals departments.³⁶ In the wake of a then industry downturn and resultant rationalisation of minerals-related programs, the report warned of an impending crisis facing the minerals industry due to the tertiary education system's incapacity to meet future skills needs.

In response the MCA established the MTEC in 2000 to oversee the investment of direct funding from MCA member companies to partner universities involved in mining engineering, metallurgy and minerals geoscience. Industry, through MTEC, is able to ensure that courses and graduates meet current and emerging industry requirements. Additionally, students have the potential for direct exposure to work-based learning opportunities, and companies have access to a pool of industry-ready graduates.³⁷ However, the future innovative minerals workforce is under threat.

The underlying structural weaknesses in minerals tertiary education, identified in '*Back from the Brink*', have resurfaced as major concerns within industry and in university minerals departments and schools.

³⁴ Productivity Commission, [Shifting the Dial: 5 Year Productivity Review](#), Report No. 84, Canberra, 3 August 2017, p. 83-84.

³⁵ Productivity Commission, [Shifting the Dial: 5 Year Productivity Review](#), Report No. 84, Canberra, 3 August 2017, p. 82.

³⁶ Minerals Council of Australia, [Back from the Brink: Reshaping Minerals Tertiary Education](#), MCA, Canberra, 1998.

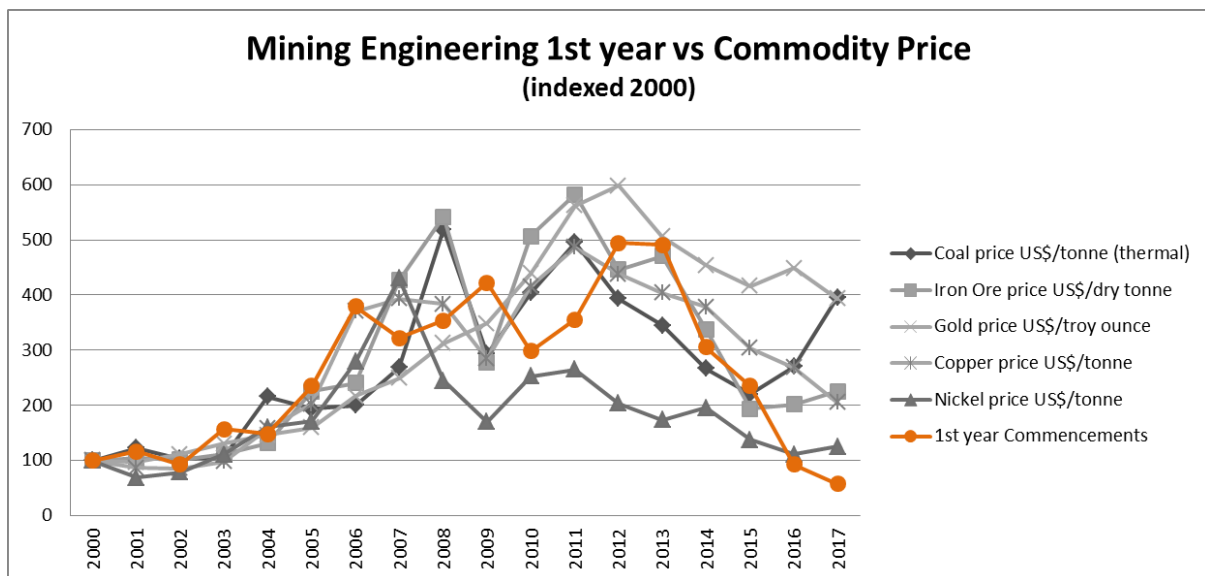
³⁷ Peter Noonan, [Review of the Minerals Tertiary Education Council](#). Report to the Minerals Council of Australia, Melbourne, 2015.

Minerals higher education in Australia experienced strong growth in enrolments across minerals-related disciplines from 2004 to 2012, as a result of the unprecedented growth within Australia's minerals industry. Since 2012, as the industry has transitioned from the construction to production phase, such demand contracted.

Decline in labour demand was exacerbated by falls in commodity prices in recent times, which in turn has impacted on the pipeline of new professionals in the key disciplines of mining engineering, metallurgy and minerals geoscience. Undergraduate intakes for most minerals higher education disciplines in Australia have experienced notable declines.

Mining engineering graduates, for example, lag the economic cycle by four years (the length of the degree). As chart 4 reveals, there is a strong causal link between commodity prices and mining engineering commencements. The number of students commencing mining programs across Australia in 2017 show that enrolments continue a drastic downward trend to levels below those last seen in 2000. There is a genuine threat of program closure because of critically low enrolment levels in programs, which are also traditionally high cost to universities to run.

Chart 4: First year mining engineering commencements versus commodity prices (indexed 2000)



Source: MCA

The supply-side paradox has been described by then Executive Director of Mining Education Australia, Professor Peter Dowd in 2015:

The inability to sustain the tertiary mining engineering skills base through periods of slower economic activity has wider repercussions in the industry. In times of rapid expansion, such as the period 2003-2012, skills shortages fuel wage inflation, which, in turn significantly reduces productivity. The supply of these skills from the university sector cannot be turned off and on at will; when a degree programme becomes financially unviable at an institution, because of sustained low enrolments, the supply of graduates is turned off by closing the programme and it cannot be turned on again.³⁸

To highlight Professor Dowd's cautionary note, at one of the MEA universities, which has traditionally been a strong supplier of four-year trained engineers to the industry, first-year preferences in 2017 fell to just five (a 2240 per cent decrease from a high of 117 in 2013). Minerals schools and departments

³⁸ Information provided by Mining Education Australia (MEA) to the MCA, April 2015.

must also now compete for resources within and between universities in an increasingly competitive environment as a result of the introduction of the demand driven system in 2012.

Capacity to meet future professional skills

The readjustment by many mining companies post 2012 has resulted in a reduction of current and projected labour demand across mining disciplines and occupations.³⁹

An analysis of government labour demand data and MCA projected enrolments into minerals higher education programs suggests the decline in labour supply (enrolments in mining-related tertiary disciplines) will outpace future labour demand in critical technical areas, creating potential skilling issues downstream.⁴⁰ For mining engineering the moving average trend for university completions from 2017 to 2020 is expected to decline by 81 per cent.⁴¹ In the same period, labour demand is expected to decline by only 13 per cent.⁴²

Ensuring the sustainable supply of graduates with the required skills is critical to the current and future prosperity to the minerals industry. The minerals industry will continue to require a broad base of talented professionals as the nature of work changes and is concerned at the dramatic reduction of commencements into mining engineering degrees at Australian universities in recent years. The MCA, through MTEC, remains committed to national collaborative programs in mining engineering, metallurgy and minerals geoscience, which continue to deliver an important pipeline of skilled professionals to the industry.

For minerals higher education to continue to meet the skills the industry needs now and into the future, and avoid a scenario where the sector falls back to the brink, further reforms to higher education funding is urgently needed. The Australian Government should continue to address the structural weaknesses within the minerals higher education sector through reforms that ensure strong safeguards to secure the viability of traditionally low student enrolment and high cost to universities (including minerals-related disciplines) to ensure that Australian's have access to meaningful education opportunities to participate in the future minerals workforce. Safeguards should include stronger accountability mechanisms to ensure increased university fee revenue is devoted to teaching and student services.

Labour mobility and skilled migration

Mining companies have a preference for hiring locally as to support host communities and as it more cost effective. However, skilled labour needs cannot always be met by local workforces, particularly in regional and remote Australia. The remote location of Australian mining operations makes fly-in, fly-out (FIFO) and drive-in, drive-out (DIDO) arrangements a necessary and desirable option for many producers and their employees.

The Reserve Bank of Australia found that long-distance commuters 'helped employers meet labour demand requirements given the reluctance of workers to move permanently to remote areas.'⁴³ This finding was reiterated by the Productivity Commission and the National Centre for Vocational Education Research.⁴⁴ The evidence does not support claims about the negative impact of mining

³⁹ Department of Employment, *Employment Projections*, 2015.

⁴⁰ Minerals Council of Australia, [Supplementary information for review of the 2016-17 Skilled Occupation List – Mining](#), MCA, Canberra, 2015.

⁴¹ Estimated from various MEA reports analysed December 2017.

⁴² Department of Employment, *Employment Projections 2015*. Provided by Skilled Occupation List (SOL) Team during 2016-17 SOL Stakeholder Consultations.

⁴³ See Reserve Bank of Australia Bulletin, [Labour Market Turnover and Mobility](#), December Quarter 2012, p. 9.

⁴⁴ Productivity Commission, [Geographic Labour Mobility](#), April 2014; National Centre for Vocational Education Research, [An exploration of labour mobility in mining and construction: who moves and why](#), 23 June 2014.

growth in regional areas. Far from restricting opportunities, the mining industry has boosted incomes, attracted families and reduced unemployment in mining regions.⁴⁵

The minerals industry employs approximately 1 per cent of its workforce through temporary skilled migration, accounting for only 2 per cent of all temporary skilled workers. Over 90 per cent of these are professionals, managers and technical trades.⁴⁶ An effective temporary skilled migration program is a vital component of meeting the skills needs of the sector, including in securing future skills and capabilities to continue driving the sector's innovation and competitiveness. Accordingly, the industry remains concerned with some aspects of the changes to the temporary skilled migration scheme on 18 April 2017 and subsequently revised on 1 July 2017.⁴⁷ Concerns include:

- The arbitrary upper age limit of 45 years (or 50 years in some cases) prevents knowledge experts, senior managers and leaders (including chief executives) from taking up key positions to aid Australia's competitive advantage in the sector
- Providing certainty to both visa sponsors and approved temporary skilled visa holders of their longer term prospects when the associated occupations move on, off, between and/or off both the Medium and Long-term Strategic Skills List (MLTSSL) and the Short-term Skilled Occupation List (STSOL)
- The *Skilling Australia Fund*, to be wholly funded from a levy per temporary skilled migrant, should be allocated proportionally to each industry to support skilling and upskilling for that and ancillary industries.

⁴⁵ See KPMG, [Analysis of the Long Distance Commuter Workforce Across Australia](#), report commissioned by the Minerals Council of Australia, March 2013; KPMG, [Analysis of the Changing Resident Demographic Profile of Australia's Mining Communities](#), report commissioned by the Minerals Council of Australia, February 2013.

⁴⁶ Department of Immigration and Border Protection, [Subclass 457 Quarterly Report 31 March 2017](#).

⁴⁷ Department of Immigration and Border Protection, [1 July changes to skilled visa programs](#).

5. WORKPLACE RELATIONS REFORMS

- Modernised workplaces are vital to the competitiveness of Australia's mining industry, including integrating new technologies and ideas into its operations.
- The MCA broadly supports the Productivity Commission workplace reforms agenda in support of productivity and innovation including confining permitted content in enterprise agreements to direct employment matters and reforming greenfields agreements to encourage investment in new projects.

The objective of workplace relations policy

The ultimate objective of sound workplace relations policy should be to foster the success of high-productivity enterprises accompanied by high wages and expanding employment opportunities. Labour market flexibility is essential to achieving this outcome. Arrangements that limit flexibility in management and work practices hinder productivity growth, employment (especially of area of future skills needs) and the ability to adapt to changing market conditions.

An ability to modernise workplaces is vital to the competitiveness of Australia's mining industry, which is increasingly focused on integrating new technology and ideas into its operations. Information and communications technology (ICT) is important in all stages of mining – especially exploration, three-dimensional seismic surveys and automation – with mining investment in ICT is expected to multiply rapidly.⁴⁸

But existing workplace relations law locks in poor practice that discourages investment and hinders productivity and innovation. Without reform, productivity and competitiveness will differ from the retention of archaic work practices and declining labour productivity, resulting in lower wages and fewer jobs. The Productivity Commission proposed a suite of detailed reforms in 2015, which it has since estimated would add \$850 million a year to the Australian economy.⁴⁹

The MCA broadly supports the Productivity Commission's workplace relations reform agenda and recommends the following as urgent priorities.

Confining permitted content in enterprise agreements to direct employment matters

The Fair Work Act has expanded the scope of permitted content in enterprise agreements well beyond the relationship between an employer and employees (Box 1). The MCA recommends:

- Removing the availability of protected industrial action over business decisions and confining the content of enterprise bargaining to direct employment matters by:
 - Amending the phrase 'matters pertaining to' the relationship between an employer and employees in section 172 of the *Fair Work Act 2009* to 'matters directly related to'
 - Amending section 194 of the Fair Work Act to include an express prohibition on enterprise agreement terms that unreasonably interfere with legitimate business decisions or restrict an employer's capacity to choose an employment mix suited to its business
 - Removing matters pertaining to the relationship between an employer and a trade union from the range of permitted matters in enterprise agreements under section 172 of the Fair Work Act

⁴⁸ Anna L. Matysek and Brian S. Fisher. [Productivity and Innovation in the Mining Industry](#), BAEconomics Research Report 2016.1, 8 April 2016, pp. iv, 12f, 41.

⁴⁹ Productivity Commission, [Shifting the Dial: 5 Year Productivity Review](#), Report No. 84, Canberra, 3 August 2017, released on 24 October 2017, p. 233.

- Amending section 409 of the Fair Work Act to delete the inclusion of a 'reasonable belief' that a claim in relation to an agreement is about a permitted matter.⁵⁰

Box 1: The undue scope of permitted matters in agreements is hindering workplace efficiency

The Fair Work Act expanded the range of permitted content in enterprise agreements from 'matters relating to' the employment relationship to 'matters pertaining to' the employment relationship – including matters pertaining to employers and trade unions.

Consequently, more content must be bargained over, more issues can form the basis of protected industrial action, and more content is then able to be included in enterprise agreements which may then be subject to dispute resolution procedures under those agreements.

In the mining industry, it is not uncommon to see clauses in enterprise agreements that restrict the fundamental right of an employer to manage its own business, or which have little to do with the employer-employee relationship. For example, these clauses can require employers to:

- Consult with unions on changes to regular rosters or ordinary hours of work
- Restrict retrenchment to a 'last-in, first-out' policy
- Restrict or prohibit the use of contractors or labour hire workers
- Provide employee representatives with the names and commencement dates of new employees
- Provide paid leave for employees to attend to union business.

The MCA supports removing the availability of protected industrial action for matters not directly related to the employment relationship. This would improve workplace efficiency by ensuring that:

- Negotiations are not stifled by claims that constrain an employer's ability to manage the workforce and work flow
- The bargaining process has a clear employment focus and protected industrial action cannot be misused for ulterior purposes.⁵¹

Refocusing adverse action provisions to discourage unreasonable claims

The Fair Work Act prohibits a wide range of conduct known as 'adverse action'. Adverse action provisions were intended to protect freedom of association and prevent discrimination in the workplace. However, they are being used to interfere with ordinary management decision-making, including performance management and organisational restructuring. This problem has emerged owing to the breadth of actions described as adverse, the broad spectrum of protections related to industrial activity, the onus on the employer to prove that adverse action has not occurred, and the uncapped nature of potential compensation.

The MCA recommends:

- Making provision for exclusions for legitimate operational and investment decisions

⁵⁰ Minerals Council of Australia, [Australia's workplace relations framework: The case for reform](#), MCA, 8 August 2017, pp. 25-28; cf. the Productivity Commission, [Workplace Relations Framework: Inquiry Report, Volume 2](#), Canberra, 21 December 2015, pp. 683, 820.

⁵¹ Minerals Council of Australia, [Australia's workplace relations framework: The case for reform](#), MCA, 8 August 2017, pp.25-28.

- Reinstating the sole or dominant purpose test to determine whether a contravention has occurred
- Discouraging unmeritorious claims by allowing cost orders to follow the result of the case
- Codifying the High Court's approach in *CFMEU v BHP Coal Pty Ltd (2014) 253 CLR 243* to confirm that just because adverse action is connected with industrial activity, it does not mean that the adverse action occurred because of the industrial activity.⁵²

Rebalancing union right-of-entry provisions

The rules for exercising workplace right of entry for union officials are rigid and allow for undue interference and disruption. Currently, a permit holder may enter a workplace even if his or her union is not party to an award or enterprise agreement which applies to employees at the premises. The workplace need only contain workers who are eligible to become members under the union's rules.

BHP's former Worsley alumina refinery had more than 550 right-of-entry visits between 2011 and 2013.⁵³ Another MCA member was subject to 257 visits between January 2015 and June 2016.

The MCA recommends:

- Rebalancing union right-of-entry provisions by anchoring right of entry provisions in the need to allow employees access to their representatives (rather than a right of unions to advance their interests)
- Addressing any continuing operational issues over frequency of entry by:
 - Removing the requirement for there to be 'an unreasonable diversion of the occupier's critical resources' in order for the Fair Work Commission (FWC) to make orders regarding the frequency of entry
 - Requiring the FWC to take account of the cumulative impact on an employer's operations, the likely benefit to employees of further entries and the reason for the frequency of the entries in making orders regarding frequency of entry.⁵⁴

Reforming greenfields agreements to encourage investment in new projects

Capital-intensive industries such as mining make large, decades-long investment decisions, which entail complex construction projects and long lead times before cash flows are generated. A degree of certainty about the industrial environment – including employment conditions – over the life of construction project is vital to providing investors with confidence and making Australia an attractive destination for new capital investment.

Under the current regulatory framework, a greenfields agreement can only be made prior to project commencement, with one or more relevant unions. This effectively gives trade unions a right of veto over negotiations for major projects, and can stop or significantly delay the agreement-making process and lead to higher labour costs at the outset of an agreement.

The MCA recommends that:

⁵² Minerals Council of Australia, op. cit., p. 28ff; cf. the Productivity Commission, op. cit., p. 622ff.

⁵³ Dean Dalla Valle, then President of Coal, BHP Billiton, 'Right to enter must not cut productivity', *The Australian*, 28 November 2014.

⁵⁴ Minerals Council of Australia, *Australia's workplace relations framework: The case for reform*, MCA, 8 August 2017, p. 32f; cf. the Productivity Commission, *Workplace Relations Framework: Inquiry Report, Volume 2*, Canberra, 21 December 2015, p. 910.

- The Fair Work Commission should adopt a simpler test in approving a greenfields agreement under which the terms are at least at the level of similar work performed at another enterprise covered by an enterprise agreement
- There should be capacity for employers to enter into 'life of project' greenfields agreements, or at least agreements with a duration of up to and including five years according to operational needs.⁵⁵

Allowing high-income earners to enter into individual agreements

Economic and social developments continue to transform the nature of work, the composition of the workforce, when and where work is performed, and what incentives are required to secure an engaged and adaptable workforce. These changes underline why employers and employees are demanding greater choice and flexibility in the world of work.

The limited options for agreement making available under the Fair Work Act restrict an employer's ability to respond to changing environments or to address individual employees' personal circumstances and requirements. The architects of the Fair Work Act envisaged that Individual Flexibility Arrangements (IFAs) would provide the dynamism necessary for modern and competitive workplaces. However, the benefits of IFAs have proved to be largely illusory, owing to unions' opposition to flexibility on key matters such as hours of work, rostering and overtime.

Individual agreements have been used extensively in the mining industry for more than two decades. They have facilitated flexible and productive work practices while also providing attractive salaries and working conditions for the industry's changing workforce. Indeed, employees on individual arrangements have consistently received higher remuneration than those on collective agreements.

MCA member companies respect the right of a group of employees to be represented by a union in a bargaining context where the employees wish to do so. Equally, a modern workplace relations framework should accommodate a form of individual agreement, backed by a strong safety net, which allows an employee to agree to employment arrangements directly with his or her employer. The safety net can be managed through the National Employment Standards and modern awards.

The MCA recommends that there should be greater capacity for employees who are earning over a particular threshold (such as the existing high income threshold for unfair dismissals) to opt out of an enterprise agreement and enter into individual agreements.⁵⁶

⁵⁵ Minerals Council of Australia, [Australia's workplace relations framework: The case for reform](#), MCA, 8 August 2017, p. 34f; Productivity Commission, [Workplace Relations Framework: Inquiry Report, Volume 2](#), Canberra, 21 December 2015, p. 691.

⁵⁶ Minerals Council of Australia, [Australia's workplace relations framework: The case for reform](#), MCA, 8 August 2017, p. 32f

6. CHALLENGES IN PREPARING THE FUTURE MINERALS WORKFORCE

The pace of technological change within Australia's minerals industry is already apparent. Technologies such as automation and big data are presently being used across the value chain to increase productivity and reduce risk. These technologies are changing how companies mine, and the skills needed to work in this new environment. The industry also recognises that the pace of innovation within the industry is changing workforce needs at speed, and this presents opportunities and challenges for the minerals education sector.

An education system requiring reforms that support skills formation linked to an open, high quality education system to prepare people with the right skills for technology adoption, use and diffusion is required for Australians to meaningfully acquire capabilities and skills in the future minerals industry.

Additionally, workplace relations reforms that modernise workplaces and embrace innovation and changing work practices as a result of technology, are vital to the competitiveness of the Australian mining industry.