MINERALS COUNCIL OF AUSTRALIA

SUBMISSION TO THE AUSTRALIAN GOVERNMENT DISCUSSION PAPER: DRIVING INNOVATION, FAIRNESS AND EXCELLENCE IN AUSTRALIAN HIGHER EDUCATION

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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXECUTIVE SUMMARY</td>
<td>1</td>
</tr>
<tr>
<td>AUSTRALIA'S MINERALS WORKFORCE</td>
<td>2</td>
</tr>
<tr>
<td>MINERALS HIGHER EDUCATION IN AUSTRALIA: STATE OF PLAY</td>
<td>4</td>
</tr>
<tr>
<td>HIGHER EDUCATION AND INSTITUTIONAL REFORMS</td>
<td>8</td>
</tr>
<tr>
<td>CONCLUSION</td>
<td>10</td>
</tr>
</tbody>
</table>
EXECUTIVE SUMMARY

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.

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.

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 continue to provide future graduates in sufficient numbers and with the skills the minerals industry will need in the decades to come.

The MCA welcomes the opportunity to respond to the Australian Government’s Driving Innovation, Fairness and Excellence in Australian Higher Education discussion paper, in which the MCA draws attention to the unique situation facing minerals-related higher education programs.

The Australian Government should urgently address the structural weaknesses emerging within the minerals higher education sector and cyclical low student enrolments with sensible higher education reforms that combine fee deregulation with safeguards to ensure the viability of vital minerals-related disciplines.

The MCA maintains that certain disciplines characterised by cyclical (and usually low) student enrolments (such as mining engineering, metallurgy and minerals geoscience) should be deemed disciplines of national interest and receive enhanced government funding.

The Australian Government should also consider the successful Minerals Education Tertiary Council (MTEC) as an exemplar of how flagship courses might operate on an industry-led, nationally collaborative basis.
AUSTRALIA’S MINERALS WORKFORCE

Mining relies on a highly skilled workforce, which allows it to innovate readily (see Box 1).

The Australian minerals industry employs a diverse professional workforce, including engineers, environmental scientists, geologists, geophysicists, mathematicians and financial professionals. The industry directly employs approximately 200,000 people, representing 1.6 per cent of the national workforce. Approximately the same number work in the professional services sectors related to the mining industry (including in the mining equipment, technology and services – METS – sector). One in five employees in the industry holds a bachelor’s degree or higher and the share of mining workers with certificate III/IV level qualifications is above the all-industries average.

Box 1: Key minerals workforce facts

- The industry employs 200,000 high skilled, high paid professionals and tradespeople, which is more than double what it was before the boom and almost triple what it was in 2000
- More than 60 per cent of Australia’s mining jobs are in regional and remote areas. In some regional centres mining accounts for 50 per cent of total employment
- Indigenous Australians comprise 6 per cent of the minerals workforce, up from 0.5 per cent two decades ago
- Women make up 13 per cent of the minerals workforce, up from 9 per cent in 1999
- More than 43 per cent of the minerals workforce is between the ages of 25 to 39, compared with 35 per cent of the all-industries average
- The average full-time weekly pay in the minerals sector is $2,610 which is 67 per cent higher than the all-industries average
- The gross value to the economy per person employed in mining is $682,000, substantially higher than any other industry
- The minerals industry provides diverse and ongoing training opportunities for its workforce. In 2011-2012 it spent $1.15 billion, or 5.5 per cent of total payroll
- Apprentices make up 3.9 per cent of the mining workforce compared to the all-industries average of 2.5 per cent
- Two-thirds of the minerals workforce hold a certificate III qualification or higher, compared to the all-industries average of 58 per cent
- The industry is the largest employer of mining engineers, geologists and geophysicists and the third largest employers of environmental scientists, chemical engineers and surveyors.

Through most of the past decade skills shortages were concentrated among experienced professionals such as engineers (particularly mining engineers), geoscientists, project managers, as well experienced tradespeople and operators. These skills gaps have narrowed as the construction phase has tapered off and commodity price falls have necessitated a rationalisation of operational labour forces. Most forecasters predict a continuing weaker skilled demand in the next few years. Despite this, industry will continue to seek specialist skills as it continues to unlock new resources, boost productivity, protect the environment, enhance worker safety and generate additional value for the wider community.

Notwithstanding cyclical activity, continued innovation is needed to ensure Australia’s long-term comparative advantage in mining is maintained. Mining is a central part of Australia’s ‘start-up’ economy, with research showing that over the last decade a higher share of mining start-ups went on to grow and

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1 Minerals Council of Australia, Miners at Work, Canberra, June 2016.
4 Chamber of Minerals and Energy of Western Australia, 2015-2025 Western Australian Resources Outlook, Perth, 2014.
flourish than in any other sector, in turn generating large numbers of high-wage, high-skill jobs. The mining sector spends nearly $3 billion on research and development (R&D) annually – nearly $1 in $6 of all business R&D spending in Australia. The mining sector is a prolific inventor and developer of specialised technologies, with 6539 Australian mining invention patents filed for between 1994 and 2011 by operating miners, the METS sector, and publicly funded entities like CSIRO.  

The industry will require a broad range of professionals to continue to excel in innovation. However, maintaining the future supply of core, home grown professionals is of concern with enrolments in specialist minerals-related higher education programs declining significantly. An effective temporary skilled migration program with the capacity to respond to economic demand within a framework that ensures integrity and efficiency is another vital component of meeting the skills needs of the sector. Importantly, industry uses this as a last resort when the requisite skills and experience cannot be found domestically. The minerals industry employs approximately 2 per cent of its workforce through temporary skilled migration and mining accounts for only 4.1 per cent of temporary skilled workers. Over 90 per cent of these are professionals, managers and technical trades. As demand for mining labour has decreased, the demand for 457 visa holders has similarly decreased – in the 12 months to end June 2015, primary 457 visa holders in mining fell by 32 per cent. 

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5 L Hendrickson, Where does employment growth come from?, Department of Industry, Innovation and Science, presentation to the Industry Innovation Workshop, 15 September, Canberra, 2015.
7 E Francis, The Australian Mining Industry: More than Just Shovels and Being the Lucky Country, IP Australia, June, Canberra, 2015.
8 Department of Immigration and Border protection, Subclass 457 quarterly report, Canberra, 2015.
The MCA is of the view that the current higher education funding model is not adequate to secure the future of Australia’s higher education sector. Consequences of the current model are that it:

- provides a financial incentive for universities to deliver undergraduate programs that are inexpensive to run and attract many students
- threatens the survival of small university departments which require significant university cross-subsidisation or industry support to be viable
- does not reflect actual delivery costs, especially for science and engineering courses and is overgenerous to some disciplines (e.g. agriculture)
- does not reward universities for attracting external (industry) support for undergraduate teaching
- does not provide funds for teaching in disciplines of national economic priority
- does not promote or reward collaboration between higher education providers.

MCA continues to advocate for specialist disciplines related to the minerals industry (including mining engineering, metallurgy and minerals geoscience) be deemed disciplines of national interest and receive enhanced government funding.

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

The failure by previous governments to index higher education funding, coupled with the regulated caps on fees, has seen many university schools and departments become increasingly unviable under the student numbers based funding system, especially in minerals-related departments that traditionally have small student numbers and high teaching costs. This has resulted in a need for direct minerals industry investment to secure a future supply of professionals for the industry. Without this industry support many schools and departments would have closed, leaving Australia without the capacity to deliver its own high quality graduates (and relying on skilled migration as an avenue for these skills).

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* identified a system beleaguered by acute shortages of talented academic staff, small student numbers and high relative costs and under-resourced departments. In the wake of the 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 Minerals Tertiary Education Council (MTEC) to oversee the investment of direct funding from MCA members to partner universities involved in mining engineering, metallurgy and minerals geoscience (across 17 Australian universities). Since its inception the MCA has invested over $50 million in minerals tertiary education through MTEC, an average of $3 million per year. Over 4500 students have undertaken MTEC supported programs.

Through MTEC, industry is able to ensure that courses and graduates meet current and emerging industry requirements. Students have direct exposure to work-based learning opportunities, and companies have access to a pool of industry-ready graduates. A survey of four MCA members revealed that in FY2014, $16.1 million was invested into supporting universities, in addition to higher education contributions through MTEC. Of this total, $9.7 million was expended on scholarships.

Through MTEC, the MCA has built a unique, innovative and powerful model for strategic and purposeful industry investment in minerals related tertiary education (see Box 2).

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Box 2: MTEC accolades 2001-2014

MTEC has been awarded funding and awards to further develop its university-industry relationship as follows:

- Award of a Science Lectureships Initiatives (SLI) grant in to assist in building and delivering collaborative courses in earth science, mining engineering and extractive metallurgy (2001)
- An Australian Museum Eureka Prize for Industry in the Research and Innovation category, for the creation of the Minerals Tertiary Education program which encourages cooperation between universities and the minerals industry to provide enhanced education opportunities for students and graduates of geoscience, mining engineering and metallurgy (2001)
- A Collaboration and Structural Reform (CASR) grant to establish Australia’s first and only 4 university national undergraduate program in mining engineering - Mining Education Australia (MEA) (2007)
- A prestigious Australian Teaching and Learning Council (ALTC) award for Educational Partnerships and Collaborations with Other Institutions. MTEC’s flagship mining program Mining Education Australia (MEA) (2010)
- A Council on Australia and Latin American Relations (COALAR) grant to explore the possibility of taking MEA to a global audience based on the teaching of sustainable mining practices (2011)
- An Australian Commonwealth Government grant under the Workforce Innovation Program to undertake a feasibility study and prepare for implementation national Associate Degrees in Mining Engineering and Geoscience, known as the Minerals Industry National Associate Degree (MINAD) Project (2012)
- Recognition of leadership in tertiary higher education management in Australia with the MTEC Executive Director (Dr Gavin Lind) being awarded the 2013 ATEM/Campus Review LH Martin Award for Excellence in Leadership
- Recipient of the prestigious Business Higher Education Round Table (B/HERT) award for Best Higher Education & Training for the Minerals Geoscience Honours Program (2014).

Whilst the minerals industry's own efforts were important in arresting the slide in enrolments over time, they are not enough and a system wide change in higher education is required. The underlying structural weaknesses in minerals tertiary education, identified in *Back from the Brink*, have resurfaced as major concerns for industry and university departments.

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 the industry has moved from the construction to production phase, with consequential lower demand in certain disciplines, most notably in civil and mechanical construction. Decline in labour demand has been exacerbated by falls in commodity prices, 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.

Enrolments in minerals related tertiary education are very important to the minerals industry and to the Australian economy. As seen in chart 1, mining engineering graduates, for example, lag the economic cycle by four years (the length of the degree).
Chart 1: Total mining engineering graduates from all Australian universities 1969 to 2015 and annual metals and minerals price index for 1971 to 2014

Source: graph courtesy of Professor Peter Dowd

As chart 2 reveals there is a strong correlation between commodity prices and mining engineering commencements. Commencements in mining programs across Australia in 2016 show that enrolments will be at levels last seen in 2000. There is a genuine threat of program closure because of critically low enrolment levels in programs that are traditionally high cost to universities. Chart 2 highlights that the number of first year mining engineering students at Australian universities closely follow the price trends of a number of commodities, even though commodity prices and commodity production levels (chart 3) are higher than at the time of the Back from the Brink report.

Chart 2: First year mining engineering commencements versus commodity prices

Source: MCA; indexed 2000
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.¹¹

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 2016 has fallen to just five (a 2240 per cent decrease from a high of 117 in 2013). Minerals schools and departments 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.

This dramatic drop off in commencements is of great concern. To put this in context, in 2014 mining engineering enrolments represented approximately 1000 of the 91,000 domestic and international students enrolled in all engineering and related technology higher education courses in Australia.¹² This fraction is exacerbated when further considered in the context of total higher education enrolments in 2014, which exceeded 1.1 million students across Australia.

From chart 2, one might conclude that student behaviour fundamentally has not changed, with economic sentiment toward the industry (through commodity prices) remaining the dominant factor in their decision to pursue mining engineering degrees. Since the Back from the Brink report, production levels of a range of commodities have either increased (almost five-fold in the case of iron ore) or output has remained constant year on year (for example gold and copper). Lower bulk commodity prices, rationalisation at the company level, the rise of anti-mining activism and the way that these issues have been widely covered in news and social media, have likely contributed to a post-boom sentiment that might explain the pronounced drop off in enrolments over the past few years since 2012.

¹¹ Information provided by Mining Education Australia (MEA) to the MCA, April 2015.
HIGHER EDUCATION AND INSTITUTIONAL REFORMS

Industry initiatives can support but cannot sustain mining engineering programs at Australian universities alone. Higher education reforms and a shift in university administration behaviour toward how programs such as mining engineering are funded at the university level is also needed for the longevity of this important profession. The MCA supports reforms that advance innovative pathways to address skills needs of the future (including through para-professional qualifications such as associate degrees). Given current funding arrangements, the MCA believes that fee deregulation alone will not assist students or niche minerals-related disciplines.

Higher education reforms are a necessary step towards securing a sustainable funding outlook for the higher education sector in Australia, in line with market demands. Funding of STEM disciplines will only become more expensive for universities as they attempt to keep pace with the technological requirements of innovative industries. Over the next few years, universities will require an additional $7.6 billion to fund projected student growth alone under the demand-driven student system. The former Minister of Education, The Hon Christopher Pyne MP, argued that students would be the biggest winners from the now-defeated fee deregulation package through increased student access to tertiary studies and the overall quality of teaching would improve due to price competition. MCA-commissioned modelling found that high course costs, low and volatile enrolments and barriers to market entry mean the Federal Government's higher education reform proposals are not likely to advantage, and rather may disadvantage minerals tertiary education, particularly if relative funding for engineering and science disciplines is reduced and enrolment levels continue to decline.

For students to benefit from fee deregulation would require not only reform at the federal level, but at the institutional level too. Under current arrangements less than 50 cents in the dollar of Commonwealth Grant Scheme (CGS) funding is allocated to MCA’s MTEC partner schools and departments by their home institutions. In most cases it is significantly less. These arrangements are not sustainable during times of low student enrolments (as these payments are volume-based) and the MCA questions university administration behaviour in not adapting funding allocations for minerals-related programs that consider market conditions.

A fundamental issue is that research in universities is not funded in the way that teaching is funded, resulting in universities redirecting teaching funds into research. The Grattan Institute estimates that in 2012 at least $2 billion in profits (representing one-fifth) meant for teaching was used to fund research in Australian universities. They further point out that while universities are not doing anything improper in spending money this way, there appears to be a fundamental problem with this arrangement in that: ‘the absence of specific teaching funding makes it hard to ensure that any extra money intended to benefit students is actually spent on students’.

The minerals industry supports sensible higher education reform that combines fee deregulation with strong safeguards to ensure the viability of minerals-related disciplines. Whilst fee deregulation would allow a true market to develop in the broad sense, it is not likely to advantage (and rather may disadvantage) minerals higher education due to high course costs, low and volatile enrolments and barriers to market entry. A cap on fees payable by students in a deregulated environment would accordingly be a strategic necessity for a sufficient pool of students to deliver a viable program. Funding caps should also reflect the actual cost to universities of delivering each program. Safeguards should include stronger accountability mechanisms to ensure increased university fee revenue is devoted to teaching and student services.

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14 A Norton & I Cherastidtham, The cash nexus: how teaching funds research in Australian universities, Grattan Institute, Melbourne, 2015.
The industry further proposes that the MTEC model be considered as a potential flagship course (proposed in the discussion paper). MTEC presents a successful national, industry-driven and multi-disciplinary model for high cost university courses.¹⁵

CONCLUSION

The minerals industry will continue to require a broad base of talented professionals and is concerned at the dramatic reduction of commencements into mining engineering degrees at Australian universities in recent years.

Through MTEC, industry remains committed to national collaborative programs in mining engineering, extractive metallurgy and minerals geoscience, which continue to deliver an important pipeline of skilled professionals to the industry. Industry can continue to support these undergraduate programs in a variety of ways, but it cannot financially sustain them.

Government, through a higher education reform process, should consider fee deregulation with strong safeguards to ensure the sustainability of minerals-related programs such as mining engineering, where associated high teaching costs and traditionally low student numbers place these programs at risk when cyclical changes affect enrolments numbers. Further ways to achieve this would be for government to enhance funding for teaching in disciplines of national economic priority by deeming them disciplines of national interest and include them in the proposed flagship courses concept.

For any funding reforms to be effective, Australian universities must adapt their internal funding policies to reflect the needs of minerals-related programs, especially during periods of low student enrolment. Directing money for teaching where it is needed most is necessary should be central to any reform.