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Submission to:

Senate Employment, Workplace Relations and Education References Committee

Inquiry into current and future skills needs

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Executive Summary

The Minerals Council of Australia (MCA) is the peak body representing the Australian minerals industry. The Australian minerals industry includes the mining industry as defined by the Australian Bureau of Statistics, as well as the minerals processing and metal production industries, but excludes the petroleum sector.

The MCA member companies generated more than A$42 billion in export revenue in 2000 – 2001, representing 85 per cent of industry exports and 28 percent of Australia's total exports of goods and services.

Information presented in Attachment A shows that since 2000, there has been:

- 30 percent decline in the number of earth science students completing Honours, and
- 50 percent decline in anticipated PhD completions in earth science since 2000;
- continuing low level of PhD completions in mining engineering; and
- greater than 75 percent decline in PhD completions in metallurgy.

These figures are alarming and consistent with trends identified by the minerals industry in 1998 (Carter 1998). The implications for the Australian minerals industry are significant.

In 1999, member companies of the Minerals Council of Australia established and committed funding for the initiative — the Minerals Tertiary Education Council (MTEC). The objective is to work with academia to secure the supply of quality professional people for the Australian minerals industry to help cement its global competitive position.

The initiative is a partnership between the Minerals Council, the Federal Government and selected university departments and research institutions. The process is to encourage collaboration between universities with high-level complementary skills, to develop and deliver world-class minerals education nationally.

This innovative approach is the Australian minerals industry's response to what was established by Carter (1998) in *"Back from the Brink"*, as a need to secure current and future skill needs for the industry.

Introduction

The 2001 Australian Census records that the Australian mining industry employs 75,165 persons of whom 11,549 are professionals (university trained staff). Each employee contributes to the generation of more than A$570,000 of export revenue for Australia.

The industry's professional employees must be highly skilled and have access to vibrant learning environments to ensure the currency of those skills, if the industry is to continue to grow and make significant contributions to the socio-economic welfare and quality of life for all Australians.

The facts are contrary to the often commonly held views that the minerals industry is "dark and dirty, low tech, polluting and old economy". In reality, the Australian minerals industry is modern, efficient, high technology and vibrant and one that drives and harnesses innovation. In doing so, it leads the world in the derivation and application of new technology on the minerals cycle and in the quality of its engagement with communities.

To achieve all this the industry relies heavily on the quality not only of its employees, but also of those in the service and support sectors.

The Australian minerals industry, through the Minerals Council of Australia, has taken the initiative to ensure the quality and availability of its professional staff.

Over the past three years the Minerals Tertiary Education Council has been collecting data on university student enrolments in the industry's three core technical disciplines. A recent MCA research report published by the minerals industry's professional association – The Australasian Institute of Mining and Metallurgy (Bartier et al 2003) highlights the issues with regard to the future supply of skilled professionals for the industry. This report is included as Attachment A.

This submission focuses on:

- the current and future skill requirements and labour demand for professional earth scientists, mining engineers and minerals processors/extractive metallurgists working in the Australian minerals industry;
- the significant decline in the quality of science education and learning within the secondary school system in Australia, and the fact that fewer and fewer school leavers are sufficiently qualified to study science and engineering at university;
- the consistent decline in university enrolments in engineering and science courses and the anticipated inability to satisfy demand for professionals in these disciplines;
  (See attachment A), and
- the need for the Government to restore the capability of Australia's public universities to provide graduates for the minerals industry and complement the multi-faceted MCA program that;
  - encourages cooperation between participating universities;
  - employs a new generation of academic staff;
  - develops and delivers new undergraduate learning material for use across the network of collaborating universities;
  - implements a postgraduate coursework program for practising professionals; and
  - has implemented a national program of work experience for undergraduate students studying for careers in the minerals industry.

Governments' role in restoring the capability of Australia's tertiary education sector is elaborated in the 2001 submission (Attachment B) from the Minerals Council to the Senate Employment, Workplace Relations, Small Business and Education References Committee. The eight recommendations made in this submission are as valid today as they were when the submission was prepared. The recommendations call for changes to the way in which universities are funded to reward collaborative behaviour and to assist them manage fluctuating demands for professionals. They also call for financial incentives for professionals and corporates to encourage a culture of lifelong learning by professionals.

Comments specific to the terms of reference

a) areas of skills shortage and labour demand in different areas and locations, with particular emphasis on projecting future skills requirements:

- Since 2000, there has been a 30 percent decline in the number of earth science students completing Honours. This is of concern because the four-year Honours course is the "defacto" qualification for anyone seeking work in the minerals industry and organisations such as Geoscience Australia, CSIRO and most state geological surveys. An Honours degree is also the minimum pre-requisite qualification for anyone seeking to undertake postgraduate research. Without a sufficient number of Honours graduates, the minerals industry will have a smaller pool of people from which to choose and the research industry will be struggling to find enough qualified PhD candidates.

- Projections for PhD completions in earth science and metallurgy anticipate a greater than 50 percent decline from 2001 to 2005. In mining engineering consistently there are less than five Australian student PhD completions each year. The impact of this situation will be felt initially by universities and CRCs that will struggle to fulfil their research obligations by failing to attract enough high quality researchers. Ten years on the minerals industry is unlikely to be able to call on Australian research institutions to deliver the innovation changes necessary to remain globally competitive.

b) the effectiveness of current Commonwealth, state and territory education, training and employment policies and programs and mechanisms for meeting current and future skills needs, and any recommended improvements:

- Of principle concern to the minerals industry is the decline in the number of secondary school students choosing to study advanced mathematics, science and technology at school. This is compounded in the state primary school systems by inconsistency in the degree to which science and technology are taught. ATSE (2002) in their report "*The Teaching of Science and Technology in Australian Primary Schools"*, identified several issues of concern of which the following are particularly relevant:
    - the adequacy of pre-service teacher training offered by universities;
    - the lack of adequate in-service training aimed at the needs of those teaching science and technology;
    - the unsatisfactory recruitment of science and technology-capable individuals into teacher training, and
    - the lack of incentives and motivation to encourage well-performed school-leavers to consider (science) teaching as a career.

  These factors then impact on the number of school leavers with suitable science and technology skills and on their preparedness to undertake technology-based learning in the higher education system.
- The Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA) in 1994 endorsed science and technology as two of the eight key learning areas within compulsory education in Australian schools. Unfortunately this endorsement has not translated into outcomes.

(c) the effectiveness of industry strategies to meet current and emerging skills needs:

The Minerals Council of Australia has several strategies that are designed to ensure a supply of well qualified and motivated professional staff for the Australian minerals industry.

Primary and Secondary School Education Initiatives:

The Minerals Council of Australia's National Education Program (NEP) is now in its eighth year of operation and represents a long-term commitment to school education in excess of $10 million over the 10-year period 1996 – 2005.

The NEP operates under a national strategic framework and is delivered by a team of education professionals based in the State and Territory Minerals Councils and Chambers.

Programs offered under the NEP align with current Australian education priorities to improve teaching and learning in science and technology. Professional development programs are offered to teachers and trainee teachers and are further supported by a range of online and hard copy educational materials and curriculum supporting presentations to students.

Over the seven years to the end of 2002, the NEP has engaged Australia-wide with more than –

926,000	upper primary students;
151,000	secondary students;
73,000	teachers; and
15,000	trainee teachers

In a further demonstration of the minerals industry's strong commitment to education, the Minerals Council of Australia is enhancing the secondary focus of its programs through a major three-year partnership with Questacon - the National Science and Technology Centre, in the Smart Moves Sydney Project. This physical and virtual experience will be designed to deliver stimulating learning experiences for students particularly in the enabling sciences and technology.

Tertiary Education Initiatives:

The Australian minerals industry, through the Minerals Tertiary Education Council (MTEC) – part of the Minerals Council of Australia - is working in partnership with a group of Australian universities to find a way forward in delivering high quality, sustainable tertiary education for the sector.

MTEC was established in October 1999 by the Minerals Council of Australia to build a world-class tertiary learning environment for the education of professionals for the Australian minerals industry. It is industry's response to the 1998 landmark discussion paper *"Back from the Brink"* that dealt with the crisis in the supply of well qualified professionals for the minerals industry.

MTEC comprises a small secretariat advised by a Council with members representing industry, participating universities, government and community. MTEC reports to Board of Directors of the MCA.

MTEC fosters a partnership between industry, government and academia. A network of selected university departments and other bodies is dedicated to achieving true 'world class' education by cooperating in the development and delivery of undergraduate and post graduate learning in the specialist disciplines of earth science, mining engineering and metallurgy.

Major elements of MTEC's programs are:

1. New Undergraduate and Postgraduate Courses and Modules

The participating universities are preparing modular course material for sharing with their peers. The material developed and delivered is determined by the particular expertise possessed by each participating university department.

- In *earth science*, the National *Geoscience Teaching Network* (NGTN) offers courses for honours and coursework Masters students.
- In *mining engineering*, the emphasis is on third and fourth year undergraduate material, and
- In *metallurgy* the emphasis is on both undergraduate and postgraduate course material.

The *Minerals Industry Postgraduate Coursework Program* (MIPCP) is establishing a national minerals industry coursework program to assist industry professionals with skills development and /or retraining.

Shortcourses will be recognised by the participating universities who will allow transfer of credits towards a postgraduate degree.

2. Industry Experience for Undergraduates Program (IEU)

Minerals companies had previously identified the need for a coordinated industry experience program for undergraduate students considering developing their careers in the minerals industry. In particular, a program that allows undergraduates to develop practical skills that are not taught at university. The IEU program entails:

- commitment by companies to make a minimum number of places available to undergraduates each year,
- a set of broad guidelines for both the company and student to follow; and
- a system to facilitate placement of undergraduates with companies. The IEU Website is a simple electronic registration process that helps match students to placements.

3. Employ New Academic Staff

Fifteen mostly industry-experienced academic staff have been employed at the participating universities to assist with the development and delivery of the new courses and modules. It is anticipated these will replace present academic staff as they retire.

4. Establish and Fund Centres of Excellence in Mining Engineering

The University of NSW has established the National Centre for Mine Ventilation. MTEC is still negotiating with the academic community to support a WA-based national centre in geomechanics.

The Australian minerals industry has comprehensive strategies in place to provide for the future skill needs of its professional staff. The effectiveness of these strategies will depend to a large degree on the adequacy of government policies on science and technology education in the nation's primary and secondary schools, and on the robustness of teaching and research in the core disciplines within the tertiary education sector.

References:

Australian Academy of Technological Sciences and Engineering (ATSE), 2002. *The teaching of Science and Technology in Australian Primary Schools – A Cause for Concern*. 28p.

Bartier, F, Tuckwell, K, and Way, A. 2003. Supply of professional staff: is there a problem? *Bulletin of the Australasian Institute of Mining and Metallurgy*, Jan/Feb 2003

Carter, R J, 1998. *Back from the Brink – Reshaping Minerals Tertiary Education*, discussion paper, 183p (Minerals Council of Australia).

Supply of professional staff: is there a problem?

There has been considerable discussion recently about the impact of external factors on the numbers of students choosing to study at Australian universities for careers in the minerals industry.

In 2000, the Minerals Tertiary Education Council (MTEC) commenced collecting enrolment data from all Australian universities in the core technical disciplines of earth science, mining engineering and, in the broadest sense, "metallurgy".

The purpose of this initiative is to understand the supply side of the professional staff equation; to guide MTEC in developing appropriate educational programs and to assist companies with their strategic personnel planning.

The data are requested from the relevant departments/schools of all universities in April each year (after the HECS reports are completed) and is supplied on a voluntary basis.

At the undergraduate level, data are collected on the total number of students taking a core discipline subject that is a pre-requisite for enrolment in the subsequent year of the designated degree program.

At the postgraduate level, departments are asked to provide the actual and estimated numbers of MSc and PhD completions for the past year and for future years.

Most, but not all universities respond and not all universities record student enrolment data in the same way. The compiled data is therefore incomplete, but is sufficiently accurate we believe to define trends that are useful for further discussion.

Collated data are presented for each of the core disciplines for each of which there are three graphs:

The first shows undergraduate student enrolments by year of study; the second Masters (coursework and research) completions and estimates and the third, PhD completions and estimates.

Earth Sciences

The very large numbers of students enrolled in first year is a characteristic of the discipline, because geology is almost always offered as a general science subject in first year. There is a consistent decline to stability in Years 2 and 3, followed by a further halving of the population electing to do Honours. *Figure 1*.

Of note there is little change in the total enrolments, especially in Years 2 and 3 over the past three years. The only major exception is that the Honours graduating cohort in 2002 is about 1/3 lower than in the previous two years.

The opportunity for the minerals industry and for university departments is to influence the more than 1000 students doing first year geology at Australian universities to consider building a career in the earth sciences.

The number of completions of **Masters** degrees, either by coursework or research (*Figure 2*) has been fairly constant in 2000 and 2001, but show a significant estimated decline from 2003 to 2004.

The reason for this is not certain, but is believed to be due to reduced industry support for technical professional development and industry rationalisation resulting in a smaller number of geologists employed.

There is a similar level of decline in the estimated number of **PhD** completions (*Figure 3*) from 2002 to 2005 from an actual peak of more than 120 in 2001.

This may be of concern as it is from this body of highly trained researchers that future academics and career research scientists, so important to driving innovation in Australia's minerals industry, are drawn.

An Honours degree in the earth sciences is the defacto qualification for anyone seeking to work in mineral exploration or geological research. Does the 30% decline in the number of Honours students over the past three years ring warning bells about the future supply of professional staff in these areas?

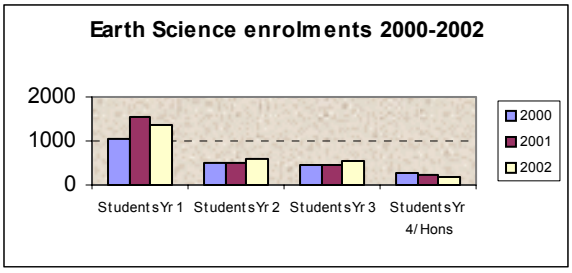

Figure 1

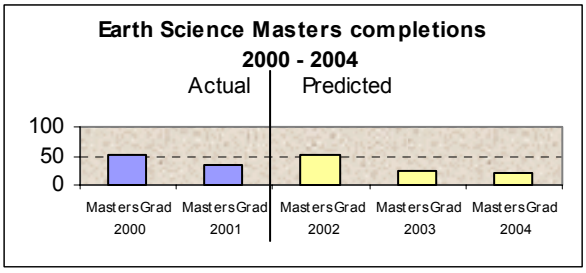

Figure 2

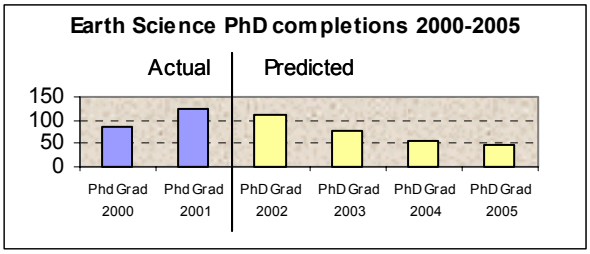

Figure 3

Mining Engineering

For each of the past three years Australian universities have produced about 170 mining engineering graduates. In 2000, more than 200 graduated representing the "bulge" of students who enrolled in mining engineering following the industry's heady year of 1996.

As the data show, long-term trends are difficult to predict. Many universities now offer common first and sometimes second year engineering programs further complicating interpretation of enrolment trends.

The 1st Year numbers in *Figure 4* include enrolments at those universities offering four-year specialised mining engineering degree programs and departmental estimates of the numbers of 1st Year students likely to choose mining engineering in later years at those universities that offer a general first year.

In fact, and inexplicably, student enrolments actually go up in some subsequent years. There are more 4th Year mining engineering students in 2002 than there were 2nd Year students in 2000?

On face value though, the lower numbers of students in 1st year mining engineering in 2002 suggests there will be significantly less than 170 mining engineers graduating in 2006.

There is actual and anticipated growth in the area of **Masters** completions in mining engineering (*Figure 5*). This is encouraging because it reflects a demand for higher skill levels that presently are being provided through coursework and shortcourse programs.

Universities should seek to grow this market by providing flexible learning programs that will allow other engineers to retrain as mining engineers to meet the probable personnel shortage from 2006.

Of most concern is the low number of **PhD** completions in mining engineering (*Figure 6*). The total numbers are not only low but in fact are predicted to decline further. Many of the students are from overseas and return home after their higher degree is completed. Therefore there is not enough high-level research training of individuals aiding the Australian minerals industry in this discipline.

There are eight universities in Australia that produce graduates with degrees and or training in mining engineering and/or geological engineering. How sustainable is this when the graduating student cohort in 2006 could be as low as 100?

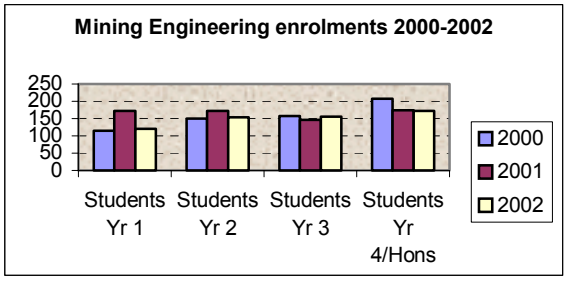

Figure 4

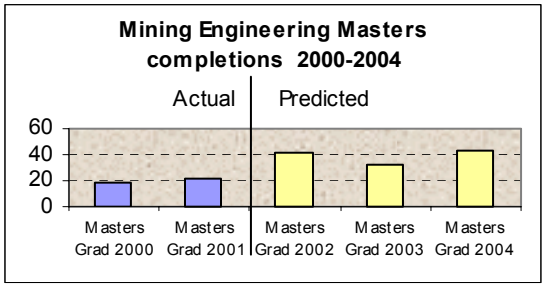

Figure 5

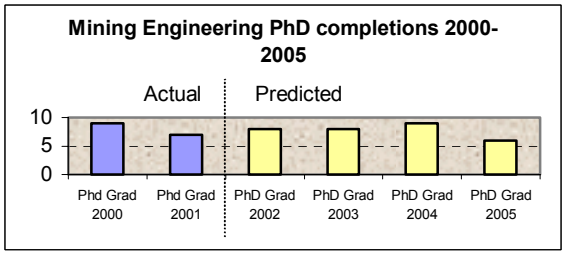

Figure 6

Metallurgy

The situation with regard to undergraduate teaching in metallurgy is quite complex; not only are there some specialised metallurgy schools, but there are also schools of materials engineering and chemical engineering, both of which provide elective courses in extractive metallurgy, particularly in Years 3 and 4 of their degree programs.

In those universities that offer common 1st and/or 2nd Year engineering programs, it is also difficult to identify the number of students likely to continue with a metallurgical major in their undergraduate degree.

In *Figure 7*, the most consistent data is that shown for the fourth year students when all options and choices have been expended.

Over the last three years Australian universities have produced about 100 graduates per year with skills and education that would allow them to practice as professional "metallurgists".

Unfortunately, enrolment data for Years 1 – 3 provide no clear indication of future trends that might suggest if and how, the 100 per year number is likely to change.

Figures 8 and 9 paint a much more alarming situation for the future of metallurgy research.

Both **Masters** and **PhD** completion data show significant actual and anticipated decline from the highs recorded in 2000.

There appears to be a very limited market for either coursework or research Masters programs. Practising professionals do not appear to be using the Masters programs to upgrade skills.

PhD completions have declined from a peak of nearly 80 in 2000 to less than 20 predicted for each of 2003 and 2004.

Where is Australia going to source its future metallurgical researchers and academics?

How is innovation in the minerals industry, which traditionally has been driven largely by Australia, going to be met if there are not sufficient numbers of up and coming research scientists?

How are the specialist research centres in extractive metallurgy going to operate if they can't source qualified staff?

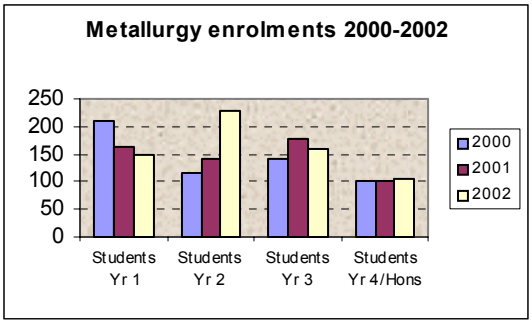

Figure 7

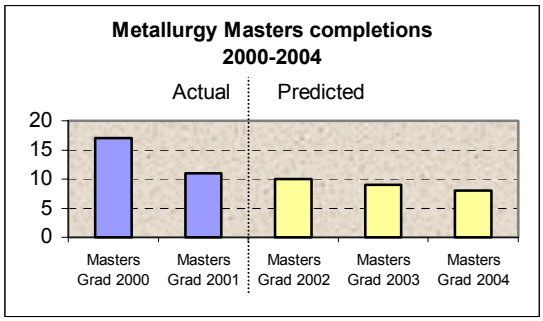

Figure 8

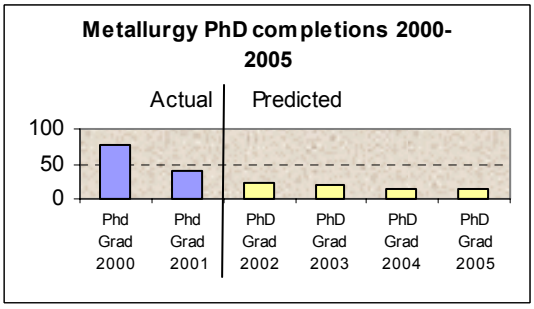

Figure 9

Conclusions

Now that the Minerals Tertiary Education Council has some hard data on trends in university enrolments, i.e. the supply of professionals for the minerals industry, the programs it supports and encourages can be better tuned to provide positive outcomes for the minerals industry.

However, of potentially greater concern to the minerals industry as well as most other technology-based industries, is the significant decline in the quality of science education and learning within the secondary school systems in Australia. Fewer and fewer school leavers are not sufficiently qualified to study science and engineering at university. Many of those who are, choose not to do so.

Over the next few years it is anticipated that university enrolments of school leavers will show a consistent decline similar to what is becoming evident in the data presented above.

The problem for all Science Engineering & Technology (SET) industries is between five and 10 years out when the current cohort of secondary school students seek to join the workforce as professional engineers and scientists. It is likely there will not be enough to satisfy demand.

One of MTEC's next tasks is to look carefully at the demand side of the equation by contacting minerals companies and building a picture of employment patterns in the earth science, mining engineering and metallurgical professions.

In the mean time, MTEC is carrying out a strategic review of its programs. Professor Jim Galvin, recently Head of the School of Mining Engineering at the University of NSW, will be assisting with the review that will be presented to the Executive Committee of the Minerals Council of Australia in June 2003.

It is anticipated the findings of this review will substantially influence the manner in which the Australian minerals industry continues to support learning programs for its current and future professional staff.

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Kevin Tuckwell – Executive Director, MTEC
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References:

Carter, R J, 1998. Back from the Brink – Reshaping Minerals Tertiary Education, discussion paper, 183p (Minerals Council of Australia).

Attachment B

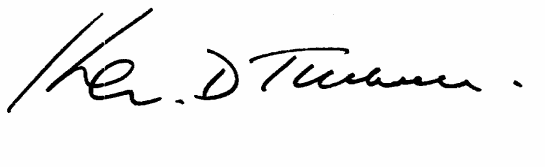
Submission to:

Senate Employment, Workplace Relations, Small Business and Education References Committee.

The capacity of public universities to meet Australia's higher education needs

From:

The Minerals Tertiary Education Council
(Part of the Minerals Council of Australia)



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Executive Summary

In late 1999, the Minerals Council of Australia resolved to fund a program of engagement with selected public Australian Universities in the core technical disciplines of greatest relevance to the minerals industry; earth science, mining engineering and "metallurgy".

Member companies have committed $15 million over five years for a multi-facetted program that:

- encourages cooperation between participating universities;
- employs a "new generation" of academic staff;
- develops and delivers new undergraduate learning material for use across the network;
- implements a postgraduate coursework program for practising professionals, the fundamentals of which are flexible access and delivery coupled with cross-institutional accreditation; and
- implements a national program of work experience for undergraduate students studying for careers in the minerals industry.

Why?

Because the minerals industry concluded in its landmark discussion paper "*Back from the Brink*" published in 1998, that Australia's public universities were not capable of meeting its needs for suitably qualified professional staff to enable it to compete successfully on the global stage.

This submission draws out eight specific recommendations the Minerals Tertiary Education Council considers are essential to restore the capability of Australia's public universities to provide graduates for the minerals industry. The outcomes expected from these recommendations complement the actions taken already by industry through the Minerals Tertiary Education Council and are expected to lay the foundations for greater sustainability in the tertiary education sector.

Introduction

The Minerals Council of Australia funds two education programs that are designed both to create a more balanced understanding of the industry **(education about the industry)**, and to make available the best undergraduate and professional development education for those who may choose to pursue careers in the industry **(education for the industry)**.

The National Education Program is focussed on primary and secondary school teachers and students with dual objectives of ensuring that the contribution minerals make to our exceptional standard of living is clearly understood and that career opportunities in the industry are made known to students and career advisors.

In addition, the member companies of the Minerals Council of Australia are also resourcing a five-year tertiary education program in an attempt to ensure the supply and quality of professionals they need to compete globally.

The Minerals Tertiary Education Council (MTEC) is charged with implementing the recommendations in the discussion paper "Back from the Brink" (Attachment A). MTEC consists of a small secretariat and an advisory council. Council members are drawn from the ranks of senior academics, senior industry personnel the government and the community.

This submission was prepared by the MTEC Secretariat on behalf of the Council and it addresses only some of the points (shown in italics) in the terms of reference for this committee.

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c) The adequacy of current funding arrangements with respect to:

i. the capacity of universities to manage and serve increasing demand.

Increasing demand for professionals is not a key consideration for the minerals industry. Commodity prices are cyclical and this drives cyclicity in employment opportunities in the industry. Consequently, the demand for technical professionals also varies, which in turn is reflected in what are generally out-of-phase undergraduate enrolments at universities.

Industry is working with its university partners to develop strategies to reduce the size of the professional employment supply/demand swings.
Unfortunately the present funding arrangements encourage universities to enrol as many students as possible in undergraduate courses, even during times of anticipated or actual downturn in the industry

<u>Recommendation 1:</u> The Commonwealth could assist by introducing greater flexibility to allow universities to manage cyclicity in undergraduate student demand in particular courses by calculating funding based on enrolment trends over rolling four or five year periods.

Virtually all the universities and research institutions run short courses and some offer Masters programs with extensive coursework components. This is a competitive market that has seen the universities respond to declining funding for undergraduate and postgraduate education by offering more 'shortcourses' for fee-paying professionals.

However, there is significant duplication in the shortcourse offerings and the material could be improved in both its preparation and delivery by better cooperation between institutions.

In most cases, unless an individual is enrolled at an institution in a higher degree program, there is no formal accreditation available, other than a certificate presented by the provider, on completion of the course. Most technical higher degree programs are not sufficiently flexible to allow an individual to participate and remain in full-time employment for the duration of the program. Nor do they draw easily upon the wealth of expertise that exists across universities and research institutions nationally.

As companies adjust to the pressures of globalisation and re-examine their priorities, many have transferred responsibility for continuing professional development and life-long learning to the individual. The tertiary institutions must respond with greater flexibility that allows individuals to gain skills in the short term to improve their immediate effectiveness at work and, in the longer term, deliver learnings to enable them to take control of their professional career development.

Industry has responded, through the Minerals Tertiary Education Council (MTEC), by facilitating the development of multi-institutional, cooperative postgraduate coursework programs to allow professionals to rapidly:

- Upgrade their current skills;
- Gain qualifications for career change; and
- Develop high-level expertise for professional development.

<u>Recommendation 2:</u> At the postgraduate level, financial incentives should be available for universities seeking to cooperate with their peers in the delivery of professional courses that may lead to higher degree qualifications.

<u>Recommendation 3:</u> Financial incentives (such as reduction of personal income tax) should be introduced for professionals seeking to keep current, increase or change their skills, if cooperative programs similar to the type described provide the new learning.

iii. the quality and diversity of teaching and research

Australia is a large country, with a thinly spread yet clustered population. Universities are mostly based in the principal population centres and the undergraduate student population does not have a culture of mobility.

In mining engineering and in metallurgy particularly, undergraduate student enrolments are low and the cost of teaching is high because the courses usually require expensive equipment coupled with travel to remote sites as integral parts of the learning experience.

One common institutional strategy employed to allow departments to function with a smaller number of students than the cost structures would indicate are viable, has

been to house specialist disciplines, such as metallurgy, in larger departments or schools and then call on academics from within the larger school, and often with peripheral expertise, to teach related subject material. Alternatively or in addition, adjunct or contract staff may also be called upon to teach to make up for lack of specialist expertise or curriculum depth in any particular department.

Industry considers that neither of these tactics is really capable of producing world class learning outcomes and would prefer to encourage the sharing of expertise, by way of staff, courses or teaching materials, between institutions.

There are several particularly strong, and in some instances, world-class schools or departments, usually linked to world-class research centres, producing graduates for the minerals industry.

These centres of excellence often have as much difficulty attracting a sustainable number of undergraduate students to underpin their existence, and so guarantee funding, as do second tier institutions that might be closer to larger population centres.

MTEC is working with the current centres of excellence and, by providing financial resources, encouraging them to develop and share some course material. In other words, MTEC's programs are designed to take the education to the students because the students do not want to move.

Participating universities will still maintain their individual cultures and overall undergraduate courses, but will be able to call on whatever expertise they require from their partners, to provide better education.

<u>Recommendation 4:</u> Government funding arrangements to universities should be modified to provide increased support to those universities that encourage collaborative teaching and flexible/distance education programs that are focussed on providing truly world-class learning.

(b) the effect of increasing reliance on private funding and market behaviour on the sector's ability to meet Australia's education, training and research needs including its effect on:

i. The quality and diversity of education

The MTEC initiative concentrates on programs that develop and deliver subject modules (subsets of larger subjects) between the participating universities. The concept is the overall quality of education will be increased because the recognised experts in that subject area will prepare and/or deliver the modules. The modules will be added to the core material within the overall course structures of each of the participating universities, so preserving institutional individuality and degree integrity.

This approach is designed to increase the quality of the educational outcomes while preserving both regional access for students and institutional diversity. It is expected that once the universities (particular departments and schools) start operating in a

truly collaborative manner, the need for industry funding will be reduced. As the quality of the undergraduate and postgraduate programs increase, the programs should attract more international students and rationalisations in staffing levels and course offerings will contribute to greater sustainability at the department level.

Refer to <u>Recommendation 4.</u>

ii. the production of sufficient numbers of appropriately-qualified graduates to meet industry demand.

This remains the principal driver behind the Minerals Council of Australia's decision to fund its tertiary education initiative, because without private sector interaction, universities and students will have little realistic view of graduate demand and skill levels required.

However, the Minerals Council of Australia has the strongly held view that Government (both State and Commonwealth) is a critical stakeholder:

> "The opportunity exists for a true partnership between industry, government and academia to reshape minerals education in Australia and secure the supply of the industry's future specialist professionals.
>
> "If this partnership does not emerge, the same changes to Australia's higher education that have created the opportunity will exacerbate the shortcomings of an already fragmented and unstable system – possible pushing it over the brink of viability as a long term supplier of the graduates that Australian industry will need in years ahead." Back from the Brink, 1998; pp5.

Previously this submission has dealt with measures the Minerals Council has facilitated through MTEC, to improve formal educational offerings in the specialist technical disciplines of greatest relevance to the industry.

MTEC has also implemented a coordinated, national program of work experience to provide undergraduate students who are looking to develop their careers in the minerals industry, with some form of structured industrial experience/training that cannot and should not be provided at university.

This program is called the Industry Experience for Undergraduates (IEU) program and has been devised after an extensive survey of all stakeholders including senior industry professionals, site managers and technical experts, young professionals, university heads of department and undergraduate students.

During 2000, and including the summer vacation (2000 – 2001), the minerals industry in Australia provided industry experience to more than 820 undergraduate students studying at Australian universities. The majority of these students were employed in jobs relevant to their chosen professions and would have learnt technical, people and lifestyle skills that no university could provide.

The minerals industry would have paid more than $9 million in wages and support to these undergraduate students while they were gaining industrial experience.

The minerals industry, by providing industrial experience of this scale, is upholding its side of the partnership referred to above.

<u>Recommendation 5:</u> **Commonwealth Government consider introducing financial assistance to companies that provide structured work experience to undergraduate students under schemes similar to that described. Training/education such as this produces better graduates and could be incorporated by expanding training assistance schemes that already exist.**

(d) the equality of opportunity to participate in higher education, including:

iii. the adequacy of current student income support measures.

As mentioned previously, Australian undergraduate students choose to study at a university that is close to their place of residence. Feedback from heads of departments with whom MTEC is working, is that students will select a course of study that is available at their local university of choice and for which they are qualified by their tertiary entry scores, rather than select a more favoured course at another or distant university.

The exceptions to this are students from regional or country centres who have to move if they wish to pursue a university education. Some of these are prohibited from doing so because of financial reasons.

The quality of graduates in key technical professions of relevance to the minerals industry could be improved if financial support measures were in place that encouraged undergraduate students to move to obtain the best education in their discipline of choice.

<u>Recommendation 6:</u> **Government scholarships such as ones that reduce a student's HEC's liability should be available for students wishing to move, either from regional centres or between states, in order to pursue the best opportunities for their undergraduate education.**

(e) the factors affecting the ability of Australian public universities to attract and retain staff in the context of competitive local and global markets and the intellectual culture of universities.

- Academic staff salaries in Australia are hopelessly uncompetitive with respect to those paid in developed countries with comparable lifestyles and expectations. **This is a function both of exchange rate and government policy on funding.**
- Academic staff salaries in Australia, in the technical disciplines most relevant to the minerals industry, are hopelessly uncompetitive compared with those paid to their peers in the minerals industry. **This is a function of government funding policy.**
- Minerals departments at Australian universities are under-resourced because of their comparatively small size, so making these departments incapable of delivering top-class teaching in all aspects of their curriculum, despite being excellent in some areas. **This is a function of government funding policy.**

The academic population at Australian public universities is aging and many have little if any industry experience. The MTEC initiative, with support from the Commonwealth Government through the DETYA Science Lectureships Initiative, is

funding fifteen new academic positions in the core discipline areas with the intention to create some sustainability and renewability in the academic community.

It is anticipated these academics will help drive the collaborative programs and boost the image of science and engineering for future undergraduate students.

Recommendation 7: **Fund incentive-based increases to bring academics' salaries more in line with those paid to their peers in industry and for whom similar levels of accountability and responsibility exist.**

Recommendation 8: **Revise the funding allocation to universities to provide greater equity for departments where the unit cost of teaching is higher because of the smaller student enrolments and the subject material being taught.**

References:

Carter, R J, 1998. Back from the Brink – Reshaping Minerals Tertiary Education, discussion paper, 183p (Minerals Council of Australia).