MINERALS COUNCIL OF AUSTRALIA

SUBMISSION TO R&D TAX INCENTIVE REVIEW CHAIRED BY MR BILL FERRIS AC, DR ALAN FINKEL AO AND MR JOHN FRASER

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

Innovation refers to a change in the method of supplying goods or services, including through new products, new processes and new forms of work organisation. 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.

The mining sector is a prolific inventor and developer of specialised technologies, with a total of 6,539 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.

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.

The policy lessons from this experience are three-fold. First, innovation is neither the preserve of 'start-ups' nor confined to the so-called new economy. Rather, innovation has been and will continue to be a fundamental ingredient in the minerals industry's contribution to the Australian economy. Critically, this contribution depends upon high-value, high-wage jobs in a diversity of professions, including engineers, environmental scientists, geologists, geophysicists, mathematicians and financial officers.

Second, the Australian minerals industry is an exemplar of innovation through collaboration, contributing hundreds of millions of dollars annually through a range of innovative partnerships with research bodies. The dividend from this collaboration has been substantial across mine safety, extractive technologies, automation, energy efficiency, low emissions technologies and environmental practices and biodiversity protection. That success has been founded on a willingness to invest in innovative research and to build this collaboration through a range of different vehicles ranging from one-on-one relationships to industry-wide research programs, including cooperative research centres, the Australian coal industry's research program (ACARP), the COAL21 Fund for low emissions coal technologies and AMIRA International (which leverages mining industry R&D).

Third, the R&D tax incentive encourages additional innovation expenditure in Australia by reducing the marginal cost of business R&D. This is crucial because innovating firms most cite lack of access to additional funds as the greatest barrier to innovation, and cost of development or implementation as the third largest. Further, the R&D tax incentive has supported new products and processes related to mining that have undeniable spillover benefits for the broader economy, such as preventing work-related deaths and injuries (SmartCap, Groundprobe, Longwall automation landmark project), reducing greenhouse gas emissions from electricity generation (Callide Oxyfuel Project), improved plans for sharing water resources between industries (Modelling The Water, Energy and Economic Nexus).

A successful innovation policy must proceed from the fact that market competition – not government fiat – ultimately determines which new combinations of inputs become successful innovations. A notable strength of the R&D tax incentive is that it is not directed toward 'priority sectors' but rather supports innovation driven by market selection. It is critical that this policy measure is not distorted by restricting eligibility on the basis of industry, firm size or any other arbitrary criterion. It is also crucial that Australian businesses now be afforded a stable and internationally competitive policy framework to encourage future additional R&D and innovation.

Recommendation

The R&D tax incentive is an effective, economy-wide, market-driven measure that should be maintained.

1. 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.[1]

It is worth emphasising that innovation is 'purely a matter of business behavior', internal to the competitive process.[2] A successful innovation policy must proceed from the fact that market competition – not government fiat – ultimately determines which new combinations of inputs become successful innovations. The proper role of government is to encourage innovation across the private sector, not to seek to initiate particular innovations or to favour industries it deems to be winners.

Australia's minerals exports (which account for more than 80 per cent of total resources exports) have risen from around one third of Australia's total exports of goods and services in 2004-05 to 45 per cent in 2014-15.[3] 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.[4] Similarly, expenditure on minerals exploration – an operating expense analogous to market research – was $1.6 billion in 2014-15.[5]

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.[6]

Similarly, the CSIRO notes that: 'Innovation has been instrumental in the development of energy and minerals resources'.[7]

The mining sector is a prolific inventor and developer of specialised technologies, with a total of 6,539 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.[8] The Australian Government's newly established METS and National Energy Resources Australia Growth Centres will add further innovative capacity to Australian mining.

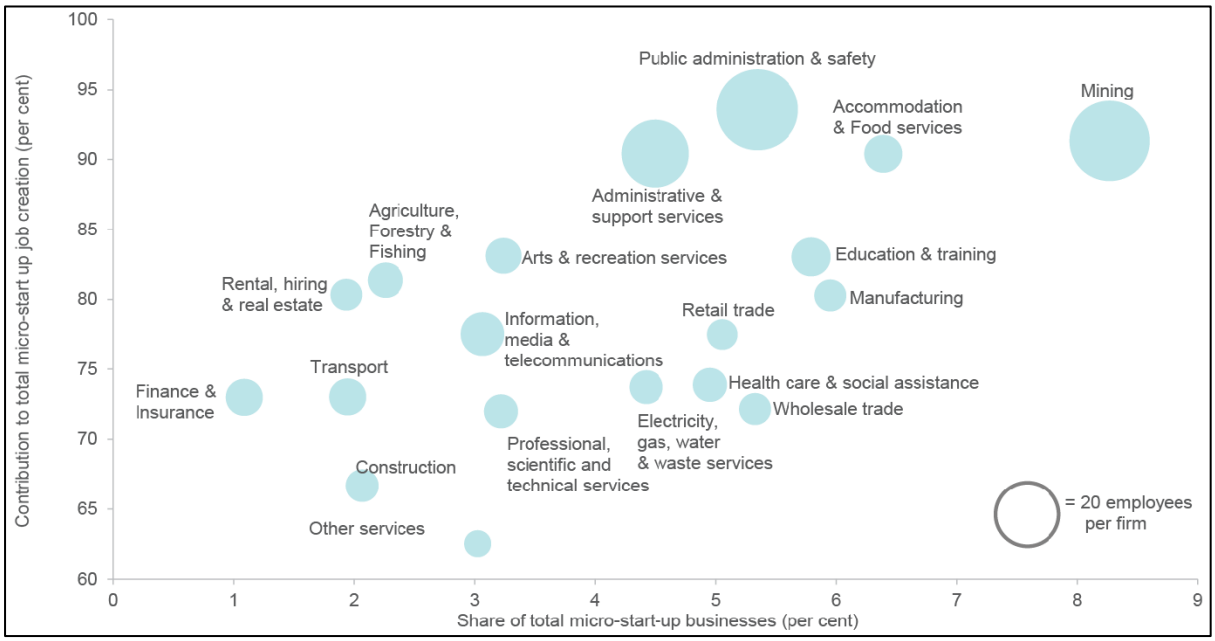
Australian mining innovation is conducted by a diverse workforce of professionals, including engineers, environmental scientists, geologists, geophysicists, mathematicians and financial officers. Mining produces more gross value added per employee than any other industry (double the finance

[1] Joseph Schumpeter, *Business Cycles: A Theoretical, Historical, and Statistical Analysis of the Capitalist Process, Volume 1,* Martino Publishers, 1939, pp. 84, 91, 94f.
[2] Joseph Schumpeter, *Business Cycles: A Theoretical, Historical, and Statistical Analysis of the Capitalist Process, Volume 1,* Martino Publishers, 1939, p. 86.
[3] Department of Industry, Innovation and Science, *Resources and Energy Quarterly publication series*.
[4] Australian Bureau of Statistics, *Research and Experimental Development, Businesses, Australia, 2013-14,* ABS catalogue number 8104.0, released on 4 September 2015.
[5] Australian Bureau of Statistics, *Minerals and Petroleum Exploration, Australia, June 2015,* released on 31 August 2015.
[6] Department of Industry, Innovation and Science, *Australian Innovation System Report,* 2015, p.11.
[7] CSIRO, *Unlocking Australia's resource potential,* 2015, p.4.
[8] Emma Francis, *The Australian Mining Industry: More than Just Shovels and Being the Lucky Country,* IP Australia, 2 June 2015, pp. 6, 22, 30.

sector) and pays Australia's highest wages. Average (full-time) adult total earnings were $2,610 per week in November 2015, 73 per cent higher than the average for all industries excluding mining.[9]

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 (Chart 1).[10]

Chart 1: 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 running down 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 (Box 1).

Box 1: Prime Minister's Prize for Innovation celebrates new minerals processing technique

Australian mining innovation was celebrated by the award of the Prime Minister's Prize for Innovation for 2015 to Professor Graeme Jameson AO at the University of Newcastle. The Jameson Cell revolutionised the 'froth flotation' technique for minerals processing by using smaller and fizzier bubbles to capture ultra-fine and valuable minerals. More than 300 units are used worldwide to process ore as well as coal and metals. This technique cost $65,000 to develop but has retrieved fine export coal particles worth $36 billion.

Professor Jameson has revised his technology with the NovaCell. This device captures bigger grains, potentially reducing mine operations' energy use by 15 per cent and boosting Australia's export income by $100 billion.[11] Professor Jameson's work demonstrates that ground-breaking innovations are not the preserve of start-ups or the so-called new economy.

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.

[9] Australian Bureau of Statistics, *Average Weekly Earnings, Australia, Nov 2015*, ABS, catalogue number 6302.0, released on 25 February 2016.
[10] 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.
[11] Jake Sturmer, 'Engineer Graeme Jameson picks up Prime Minister's science prize for billion-dollar bubbles', *ABC News,* 21 October 2015.

2. THE R&D TAX INCENTIVE PLAYS A VITAL SUPPORTING ROLE

The R&D tax incentive is an effective means of encouraging additional business R&D expenditure in Australia. Crucially, it helps competitive and innovative businesses respond to market demand, rather than allocating taxpayer funds to particular industries or activities that may or may not have a market value. The R&D tax incentive is self-selecting in that only innovating firms will seek to gain access to it. It does not involve governments second-guessing consumer preferences or new techniques of production or distribution, and therefore avoids the risk of taxpayer-backed 'losers'. The national Commission of Audit noted the benefits of market based mechanisms to drive research and development rather than grant based program:

> A significant amount of firm and sector-specific research is supported by measures such as the Research and Development tax concession. Specific grant programmes in addition to this support have the potential to skew investment decisions.[12]

The R&D tax incentive stimulates additional innovation by reducing the marginal cost of investing in new (or significantly improved) products and processes. The latest issue of the Australian Bureau of Statistics' *Innovation in Australian Business* shows that 'lack of access to additional funds' is the barrier most frequently cited by innovating businesses – both in mining and across all industries. The 'cost of development or introduction/implementation' is the third most common obstacle cited by mining companies and businesses overall, after 'uncertain demand for goods or services' (for mining) and 'lack of skilled persons' (for all industries).[13]

The spillovers from the R&D tax incentive are clear and significant. A striking example is the development of a vibrant, home-grown METS sector, which generates revenues of around $90 billion annually with an export component worth $15 billion per annum.[14]

The R&D tax incentive also encourages collaborations – both within industry and between industry and researchers – that advance scientific knowledge, solve industry-wide problems and benefit the economy as a whole. Partnerships with higher education providers include the Rio Tinto Centre for Mining Automation at the University of Sydney and the Rio Tinto Centre for Advanced Mineral Sorting and Julius Kruttschnitt Mineral Research Centre at the University of Queensland, the world-leading Centre of Excellence in Ore Deposits (CODES) at the University of Tasmania, Iluka's partnership with the University of Western Australia's School of Plant Biology to research rehabilitation and conservation of rare shrub-lands, and BHP Billiton's investment towards establishing a new engineering zone at the University of Western Australia.

Further examples of successful collaboration between industry and scientific researchers include:

- **Cooperative Research Centre Mining (CRCMining),** which operates to deliver transformational research and innovations that maximise mining productivity and enhance resource utilisation, safety and sustainability ($12.2 million in 2013-14 with $6.2 million contribution from industry, now wholly funded by industry).[15]
- **Cooperative Research Centre Optimising Resource Extraction (CRC ORE),** which works to improve the efficiency and cost-effectiveness of mineral extraction ($100 million over six years from July 2015, including around $65 million in cash and in-kind support from industry).[16]

[12] Australian Government, *National Commission of Audit*, February 2014, p. 171.
[13] Australian Bureau of Statistics, *Innovation in Australian Business, 2012-13*, Cat. no. 8158.0, last updated 17 September 2014.
[14] Austmine, *Highlights of 2013 METS survey*, 25 May 2013.
[15] CRCMining, *Transforming Mining: Annual Report 2013-14*, p. 41.
[16] CRC ORE, *About Us.*

- The **Australian Coal Industry's Research Program (ACARP),** which aims to improve the industry's competitiveness, safety and environmental performance ($273 million in funding to 1,468 projects since ACARP's inception in 1992).[17]

- The Australian black coal industry's **COAL21 Fund,** which invests in the demonstration of low emissions coal technology ($300 million committed to date).[18]

- **AMIRA International** – a mining industry vehicle headquartered in Melbourne that leverages R&D – has developed almost 700 projects and attracted $578 million of investment since 1959.[19]

- **The Cooperative Research Centre for Greenhouse Gas Technologies** (CO2CRC), a world leading collaborative research organisation comprising participants from the mining industry, universities, and government research organisations focusing on carbon dioxide capture, geological sequestration and storage (CCS) researching and aiming to demonstrate technologies to reduce the costs of capturing CO_2 by 75 to 80 per cent.

These collaborations have generated world-leading research and innovation including (but not limited to) the following:

- **SmartCap** – a wireless system of sensors built into a baseball cap that measures driver/operator drowsiness and displays it on a monitor in the cab. Major mining companies implementing the technology have found the risk of fatigue-related safety incidents is being reduced. The SmartCap is now being considered and adopted by other sectors such as maritime, defence, aviation, and transport and logistics (CRCMining, Anglo American Metallurgical Coal, ACARP and 13 other industry partners).[20]

- **Groundprobe** – radar technology that monitors the stability of open cut mine slopes and walls and forewarns mine workers of instability through an alarm system, credited with saving 20 lives in its first year of commercial use (University of Queensland, ACARP, CRCMining and CRC for Sensor Signal and Information Processing).[21]

- **Callide Oxyfuel Project** – successful capture of CO_2 from a coal-fired power plant in Central Queensland. Callide is the world's largest demonstration of oxyfuel technology to date (COAL21, CS Energy, Glencore, Schlumberger, J-POWER, Mitsui & Co. and IHI Corporation).[22]

- **Future Reef Map** – the first project to monitor ocean chemistry along the entire length of the Great Barrier Reef. Rio Tinto's bauxite shipping vessel *RTM Wakmatha* is fitted with sensors that continuously collect samples and record data during the ship's regular voyages from Weipa to Gladstone and back (Rio Tinto Alcan, CSIRO and the Great Barrier Reef Foundation).[23]

- **Bush Blitz** – Australia's largest nature discovery project that has already identified more than 900 new species and has added thousands of species records to what is already known, helping Australia to protect its biodiversity for generations to come (Australian Government, BHP Billiton Sustainable Communities and Earthwatch Australia).[24]

- **Grade Engineering** – a new set of techniques for assessing and conducting the extraction of ore. Grade Engineering maximises high-value ore going to processing by using innovative

[17] ACARP, *What is ACARP? The Australian Coal Industry's Research Program*; *Annual Report 2015*, p. 3.
[18] Minerals Council of Australia, *About COAL21*.
[19] AMIRA International, *Who we are*.
[20] SmartCap, *Saving lives is our priority*.
[21] Department of Industry, Innovation and Science, *Saving Lives and Profits at Groundprobe;* Groundprobe, *Our company: history*.
[22] CS Energy, *Callide Oxyfuel Project.*
[23] Rio Tinto, 'A natural wonder', *Mines to Markets,* Issue 6, November 2014.
[24] Bush Blitz.

coarse separation technologies and modified circuit designs to remove low-value ore as early as possible in the extraction and pre-concentrate phases. The value of ore sent to processing is increased with no significant impact on the rate of extraction (CRC ORE in collaboration with the mining and METS industries).[25]

- **Geology and Mass Mining project** – new guidelines for the mining of large underground rock masses that enhance the capture and utilisation of geological data for predicting the results of cave creation and blasting. Use of the guidelines is shown to increase the efficiency of these operations (WH Bryan Mining and Geology Research Centre, University of Queensland, sponsored by Newcrest Mining, Anglo American and Glencore).[26]
- **Modelling The Water, Energy and Economic Nexus** – ACARP project that first identified geographic pressure points on water resources in Queensland between the coal mining, coal seam gas and agriculture industries, and then developed plans to better manage water resources.[27]
- **Longwall automation landmark project** – ACARP, partnering with CSIRO, Glencore and other industry participants, produced information to help develop automated technology for longwalls in underground coal mines to increase productivity and improve safety by reducing interactions with machinery in hazardous underground areas.[28]

[25] CRC ORE, *Transforming mining productivity with grade engineering: reversing the trend of declining feed grade and quality*.
[26] *Geology and Mass Mining*, WH Bryan Mining and Geology Research Centre, Sustainable Minerals Institute, University of Queensland.
[27] Alan Woodley, Greg Keir, Estelle Roux, Damian Barrett, Jackson White, Sue Vink, *Modelling The Water, Energy And Economic Nexus*, February 2014.
[28] ACARP, E-Newsletter, *longwall automation boosts productivity, lowers costs*, October 2013.

3. STABLE AND COMPETITIVE R&D POLICY SETTINGS ARE ESSENTIAL

The R&D tax incentive is vital to securing additional R&D investment in a global economy. As a partner at PwC has pointed out:

> Forward-thinking economies like Belgium, Canada, the Czech Republic, France, Ireland, Japan, Norway and, in our own backyard, New Zealand, Singapore and Malaysia have all been significantly expanding their R&D incentives.
>
> We must remain internationally competitive by offering incentives to companies to come to Australia to innovate as well as having an innovation system based on the R&D Tax Incentive so Australian-based companies stay and thrive here.[29]

The fact that nations are competing aggressively to capture R&D expenditure reinforces the need for stability in Australia's R&D policy settings. Unfortunately, the R&D incentive has been characterised by persistent uncertainty owing to frequent changes by successive governments. Following a major review and far-reaching changes in 2011, proposals were made to remove large corporates from eligibility. Those proposals were not passed by the Senate and were then replaced by legislation that introduced a $100 million cap on eligible R&D expenditure, which remains in place. Legislation to reduce the tax offset rate by 1.5 per cent from 1 July 2014 was introduced for a second time in June 2015.

The OECD Directorate for Science, Technology and Industry has emphasised the importance of stability in R&D tax arrangements:

> [C]ountries that have experienced a large number of R&D tax policy reversals, the impact of R&D tax credits on private R&D expenditure is greatly diminished. It is therefore important that governments do not repeatedly tinker with such policies to minimise policy uncertainty for firms.[30]

It is important that Australian businesses now be afforded a stable policy framework in this area to encourage future additional investment in R&D and innovation. Revisiting fundamentals including the eligibility criteria and repeated moves to reduce the rates, including *Tax and Superannuation Laws Amendment (2015 Measures No. 3) Bill 2015* currently before the Senate, undermine stability and confidence in Australia's' support for R&D to be undertaken in Australia.

It is also important to note the role R&D tax incentives provide for larger firms and multinational companies which can locate R&D spend across a number of jurisdictions. The 2009 report 'Powering Ideas: An Innovation Agenda for the 21st Century', which informed the design of the R&D Tax Incentive, acknowledged the importance of larger companies investing in R&D and the importance of maintain Australia's tax competitiveness:

> We also know that larger firms are critical to Australia's innovation effort; 70 per cent of our business R&D is done by firms with 200 or more employees, and we can't afford to see this capacity compromised. Finally, we know that more and more international firms are outsourcing their innovation activities to whichever location they believe is best equipped to support them. This has created fierce competition between knowledge-producing countries to attract foreign R&D investment.[31]

Competitor countries recognise the importance of R&D by providing tax incentives to encourage and attract innovation investment given the positive spill over benefits. These include Brazil's 'super-deduction' equal to 160 per cent of total R&D expenditures, 15 per cent Canadian federal tax credit for R&D costs and provincial government incentives and the UK's 11 per cent tax credit for large

[29] Sandra Boswell, Partner, PwC, 'R&D tax break too important to target for cuts', *The Australian Financial Review,* 3 November 2015.
[30] OECD Directorate for Science, Technology and Industry, *Maximising the benefits of R&D tax incentives for innovation,* October 2013.
[31] Department of, Industry, Innovation, Science & Research, *Powering Ideas: An Innovation Agenda for the 21st Century*, May 2009, p. 45.

company R&D spend.[32] It is important Australia does not move out-of-step with overseas jurisdictions to ensure Australia can attract and retain R&D investment.

[32] Deloitte, *2015 Global Survey of R&D Tax Incentives*, October 2015.