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Presiding Commissioner
Public Support for Science and Innovation Research Study
Productivity Commission
PO Box 80
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Submission in response to Draft Research Report – Public Support for Science and Innovation

The Minerals Council of Australia (MCA) welcomes the Productivity Commission's extensive Draft Research Report for its study of Public Support for Science and Innovation and is pleased to present this submission commenting on that draft. We appreciate the extension of time granted to us in order to provide this response.

The MCA represents Australia's exploration, mining and minerals processing industry, nationally and internationally, in its contribution to sustainable development and society. MCA member companies produce more than 85 per cent of Australia's annual mineral output and devote considerable effort and resources to R&D to remain internationally competitive in highly competitive, international markets.

Australia has long enjoyed a "comparative advantage" in the development of its endowment of geological wealth. Our ability to undertake mining and minerals processing activities and sell product to overseas markets is reflected in the large trade surplus (value of exports minus value of imports) we run in mineral commodities. However, we cannot take that for granted. To fully realise its growth prospects, the minerals industry needs to be safe, globally competitive, socially responsible and trusted, innovative in technology, processes and systems, and environmentally responsible. Furthermore, to retain its competitiveness, the minerals sector also relies on the economic efficiency of the sectors providing it with key inputs to production. **The broader impact and efficiency of Australia's science and innovation policies are therefore very important to the industry** and the MCA is well positioned to comment on the effectiveness of Government initiatives in relation to innovation especially in respect of the minerals industry.

SUMMARY OF RECOMMENDATIONS

In summary, the MCA advocates:

- **there is a strong rationale for the provision of public funding support for science and innovation** that takes into account Australia's comparative advantages and current and emerging competitive advantages;
- **retention of the R&D Tax Concession as the fundamental support mechanism for R&D by industry** – providing an R&D incentive to all companies with common rules across industry;
- **an increase in the 125 per cent basic rate to either 150 or 175 per** cent to reflect the increasing difficulty in harnessing the benefits of R&D and to strengthen the likely returns of R&D projects given the significant narrowing of the coverage of the scheme since its inception;
- **a broadening of eligible activities** under this basic rate and no incremental "incentive" concession rate that is "after the act" to address industry's desire for greater cost certainty at the project evaluation stage;
- **the R&D Tax Concession and commercial grant support be available to all firms that meet the established selection criteria and integrity measures** (based on rational, pragmatic, effective and constructive criteria);
- **continued support for government facilitated research, development and demonstration (R,D&D) and other public support for science and technology** through programs and institutions such as Cooperative Research Centres, Universities and CSIRO;
- **more consideration being given in the draft findings to building capacity in Australia's publicly funded education and training systems and addressing the impediments to skills development** – eg by supporting policies whereby**:**
  - the Australian Government complement its educational efforts and those of the broader minerals industry:

a) by moving from Cluster 8 to Cluster 10 the Commonwealth Course Contributions for Process and Resources Engineering (FOE Code 0303) to help offset the higher unit teaching cost per student, each of whom will make a significant economic contribution (> $600,000 pa) to export income after entering the workforce; and

b) through assisting the Minerals Tertiary Education Council (MTEC) and its partner institutions to gain market access to Latin American countries through organisations such as the Council of Australian and Latin American Relations (COALAR) to deliver courses in engineering and physical, environmental and social sciences relevant to the minerals industry; and

– the Australian Government approach to skilled migration encompass measures to promote employment of skilled persons under 457 Visa arrangements that are flexible and avoid unnecessary processing delays. International postgraduate research students be encouraged to come to Australia to participate in R&D activity and to gain an Australian postgraduate qualification through flexible visa, scholarship and study arrangements;

- **retention of the Australian Government's articulation of national research priorities at the present level of detail**;
- **reinstatement of the original objective of the CRC program** — the translation of research outputs into economic, social and environmental benefits;
- **the adoption of measures that reduce the legal and administrative requirements placed on CRCs while still maintaining adequate levels of accountability for the expenditure of taxpayers' funds**;
- **as a complement to the CRC program a program be developed with smaller, shorter and more flexible collaborative arrangements**; and
- **delay the adoption of the Research Quality Framework** (RQF) until further analysis is carried out to demonstrate substantial net benefits of such a move.

The remainder of this submission comments on particular findings by the Commission in its Draft Research Report.

DETAILED COMMENTS ON THE DRAFT FINDINGS OF THE PRODUCTIVTY COMMISSION

Draft Finding 3.1 – Provision of public funding support

The MCA strongly endorses the Draft Report view that there is a strong rationale for the provision of public funding support for science and innovation and this should be taken to include:

- **public good spillovers** from innovation that cannot be fully captured by innovators and/or fully realised without public support – some examples of which include:
  - **activities that seek to address environmental, social and other public good issue**. For example (and this goes further than the Draft Report discussion), given concerns over global warming induced by human activities, there is a strong rationale for publicly funded research, development and demonstration of transformational, step-change technologies that lower greenhouse gas emissions or sequester CO_2 – **there is also a strong argument that even after commercialisation, such technologies will require further public funding for deployment**. Another example is assistance in precompetitive geoscientific information through Geoscience Australia and its state/territory counterparts. A third example is the recent comprehensive Innovation Road Map of Victoria's earth resources, which accommodated the physical sciences, environmental sciences and social sciences. The Road Map has identified the key innovation pathways that are critical to Victoria achieving the full potential of the mineral resources of the State;
  - **where businesses are engaged in novel (and by definition risky) R&D activities** with potential spillover to others and/or that trigger cycles of innovation by others in the same or different industries (eg environmental, building and construction and waste management innovations developed through collaborative work between industry and government bodies that have spilled over from the minerals sector into other sectors and vice versa). Sometimes technologies transferred out of the minerals sector are improved by other sectors and retransferred into minerals applications. The spillover benefits will be greatest

when the economic and social benefits to Australia are greatest and not necessarily when there are many potential domestic beneficiaries as stated in the Draft Research Report. Examples of spillovers include:

a) the waste management industry utilises aspects of mineral processing technology developed with the assistance of CSIRO and other public bodies in concentrating low value items into higher value ones;

b) a range of mining equipment (laboratory automation equipment, trucks and ore sorters) has been developed and led to spin-offs to other industries. Similarly, some of the mineral sector's environmental management and rehabilitation initiatives, ground penetration and geological and/or geochemical survey techniques have been and are continuing to be developed to assess and address environmental problems in other industries;

c) machine vision technology developed in the minerals sector having manufacturing applications – in particular sorting items off conveyor belts (eg ginger, pineapple and prawn), sheet metal inspection and weld quality inspection;

d) new mining disc-cutter technology transferred to sugar milling, coal transport technology transferred to other bulk commodity handling applications and the swing-control technology developed for draglines having application to large cranes used in other industries where uncontrolled load swing can be a major safety problem;

- **scientific research in universities and public sector research agencies working in consort with industry's R&D needs** – including policies aimed at increasing the effectiveness of an innovation system or at more efficient use of both public research institution personnel and infrastructure; and
- **addressing rigidities in capital markets that could affect the availability of finance and insurance services to risky or uncertain investments** not just in small firms and start-ups as stated in the Draft Research Report but also elsewhere (eg in carbon capture and storage technology demonstration and in experimenting with evolving R&D applications in relatively benign environments – such as storage systems for potable water – so that once proven, they can then have application in the actual target area of toxic and hazardous substance storage environments in the minerals sector).

Draft Finding 5.1 – Impediments to innovation

The vital role of human capital in the innovation process places the education and training systems firmly at the centre of an innovation policy framework in Australia. Innovation success in Australia requires an innovation policy framework that values education, skills and the ongoing development and contribution of people. Innovation success also requires the development of skills in our people for:

- creating and using new knowledge;
- recognising opportunities to adapt existing knowledge and innovation from other industries; and
- applying such knowledge in order to improve Australia's innovativeness and competitiveness (including through technology transfer from overseas).

Much is being done to address skills and people shortages by both industry and government and the Draft Research Report does recognize the importance of the education and training systems in Australia and the delivery of the skills and skilled people essential for innovative activity**.** The MCA agrees with the concerns raised by the Commission regarding the shortages in engineers (though the key shortage is in **new graduates**) and in science and mathematics teachers. However, with regard to *Terms of Reference 2* for this research study, apart from those conclusions there is no finding regarding the impediments to skills development. **The MCA would like to see more in the findings about improving the education and training system and addressing the impediments to skills development.**

- With regard to school education, the MCA supports programs and initiatives that:
  - enhance teacher access to quality professional learning;
  - provide greater flexibility in pay structures for teachers to help address science and mathematics teacher shortages;
  - assist young people make an informed and smooth transition from school to further study, training or work

particularly through the Careers Advice Australia network;

- streamline entry pathways to trades and semi-skilled occupations; and
- expand provision of Higher Education Contribution Scheme relief for teacher trainees in science, maths and technology.

- With respect to **Vocational and Technical Education**, the minerals industry supports the Australian Government's new Vocational and Technical Education (VTE) arrangements through its representation on the National Industry Skills Committee and active involvement in the Institute of Trades Skills Excellence and the National Quality Council. The MCA policy position on VTE is tempered by the over-riding priority of attracting to and retaining employees in the industry. The MCA seeks a VTE system that:

  - is driven by industry and business needs;
  - is flexible in its ability to deliver training to remote and regional communities;
  - provides certification that is transportable across State and jurisdictional boundaries;
  - recognises training providers as service providers;
  - prioritises public resources to critical skill shortage needs in the mechanical and electrical trades;
  - delivers quality training outcomes; and
  - services industry at times and places that meet industry and employee needs.

  MCA initiatives being implemented within this framework are informed by research carried out under a two year National Skills Shortage Strategy (NSSS) Project between the MCA, the Chamber of Minerals and Energy of Western Australia and the Department of Education, Science and Training (DEST). The research findings are documented within the following three reports:

  - *The Labour Force Outlook in the Minerals Sector, 2005 to 2015;*
  - *Accessing the Required Skills from International Markets;* and
  - *Addressing the Barriers to the Employment and Training of Trainees and Apprentices in the Australian Minerals Industry.*

  The MCA welcomes the Australian Government's *Skills for the Future* package offering 500 additional Commonwealth supported university engineering places as a step towards redressing the skills shortages which impact upon the mineral industry. Even so, we need to be mindful of the potential impact of students who previously could not enrol in engineering at university and may now be able to do so thus opting out of a trade, students of which are also in short supply.

  The MCA and DEST are now engaged in further dialogue to identify the policy drivers that will generate leverage for both industry and government initiatives to address current people and skills shortages.

Recommendation:

The MCA recommends the Commission support policies for example whereby:

- the Australian Government complement its educational efforts and those of the broader minerals industry by:
  - *moving from Cluster 8 to Cluster 10 the Commonwealth Course Contributions for Process and Resources Engineering (FOE Code 0303) to help offset the higher unit teaching cost per student, each of whom will make a significant economic contribution (> $600,000 pa) to export income after entering the workforce; and*
  - *assisting the Minerals Tertiary Education Council (MTEC) and its partner institutions gain market access to Latin American countries through organisations such as the Council of Australian and Latin American Relations (COALAR) to deliver courses in engineering and physical, environmental and social sciences relevant to the minerals industry;*

- the Australian Government approach to skilled migration encompass measures to promote employment of skilled persons under 457 Visa arrangements that are flexible and avoid unnecessary processing delays. International postgraduate research students be encouraged to come to Australia to participate in R&D activity and to gain an Australian postgraduate qualification through flexible visa, scholarship and study arrangements.

Draft Finding 8.1 – Economic impact of public support for science and innovation in Australia

The minerals industry has a long association with the research community through, for example, CSIRO, various Cooperative Research Centres, the Australian Mineral Industries Research Association (AMIRA International) and many universities. **The MCA supports the overall conclusion of the Draft Research Report that "Australia's innovation system does not warrant radical overhaul in either its total funding or in the allocation of that funding" with the exception of the findings regarding the R&D Tax Concession and commercial grants.**

Draft Finding 9.1 – The R&D Tax Concession

The MCA does not support the draft finding. The MCA strongly supports retention of the R&D Tax Concession as the fundamental support mechanism for R&D by industry – providing an R&D incentive to all companies with common rules across industry.

The R&D Tax Concession has been in place for nearly 22 years and has assisted the Australian resources sector and the broader economy in developing its technology base. This expanded and competitive technology base has contributed to the enhanced performance of business R&D, and to Australia's global presence as an innovator in minerals R&D.

There exists very strong justification for a tax deduction in excess of 100 per cent for R&D related expenditures:

- the Productivity Commission, in its submission to the (Mortimer) Review of Business Programs provided a *Checklist for Assessing Proposed or Existing Business Programs* and the Concession is strongly justified in terms of that Checklist (refer to **Table 1**);
- increasing global competition means the continued viability of Australian mining and minerals processing is highly dependent on cost reductions, many of which are commonly achieved through the accumulation of technological expertise and an ability to convert this expertise to improved processes and systems. The issue is that key developments such as globalisation and the growing integration of markets means the benefits of R&D are becoming increasingly difficult to harness;
- the successful adoption of technology is a fundamental contributor to improved productivity and economic growth in the Australian minerals industry. This in itself has significant benefits such as employment growth and stronger taxation revenues. Spillover benefits associated with R&D in the minerals sector and elsewhere include the diffusion of concepts and practices to other related and non-related sectors of the Australian economy; and
- Australia's level of industrial research and development as reported by the Commission (in Appendix C) continues to be low by international standards:
  - the Government Expenditure on R&D to GDP ratio is 1.65 per cent for Australia, compared to an OECD Average of 2.2 per cent);
  - Australia's Business Expenditure on R&D (BERD) at just under 1 per cent of GDP is 0.7 per cent below the OECD average and less than half the European Community's business R&D target; and
  - Australian Government financed R&D is 0.69 per cent of GDP compared to the OECD average of 0.66 per cent of GDP;
- apart from Australia, the only other OECD countries that do not employ empirical R&D targets are the two largest R&D performers, the United States and Japan (in Appendix C to the Draft Report).

If the Tax Concession is removed there is a serious concern that BERD will drop if Australia does not provide a climate that is at least as favourable to investment in R&D as provided in other developed countries. The main problem with the Concession is that its value is now 7.5 cents in the dollar (before compliance costs are taken into account with typically only a portion of a project's expenditure being eligible for the Concession) and it is probably the least

generous of its type in the OECD. While it is true that the Tax Concession is available to all firms for all eligible R&D (only a part of which will generate additionality), nevertheless spillovers from any industry investment in R&D are strong.

TABLE 1: The R&D Tax Concession and the Productivity Commission's
Checklist For Assessing Proposed Or Existing Business Programs

Threshold questions	
Are there externalities, information deficiencies or policy impediments that warrant government involvement?	There are likely to be significant external social benefits from R&D activities undertaken by private firms.
Are there significant costs if nothing is done, and do they exceed the costs of government intervention?	The Productivity Commission and the Bureau of Industry Economics have in the past both concluded that removal of the Tax Concession for R&D would lead to a reduction in GDP.
Is a business program the only, or the best, way to address the problem?	The tax-based concession is a good way of addressing the problem since it allows firms themselves (rather than governments or their agencies) to decide what R&D to undertake and when.
Design and delivery questions	
If the answer to all of the above questions is "*yes*":	
• does the program target the problem explicitly;	The problem of under-investment in R&D because of market failure is widely spread among firms. Therefore, a general (non-selective) approach to correcting market failure is most suitable.
• is its emphasis on supporting additional activity;	The current approach supports additional activity since firms themselves must take the initiative in R&D.
• is the program open to any firm and, if not, why not;	The concession is available to all firms with eligible R&D activities – meaning that firms have limited incentives to lobby for special treatment.
• is there scope to reduce compliance costs without adversely affecting broad outcomes, or reducing the capacity of the managing agency to monitor the program;	The scheme has relatively low administrative and compliance costs and these would not be likely to increase if the level of the incentive were returned to 150 per cent or raised higher.
• does the program avoid duplication with other Commonwealth or state and territory programs;	Despite the availability of some other grant and concessional loan schemes for R&D, the tax concession does not appear to duplicate other Commonwealth or state incentives for R&D.
• is the support provided to firms transparent;	The total cost of the concession is transparent and publicly reported each year.
• does the program have clear eligibility criteria which avoid undue administrative discretion;	Eligibility criteria are clear: – expenditure must involve innovation/risk; – R&D must (generally) be carried out in Australia; – it must have adequate Australian content; and – the results must be exploited for the benefit of Australia.
• is there a requirement for public reporting of outcomes achieved and the beneficiaries of assistance;	Over the years improvements have occurred in monitoring the effectiveness of R&D carried out under the scheme and tightening eligibility.
• does the program have a sunset clause and is there provision for independent, periodic review; and	The scheme has been reviewed by independent bodies and found to be in the public interest.
• when the program involves a service to business, is delivery contestable and are users required to contribute to costs?	The scheme needs no sunset clause since it addresses an ongoing market failure that is implicit in R&D activities.

Source of column 1: Productivity Commission (1997), *Submission to the Review of Business Programs*, p. vii

Often it is argued that the reduction in the level of the Tax Concession from 150 per cent is offset by the reduction in the company tax rate to 30 per cent. However since its inception, there have been various amendments to the way it operates:

- it is well recognised from a technical point of view, that minerals industry process solutions developed in the test laboratory and in small-scale (pilot plant) trials, often *do not work* as expected in scaled-up versions. Indeed, much R&D activity of this nature cannot be modelled in laboratory and pilot plant environments. This activity needs to continue in fully scaled-up plants to enable fully developed process solutions to be achieved. This leads to the complication that any planned or hoped-for commercial application of plant developed with assistance under the Tax Concession where the R&D phase is successfully completed, probably renders the expenditure ineligible for the R&D incentive at any stage;
- over the years since its inception, there have been many changes to the Concession, which is now much more focussed on research than on development activities (eg court/tribunal cases have led to tightening of eligibility criteria and feedstock has been removed as an eligible activity);
- the maximum concession benefit would now only apply for the period the relevant plant is used exclusively in eligible R&D activities; and
- R&D plant and equipment is now deductible over its remaining effective life at the normal (100 per cent) rate once it is no longer used in R&D activities.

Reorienting the Tax Concession towards the 175 per cent incremental component and small firms is not supported. The problem with incremental incentives, in general, is that they do not work effectively. When business sales are increasing significantly it is hard for companies to increase their R&D expenditure as a percentage of turnover. But to a degree, this is when they should be rewarded for doing so. When the economy is performing poorly, companies may not be able to afford to increase R&D and take-up the incremental benefit. In addition, the incremental incentive is complicated by the grouping provisions, which means that most larger companies do not know until after year-end if they are going to be able to benefit.

The eligibility criteria for the incremental concession create other anomalies. For example, if one member of a (consolidated) corporate group fails to spend their anticipated R&D budget in one year, this can result in a group average decline in R&D expenditure in that year even though the short fall may be spent early in the next period. The incremental incentive may therefore be just a windfall gain if the group's circumstances deliver an overall increase in R&D spend in a particular year.

The R&D Offset needs to be reviewed so that the present upper limit on turnover is increased and the penalties for exceeding it reduced. Furthermore, it appears that many firms only discover that they are eligible for the 175 per cent component or the tax offset after the end of the financial year. This means that there is limited incentive effect.

The Report defines ''additionality" as private investments that would not otherwise have been made. Designing a public program that encourages "additionality" is difficult, as there are many drivers to why firms undertake R&D and at what level. For minerals producers one critical driver is the anticipated return on investment of an R&D project. The final Report should acknowledge that there are spillovers and social benefits from any and all business R&D and that additionality should be just one consideration among others for public support.

Like all other potential expenditures, minerals companies commonly assess R&D projects in terms of their likely returns. An assessment of likely returns necessitates a very clear understanding of a project's costs and benefits at the project selection stage. Currently, for major minerals companies the incremental tax concession is too hard to account for due to the uncertainty associated with determining eligibility.

R&D programs should be designed to assist companies maximise their returns on all R&D investments (at levels and at periods of time of a company's choosing). This means the Tax Concession should be increased beyond 125 per cent as a flat rate so as to make the tax benefits in NPV terms roughly comparable to the benefits that were enjoyed when the R&D concession was 150 per cent – and when the MCA's annual Minerals Industry Survey suggests minerals sector R&D expenditures were at their highest levels (this would necessitate an increase to 150 per cent, and possibly 175 per cent). The costs of administration of the Concession would not be expected to rise significantly at the

higher rate due to the maturity of the scheme. The Tax Concession should also encompass a greater range of eligible activities than is allowable today so it is again a Concession for R *and* D.

Linking access to an incremental tax concession to a fixed base R&D-to-sales ratio is not supported, as it would not induce the minerals industry to maintain sustained R&D budgets. Given the industry's very high levels of turnover at present, access to the premium concession would be difficult. For example, if the ratio was set at 0.66 per cent (being the industry's estimated 30 year R&D-to-sales ratio average based on the MCA's annual survey), the industry in 2006 would have needed to increase its R&D spend by 60 per cent. This is unrealistic and prohibitive. Like the current three-year rolling average guideline, an arbitrary 'hurdle' rate penalises those with responsive and flexible R&D expenditures and does little to encourage a culture of budgeting and planning for sustained R&D expenditures.

Report's view in Chapter 7 regarding National Research Priorities

The MCA supports the Productivity Commission's view in favour of retention of the Australian Government's articulation of national research priorities at the present level of detail.

Draft Finding 9.2 – Commercial grant programs

It is appropriate that public support for research should maximise socially valuable outcomes, including high quality, high impact, commercial research (as well as pre-competitive commercial research). The MCA is aware of the arguments in favour of targeting small and medium sized firms in commercial grant programs. However, the Minerals Council points out that **support should also be available for large firms that meet the established selection criteria and integrity measures (based on rational, pragmatic, effective and constructive criteria).** The MCA therefore supports the statement in the Draft Report that this would probably "require a substantial increase in overall program funding given the differences in the scale of research activity by larger firms".

Draft Finding 9.4 – Cooperative Research Centre (CRC) program

The MCA:

- supports the finding that **the original objective of the CRC program**, which incorporated a sustainable development approach – the translation of research outputs into economic, social and environmental benefits – **should be reinstated** as this is likely to produce better outcomes than focusing public support on the commercialisation of industrial research alone;
- supports in principle the adoption of measures that reduce the legal and administrative requirements placed on CRCs **while still maintaining** adequate levels of accountability for the expenditure of taxpayers' funds.

Draft Finding 9.5 – A complement to the CRC program

The MCA supports the finding that a complement to the CRC program should be developed with smaller, shorter and more flexible collaborative arrangements. This might also follow the two-strand approach recommended above.

Draft Finding 10.1 – Public sector research agencies

The MCA supports the thrust of the Commission's draft finding that the current *real value* of "block funding" should not be reduced but reasonable additional funding should be considered as part of the usual funding review processes.

Draft Finding 11.1 – Research Quality Framework (RQF) program

The **MCA is concerned at the adverse consequences and costs of introducing a RQF and supports the thrust of the Commission's findings to delay its adoption** until further analysis is carried out to demonstrate substantial net benefits. The RQF appears to place greater value on pure research than on applied research. The Commission should carefully evaluate the net benefits of such an approach – especially if it would result in research funding flowing more to pure science and technology research.

The MCA would welcome the opportunity to discuss any of these matters further should that be of assistance to the Commission.

Yours sincerely

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