

Submission
September 2015



Inquiry into Technological and Service Innovation in Western Australia

**Economics and Industry Standing Committee -
Legislative Assembly**

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About CME

The Chamber of Minerals and Energy of Western Australia (CME) is the peak resources sector representative body in Western Australia funded by its member companies, which generate 95 per cent of the value of all mineral and energy production and employ 80 per cent of the resources sector workforce in the state.

The Western Australian resources sector is diverse and complex, covering exploration, processing, downstream value adding and refining of over 50 different types of mineral and energy resources.

In 2014, the value of Western Australia's mineral and petroleum production was \$114.1 billion. Iron ore accounted for approximately \$65.1 billion of production value to be the state's most valuable commodity. Petroleum products (including LNG, crude oil and condensate) followed at \$25.1 billion, with gold third at \$8.7 billion.¹

Notwithstanding the recent decline in the price of several export commodities, the estimated value of royalty receipts the state received from the resources sector still composed over 16 per cent of estimated total state revenue in 2015-16, or around \$4.4 billion.²

As at March 2015, there was approximately \$179 billion in resources sector projects committed or under construction in Western Australia and a further \$118 billion in proposed or possible projects.³

Recommendations

- 1. CME recommends technological and service innovation policy initiatives are designed to have industry embedded into them at their core.**
- 2. Whilst industry has taken the lead in this space through a number of different programs, CME recommends government to take a stronger leadership role in growing STEM awareness and uptake, as improved STEM skills capacity will lead to a competitive innovation economy.**
- 3. CME recommends work is undertaken by government to better understand industry's future workforce needs to inform development of the education and training sector.**
- 4. CME recommends government take a holistic approach into developing policy that fosters an environment conducive to innovation and commercialisation.**

¹ Department of Mines and Petroleum (DMP), *Mineral and Petroleum Industry 2014 Review*, 2015, www.dmp.wa.gov.au/1525.aspx, p. 1

² Government of Western Australia, *2015-16 Budget, Budget Paper No. 2 Volume 2*, www.ourstatebudget.wa.gov.au/Budget-Papers, pp. 541 & 593

³ DMP, 2015, *loc. cit.*

Context

The Chamber of Minerals and Energy of Western Australia welcomes the opportunity to provide input into the Inquiry into technological and service innovation in Western Australia.

CME considers innovation a critical strategic imperative for the Western Australian Resources sector. Indeed, CME's Strategic Plan explicitly mentions the need to link industry and researchers to promote adoption of new technologies as a priority outcome as part of industry's economic competitiveness aspiration.

Beyond economic competitiveness, driving innovation is at the core of improving industry's performance across a number of measures - including how industry interacts with the natural environment and the safety, wellbeing and prosperity of people and communities, both those directly engaged by the resources industry and wider stakeholders.

The Western Australian resources sector has positioned itself in the global market through the development of innovative projects and processes and through having an innovative and highly productive value-chain. The resources sector at a national level has been recognized as innovation leaders by the Federal Government, with scope for further development. The Industry Growth Centres are the centrepiece of the Government's industry policy and form part of the Industry Innovation and Competitiveness Agenda. Two of these five Industry Growth Centres under development relate directly to the resources sector – Oil, Gas and Energy Services and Mining Equipment, Technology and Services (METS).

For the continued growth of the resources industry's competitiveness, the fostering of an environment, culture and workforce that is innovative is crucial. This submission will provide responses to some of the issues around innovation the Inquiry is examining.

Collaboration and Partnerships

CME considers there to be existing models which deliver innovative outcomes that significantly benefit the major stages of the resources industry – exploration, mining/extraction and processing. These partnerships demonstrate collaboration between government, universities and business either directly through participation in projects and activities or indirectly through funding support.

There are two resources-related State Government backed organisations that have been successful in recent times, both of which have been supported by CME: the Western Australian Energy Research Alliance (WA:ERA) and the Minerals Research Institute of Western Australia (MRIWA).

WA:ERA has brought together oil and gas industry partners, the Commonwealth Scientific and Industrial Research Organisation (CSIRO), the Federal Government and State Government in a collaborative environment to lead to research and development outcomes. A report commissioned in 2010 found, at the time a risk-adjusted present value impact for industry for part of WA:ERA's research was valued to be \$354m-\$623m over ten years. This was as a result of reduction of capital intensity in LNG infrastructure, production efficiencies and discovery of new gas reserves. To ensure the future innovative development of the Western Australian oil and gas industry, WA:ERA has tendered to house the aforementioned Industry Growth Centre's headquarters. This would be a boon for the Western Australian industry and this co-location would no doubt lead to research synergies, improved access to talent and the creation of a global hub for oil and gas technology, both for large players and small to medium enterprises.

Secondly, CME has been at the centre of the development of the Minerals Research Institute of Western Australia (MRIWA) and its predecessor the Minerals and Energy Research Institute of Western Australia (MERIWA). MRIWA fosters an innovative resources sector by investing State Government funds in research proposals geared to develop

solutions and opportunities through multi-partner industry co-funded projects. MRIWA has partnered with around eighty companies to deliver on its Research Priority Plan. MRIWA also awards scholarships for post-graduate research for PhD candidates and also for final-year undergraduate students to ensure the next wave of researchers are well-supported. This model has proven successful in stimulating minerals research to in-turn support investment in a globally competitive minerals industry in Western Australia.

In addition to these Western Australian institutions, the Federal Cooperative Research Centre (CRC) model has also served the resources sector well. Previous CRC's such as CRC for Sustainable Resource Processing, CRC Mining, CRC for Mining Technology and Equipment, CRC for Extractive Metallurgy and the Parker CRC for Integrated Hydrometallurgy Solutions have all added significant value to the resources industry through research-based solutions and projects. Current CRC's such as CRC Optimising Resource Extraction and the Deep Exploration Technologies CRC continue important work in developing commercialised step-change advances through industry-led collaborations between researchers, business and the community.

Finally, the Centre for Exploration Targeting, based at UWA's School of Earth and Environment is an example of an applied research enterprise delivering a substantial portfolio of applied research and specialized education and training programs, with a strong industry buy-in through its industry membership program. CET's mission is to focused on increasing both the rate and quality of mineral discoveries through innovative and cost-effective developments in exploration and resource management and is supported by a number of means – through competitive grants, direct partnerships with industry and through individually tailored research projects. CET has had great success across a range of commodities relevant to Western Australia across exploration through demonstrated results and clear presentation of a value proposition for their activities.

These institutions mentioned and the innovation sector more generally, are more critical than ever for the resources sector which has seen significant declines in productivity over the last decade and a constrained financial environment leading to significantly reduced exploration activity. This is also against a backdrop of the average grade of mined Australian ore bodies halving over the last thirty years and higher strip ratios; leading to an increase in energy costs and reduced efficiency.

The common link for each of these collaborative ventures is that, through various means, they each have industry advice and participation embedded into their structures. This simple aspect ensures there is industry currency, relevance and buy-in which is critical for research-related organisations. CME encourages the Committee meet with the leadership of the Centre for Exploration Targeting and visit its premises at the University of Western Australia to get an appreciation of their successes and the characteristics which lead to a successful, industry-led research organisation.

Whilst these organisations facilitate innovation particular to their expertise, there is a need for ongoing broader communication between industry and the research sector to ensure there is a clear understanding of what each sector requires to be successful. To this end, CME will be hosting an innovation forum in late 2015 to ensure this communication can occur. Research organisations and providers will be brought together with key industry executives to foster discussion, collaboration and innovation.

Recommendation: CME recommends technological and service innovation policy initiatives are designed to have industry embedded into them at their core.

Education

Underpinning the development of an innovative resources industry is the capacity of the Western Australian workforce, both current and future, to drive the sector. The science, technology, engineering and mathematics (STEM) skills required for industry at present, and

into the future, currently plays, and will continue to play, an important role determining our ability to be successful.

The Australian Chief Scientist recently stated that 75 per cent of the fastest growing occupations require STEM skills and knowledge⁴. Also, the Committee for Economic Development of Australia report into Australia's future workforce stated that 40 per cent of Australian jobs that exist today have a moderate to high likelihood of disappearing in the next ten to fifteen years due to technological advancements⁵. These statistics are stark evidence as to the importance of ensuring the Australian education sector has a clear focus on attracting students and educators to STEM disciplines.

CME notes the Australian Chief Scientist's Vision for a Science Nation paper and the WA Chief Scientist's State Science Statement both recognise the importance of the development of STEM skills for the workforce. However, for this vision and statement to translate into meaningful change, government initiatives directed at improving Australia's STEM capacity must be funded and activated, not just be recognised as important.

Industry has already been proactive in this space for many years. Earth Science Western Australia recent winners of a Premier's Science Award, has seen significant industry investment in the organisation to raise enrolments and awareness of Earth and Environmental Science (EES) across all school years and to develop the capacity of educators to confidently and competently deliver EES related content. Importantly this learning is contextualised to the Western Australian resources sector. This highly successful program engages over 400 schools, 1,000 educators and 6,000 students in Western Australia annually and it has run without financial assistance from State and Federal Government for over a decade. Significant financial and in-kind contributions have been made to ESWA by CME; Woodside, through its Woodside Australian Science Project (WASP); Conoco-Philips through its Primary Australian Literacy Mathematics & Science (PALMS) and a host of other companies.

A recent proposal has been developed to roll out the ESWA model across all STEM disciplines by a consortium known as STEM-WA. This pilot proposal has been supported by CME, other industry associations and a number of eminent scientists and industry leaders and is intended to commence in the 2016-17 year. This is an off-the-shelf project that can be implemented by Government to ensure STEM is prominent in schools and therefore the schools sector is delivering candidates into the tertiary education and training sector aligned to the future needs of the Australian workforce.

Another example of industry taking the lead is the Minerals Tertiary Education Council (MTEC). Through direct funding from Minerals Council of Australia member company members, MTEC has invested over \$40m over the past fifteen years into resources-related undergraduate higher education, to develop the next generation of industry professionals through collaborative efforts between the university sector and industry. This has been delivered in an environment of uncertainty in higher education and many closures and mergers of Australian minerals-related higher education departments and schools. Under current government funding arrangements, the small size of the departments MTEC supports will always leave them as vulnerable. Given the high value add graduates produced by resources-related higher education, it is critical this sector is supported and sustainable.

Given the aforementioned reliance on STEM skills for future employment, it is imperative currently underrepresented groups are provided special and targeted support. Examples of industry investment in STEM-related programs targeting women and Indigenous people include:

⁴ Chief Scientist, *Science, Technology, Engineering and Mathematics: Australia's Future*, September 2014, p.7

⁵ Committee for Economic Development of Australia, *Australia's future workforce?*, June 2015, p.6

- BHPB Billiton's investment of \$22m to support the Australian Mathematical Sciences Institute to increase the representation of women in the field of mathematics;
- BHP Billiton's investment of \$28.8m to support CSIRO's program to promote pathways aimed at increasing Aboriginal and Torres Strait Island representation in STEM professions.
- Rio Tinto's joint initiative Girls in Engineering Program with The University of Western Australia (UWA) as part of its Global Education Partnerships Programme to foster skills for the future and build education capability.

Recommendation: Whist industry has taken the lead in this space through a number of different programs, CME recommends government to take a stronger leadership role in growing STEM awareness and uptake, as improved STEM skills capacity will lead to a competitive innovation economy.

How Research Can Lead to the Development of New Jobs

A key development in the Western Australian resources sector in recent times has been the introduction of automated technologies in project development and operations. The industry has seen remote drilling, trucking and train operations being rolled out over the past decade.

Remote operations centres for BHP Billiton, Rio Tinto and Roy Hill in the mining sector and most players in the oil and gas sector has seen a new means of production for the resources industry. This has led to changes in the skills needs for industry, away from on-site operator roles, towards highly-skilled remote operations role, specialist trade roles particularly with regard to maintenance needs of automated equipment, and technologist roles and engineering roles for the invention and development and implementation of automated solutions. These roles will require development of STEM skills to ensure a qualified workforce to operate and maintain the industry of the future.

The Resources Industry Training Council has commissioned two reports looking at the future skills needs of industry *Rise of the Machines? (2012)* and *Component Automation in the Australian Mining Industry (2014)* which unpack the issues relating to the impact on skills as a result of automated technologies. These reports highlight the importance of higher skills being required by industry as automation is introduced, particularly in information and communications technology and in the analysis of big data.

As a result of automated and computerised technologies it is possible to collect and monitor vast sets of data pertaining to resources sector operations. Analysis of this big data is where industry can generate improved productivity and safety. People with the appropriate skills and education and training in this field (and STEM fundamentals) will become even more critical to industry over time as these technologies become standardised across the resources sector.

It is clear from the example of automation that research and innovation leads to new roles in the resources sector. Again, having the fundamental skills in STEM to capitalise on these opportunities is critical.

Recommendation: CME recommends work is undertaken by government to better understand industry's future workforce needs to inform development of the education and training sector.

Fostering Investment in Innovation and Commercialisation

Technology transfer and the commercialisation of innovation and research has long been recognised as challenging in Australia. This is as a result of multiple factors including: small capital markets (on a global scale), cultural issues between industry and academia, a

challenging legal framework around intellectual property and a complex taxation environment.

To facilitate and incentivise Research and Development (R&D) investment, Australia needs competitive and stable tax systems. It is critical the tax settings and incentives are structured such that there is the appropriate incentive for investment, which is often of a significant scale in the resources industry, into new technologies. The Australian mining sector is a significant investor in R&D, currently spending around \$4 billion per annum. This accounts for 22 per cent of all business R&D investment in Australia⁶.

Offsets programs such as the R&D Tax Incentive are critical to stimulate business investment in R&D. The current review of this program in conjunction with the Tax White Paper will hopefully see the benefits of the Incentive program, and recommend it is expanded, so it can continue to ensure Australia remains a global centre of resources research, exploration and production. The Incentive is also particularly important for SME's, who are a large part of the METS and oil and gas services industry, in that it accommodates their early cash flow challenges of these businesses.

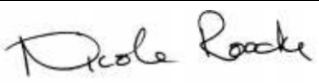
For commercialization of research and technology transfer to improve, reports have recommended realistic and detailed planning and focus in the university/research sector with regard to their commercialization activities and offices⁷. However this is only part of the solution, with appropriate government policy to stimulate investment in innovation also necessary.

Recommendation: CME recommends government take a holistic approach into developing policy that fosters an environment conducive to innovation and commercialisation.

Conclusion

For sustained growth in the Western Australian resources sector, it is essential we have the ability to compete in a global marketplace. Continued innovation, through collaboration between industry, government and academia will deliver the breakthroughs and step-changes in exploration, mining, extraction and processing that will drive the long term productivity, safety and therefore prosperity of the sector.

CME welcomes the progression of the Inquiry and anticipates the final report's recommendations.

Authorised by	Position	Date	Signed
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Document reference	150908-PS-CME Submission into Technological and Service Innovation Inquiry.pdf		

⁶ Minerals Council of Australia, *Submission on the Australian Government's Tax Discussion Paper*, June 2015, p. 18

⁷ Australian Venture Consultants Pty. Ltd., *University Commercialization in Australia*, 2012, pp.47-49