

RESOURCE INDUSTRY TRAINING COUNCIL

INDUSTRY DEVELOPMENTS AND WORKFORCE CHALLENGES

MINING/ OIL AND GAS

Western Australia's mineral and petroleum industry reported sales of \$145 billion in 2018/19 which was a record result. The \$30 billion increase in sales value when compared with 2017/18, was mainly due to improved iron ore prices and increased sales of LNG¹.

As with 2017/18, iron ore, LNG and gold were the major contributors to industry value with iron ore sales reaching a record of \$78.2 billion despite a reduction in volume sold. It was a similar story for the gold sector, with robust prices compensating for a reduction in sales volume, the first reduction experienced since 2014/15. Total gold sales in 2018/19 were almost \$12 billion. The value of LNG sales increased dramatically in 2018/19, rising from \$18.9 billion in 2017/18 to \$29 billion in 2018/19².

Iron ore remains the state's most valuable commodity accounting for 73 per cent of minerals sales in 2018/19 and 54 per cent of overall mineral and petroleum product sales.³⁴

Gold was the next most important mineral commodity for Western Australia. While gold sales fell for the first time since 2014/15, the value of sales from the gold sector increased to a record high of almost \$12 billion on the back of a persistently strong gold price. Gold sales volume decreased by nearly 0.5per cent in 2018/19 to 211 tonnes (7.5 million ounces)⁵

Alumina and bauxite sales again rose in both quantity and value terms in 2018/19, reaching a record 15.4 million tonnes in 2018/19 valued at \$8.3 billion. In 2018/19, alumina prices reached the highest level (\$591.81 per tonne annual average) since Departmental records commenced in 1985. However since October 2018, alumina prices have steadily declined due to weakening demand from China – the world's largest consumer of aluminium.⁶

LNG sales rose by over 50 per cent in 2018/19 to \$18.9 billion as LNG volumes increase due primarily to new projects (Gorgon and Wheatstone) ramping up production. The volume of LNG sales reached a record level of 37.9 million tonnes in 2018/19 with sales volume over the 5 years to 2018/19 increasing by 113 per cent.

The petroleum sector (comprising crude oil, condensate, LNG, and natural gas) accounted for 26 per cent of the total value of mining and petroleum sales in 2018/19. The sector remained the second most valuable behind iron ore over the same period. Sales value of the Western

¹ WA Department of Mines, Industry Regulation and Safety, Statistics Digest 2018/19 P4

² WA Department of Mines, Industry Regulation and Safety, Statistics Digest 2018/19, P4-5

³ WA Department of Mines, Industry Regulation and Safety, Statistics Digest 2018/19 P4

⁴ WA Department of Mines, Industry Regulation and Safety, Resource Data Files -

⁵ WA Department of Mines, Industry Regulation and Safety, Statistics Digest 2018/19 P4, 28

⁶ WA Department of Mines, Industry Regulation and Safety, Statistics Digest 2018/19 P31, 32

Australian petroleum sector totaled \$38.4 billion in sales in 2018/19, a 45 per cent increase over 2017/18 sales.

Economic Contribution

A survey of 53 Western Australian resources sector companies, undertaken by CME has identified the sector contributed more than \$67.1 billion to the national economy in 2018/19 and directly created more than 71,000 full-time jobs. Of this financial benefit, \$45.8 billion was directed to the Western Australian economy. Highlights from the CME survey included:

- \$41.7 billion was spent on purchasing goods and services from nearly 14,500 Western Australian businesses;
- 902 community organisations and 77 local governments across the nation were also financially supported by the sector;
- Nearly 71,300 full-time workers received more than \$8.5 billion in wages and salaries from working in the sector;
- The sector makes \$5.7 billion in payments to State Government and \$11.1 billion in payments to the Commonwealth Government;
- An additional \$50.3 billion in value was created by the sector in supply-chain purchases creating nearly 312,000 jobs in a wide range of industry areas; and
- The resources sector in Western Australia supports 1 in 5 jobs in the state.⁷

Reflecting sustained strong commodity prices, mineral exploration expenditure in Western Australia (trend expenditure data) has shown sustained increases since the trough in the September quarter 2015, although onset of the COVID-19 pandemic has seen exploration expenditure sharply drop off in the March quarter 2020. In the March quarter 2020, mineral exploration expenditure (in original terms) was \$367.5 million, some \$86.4 million (19.0per cent) less than the December quarter 2019 outcome.⁸

Supported by relatively strong commodity prices (benchmark spot 62% iron ore fines for delivery to China hit US\$112.48 a tonne in mid-July , Mining.Com July 20) and strong demand from Western Australia's dominant iron ore customer, China (received 81.9 per cent of Australian iron ore exports in 2018/19), major iron ore miners have all operating at full capacity. The COVID-19 pandemic has hit both the iron ore demand and supply side – with supply from Brazil being impacted by localized COVID-19 related lockdowns and industry efforts to recover from the Brumadinho tailings dam collapse. New projects and replacement capacity iron ore projects flagged in 2019 are continuing, albeit impacted by COVID-19 related restrictions.

⁷ CME Media Release 20 July 2020, "WA's resources sector contributes \$67.1 billion to Australia's economy"

⁸ ABS, Cat 8412 – Mineral and Petroleum Exploration, Australia, March 2020. Accessed 20 July 2020.

These include BHP's \$4.7 billion South Flank project, FMG's \$1.7 billion Eliwana mine and its US\$2 billion Iron Bridge magnetite project, and Rio Tinto's \$2.6 billion Koodaideri mine.

Reflecting these expansions, the Office of the Chief Economist⁹ expects Australian iron ore exports to increase from 835 million tonnes in 2019 to 920 million tonnes in 2022 – a 10.2 per cent increase.

Rio Tinto estimates its Pilbara operations cost structure is driven by labour costs which account for 35 per cent of total costs. With the skilled labour market showing signs of tightening during 2019 and this continuing into 2020 (resources sector has continued operations through the COVID-19 pandemic), the risk of increasing costs has been highlighted as a headwind facing the company in 2019 and beyond.¹⁰

Automation and digitisation continue to gain momentum, across the large scale surface mining industry in Western Australia as companies focus on harnessing technology to reduce the cost of maintenance and extraction and to drive greater productivity and safety¹¹ Rio Tinto estimates in 2018 each of the company's 130 autonomous trucks operated on average 700 hours more than conventional haul trucks at 15 per cent lower costs.¹² In December 2018, Rio successfully deployed AutoHaul™, the world's first automated heavy-haul, long distance rail network¹³. So far, over 7 million kilometres have been successfully travelled by the AutoHaul™ system.

With autonomous haul trucks having delivered an 11 per cent productivity increase, autonomous drills a 26 per cent increase and the AutoHaul™ system moving iron ore autonomously by rail, the industry continues to extend its technological reach, efficiency and safety performance.

While operating continuously throughout the COVID-19 pandemic, Western Australia's resources sector has implemented strict protocols to ensure the safety of its workforce and the communities in which the industry operates. These protocols have involved a range of measures including minimising the movement of people to sites. This has necessitated a lengthening of rosters across the sector. Border restrictions enacted by the Western Australian Government also resulted in many companies moving eastern states based critical workers into Western Australia in the first quarter of 2020. Minimum staffing levels at site have also seen non-essential maintenance activities deferred. The RITC has sought to better understand and estimate skills requirements associated with this deferral of maintenance work.

⁹ Office of the Chief Economist, Department of Industry, Science, Energy and Resources, Resources and Energy Quarterly, June 2020

¹⁰ Rio Tinto Shareholder Presentation - ibid

¹¹ Mine 2019: Resourcing the Future pg 8

¹² Source: <https://www.riotinto.com/about/innovation/automation> - accessed 20 July 2020.

¹³ Rio Tinto 2018 Annual Results Report

Modelling conducted by PitCrew has shown that under the most likely scenario (low infection rate with extended WA border controls/restrictions):

- Impact on the December 2019 business as usual employment level of 101,463 is 10,699 – that is 10,699 fewer people are working in operations and maintenance activities when compared to the December 2019 baseline level
- In peak recovery (December 2020/January 2021) an additional 8,049 workers will be required comprising:
 - 2,647 tradespeople;
 - 2,565 machinery operators and drivers; and
 - 997 labourers.
- These three occupational groups account for 77 per cent of the forecast additional 8,049 workers required.

Western Australia's gold sector has been driven by global geopolitical instability, uncertainty created through COVID-19 and continued high gold prices (in A\$ terms). According to the Office of the Chief Economist¹⁴, COVID-19 impacts are expected to see the gold price hit an 8 year high averaging about US\$1,630 an ounce in 2020. This bullish price forecast is feeding through into exploration and production expansion plans.

According to Deloitte¹⁵ and The Gold Industry Group¹⁶, Australia has 66 operating gold mines and 14 of the world's largest with 11 of these 14 being found in Western Australia. The AusIMM¹⁷ estimates that just over 50 per cent of Australia's gold production is sourced from underground mines, with a further 30 per cent being sourced from open pit operations and 18 per cent from combined underground and open pit operations. The gold sector in WA's accounts for about 70 per cent of Australia's total gold production (estimated to be about 10 million ounces). The top 10 gold projects in WA accounted for 58 per cent of the State's total gold production with Kalgoorlie and Boddington featuring the largest mines¹⁸. In late 2019, WA based gold producers, Saracen and Northern Star acquired 50 per cent interests in the Kalgoorlie Super Pit placing the mine in local hands. According to reports in the Financial

¹⁴ Office of the Chief Economist, Resources and Energy Quarterly, June 2020 P98

¹⁵ Deloitte Access Economics, Golden Nation – The gold industry's economic and social contribution to Australia, May 2017

¹⁶ <https://www.goldindustrygroup.com.au/facts-figures> - accessed 22 July 2020

¹⁷ AusIMM, Bulletin – The Australian and New Zealand gold industry – going all in, December 2016

¹⁸ DMIRS, WA Mineral and Petroleum Statistics Digest 2017-18 page 28

Review¹⁹, Northern Star's all in-sustaining cash costs for \$1,450 to \$1,550 per ounce with the company expected to produce around one million ounces of gold in 2020/21.

Kalgoorlie resources sector predominantly draws its skilled labour from the local area. Kalgoorlie is a residential workforce town and current operating conditions (gold being nearly US\$2000 per ounce) are placing pressures on the town's accommodation and other services.

Driven by strong global battery technology demand, Western Australia has been experiencing a surge in exploration activity for lithium. WA is now home to seven lithium projects, all of which are hard rock based and most of which are currently exporting a spodumene concentrate product²⁰. With construction of a \$400 million lithium refinery underway in Kwinana (commissioning of the Tianqi plant is being delayed) and expansion of lithium mining activity in the State's south-west (construction of the Albermarle Lithium Plant at Kemerton), the sector promises to add substantially to the State's mineral exports. Three of the world's four largest producers of lithium are looking to develop downstream processing projects in Western Australia. The three companies plan to invest more than \$2 billion in the development of these projects, creating more than 1,000 jobs during the construction phase and 800 during the operation phase²¹. Australia is home to 30 per cent of the world's lithium resources and produced 55 per cent of the world's lithium in 2019 making it the biggest exporter in the world.

Lithium commodity prices have fallen relatively sharply in 2020 as supply outstrips demand. The spodumene price fell by 17 per cent to US\$425 per tonne in the first 5 months of 2020 and the Office of the Chief Economist expects this price to remain flat until electric vehicle demand precipitates shortages sometime after 2022.²² Lithium carbonate prices have been impacted much more heavily with prices falling by around 14 per cent to US\$6,00 per tonne in the first 6 months of 2020 and by 46 per cent when compared to the same time in 2019.

Depressed lithium/spodumene prices are currently weighing heavily on the industry in WA.

The Western Australian Government established a lithium Taskforce in 2018 to capitalize on the opportunities presented by the global demand for lithium – according to the Office of the Chief Economist²³, electric vehicle sales globally are expected to increase from 2 million to 298 million by 2030. Rechargeable battery production is estimated to consume approximately 46 per cent of the world's lithium.

The Taskforce released the Western Australian Future Battery Industry Strategy in January 2019. The Strategy is intended to position the State as a world-leading exporter of future battery minerals, materials, technologies and expertise. One of the first initiatives to be

¹⁹ <https://www.afr.com/companies/mining/newmont-focused-on-boosting-other-aussie-assets-after-superpit-sale-20191217-p53kni> - accessed 232 July 2020

²⁰ Ibid, Page 38

²¹ JTSI, Future Battery Industry Strategy, Western Australia, 2019, P7

²² Office of the Chief Economist, *ibid.* p142

²³ Office of the Chief Economist, *ibid*

implemented by the Government is the development and implementation of an investment attraction strategy - to further develop and strengthen relationships with investors and manufacturers in global battery and electric vehicle supply chains. The Government has also announced it will continue to facilitate the establishment of new future battery projects in WA - assisting and supporting projects through the approvals process. The WA Government has also committed \$6 million to host the Future Battery Industries Cooperative Research Centre (FBICRC) in Perth²⁴.

Hosted at Curtin University, the FBICRC has recently marked its first year in operation (July 2020) and has established a research program with research into the feasibility of a Western Australian cathode pre-cursor industry being one of the CRC's flagship projects. South Metropolitan TAFE, an Associate member of the FBICRC has also commenced a project to identify the vocational education and training skills gaps for future battery industries and to develop a corresponding workforce development strategy.

Australia overtook Qatar briefly as the world's largest exporter of liquefied natural gas (LNG) in 2019²⁵ as it transitions to a 21 LNG train operating environment with a nameplate capacity of around 88 million tonnes of LNG per annum expected to be reached in the post 2020 period. Over 50 per cent of this production capacity is focused in Western Australia with a further 25 per cent in Queensland. In 2019/20 LNG exports were estimated to have reached 79 million tonnes.

The prospects for brownfields expansion at Australia's 10 LNG plants are forecast to be limited in the short term due to the COVID-19 induced market conditions for LNG. Additional gas field development is likely to occur to backfill depleted fields which service current LNG assets. New LNG capacity coming on stream in Qatar, USA and Russia in the period up to 2021 is expected to place downward pressure on LNG prices which will disincentivise further investment in local LNG capacity.²⁶

Three-quarters of Australia's LNG is sold under long term contracts. Modest recovery in LNG pricing is expected to occur in 2021/22 after reaching a near record low in the September quarter in 2020²⁷

Approximately 17 per cent of Australia's LNG trade is with China with this trade being valued at \$17 billion. Japan remains Australia's largest single destination market for LNG accounting for 22 per cent of Australian LNG exports.²⁸ Chinese demand for LNG can be expected to continue

²⁴ www.mediastatements.wa.gov.au McGowan Government launches Future Battery Industry Strategy Thursday, 31 January 2019

²⁵ Office of the Chief Economist, Resources and Energy Quarterly, June 2020.

²⁶ Department of Industry, Innovation and Science – Office of the Chief Economist, Resources and Energy Quarterly, March 2019

²⁷ Office of the Chief Economist, *ibid*, P68

²⁸ Office of the Chief Economist, *ibid*, P67

to rise as it grapples with a range of environmental policy issues and a move away from coal in favour of cleaner LNG.

Australia's oil and gas industry is also being challenged by a range of environmental considerations and the move to "net zero" emissions. In this context, LNG is a transition fuel and is clean burning relative to other fossil fuels. Many oil and gas companies are actively engaged in research and development around alternative sources of energy, with Woodside signing an agreement in April 2020 with a number of Japanese companies around exploring the production of "blue" and "green" hydrogen to meet Japan's energy needs. This includes the export of hydrogen as ammonia – where it can be shipped readily as a liquid.²⁹

Existing and Anticipated Supply and Demand for Skills

The resources sector demand for skills continues to grow as a result of new project activity. Despite impacts of COVID-19, greenfields iron ore projects and brownfields expansion projects/sustaining capital projects continue albeit at slower pace due to restrictions around people movement into and within Western Australia.

In December 2019, PitCrew identified 111 projects on the Major Projects List for Western Australia valued at \$182.3 billion. Iron ore projects (greenfields and sustaining capital projects) dominate due to robust demand and COVID-19 induced restrictions in global supply. LNG major project activity is projected to decline dramatically as market conditions remain unfavourable. In 2019, Australia became the largest exporter in the world of LNG ahead of Qatar. Japan remains Australia's single largest customer accounting for 22% of LNG exports valued at \$21 billion.

The WA Government's decision to enforce border restrictions due to COVID is having a substantial impact on skill availability for the sector in both an operations/maintenance and construction context. In December 2019, available forecasts for resources and infrastructure construction pointed to a peak labour force demand approximately half of that experienced in the last cycle (ending in 2012). While on the face of things, this would suggest a relatively benign skills market, COVID impacts (including border restrictions) and State and Commonwealth infrastructure stimulus measures aimed at job creation will require significant quantities of construction skills and will be competing against resources sector demand in the current cycle. With data from the 2005 to 2016 period showing approximately 35 per cent of individuals mobilized to resources sector sites came from outside of Western Australia, eastern states infrastructure developments mean this source of skilled labour cannot be relied upon for the current cycle. The Western Australian Government's desire to source skills locally wherever possible can be expected to contribute to further pressure in the skills market which will likely flow into remuneration arrangements.

²⁹ Source: <https://www.woodside.com.au/news-and-media/stories/story/hydrogen-alliance>, accessed 30 July 2020

The mining industry's further expansion (additional capital stock) will require additional skilled workers for the operations and maintenance phase. More investment is needed to ensure the right mix of skills are available for a sustainable future. There is a need to form alliances with complementary industries such as defence, technology and logistics to supply the necessary skills.

There is a significant opportunity to create long-standing and mutually beneficial partnerships with the defence sector given commonalities in technological advancement and the often "remote" nature of operations. The State Government's desire to attract defence related work into Western Australia could be used as a lever to progress such partnerships.

Increasing application of technology across the industry in the context of its expansion will have a skills impact. Automation has the potential to achieve levels of performance and safety that are otherwise impossible. Examples of automation introduced to mining more recently include: software for mine planning and enterprise optimisation; pedestrian proximity detection systems interlocked with underground continuous mining machines; automatic face alignment and horizon control of underground coal longwall equipment; automatic cutting cycles of continuous mining machines; automation of swing, dump and return phases of the shovel loading cycle; automated drilling systems and automated haul trucks at surface mines; and automated haulage in underground metal mines³⁰.

While automation and continued technology deployment will have an impact across the existing workforce, this will largely be confined in the short term to the large tier 1 surface miners and contract miners. It must be kept in mind, however, these are the largest employers in the sector.

While a number of roles will be impacted by technology, relatively few will be heavily impacted in the short term (such as haul truck drivers) with automation largely occurring at the task level. Companies are working to formally recognize skills held by these employees and to provide opportunities for re-skilling to take up alternative employment opportunities in the industry or outside the industry.

Technology will also have an impact on many operational roles and see increased cross-skilling or hybridization of roles. Mechanical, electrical/instrumentation and systems related tasks are forecast to be merged into single roles to service autonomous equipment being deployed to mine sites. There are many challenges associated with this change including regulatory change and the workplace relations environment.

The RITC's *Supporting Automation* project has explored some of these issues at the task level in the context of roles that support automation – in the case of the iron ore sector, this was

³⁰ www.ausimmbulletin.com/feature/mining-automation-human-systems-integration-cmoc-northparkes-case-study: Feb 2019

focused around maintenance roles. The report³¹ found further advances in technology will create new opportunities and roles requiring new combinations of existing skills. This is in contrast to some views that equate increasing automation across the sector with job losses.

Key maintenance roles such as diesel fitters/maintainers and electrical roles will require upskilling with a greater focus being placed on data related skills. New non-maintenance roles such as automation technicians are expected to become more commonplace with these technicians having responsibility for communications and electronics tasks.

At the task level, the report found diesel fitters/maintainers are likely to require greater data and electrical skills in an automated context as outlined below³²:

Top tasks before and after automation		
Main tasks	Pre automation Timeshare	Post automation Timeshare
Conduct maintenance calibration and check operational equipment is operating without faults	M	M
Diagnose, inspect and identify faults (root cause analysis) in equipment	H	H/M ¹
Interpret, collect and manage data (e.g. read graphs, ensure accurate reporting)	M	H
Conduct basic maintenance on onboard autonomous haulage systems (AHS)	-	L
Maintain and replace defunct machinery/equipment with a functioning piece onsite (mostly hydraulic and mechanical with some electronic in hybrid case) ²	H	H
Send machinery/equipment to workshop or off site for repair (e.g. send lasers to refurbished and fixed)	M	H
Refer issues to OEM and /or specialised maintenance staff (e.g. automation/mechatronics technician)	M	H
Liaise with OEM's and /or specialised maintenance staff to learn new methods and best practice maintenance	L	M
Conduct routine administrative activities (e.g. log operational activity)	M	L

High
Timeshare
Low

Top skills from job ads and expert interviews			
Desirable future skills			
• Communication Skills	• Preventive Maintenance	• Data literacy	• Auto-electrical knowledge
• Fault-finding	• AHS	• Data analysis	• Replace electrical units
• Issue escalation	• Risk management	• Data recording	• Digital interfaces

The emergence of such roles is challenging, and will continue to challenge, the vocational education and training (VET) system. Training products are not currently evolving with sufficient speed to meet industry demand, placing greater emphasis to provide skills development on new technology internally, often in collaboration with technology suppliers. This was highlighted in the Joyce Review into vocational education and training released in 2019.

³¹ AlphaBeta, Skilling Pathways – Preparing the resources sector for an automated future, February 2020

³² AlphaBeta, ibid, P20

Improved penetration of the nationally recognized training system will involve industry engaging and creating partnerships with educational providers.

The Rio Tinto/ South Metropolitan TAFE VET Collaboration is a positive example of such collaboration in action with the introduction of Australia's first nationally recognised qualifications in automation, providing workers, with the skills and knowledge needed to succeed in an increasingly STEM-based industry. The Certificate II in Autonomous Workplace Operations is currently (as at July 2020) being piloted by Year 11 and 12 students in selected high schools across the state and has been extended to existing mine workers at Rio Tinto. A Working Effectively in an Automated Workplace micro-credential course for trade-qualified, apprentices and technicians is available and a Certificate IV in Remote Centre Operations has been accredited and should commence piloting late in 2020/early 2021.

This collaboration has strong potential to create new pathways into Western Australia's mining industry – automation apprenticeships (including higher apprenticeships), traineeships and/or cadetships are training pathways that will be examined by industry in developing automation qualifications. The development of these pathways and the notion of job clusters is work which is currently being explored by the RITC.

In 2019, the Commonwealth Government also announced a Skills Organisation Pilot for the mining sector under the auspices of the Minerals Council of Australia (MCA). A Steering Group and Working Group have been established by the MCA to guide work of the Skills Organisation Pilot with priority areas of activity including apprenticeships, automation, workforce development planning and skills transferability. The RITC and CME are represented on the Pilot Working Group.

A number of mining companies and contractors servicing the industry continue to report a tightening of the skilled labour market for trades – particularly experienced heavy-duty diesel fitters/mechanics. Similar pressure is being experienced across a range of professional occupations such as mining engineers and geologists. According to Hays³³, RC drillers, diamond drillers, field assistants, drill and blast operators, auto electricians, surface mining plant operators (load and haul) and heavy-duty diesel fitters are all in strong demand. This demand has largely been unaffected by the COVID-19 pandemic and is expected to intensify based on continuing border restrictions and the resulting increasing reliance on the local skilled labour market.

Automation is placing a premium on just-in-time learning, micro-credentials or skill sets where the existing workforce is provided with a “skills top up”, enabling them to be productive in an automated environment. This places some challenges on existing delivery paradigms for Government funding and TAFE provision which are still largely based at the full qualification

³³ Hays, Hays Job Report- January to June 2020, Hays Resources and Mining.

level. Regional providers, often where the highest direct need will emerge, are likely to be disproportionately impacted given their proximity to resource industry sites.

Increased exploration expenditure (in a pre-COVID context) and expansion of existing operations was placing pressure on the drilling sector. There was a slight pause in activity as COVID impacted and the drilling industry adjusted through measures such as roster length and level and restructuring of drill rig crews to comply with minimum staffing levels. Throughout this, however, the Australian Drilling Industry Association (ADIA) reports³⁴ activity levels in the Western Australian drilling sector have remained high. Restrictions imposed have required more staff according to the ADIA which has presented some challenges to industry.

The Australian market has seen a rise in drill rig utilisation levels of about 40 per cent over the last two years (to 2019). The number of rigs working in the mining exploration sector, both greenfield and brownfield, is now around 700 and as a rule of thumb, each rig needs 10 workers to cover a 24-hour shift operation and a typical rotational roster of two weeks on and one week off. While ADIA current drill rig utilization data is not currently available (end August 2020) it is expected it will be at levels very similar to that of 2019. Larger drilling contractors working with major resources sector companies have reported they are operating at maximum capacity. Activity is focused around iron ore and gold with global economic uncertainty caused by the COVID pandemic forecast to see the gold price rise about US\$2,000 per ounce for the first time in history.

The ADIA has noted the biggest impediment the industry faces is a lack of skilled drillers and offsidiers³⁵. Many of the industry's skilled workers were forced to exit the industry in the last downturn. It is not just the exploration sector which is being impacted by the skills shortage, it is more widespread and is affecting many other drilling sectors. Blast hole, oil and gas, geotechnical and water well are all experiencing the same problems. Contributing to the challenge, over half of new entrants to the industry leave within the first 12 months of their employment. Industry has historically found it difficult to recruit new entrants into the industry due to the often remote and difficult working conditions³⁶.

In a COVID context, the risk is interruption to work will see drillers and offsidiers potentially move into the transport and logistics industry where their truck license can be put to use.

A paucity of local drilling training delivery capability will limit the provision of skilled labour, to support increased exploration and production activity in Western Australia over the short to medium term. There is currently no TAFE College in Western Australia actively delivering drilling industry training.

³⁴ Consultations undertaken by the RITC

³⁵ PwC, Drilling Workforce Development Study – unreleased.

³⁶ GEO Drilling International - What's been happening Down Under Peter Hall CEO of the Australian Drilling Industry Association Feb 2019

This may create opportunities for a focused TAFE intervention in context of the recent Training Review recommendations and should the appropriate resources in terms of teaching and learning capability be made available, the industry may see this as a credible option to address its skill development need.

Skilled migration arrangements do not allow drilling companies to draw on overseas skilled labour pools (due to ANZSIC skill levels) exacerbating the current labour shortages.

The broader resources sector is facing strong headwinds in building the necessary talent pipeline. A *YouthInsight* survey, with a nationally representative sample of 1061 senior high school students and first year university students aged between 15 and 20 years of age, found their knowledge of mining careers was critically low, with 59 per cent of young people surveyed knowing nothing about careers in the resources sector.³⁷

Furthermore, the survey found the low consideration of a career in mining was driven by a lack of knowledge, with respondents saying *“it’s not an industry I have ever thought about”* (45 per cent) and *“I don’t know anything about mining”* (40 per cent).

This issue can be improved using a collaborative approach as it is in the industry’s best interests to collectively grow the talent pipeline and raise the awareness of young people to the diversity of job opportunities and careers available in the industry now and into the future.

Diversity and inclusion is also a priority for Western Australia’s resources sector. According to CME’s Diversity in the Western Australian Resources Sector 2019 report³⁸, respondents reported women comprised 20.3 per cent of the sectors workforce in 2019/19 with 4.7 per cent being Indigenous. This compares favourably to the Western Australian all industries average of 46.1 per cent female representation in the workforce and 1.9 per cent Indigenous representation.

Of all companies participating in CME’s diversity survey, nearly 91 per cent had a gender recruitment policy or strategy and 82 per cent had undertaken a gender pay gap analysis.

Australia’s oil and gas industry is a relatively small direct employer. In 2018, NERA estimated the oil and gas industry (inclusive of exploration and petroleum manufacturing activities) directly employed around 34,000 people nationally and created over \$32 billion in gross value add.³⁹ The industry has a relatively large multiplier and it is estimated it supports a further 100,000 jobs across the broader economy.⁴⁰ According to AlphaBeta, the industry value chain

³⁷ Minerals Council of Australia, Australian mining sector must work hard to promote industry careers <https://www.minerals.org.au/news/australian-mining-sector-must-work-harder-promote-industry-careers>, accessed 29 July 2018.

³⁸ <https://cmewa.com.au/wp-content/uploads/2020/05/Diversity-in-the-Western-Australian-Resources-Sector-2019-Report-FINAL-2.pdf>, accessed 30 July 2020

³⁹ NERA, Sector Competitiveness Plan – 2018 update P12

⁴⁰ Unpublished data.

contributed a further \$38 billion to the Australian economy in 2016/17 making it 1.2 times the size of our construction sector and almost 2 per cent of GDP.⁴¹

Based on ABS census data, the oil and gas workforce has expanded by over 100 per cent, rising from nearly 9,000 in 2006 to nearly 19,000 in 2016. The largest area of occupational growth has been in in medium and high skill level production roles which is commensurate with the industry expansion over this period. COVID-19 has hit the sector heavily, with the oil price collapsing and overall operating conditions globally being amongst the most challenging industry has ever faced. As a result, capital and operational expenditures have been substantially reduced. In addition, many oil and gas operating companies have, are in the process of, or have flagged, restructuring in response to operating environment issues. This restructuring will inevitably involve a loss of jobs as functions consolidate where possible.

Industry demand for operations skills is largely met through its partnership with the Australian Centre for Energy and Process Training (ACEPT) which is owned and operated by South Metropolitan TAFE. Officially opened in 2008, this facility provides process operations and maintenance training for the industry and acts as a learning hub for the industry on a national basis. Considering a COVID-19 induced industry downsizing, and relatively low turnover, skills demand for process operators is likely to remain subdued into the medium term.

An increasing source of demand will be from existing workers seeking to upskill based on continued technological change affecting the industry. Maintenance technicians will need new skills in data analytics in the form of predictive maintenance analytics, which will place a focus on preventative and 'just in time' asset maintenance. It is likely these maintenance technicians will also use technology in accessing necessary maintenance data in the field to effect repairs.

As work becomes more technology enabled, it can be expected that process operators will spend less time on inspection driven activities and greater time on data driven activities with problems likely to require greater and more diverse inputs through team focused interventions. It is important training products and training delivery keeps pace with these developments.

Industrial automation is not new to the energy resources sector. Plants across the sector are already heavily instrumented to feed control systems and increasingly, measurement data is used for plant condition analysis, to inform maintenance and optimise performance. However, internet enabled and integrated digital technologies, including sensors, combined with ever more powerful data analytics tools, is providing new opportunities for facility owners to derive greater insights to increase asset utilisation and improve productivity. According to work by the McKinsey Global Institute ²⁸, this opportunity to gain the greatest benefits from the development, adoption and deployment of new and emerging technology could see benefits to the global primary resources sector (oil and gas, coal, iron ore and copper) of \$290 billion for

⁴¹ AlphaBeta, Growing Australia's Oil and Gas Supply Chain 2020, March 2020 – published by NERA.

incremental adoption and an additional \$100 billion through its accelerated adoption, of this \$230 billion and \$60 billion are potentially attributable to oil and gas.

In the near term, industry is focused around standardization of existing LNG operator training through development and adoption of an industry wide LNG Operator Skills Framework. This framework, which is being overseen by the LNG Jobs Taskforce Education, Training and Innovation Working Group, will modernize and strengthen the existing PMA training package enabling training providers to produce a more contemporary operator. A total of 15 new units of competency have been developed under this project and these are scheduled to be considered at the Australian Industry Skills Committee meeting to be held in August 2020.

Emerging International, National or State Training Issues Impacting the Industry

As a trade exposed sector, Western Australia's mining industry will continue to need to drive productivity and efficiency gains to remain internationally competitive. Data from large surface miners indicates significant efficiency gains are possible through automation of the mining value chain.

Although not every mining operation is capable of being automated, due to ore body and mine economics, as technology moves up the adoption curve to becoming "industry standard", it will potentially become within the reach of mid-tier mining companies further extending demand for skills.

The incidence of remote operations centres and the mining of data from machine sensors across the mining industry can be expected to increase as technology matures which will increase demand for a wide range of skills, widespread re-skilling of the existing workforce and the creation of new technology intensive career pathways in the industry.

There is an opportunity for Western Australia, being positioned at the genesis of automation across the mining sector globally, to create a rich learning culture and framework which can be exported to other countries and industries. This will assist in "future-proofing" the industry workforce and providing a capability for overseas based resources sector companies to grow their own talent by adopting our proven programs and curriculum.

Skills Service Organisations (SSOs) and their Industry Reference Committees (IRCs) are currently considering the impact of automation, digital skills and supply chain skills through training package review and cross sector project processes. A range of autonomous and remote operations units of competency are being developed for inclusion in the RII Training Package and a collaboration between TAFE Queensland, CQU and BMA is also focused around developing training programs in the context of an autonomous coal sector in Queensland.

From an oil and gas standpoint, a 2018 United Kingdom Continental Shelf (UKCS) Workforce Dynamics Review conducted by OPITO in partnership with Robert Gordon University found the following⁴²:

- Over 40,000 people are expected to enter the industry over the next 20 years including 10,000 in new areas such as data science, data analytics, robotics, material science, change management and remote operations;
- Over 80,000 workers are likely to retire or leave the sector for other reasons by 2035;
- Closer collaboration is required between industry and training providers to up-skill and re-skill the workforce to enhance technology capabilities across the industry and ensure it is competing effectively with other sectors for the best talent; and
- A new skills strategy is now required to ensure industry responds effectively to securing future talent requirements and achieving the best-case scenario to safeguard posts.

The 2019 update from UKCS⁴³ found:

- Taking into account ongoing attrition and retirement, it is estimated that over 25,000 additional people will be required by 2025 (out of 40,000 by 2035);
- By 2025 there will be approximately 4,500 (out of 10,000 by 2035) new people employed in roles that don't currently exist. These new roles will require a different set of skills and competences, which means we need to look at ways of reskilling our current workforce and consider how we compete with other industries for future talent; and
- In addition, there is the need to upskill and reskill the existing workforce to ensure that people have the requisite skills for success.

With Australian qualified LNG operations workers being highly regarded internationally, the above paints a scenario against which local oil and gas operating companies need to remain vigilant. While Australian oil and gas salaries are relatively high by international comparison, opportunities to work overseas can be appealing to a younger workforce which is seeking opportunities to extend their experience base.

While traditionally being at or near the top of the “skills food chain” in Australia, it is possible this position could be eroded by other industries (including the mining industry) which are

⁴² See <https://www.opito.com/news-article/oil-and-gas-industry-urged-to-support-new-skills-strategy-to-safeguard-jobs-and-up-skill-for-digital-transformation>

⁴³ OPITO, Workforce Dynamics: The Skills Landscape 2019 – 2025 Page 2

investing heavily in technology and therefore presenting a different value proposition to new and existing workforces.

INDUSTRY WORKFORCE PRIORITIES

As Western Australia's mining sector moves into a new expansion phase with new project activity and the expansion of existing mines, pressure will start to be exerted on securing the necessary construction and operational skills. Skill shortages in a range of trade areas were apparent pre-COVID and evidence to date⁴⁴ suggests a combination of border restrictions together with normalization of operations and maintenance schedules will see potentially significant shortages of appropriately skilled and experienced workers occur in Western Australia in 2021. A range of metal trades led by heavy duty diesel fitters and electrical trades (particularly automotive electricians and instrument related trades) State and Commonwealth Government infrastructure spending to stimulate job creation as a COVID recovery strategy can be expected to exacerbate these skill shortages.

As Western Australia's mining industry transitions from "traditional" operations to fully autonomous operations, considerable structural adjustment will need to occur in its workforce. Companies are tackling this challenge head on, through deep engagement with their workforces to determine the aspirations and job role preferences of their employees. This engagement is likely to result in re-skilling opportunities and formal processes to recognize the skills that have been accumulated over (often) a considerable period of time in the industry.

In 2019, universities were reporting a collapse in mining engineering enrolments at a time of expansion in the iron ore sector, continued buoyant conditions in the State's gold sector and the emergence of a potentially significant lithium sector. This is seen by the industry as effectively sowing the seeds of labour market pressures in the short to medium term. According to the Minerals Council of Australia, the number of mining engineering graduates will fall by 81 per cent by 2020⁴⁵. Curtin University reports mining engineering enrolments at the Western Australian School of Mines located in Kalgoorlie have fallen by 83 per cent since 2013⁴⁶.

Direct industry action has seen these numbers improve somewhat in Western Australia and border restrictions have meant the international workforce (living in WA but working globally) is now considering employment options locally. This is particularly apparent for a range of professional occupations such as geologists⁴⁷.

Both the University of Western Australia (UWA) and Curtin University have reported taking steps to update the mining engineering curriculum to attract more students and to ensure

⁴⁴ RITC consultations and PitCrew data

⁴⁵ <https://thewest.com.au/news/wa/wa-bid-to-lift-mining-enrolment-numbers-ng-b88900474z> - accessed 30 July 2018

⁴⁶ ibid

⁴⁷ Source, RITC industry consultation

mining engineering graduates are competent in understanding and utilising emerging technologies.

UWA has incorporated data science subjects such as robotics, automation, cyber security and data mining in its mining engineering degree. Curtin University, is working with alumni in a bid to help improve student enrolments. It has also introduced several initiatives to specifically improve the number of female students pursuing a career in the mining sector⁴⁸.

To overcome this, industry needs to face the challenges associated with a highly cyclical industry – a factor which is deterring potential new entrants to a career in Western Australia's resources sector.

Western Australia's LNG sector has fully transitioned to a production environment with Chevron's Wheatstone project and Shell's Prelude FLNG project both entering commissioning/operational and maintenance. With employee turnover presently low across critical operations roles, attention will focus on the capacity and capability of Western Australia's maintenance contractors to safely and efficiently perform necessary shutdown and turnaround functions – this is particularly apparent in the current COVID-19 environment.

Despite the synchronized maintenance approval for operating companies in the industry provided by the Australian Competition and Consumer Commission (ACCC)⁴⁹ some years ago now, there is mixed opinion on whether the depth of Western Australia's skills base is sufficient to meet industry demand. At the very least, a relatively significant number of new workers will be brought into the LNG industry for the first time. This may impact the capacity of maintenance programs to be completed within the allocated time windows and on budget. It also presents potential safety performance risks which are being mitigated through industry collaboration⁵⁰.

Standardisation of workforce requirements across LNG operations is seen as a priority to facilitate the easy mobility of labour across operations. Industry alignment around competency requirements for a range of maintenance related trades and semi-skilled occupations (for example high risk work license: confined space entry) will be pivotal in achieving mobility gaining efficiencies and maintaining a safe workplace

In the 21 national LNG train operating environment, the industry will place priority on the continual re-skilling of its workforce to meet continued technological change associated with production efficiencies. Leveraging off initial qualifications gained by the workforce, this re-

⁴⁸ [www.australianmining.com.au/news/universities-launch-efforts-to-lift-mining-enrolments/March 2019](http://www.australianmining.com.au/news/universities-launch-efforts-to-lift-mining-enrolments/March-2019))

⁴⁹ <https://www.accc.gov.au/public-registers/authorisations-and-notifications-registers/authorisations-register/western-australian-and-northern-territory-lng-producers>

⁵⁰ See <https://www.safertogether.com.au/news/article/safer-together-wa-nt-launch-of-a-new-model-of-safety-collaboration>

skilling will require a flexible approach from training providers and be at the sub-qualification level (micro-credentialing and skill sets).

The internet of things, artificial intelligence, robotics, data analytics and remote operations are areas which will impact skills requirements in the future for the industry.