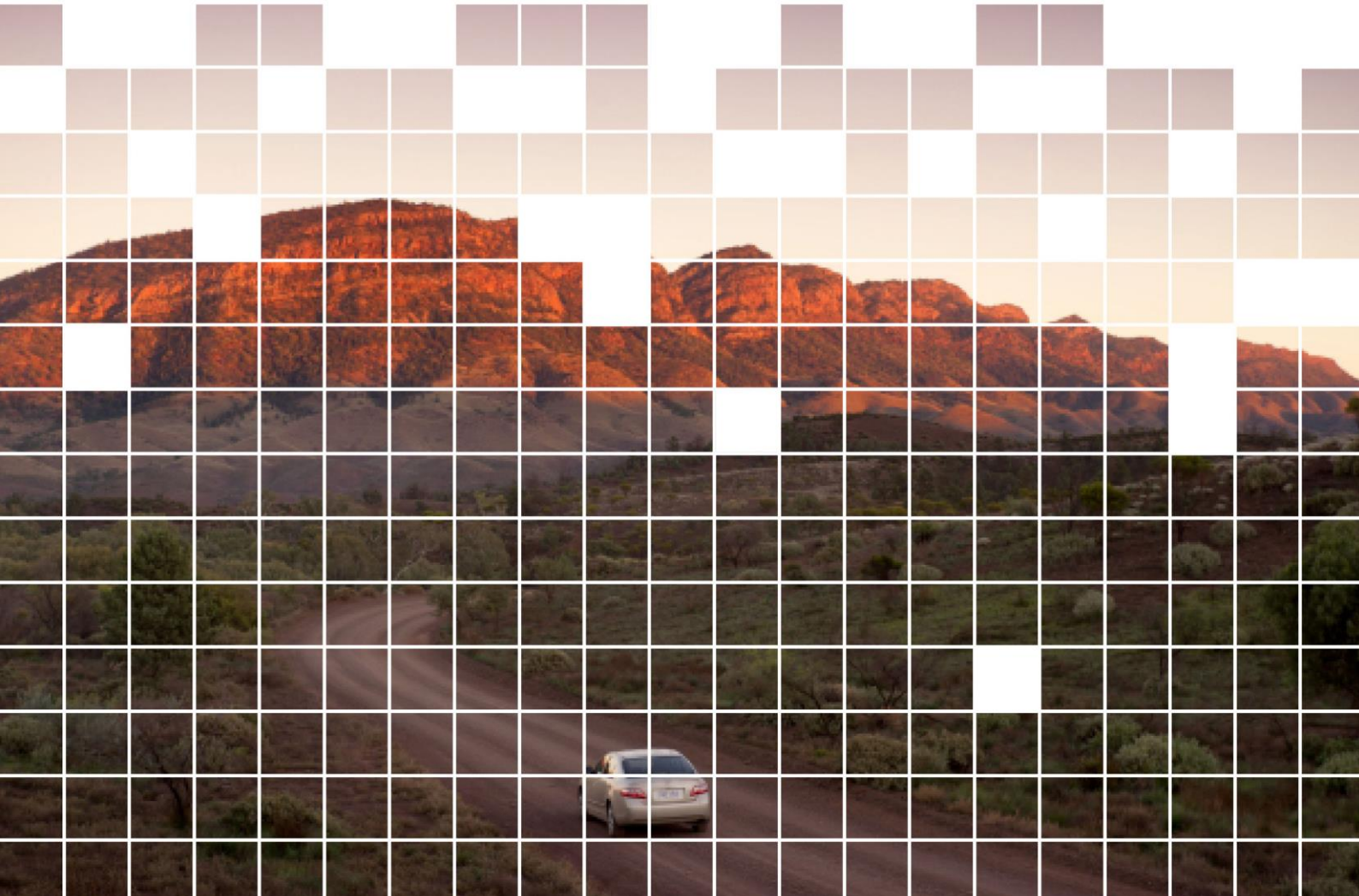
April 2020

Resources and Engineering Skills Alliance

RESA
Capability Solutions

South Australian Copper Skills Forecast 2019 - 2025

An independent five year workforce scoping study for the copper mining industry in South Australia.



Contents

Acknowledgement of Country

We at RESA acknowledge the Traditional Owners as the custodians of the lands where we live and work. We respect their spiritual relationship with their country and acknowledge that their cultural and heritage beliefs are still es important to the living descendants of the first Australians today. We pay respect to their Elders – past, present and emerging, and acknowledge the important role Aboriginal and Torres Strait Islander people continue to play within our community

Disclaimer

In preparing this report, RESA has presented workforce related data provided by companies, taking into consideration data variability and limitations. This report is supplied in good faith and reflects the knowledge, expertise and experience of the consultants involved. In no event shall RESA be liable for any incidental or consequential damages arising from any use or reliance on the material provided.

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Confidentiality

All respondents contributed to the Project on the basis that their specific data would remain confidential. All information presented in the Report is an aggregate of final data from all participating organisations. No individual data will be released.

Key Findings

The key findings of the copper workforce scoping study are highlighted in Table 1 below.

	***In 2019***, copper mining industry currently ***directly employed*** **3,994** people
	Workforce (direct and indirect operational workforce) expected to ***increase by 13%*** to **14,669** by 2024/25
	Uptake of ***digital technologies*** is ***creating new job*** roles
	Potential skills shortages have been identified in professional, trades and operational roles.
	Engineering, Mechanical/Metal trades and Equipment Operators represent the highest current workforce and future employment demand.
	***May 2019*** recorded the ***highest level*** of ***job advertisements*** in the resources sector in South Australia ***since 2013***, at January 2020 - monthly job ads ***continue*** to ***exceed*** pre-downturn levels.
	Workforce projections indicate ***2030 directly employed workforce*** to increase as much as ***250%*** up to **14,000** to achieve Copper Strategy target of 1 mtpa.

Table 1: Key Findings

Introduction

The Copper Mining Industry in South Australia

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South Australia hosts 68 per cent of Australia's known copper resources, and minerals are South Australia's biggest export category. South Australia produces and exports $2 billion of copper annually, contributing about 1.8 per cent to Gross State Product[1]. Copper is the biggest contributor to those exports.

Global demand for copper is growing, it is among the most important industrial metals valued for its malleability, heat and electrical properties. It is playing a key role in the transition to a clean energy economy, from electronics and smart homes to electric vehicles and increased use in renewable energy, copper's versatility makes it core to an energy-efficient future.

South Australia's Copper Strategy states "**By 2030 South Australia will be the major contributor to Australia's position as the world's third largest copper producer."**

RESAs *South Australian Copper Skills Forecast 2019 – 2025* report is unique, as it reports on the current workforce based on primary data sourced directly from the copper mining companies in South Australia. It also analyses and forecasts the copper workforce, including its size and structure, to 2025.

RESA has also independently undertaken a general workforce forecast for 2030 in alignment with the Copper Strategy timeframe and production target of 1 Mtpa.

[1] South Australia's Copper Strategy, Department of State Development, 2016

Workforce Scoping Study

The broad definition of the South Australian copper mining industry, for the purpose of this study, refers to companies determined by the Department of Energy and Mining as ***Operating*** with Copper as an identified Commodity. This includes:

Hillgrove Resources Limited

Oz Minerals

BHP

The scope of this report is to identify:

1. Workforce trends in the five year period from 2019 - 2025
2. Occupations in demand
3. Potential industry skills shortages.

For the purposes of this report, the copper mining workforce is limited to primary operators (sub sector level) and workforce contractors (total direct employment trends).

Data Limitations

All workforce data provided in this study has been provided from operating companies.

The data presented in this report has been aggregated to ensure confidentiality.

RESA provided a standardised template for the submission of data to companies. Companies were able to provide the data in an alternative format which was then reclassified to align with the standardised occupation listings for the purpose of aggregating the data.

During this process it was identified that the initial classification list contained some duplication of alike occupations across subsectors. To address this, each occupation was reclassified according to the sub-sectors utilised for RESAs Hiring Intentions Report. which is more closely aligned to ANZSCO job classifications (Appendix A).

The data provided is based on known operational demands in the period from 2019 – 2024/5. The forecast periods needed to be flexible to reflect the operational planning periods for the participating companies.

Workforce Data

Current Employment

In May 2019, the aggregated total for the ***directly employed*** workforce by South Australian copper mining operations was ***3,994***.

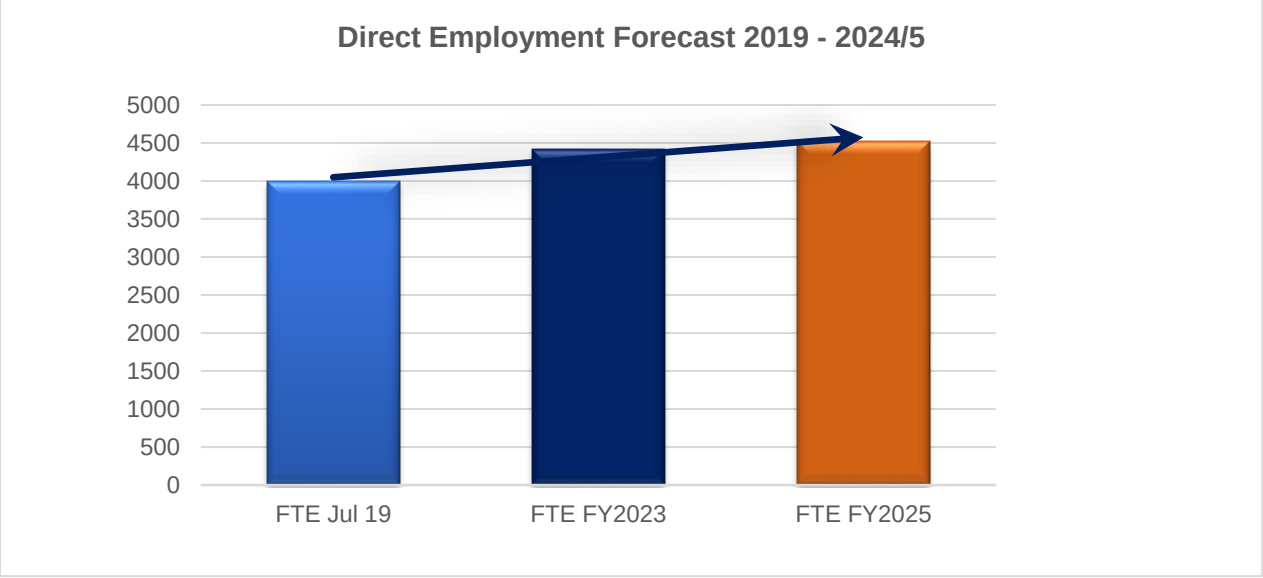
The ***contracted workforce*** is significantly larger than the direct workforce. Although respondent data is incomplete, RESA's available data indicates the contracted workforce is more than double (225%) the direct workforce which indicates a total workforce of ***8,987***.

The combined direct and contract workforce total is ***12,981.***

This total does not include contractors engaged in work activities other than day to day operations and operational maintenance through a tier one supplier.

Workforce Forecast

The workforce data indicates direct employment will ***increase*** by ***13%***, from ***3,994*** to ***4,519***, between 2019 and 2024/25, as shown in Graph 1 below.



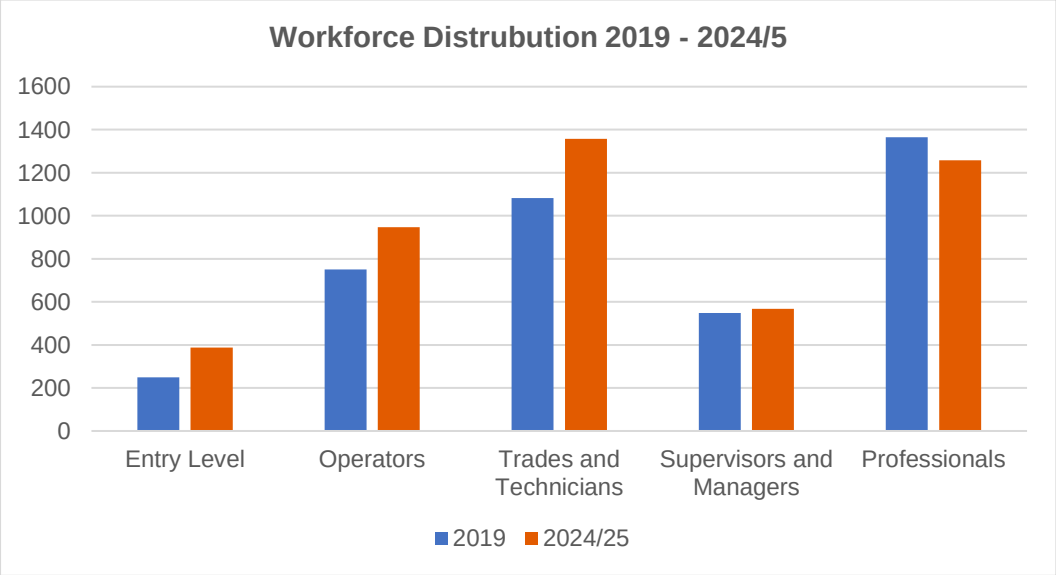
Graph 1: Direct Employment Forecast 2019 – 2024/25

This increase indicates a total workforce of ***14,669*** for direct workforce and contracted workforce combined. A total increase of ***1,688*** jobs for South Australians.

Workforce Demand

Workforce Distribution

The occupational sub-sectors that will experience the greatest demand will be in entry level occupations, operator roles, trades and technicians. Supervisors and manager occupations will remain stable and professional roles will see a slight decrease. This decrease can be attributed to projects progressing from design and construction to operations. The growth and decline in occupational sub-sectors is shown in Graph 2.



Graph 2: Workforce Distribution 2019 – 2024/25

Although in the breakdown of occupational level there appears to be no overall growth in demand for professional and supervisor/manager roles, there is some growth in demand for occupations within each of the occupational levels.

The table below highlights the occupations that will experience the highest percentage increase in demand and the actual increase in job roles as indicated by respondents. (Table 2)

Jobs in Demand

The highest volume of jobs in demand will be in operator and maintenance roles.

	Highest % Increase in Demand	Actual Increase
Professionals	Construction Manager (63%) Operations Manager (171%) Control Systems Engineer (60%)	Construction Manager **10** Operations Manager **12** Control Systems Engineer **9**
Supervisor / Managers	Blasting Supervisor (160%)	Maintenance Manager **6** Blasting Supervisor **48**
Trades / Technicians	Electrical Technicians (58%) Mechanical Technician (30%) Maintenance Trades (28%)	Electrical Technician **87** Mechanical Technician **136** Maintenance Trades **70**
Operators	Plant operators (35%)	Plant and Mobile Plant Operators **222**
Entry Level	Apprentice Electricians (167%) Maintenance Support Worker (54%) Apprentice Fitter: Mechanical (167%)	Apprentice Electrician **5** Maintenance Support Worker **128** Apprentice Fitter: Mechanical **5**

Table 2: Percentage and Actual Increase in Highest Demand Job Roles

The greatest challenge represented in this data is the disproportionate rate of opportunities in entry level trades in comparison to high volume skilled trade/technician requirements.

When considered in light of Defence (Submarine) and Space industry skills requirements these indicators highlight potential skills shortages in these occupations that will have a profound effect on industry.

Emerging jobs

Workforce projections have highlighted new job emerging as a result of the implementation of new technologies into operations.

The emerging job roles are:

- Specialist – Integrated Remote Operating Centre
- IT Engineer
- IT Supervisor
- Data Analysts
- IROC Controller

The challenge with addressing workforce requirements for emerging jobs is to ensure a career pathway exists to provide the knowledge, skills and experience for job roles not previously identified in this industry.

Occupation	Qualifications / Pathways
Specialist – Integrated Remote Operating Centre	• Bachelor Degree in Computer Science or Electrical Engineering. • Broad understanding of Autonomous Control Systems • Understanding of the relevant industry ISO standards and guidelines that relate to Autonomous Control Systems, including limitations and constraints • Comprehensive exposure to Functional Safety Requirements for implementing Autonomous Control Systems within a mining environment • Considerable experience of integration layers required to support an Autonomous Control System • Extensive experience implementing control system solutions within complex environments
IT Engineer	• Certificate IV in Computer Systems Technology (ICT41015), a Diploma of Information Technology Networking (ICT50415), Advanced Diploma of Computer Systems Engineering (ICT60515) or • Bachelor degree majoring in Computer Engineering.
IT Supervisor	• Bachelor degree in Computer Science, Information Technology or IT Project Management • 3+ years experience
Data Analysts	• Bachelor Degree in Mathematics, Computer Science or Information Technology • + Masters Degree or Certificate in Data Science, Data Analytics, Big Data Management
IROC Controller	Operator experience, In-house training, IT and Gaming Skills ***Course of study available:*** 52851WA - Certificate IV in Autonomous Control and Remote Operations or 52845WA - Certificate II in Autonomous Workplace Operations

Table 3: Emerging Jobs

Industries response to recruitment to fill vacancies in emerging job roles will require a combination of institutional learning and on job contextualisation and learning to address the complexities of application of technology in a mining operational environment.

There may also be requirements to identify skill sets to provide accelerated pathways from aligned industries/job roles to the application of skills and knowledge in the resources context.

Labour Supply and Demand

Jobs in Demand

For the purpose of this study, respondents were asked to rate occupations on a scale of one to ten with 1 indicating job roles were easily filled and 10 indicating job roles that were unable to be filled. The table below highlights occupations identified as difficult to fill (ranked 8 or above) which will also experience growth in demand thereby forewarning potential skills shortages.

Jobs in Demand	
Professionals	Project engineers/project managers Mining engineers Mechanical engineers Reliability Engineers Geologists Surveyors Occupational Hygienists* Data Analysts Project support
Trades	Mechanical Trades (Mechanic, Diesel Fitter, Mech Fitters) Electrical Trades (Electrical Fitters, Auto Electrician, Electrician, Instrumentation Electricians, Electrical Technicians)
Skilled Operators	Jumbo Operators

Table 4: Jobs in Demand

Further investigation into the skills pipeline for the identified occupations provides insights that will contribute to the contributing factors and associated with the skills shortfall.

The tables[2] below provide details of:

- the projected 5 year growth of the identified skills shortage occupations across industry sectors;
- the qualification pathway; and
- indicative pay rates for the occupation in the resources sector.

[2] Sources: Projected Growth, Qualifications and Indicative Pay Rate: SEEK Career Advice (https://www.seek.com.au/career-advice/) and Pay Scale (http://payscale.com/).

Professionals

Occupation	Projected Growth 5 years	Qualifications / Pathways	Indicative Pay Rate
Project engineers/project managers	13%	4 Year Bachelor of Engineering, + 2 years, Engineers Australia membership	$120-140k
Mining engineers	9.6%	4 Year Bachelor of Engineering (Mining) + 2-3 years as a Graduate Mining Engineer *May complete years 3 and 4 at Mining Education Australia (MEA), a collaborative venture with the University of NSW Sydney, University of Adelaide, University of Queensland and Curtin University*	$140k
Mechanical engineers	4.7%	Bachelor of Engineering (Mechanical) + 4 years, Professional Engineer's Licence	$110k
Reliability Engineers	N/A	Bachelor of Engineering (Mechanical or Electrical) 2-5 years, Professional Engineers Licence	$119k
Geologists	5.4%	Bachelor of Science or Applied Science (Major: Geology, Geoscience, Applied Geology, Geophysics or Earth Sciences) + Experience	$130k
Surveyors	13.2%	Associate Degree of Engineering (Mining), Bachelor of Geoscience, Bachelor of Science (Geographic Information Science), Bachelor of Surveying (Honours) 3 -5 years	$103k
Occupational Hygienists*		Tertiary qualification in Science, Environmental Science or HSE + 3 years or Australian Institute of Occupational Hygienists accredited post graduate programs	$120k
Data Analysts	12.9%	Bachelor Degree in Mathematics, Computer Science or Information Technology, + Masters Degree or Certificate in Data Science, Data Analytics, Big Data Management	$110
Project support	N/A	Varied – depending on type of support which may include HR, WHS, Training, Technical, Administrative, Engineering or other support.	Varied

Table 5: Engineering and Projects Skills Shortage Job Profile

* Iron Oxide Copper Gold (IOCG) ore bodies in South Australia will likely contain uranium, and likely be underground, this is a profound shortage current and future.

Trades

Occupation	Projected Growth 5 years	Qualifications / Pathways	Indicative Pay Rate
Mechanical trades	4.3%	Trade Certified + experience with relevant plant/equipment, industry experience	$140k in mining, $60k in other industries
Electrical Trades	4.9%	Trade Certified + experience with relevant plant/equipment, industry experience	$150k in underground mining (Electrician) $180k in mining, $70k in other industries (Auto Electrician)

Table 6: Trades Skills Shortage Job Profile

Skilled Operators

Occupation	Projected Growth 5 years	Qualifications / Pathways	Indicative Pay Rate
Jumbo Operators	7.4%	HR Licence, Police Clearance, relevant/related industry experience using earthmoving plant or equipment	$110k

Table 7: Skilled Operator Skills Shortage Job Profile

The consideration of the career pathway in relation to potential skills shortages provides insight into the challenges to industry. In the occupations identified by industry in this study the key challenges can be related to:

- Skills pipeline – time frame
- Context
- Industry attraction
- High skills and knowledge – low volume (availability of – economies of scale)
- Occupational levels
- Retention – State and Industry

These challenges will be further examined under Challenges, Strategies and Opportunities.

Challenges, Strategies and Opportunities

Challenges

Skills pipeline – time frame
In the Professional and Trade occupations identified as Skills Shortage Occupations in Demand the career pipeline timeframe is 4+ years in addition to on-job experience to provide the depth of knowledge required to effectively perform to industry standards.

Context
In order to work effectively in a mining industry environment, the application of skills and knowledge to, and in, mining operations is essential. Industry has determined a range of 2 – 5 years of experience as necessary to provide confidence in an applicant's ability to meet the requirement of the sector.

Industry Attraction and Retention
The mining industry is experiencing difficulties in attracting and retaining talent. This applies across the skills pipeline from student pathway choices, to trades and graduate employment entry and retention.

Industry has also indicated that attracting and keeping South Australian talent in the State has also proved challenging. This can be partially attributed to greater growth, volume of opportunity and remuneration being available interstate and the more prominent profile of the industry in other jurisdictions.

The opportunities and well supported engagement strategies used to promote Submarine (Australian Submarine Corporation) and Space (South Australian Space Industry Centre) opportunities present a challenge for the sector which does not have a co-ordinated industry-wide attraction and engagement strategy, at State or National level.

This is a particular challenge in Engineering and Trade occupations which will be in high demand across sectors.

Critical Specialisations
Industry has indicated particular challenges in recruitment for highly specialised roles that are critical to operations but do not have a high volume of employees.

With economies of scale determining what Universities can offer and the public awareness of specialist occupations industry is experiencing difficulty in meeting demand for roles such as Occupational Hygienists, Mining Engineers and Data Analysts with mining experience.

Occupational Levels
RESA classifies job roles into one of five levels, Entry Level, Operator, Trades/Technician, Supervisor/ Manager and Professional. The data indicates that skills shortages for jobs in demand may occur at Operators, Trade and Professional levels across a range of occupations.

Industry Strategies

At a national industry level, a range of strategies have been implemented to address hard to fill occupations.

In ***trade*** and ***operator*** roles this has included offering flexible rosters and higher salaries (up to 60% higher for diesel mechanics working FIFO rosters in mining).

Offering higher salaries is not one of the specified strategies implemented by South Australia's copper mining operations. The advantages of strong regional communities in close proximity to operations and the short FIFO turnaround for employees in metropolitan areas offer lifestyle benefits that may offset higher salaries offered elsewhere for some employees. Higher salaries interstate does, however, place pressure on South Australia's operations especially in relation to workforce retention as skilled workers seek higher paid opportunities elsewhere.

The industry recognises the efficiencies and social benefits of employing locally but the challenge is to ensure the skills required are able to be sourced locally. This involves ***retaining*** existing skills and ***attracting*** young people to the industry as their *industry of choice* in the senior secondary and undergraduate years.

In response to the fall in enrolments for ***Mining Engineering*** (nationally) the industry and government have collaborated at a state and national level to provide a specialist career pathway to ensure essential skills will be available in the future.

The industry funded collaboration has provided for a Mining Engineering qualification to be delivered in two stages. The first two years of the Bachelor of Engineering (Honours) (Mining) focus on building engineering, mathematics and science foundations. In the second stage, the third and fourth years, students undertake a program of study developed by Mining Education Australia. This is collaboration of the University of Adelaide, the University of New South Wales, the University of Queensland and Curtin University addressing a national industry issue.

Other strategies, identified by industry, to engage tertiary students include scholarships and internships.

The Playford Trust[3] scholarships offer support for South Australian undergraduates and postgraduate students to undertake studies in mining related disciplines through the:

- Mining and Petroleum Engineering First Year Undergraduate Scholarships
- Oz Minerals Honours Scholarships
- AUSIMM Honours Scholarships
- GSA Honours Scholarship

In addition, industry indicated that graduate placement programs and internships have been extended to provide more opportunities for engagement across a broader range of the business operations.

[3] https://playfordtrust.com.au/

Common themes that can be identified from effective strategies include:

- the effectiveness of collaboration between key stakeholders;
- developing strategies that address ***point of entry*** attraction across occupational levels;
- supporting pathways and connection to the industry.

The strategies identified relate to specific workforce issues industry has prioritised. A strategy that takes an industry wide, collaborative approach to the broader issues highlighted in this report could provide opportunities for South Australians to connect with industry and support the copper mining into the future.

Forecasts to 2030

The SA Copper Strategy, 2016 indicated a 2030 copper production of target of 1 million tonnes per annum. In 2018/19 production was 268,054t[4]. This represents ***29%*** of the ***production target***.

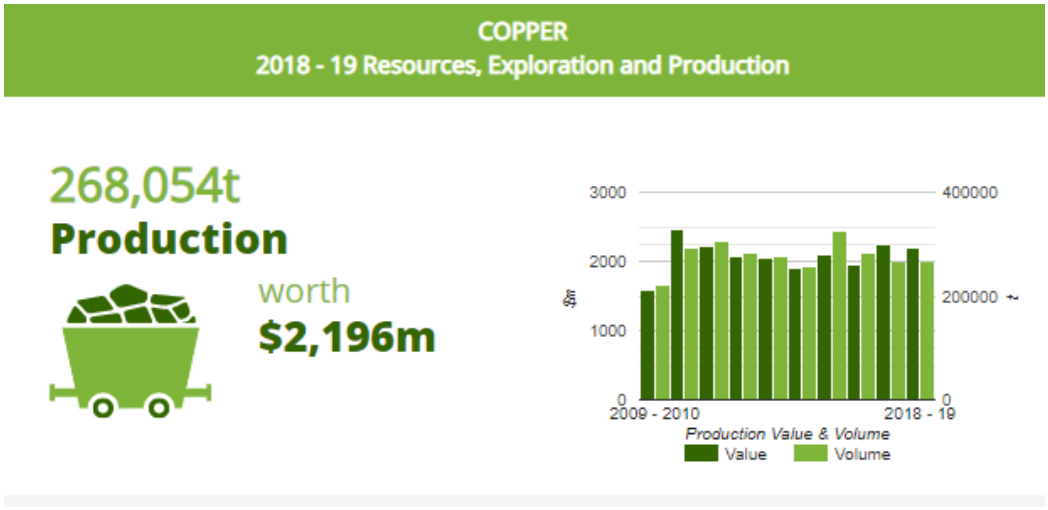
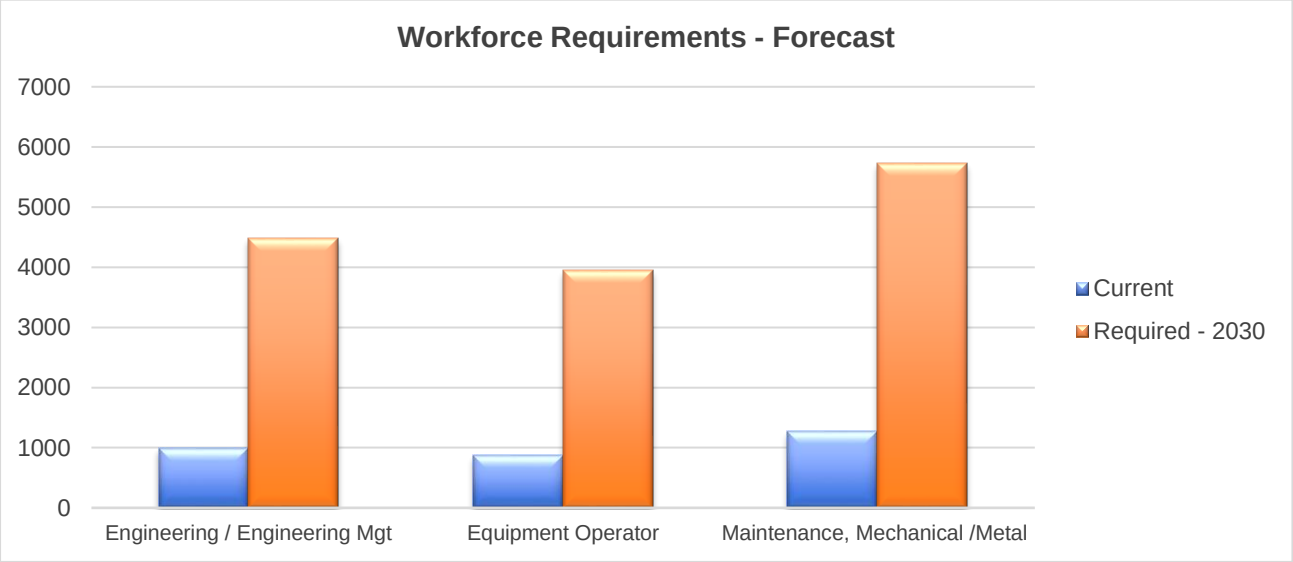


Image: SARIG 2018 – 19 Copper Production

If the workforce requirements increase linearly in alignment with copper production, we would expect an ***indicative directly employed*** workforce of up to ***14,000***. In high volume occupational subsectors this could represent up to ***2,490 engineers***, ***3,000 equipment operators*** and ***4,450 maintenance and mechanical/metal*** personnel.

The forecast growth for high demand occupations is shown in Graph 3.



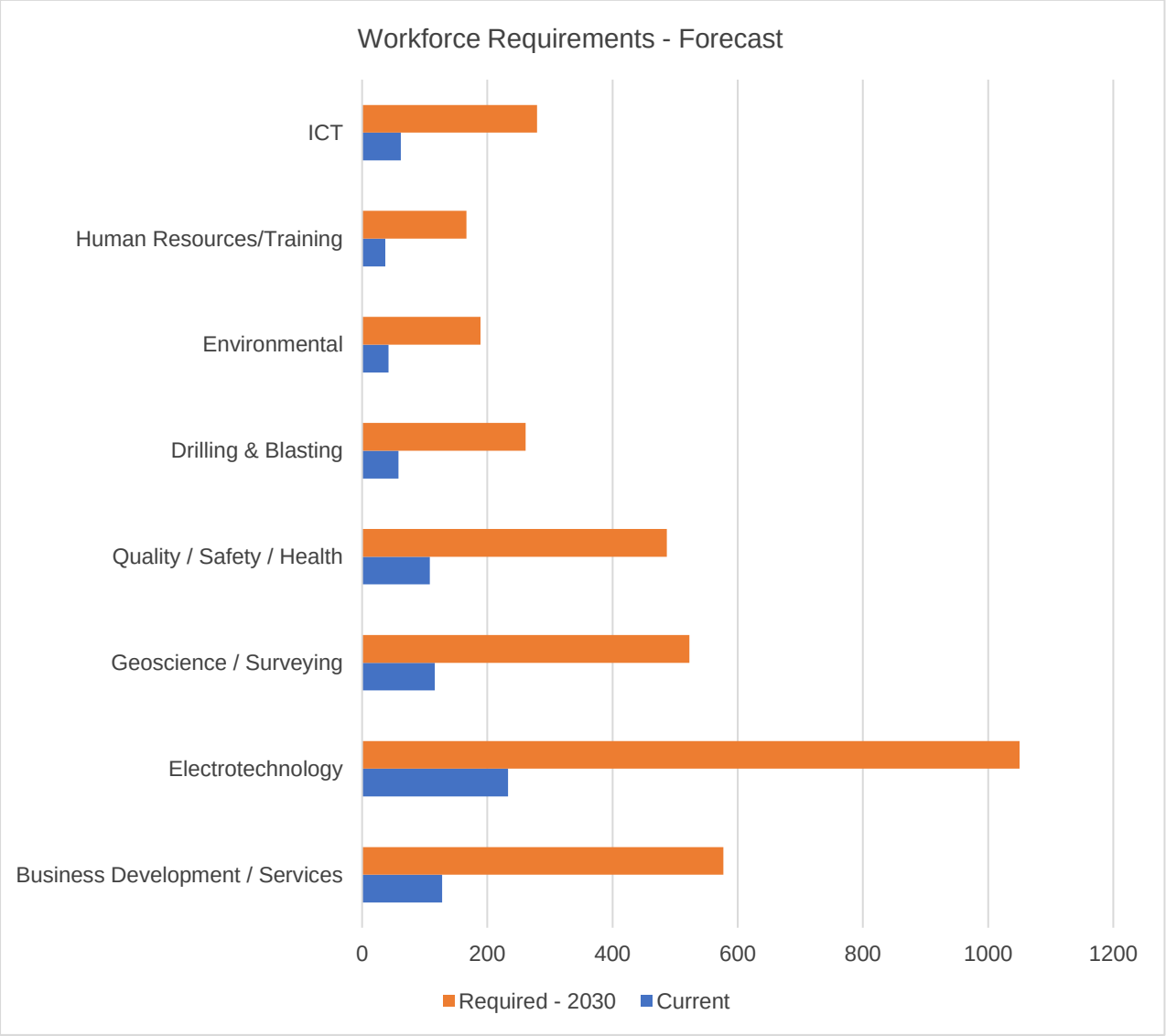
Graph 3: Workforce Requirements Forecast, High Volume Occupations

[4] SARIG, South Australian Commodities, Copper 2018-19 Resources Exploration and Production

Other Occupations

In addition to high volume occupations we would expect to see an increase across other business areas, particularly electrical trades, business services, drilling and blasting and geological roles. Along with specialist roles in information and communications technology (ICT), quality/safety and health and human resources.

This indicative growth is shown in the table below.



Graph 4: Workforce Requirements Forecast, Other Occupations

It is important to note that the current workforce data used as a baseline for this forecast includes two sites in the various stages of construction. This impacts the projections in two ways:

1) an operational workforce is usually less than a construction workforce and

2) sites in construction were not producing copper at the time of supplying data.

The impact of these combined factors will be a smaller workforce producing a higher volume of copper for export.

Other variables not considered, such as changes in grade, investment, construction activity new and emerging technology and production efficiencies, will also impact on future workforce requirements.

While this might be considered to negate the 2030 forecast, it is important to consider the ***workforce impacts*** that may result from a ***significant new discovery*** resulting in additional projects in South Australia. With current operations achieving 29% of the target in 2019, the ongoing development of new projects will be essential.

In 2019, Oz Minerals' Prominent Hill operation produced 102,479 tonnes of copper[5]. Oz Minerals produced its first concentrate at its Carrapateena site in December 2019 and expects to ramp up to full production in 2020 – with full production concentrate of 4.25 mtpa[6]. This growth and the changes to the workforce profile are captured in this workforce scoping study. In addition, OZ Minerals has a block cave expansion study underway to increase throughput to 10-12 Mtpa and increase life of mine average copper production to 105-125,000 tpa from 2026.

BHP has potential, through the Olympic Dam Brownfield Expansion project, to increase copper metal production at Olympic Dam to 240-300 ktpa[7]. This workforce scoping study captures some activity related to this project but not the growth and the changes to the workforce profile that would follow further studies and approvals.

The projections provided give an insight into the workforce demands that may need to be met to support upcoming projects at the level required to achieve the 2016 Copper Strategy target of 1 Mtpa by 2030.

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Conclusion

RESA welcomes comments and questions relating to the content of this Report.

[5] https://www.ozminerals.com/uploads/media/OZL_Q4_2019_Report.pdf
[6] https://www.ozminerals.com/operations/carrapateena-project/
[7] https://www.bhp.com/our-businesses/minerals-australia/olympic-dam/

Appendix A

Subsector Classifications

Business Development / Services
Electrotechnology
Engineering / Engineering Mgt
Equipment Operator
Geoscience / Surveying
Maintenance, Mechanical /Metal
Quality / Safety / Health
Drilling & Blasting
Chemical Processing
Finance / Accounting
Transport & Logistics
Environmental
Exploration/Field Services
Human Resources/Training
Camp Site Services
ICT

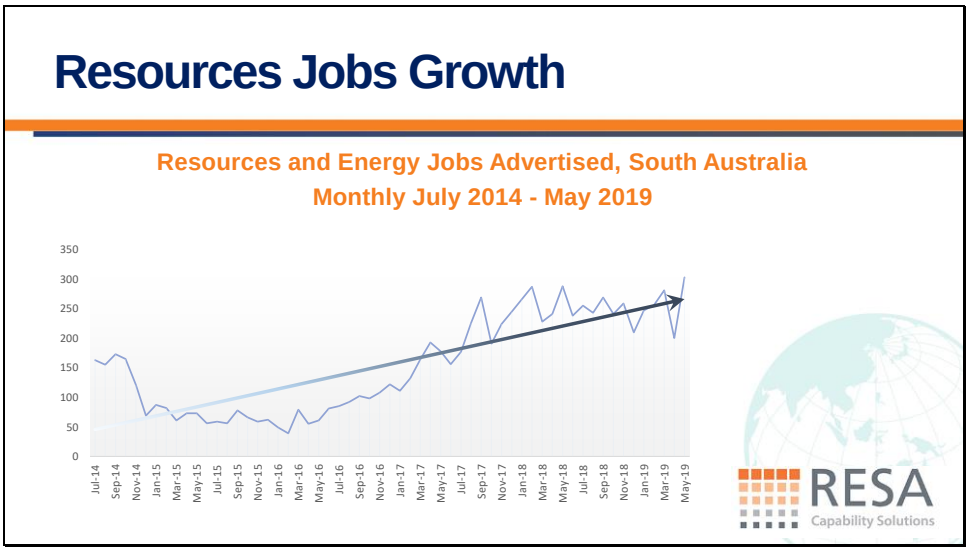
Occupation Classifications

RESA classifies job roles/occupation titles into 638 occupation titles using a ‘best fit’ approach.

Appendix B

Copper to the World Conference Presentation – May 2019

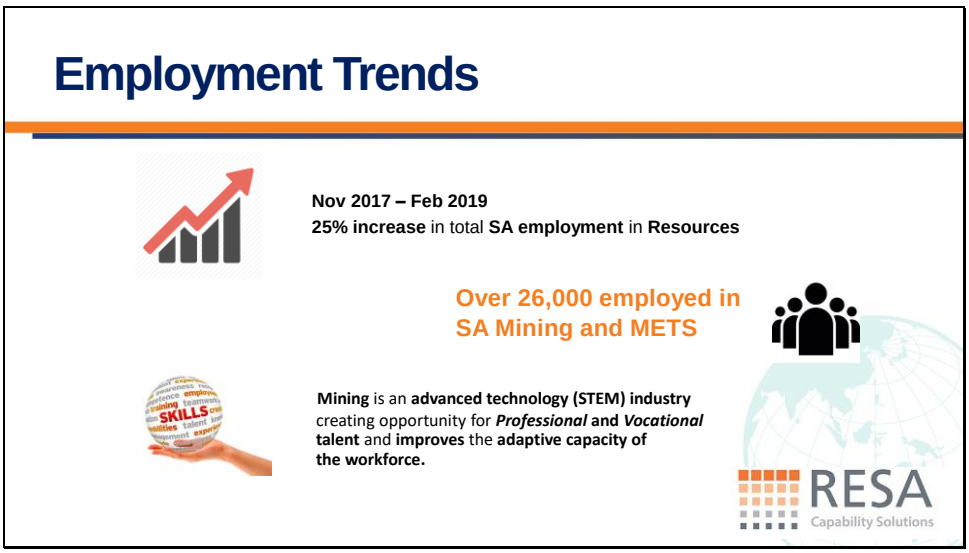
Slide 1



RESA has been monitoring hiring intentions in the SA resources sector since 2013. In May 2019, over 300 job ads were listed for the resources and energy sector – the highest on record.

This reflects continuous growth in the sector since 2015, with consistently job opportunities for South Australian's across the mining and METS sector.

Slide 2



Jobs: According to the ABS Mining currently employs 11,100 up from 9,500 people in Nov 17, in SA 25% growth since 2017

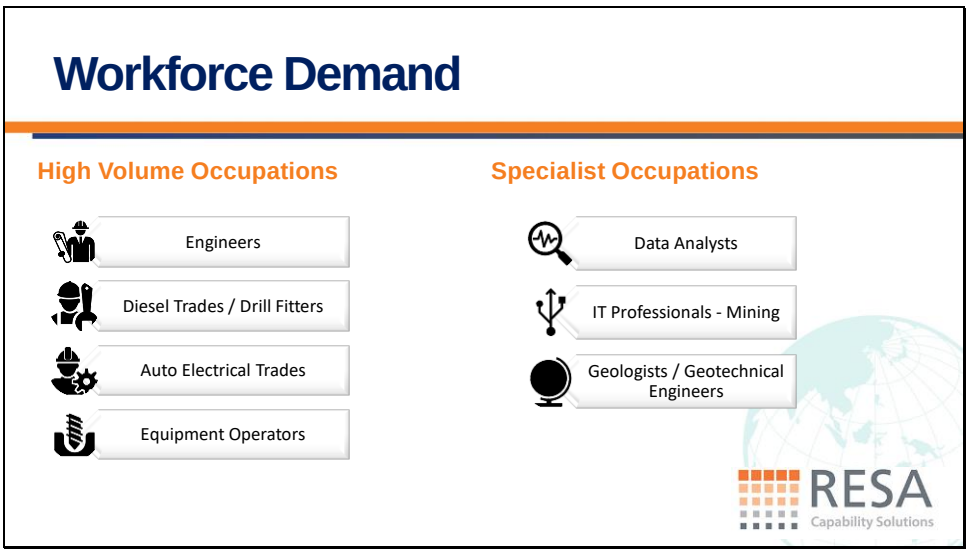
- Research indicates about 15,000 South Australians are also employed in Mining, Equipment, Technology and Services (METS) Jobs

- Combined employment in all facets of mining in South Australia is over 26,000 people

Both the hiring intentions and ABS data indicate strong growth in job opportunities for South Australians.

The occupations in demand for the sector evidence that mining is an advanced technology sector providing opportunities for Professional and Vocational talent – with the added benefit of contributing to the adaptive capacity of the workforce.

Slide 3



RESA is currently undertaking a workforce scoping project to identify the current and medium-term (5 year) workforce requirements for SA copper mining.

Hiring intentions and early indicators demonstrate high volume demand for:

Professional occupations - particularly

Engineers: Project, Reliability and Mining

Vocational Occupations

- Equipment operators
- Diesel Trades
- Auto Electrical Trades
- Drill fitters

Difficult to fill / in demand occupations include:

- Geotechnical engineers / Geologists
- Data Analysts
- FIFO IT professionals

Although the current demand has been able to be filled there is an understanding that job ready, available skilled people are becoming more difficult to find especially in light of increasing demand from interstate coupled with high wages and challenges with attraction to the industry.

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