



BIS OXFORD
ECONOMICS

AUSTRALASIAN RAILWAY ASSOCIATION SKILLS CAPABILITY STUDY

SKILLS CRISIS: A CALL TO ACTION

NOVEMBER 2018

FOREWORD

We are living through a renaissance of investment in rail. Projects such as Cross River Rail in Brisbane, Inland Rail, Sydney and Melbourne Metros, the Level Crossing Replacement Program, the Metronet project in Perth, rail extensions in South Australia, expansion of rail lines in the Pilbara, and numerous light rail projects in cities across the country, are heralding this renaissance. New Zealand too, is experiencing a deepening focus on rail.



But this hasn't always been the case. Rail investment stagnation, stop-start funding cycles and short term cost cutting have been a feature of the Australian rail sector since the 1980s.

And one of the consequences has been the collapse in investment in training and skills development of the people to build our infrastructure and to operate and maintain first class rail services. This is a clear case of market failure.

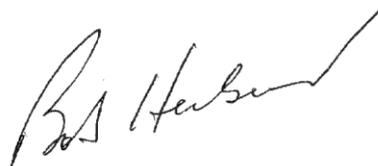
ARA commissioned this Report to undertake a workforce capability analysis based on planned and forecast rail infrastructure development in Australia and New Zealand over the next 10 years, with implications for a range of rail industry skills across construction, manufacturing, operations and maintenance. And to determine strategies to address them.

The term supply and demand is well understood in the marketplace. However, as to rail skills in the current investment environment, it is a case of 'demand and no supply.' This is the crisis that this Report seeks to address.

We welcome the massive investment in all aspects of rail now underway. This is crucial for our economic growth and improving amenity in our cities and regions.

This Report should spur government policy makers, in partnership with industry and the training sector to take bold initiatives in workforce growth and development; cast aside 'business as usual' processes and take decisive action to produce the skilled workforce we need in rail passenger and freight transportation.

Reform of considerable magnitude and intensity is essential if the looming skills crisis is to be avoided. To do otherwise, the consequence will be sub-optimal outcomes, cost blow outs and substantial delays in project delivery. This Report is a call to action.



R N (Bob) Herbert AM

Chairman of the Australasian Railway Association

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EXECUTIVE SUMMARY

The overwhelming evidence is that there is a fast developing skills crisis in the Australasian rail industry. Shortages of skills are already apparent. With every new rail project this crisis is deepening. The inevitable result will be a substantial blow out in project costs and unavoidable delays in project delivery.

Further, the training system across Australasia is not meeting the challenge of providing a 'fit-for-purpose' workforce to help ameliorate the looming skills crisis. Substantial reform is required, particularly cohesion between federal and state government jurisdictions, training providers, both public and private, and the rail industry itself.

This report is a call to action. The rail industry is already a significant contributor to the economies of both Australia and New Zealand and this is set to grow as rail consolidates its position as the backbone of the transport system. With a concerted effort and commitment at the highest levels there are additional, worthy benefits to be reaped.

OBJECTIVE

In 2018, the Australasian Railway Association engaged BIS Oxford Economics to undertake a workforce capability analysis for the rail industry based on planned and forecast rail infrastructure development in Australia and New Zealand over the next 10 years, with implications for a range of rail industry skills across construction, manufacturing, operations and maintenance.

Through expansive stakeholder and industry engagement – as well as gap analysis including extensive data analytics – this report seeks to explain how skills demand will form for the rail industry over the coming decade, what will be the key threats to workforce capability, and what industry and government can do to respond to meet the challenges of delivering on the significant rail infrastructure investment.

KEY MESSAGES

The key messages from the analysis undertaken for this report are:

- **The rail industry in Australia and New Zealand is already experiencing skills shortages as investment grows in new rail infrastructure and rollingstock and operations expand**, with the number of train drivers, controllers, track workers, signalling engineers and technicians, maintenance workers, electrical technicians and tunnellers not keeping up with growing demand. Just as importantly, from a future skills perspective, the industry is also suffering a chronic shortage of trainers and assessors.
- **The skills challenge is intensified by the need to not only meet growing demand, but also to replace skills lost to an ageing workforce** over the coming decade. The quantitative modelling for this report indicates that over 20 per cent of the existing workforce will retire by 2028, adding substantially to existing workforce gaps across the industry.

- **The ‘stop start’ history of rail investment in Australia and New Zealand – along with differences in standards and systems – has acted as a long run constraint to the sustainable development of skills for the rail industry.** However, while the current ‘tsunami’ of rail investment (funded predominantly by the public sector) is creating a renewed sense of urgency towards the development of ‘construction-side’ skills, some of the largest risks relate to roles that will be required to operate and maintain the new rail networks once they are commissioned. These skills are not adequately targeted by recent government initiatives aimed at boosting the number of capable employees at all skill levels.
- **New technologies are driving demand for new or expanded skills in the rail industry** and this process will accelerate in coming years. In an increasingly technologically-oriented world, the rail industry faces strong competition for technical skills, and will need new strategies to attract these skills into an industry still perceived as old and male dominated. In turn, the new technologies provide an opportunity to increase the diversity of the rail workforce. Conversely, new technologies will also see demand for some existing rail occupations drop away.
- **As noted in this report, the rail industry – in partnership with government – is making some progress in developing skills the rail industry needs.** But, as indicated in the recommendations to this report, much more needs to be done now and in coming years to place rail workforce capability on a sustainable path.

A SUSTAINABLE, DIVERSE, CAPABLE, WELL TRAINED WORKFORCE

Identifying the risks and providing positive solutions to meeting the workforce threats facing the rail industry is a key objective of this report. Through the findings of this workforce capability analysis, both quantitative and qualitative, a range of actions have been identified which can assist the rail industry in Australia and New Zealand in navigating risks to workforce capability now, through the coming decade, and beyond. These include measures aimed at making the greatest possible use of available skills now, whilst also putting forward recommendations aimed at developing and sustaining the skills the industry is expected to need in coming years. In addition, a key focus of the recommendations in the study relate to ensuring that training provision is fit-for-purpose, while reducing barriers to transferability of skills and qualifications.

With key risks to workforce capability driven by the presence of market failures in the industry now, and over previous decades – including local monopoly characteristics which prevent easy movement of skills between jurisdictions, the lack of economies of scale, externalities in training and operations, as well as network effects – the solutions necessarily imply a role for an formally structured body or taskforce to work in partnership with government, the rail industry and the education sector to redress suboptimal market outcomes.

THE NEED FOR ACTION

The term 'supply and demand' is well understood in the market place. However, as to rail skills in the current investment environment, it is a case of 'demand and no supply'. This is the crisis that this report seeks to address. We are entering an era of growth and investment never experienced before but the opportunity will be lost if the gaps in available skills and the need for 'fit-for-purpose' training are not immediately actioned.

The dimension of this crisis falls into two baskets. First, is the volume of significant projects committed or proposed? There is a vagueness about their dimension with no cohesive intelligence about the values, timing, or resources required. The second concerns the nature of the training system to address skill shortages and build an industry skill profile that will endure into the future – at least for a decade or more for construction and longer for operations and maintenance.

The conundrum for rail is that there is no sovereign government addressing these challenges like there is in defence or shipbuilding. Both federal and state jurisdictions are major rail investors but there is little coordination about the timing and resources required and each jurisdiction influences the nature of training on offer. Accordingly, silos are unwittingly constructed between jurisdictions and within jurisdictions to the detriment of the national rail industry.

Fundamental to addressing this conundrum is establishing a taskforce as a mechanism to achieve greater cohesion between jurisdictions for country-wide outcomes with a strong industry engagement.

The taskforce would be a powerful body because of its composition – a manageable number of very senior bureaucrats, industry CEOs and acknowledged leaders in the training sector. Its purpose would be three-fold:

- First, to facilitate the development and maintenance of an Australasian Rail Industry Pipeline of rail projects whose purpose will be to map skills required across construction, manufacturing, operations and maintenance. The ANZIP pipeline, established by Infrastructure Partnerships Australia, which enjoys financial backing from both the Australian and NZ governments, should be adapted and refined for this purpose;
- Second, to drive reform in education and training systems and practices that increase the availability of required skills, their productivity, transferability, and mobility while retaining a commitment to quality and safety. Access to specialist input may be required; and
- Third, the need to attract skills and career aspirants to the rail industry is widely recognised. Industry has a significant responsibility in this regard. The taskforce should add its weight to initiatives such as establishing 'branding partnerships' with related industries across transport, mining and manufacturing.

To achieve these aims it is proposed that the taskforce should be responsible for developing and implementing a **National Rail Industry Skills Development Strategy**, synthesising identified skilled labour gaps with industry initiatives, education and training reforms, and developing proposals for partnerships between industry, government and education bodies to drive reform, increase the availability of skilled labour and develop ‘fit-for-purpose’ training.

The rail industry in all its sectors, jurisdictional and national governments and the education system must work in **partnership** if the outcomes recommended in this Report are to be realised. To succeed in its aim, the proposed taskforce will need to be supported – both with resources and funding – by all jurisdictions and industry.

This report provides a comprehensive set of recommendations. These are set out in the tables in Section 6 and include the following key directions:

- **A. Smoothing the investment pipeline:**
 - Develop and refine Infrastructure Partnerships Australia’s infrastructure pipeline for the rail industry (ANZIP).
 - Advocate for government to coordinate investment plans to mitigate against the emergence of major capacity and capability constraints.
- **B. Develop a National Rail Industry Skills Development Strategy to provide fit-for-purpose training:**
 - Develop a stable of rail trainers, training advisers and assessors
 - Review and update trainer and assessor competencies to cover new rail technologies and operating practices.
 - Encourage industry to release key training personnel.
 - Identify all rail related courses, progressively review the list of required competencies for relevance.
 - Increase number of nationally agreed roles.
 - Review training incentives to ensure adequate accessibility and coverage.
 - Adopt a modular training system to achieve a fit-for-purpose outcome and to promote transferability of skills, separating competency components from domain-specific knowledge requirements.
 - Remove inconsistency in standards between jurisdictions.
 - Address cultural issues including diversity, youth and gender balance.
 - Develop a template to facilitate companies engaging in cadetships and apprenticeships.
 - Review immigration requirements to improve recognition of international qualifications and minimise unnecessary retraining.
- **C. Boosting awareness and attraction of rail careers**
 - Investigate options for establishing an industry wide marketing function funded by industry and government members, but staffed

by professionals with expertise in branding, marketing and promotion.

Central to achieving sustainable workforce capability, however, will be developing a more collaborative, partnership culture between the three main actors affecting skills development in the rail industry:

- **The rail industry**, comprising the plethora of private and public sector organisations who own, build, operate and maintain rail systems, infrastructure and equipment, who have access to authentic learning environments and can find innovative solutions to workforce gaps if given the right incentives to do so;
- **Jurisdictional and national governments**, who regulate the rail industry, set standards, enact policies and, through funding and procurement of new rail assets, can reset the ground rules for “value for money” to include innovative criteria for building rail workforce sustainability; and
- **The education system**, including registered training organisations (RTOs), the VET system and universities who collectively are responsible for training and developing the next generation of rail skills.

Operators are best placed to deliver hands on training given access to rail equipment and track but are pressed financially to deliver training on top of their operational requirements. The VET sector has quality and rigour in their training programs but suffers from a lack of access to critical training environments and also current industry knowledge and skills. Both public and private registered training organisations are challenged by a lack of scale. Governments, meanwhile, do have the scale, policy, funding and procurement power to incentivise change.

It is important to recognise that *collaboration* – along with effective *communication* – are also skills. Meeting the workforce challenges of volatile demand and jurisdictional differences in standards, systems and training approaches will require increasing coordination between rail organisations and governments in order to maximise the benefits of new rail investment and make the most of the skills base available in the industry today.

“This report is a call for action by all rail industry stakeholders acting in concert. There is an urgency about it if the benefits of the surge in rail investment are to be realised. A formally structured body or taskforce should be established to drive the required concerted effort of all rail stakeholders working in partnership.”

1. INTRODUCTION

The rail industry faces a convergence of challenges and threats to workforce capability across the coming decade to FY2028 and beyond. Across Australia and New Zealand, sharply rising levels of demand for rail operations as well as infrastructure investment is occurring alongside rapid changes in technology, funding and the role and function of representative rail agencies across government, education and industry.

The key aim of the rail workforce capability and capacity study is to predict the skills and capabilities that railways industry will need over the next 10 years (to FY2028) to deliver service objectives (particularly construction, operations and maintenance), match these against the current and projected future workforce, identify potential or emerging workforce capability gaps and provide recommendations to rail agencies and related stakeholders (government, education sector, industry) to meeting these gaps.

1.1 SCOPE AND METHODOLOGY

The scope and methodology for the rail workforce capability study is contained in the final proposal prepared by BIS Oxford Economics in April 2018 and accepted by the Australasian Railway Association (ARA) in May 2018. In summary, the approach has been as follows:

- (1) **Hold an initial workshop** between BIS Oxford Economics and the ARA to discuss key issues and concepts, as well as refine project scope and deliverables
- (2) **Industry survey to gain insights / model parameters and data**
- (3) **Carry out 'deep dive' consulting** with industry and stakeholders to better understand skills formation and risks to workforce capability in the rail industry
- (4) **Undertake quantitative data collection and skills gap modelling**, via a range of sources including an industry survey, access to industry skills data, ABS labour statistics, as well as education and migration data. Key objectives of the quantitative exercise is to estimate the size of workforce gaps (the difference between existing workforce estimates and labour demand) over the decade to FY2028. Apart from estimating labour supply, the model needs to also predict as best as possible future demands for occupations across rail construction, operations and maintenance based on the outlook for demand drivers. These demand drivers will include BIS Oxford Economics estimates and forecasts of rail construction, maintenance and capital stock amongst other variables.
- (5) **Present draft findings** to ARA and project stakeholders
- (6) **Complete a final report** based on feedback to the draft findings

Recommendations and findings resulting from this research allows rail sector participants to work collaboratively across the sector and with all levels of educational institutions to ensure mid to long term strategic workforce planning needs are identified and addressed.

2. METHODOLOGY

2.1 INTRODUCTION

In assessing the simultaneous impact of challenges and threats to workforce capability across the coming decade to FY2028 and beyond, BIS Oxford Economics has embarked on a multi-faceted approach. As well as undertaking a quantitative analysis (Section 4) our methodology revolves around industry liaison, via both survey and interview (Section 5), aimed at gathering views from various industry players – operators, track managers/owners, government agencies, manufacturers and suppliers, education providers, contractors – on what they see as the looming threats, limitations and challenges in ensuring rail workforce capability over the coming decade. In these soundings, industry stakeholders had both positive and negative feedback regarding the current state of the rail sector's workforce capability, the outlook and opportunities for various skills, where the greatest risks to capability lay, and what actions could be undertaken to help minimise capability risks and leave a positive legacy for the future.

2.2 INDUSTRY LIAISON

BIS Oxford Economics, with assistance from the Australasian Railway Association, sought 'grass roots' perspectives from the rail industry through a series of 'deep dive' interviews. This engagement sought to understand critical workforce capability issues faced by the rail industry (Section 5) and to identify potential solutions to any perceived workforce capability deficits (the focus of Section 6).

These issues covered in these sessions were as follows:

- To what extent are skills shortages currently being experienced? In what areas?
- What have been the main reasons for these shortages?
- What is the impact of the following on skills:
 - Government policy including local procurement policy
 - Length of time for training
 - Training requirements
 - Capacity of RTOs and Trainers
 - Transferability of skills
 - Demand in other industries
 - Industry image
 - Awareness/promotion
- How will technological disruption (e.g. driverless trains, digital signalling, big data, IoT) effect the role of the rail industry, and what sorts of skills will be required in future given these developments?
- What skills, if any, may become less important for in the future given changes in technology?

- For what occupations or skills would you expect the rail industry to experience gaps in capability in the next 5-10 years? Are these existing skill sets or future skill sets?
- In your view, what are the key risks to rail industry workforce capability over the next 5-10 years?
- What initiatives should be undertaken to mitigate against these risks? (e.g. changes in education, training, cadetships, skills retention, etc, or other initiatives?)

The breakdown of industry participation in the consultation program by type of organisation is shown in the following table.

Table 2.1: Industry Consultation Participation by Organisation Type

Deep Dive Industry Consultation	
Type of rail organisation	Number Involved
Operators	9
Asset owners	7
Contractors	8
Suppliers	13
Education	4
Government Agencies	7
TOTAL	48

Source: BIS Oxford Economics

In this Report we do not identify or attribute any comments or views expressed in these interviews back to individuals or organisations. We have simply published the issues raised and the thoughtful contribution participants have generally made toward planning and policymaking for ensuring rail sector workforce capability in Australia and New Zealand.

2.3 INDUSTRY SURVEY

As well as industry interviews, BIS Oxford Economics designed an industry survey to obtain quantitative feedback on various issues concerning rail industry workforce capability in Australia and New Zealand.

The survey instrument generates quantitative ratings of industry opinion and complements the qualitative feedback from industry interviews.

Questions and ratings surveyed include:

- The level of difficulty in recruiting staff by occupation, and why
- Occupations most likely to see skills shortages over the next 10 years
- Key risk factors to rail sector workforce capability over the next 10 years and why
- Key risks to rail sector workforce capability through technological change and why
- Initiatives that should be undertaken to reduce risks to workforce capability

The survey form responses are provided in Chapter 7. The survey was designed to get a broad cross section of views across the industry, including

manufacturers, suppliers and the training sector, as well as operators, track owners, consultants and government and industry agencies.

2.4 QUANTITATIVE ANALYSIS

The methodology used in this quantitative analysis involves, firstly, the estimation of a skilled (rail) labour ‘usage coefficient’. This is the amount of labour that is currently required to perform a certain volume of rail-related activity. Then, projections of end use sector activity over the decade to 2027 have been translated, using these coefficients, into forecasts of future skilled labour demand.

Given the timeframe of the study, attrition of the existing workforce through ageing (e.g. via retirement and death) also becomes an important issue. The existence of workforce attrition means that the total additional skilled labour workforce requirement will end up higher than the total labour demand estimated by changed end use sector activity alone. This is because skilled labour also must be found to replace existing skills lost because of the ageing workforce.

The second step therefore involves the comparison of the expected *demand* for skilled labour with our projected levels of labour *supply*. The difference between the total labour demand and the size of the existing workforce is referred to as the ‘workforce gap’. This gap, when positive, will need to be met by additional supply if projected levels of end use sector activity are to be achieved.

The approach taken by BIS Oxford Economics to forecast future skilled labour demand is similar to other demand forecasting exercises we have undertaken for clients operating in the roads and the building and construction sector. That is, we firstly relate our estimates of ‘base year’ demand to an appropriate ‘base year’ activity indicator to derive a ‘usage coefficient’ per unit of end use sector activity. We then apply this usage coefficient to our forecasts of the activity indicator to derive forecasts of future demand.

In this case:

- Base year demand is estimated skilled employment in the rail sector in FY18.
- “End use” activity indicators chosen for the sector are:
 - Construction activity
 - Rail capital stock (in terms of track length)

That is, the model assumes that future changes in demand for skilled labour in the rail sector are driven by changes in rail construction activity and maintenance/operations activity via the size of the capital stock.

2.5 DEFINING THE RAIL SECTOR

The task of identifying a rail workforce is complicated by the fact that there is no precise ABS definition of a ‘rail’ industry sector. While ABS Census data does have ‘Rail Transport’ as an industry category, the reality is that using only Census data from this industry sector would, in our view, severely underestimate the size of the rail workforce.

Consequently, BIS Oxford Economics considers that the rail sector not only includes the 'Rail Transport' sector but also a proportion of people employed in Construction, Manufacturing, and Freight/Transport Services. The size of the rail industry labour force has been estimated based on the 2016 Census for Australia and 2013 Census for New Zealand. To bring the New Zealand Census data and our rail industry estimates up to date, we have estimated data for New Zealand guided by known changes in industry sector activity since 2013.

2.6 DEFINING THE RAIL SECTOR WORKFORCE CAPABILITY SKILL SETS

Demand and supply were modelled initially at the 4-digit level and subsequently rolled up into a number of occupations classes. These occupation classes were classified under the following broad occupation categories: managers; professionals; technicians and trades workers; community and personal service workers; clerical and administrative workers; sales workers; machinery operators and drivers; and labourers.

3. STATE OF PLAY

3.1 AUSTRALIA

Between FY13 and FY16, railway construction in Australia fell steadily after a strong period of resources-driven growth. Total work done halved from the peak in FY12 to a trough of \$3.8bn in FY16. However, in FY17 railway construction activity rose to \$4.5bn (an 18% increase) as major projects began in Australia's largest cities. In FY18, growth continued to accelerate, growing to \$7bn.

The medium-term outlook for the railways sector is the strongest of all engineering construction markets in Australia, with annual work done expected to surpass the resources-driven peak of \$8.3bn by FY21. Total activity is expected to grow around 8% per annum over the five years to FY23.

Publicly funded metropolitan passenger rail projects in Victoria, New South Wales, South Australia, and Queensland together with work on the Federal Government's \$10bn Inland Rail freight project (due for completion in 2025) will be the key growth drivers over the next five years. Private sector funded activity is also expected to rise in the near term in line with lifting resources investment.

Beyond FY23 railways construction work in Australia is expected to remain elevated, supported by rail links to Melbourne Airport and Western Sydney Airport and continued work on Inland Rail, Sydney Metro West and Parramatta Light Rail Stage 2. However questions remain over capability of the industry to deliver this volume of work within the specified timeframes. This may result in a "stronger for longer" tide of work, rather than the projected "tsunami" over the next 5-8 years.

Rail investment activity lifting in most Australian jurisdictions

With the exception of Tasmania and the Northern Territory, all the states and territories have major metropolitan passenger rail projects either currently underway or due to get underway in the next five years.

New South Wales activity levels will be spearheaded by major metropolitan rail projects such as the CBD Light Rail project, Metro City & Southwest and Parramatta Light Rail.

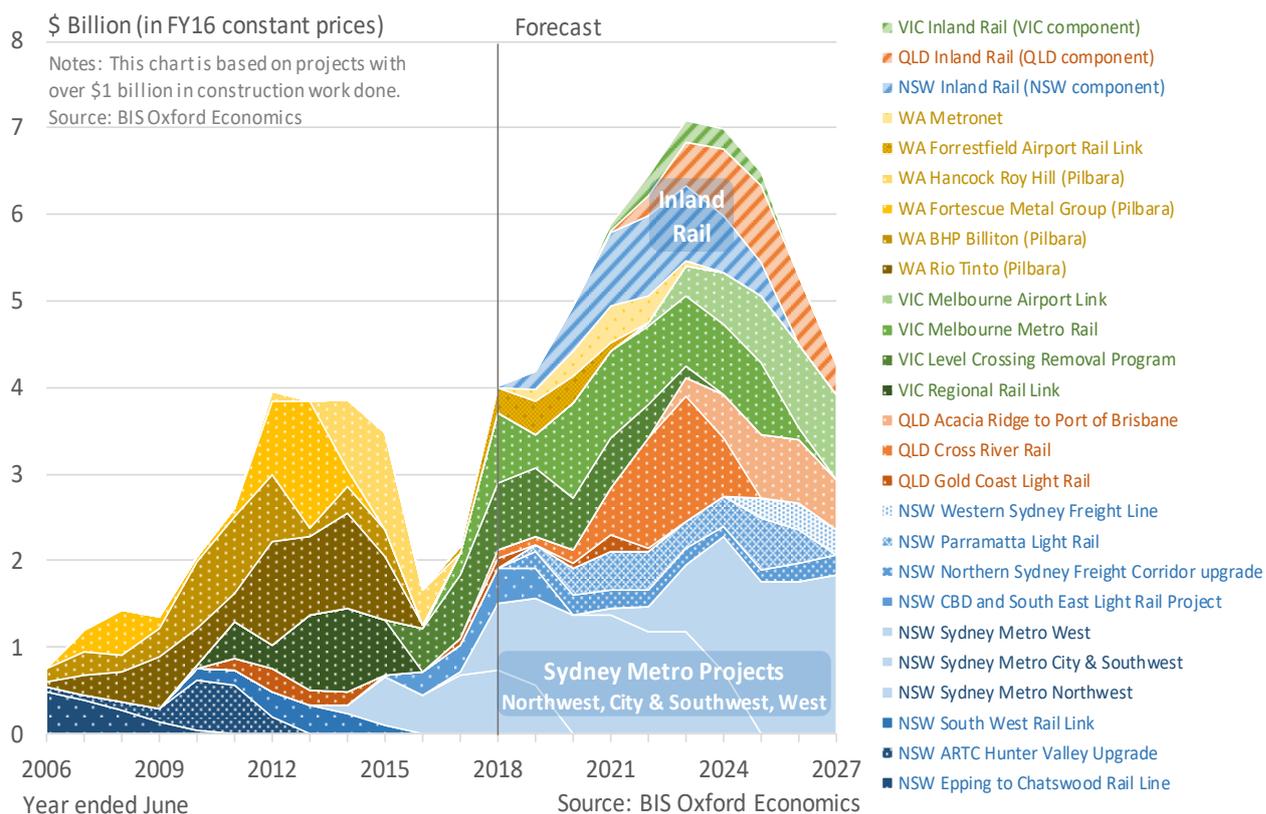
Victoria will continue to see high activity levels on the Melbourne Metro and the level crossing removal program over the next five years, with activity further bolstered by the Regional Rail Revival program.

Queensland will be late to join the upswing, with work on the Cross River Rail project not expected to ramp up fully until FY21. The Beerburrum to Landsborough duplication and Gold Coast Light Rail Stage 3 will support activity in the interim.

While the three biggest states will be the key drivers of growth over the next five years, Perth's Metronet, Canberra's light rail and projects in South Australia will also underpin a strong phase of activity in their associated states and territories.

Freight rail activity is also set for a strong phase of growth underpinned by the Inland Rail project in New South Wales, Victoria and Queensland and the Adelaide-Tarcoola improvement program in South Australia.

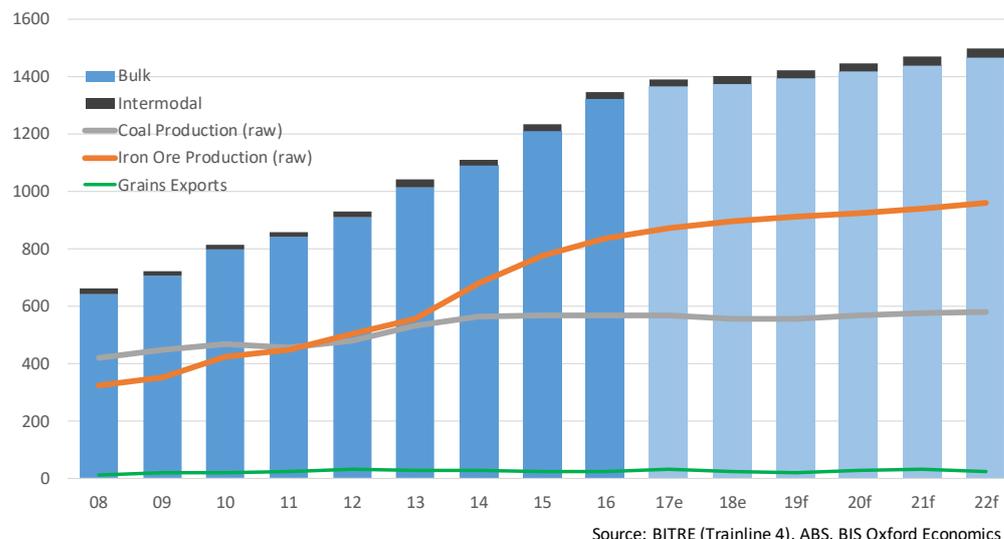
Figure 3.1 Major Rail Project Outlook, Australia



Australia's rail networks play a key role in meeting the national freight task and supporting the economy. Rail accounts for almost half of freight activity in Australia, up from 36 per cent in 2000. However, the efficient landside movement of containers is being tested by rising congestion that is occurring within and around Australia's major container ports.

The rail freight task doubled between 2008 and 2016 driven by the resources boom. In terms of the projected freight task, further growth is expected in the medium term. Iron ore is expected to be the key driver of growth with production expected to grow around 1.4 per cent a year to FY22 and coal around 1 per cent a year. The Pilbara Ports Authority (PPA) delivered a record annual throughput of 699.3 million tonnes (Mt) for FY18, a six-fold increase on the throughput seen in 2007/08.

**Figure 3.2 National Rail Freight Task and Bulk Demand Drivers- Australia
(million tonnes)**



3.2 NEW ZEALAND

The New Zealand Government, together with Auckland Council and Greater Wellington Regional Council, has invested significant amounts into New Zealand's metro rail network over the past decade, including:

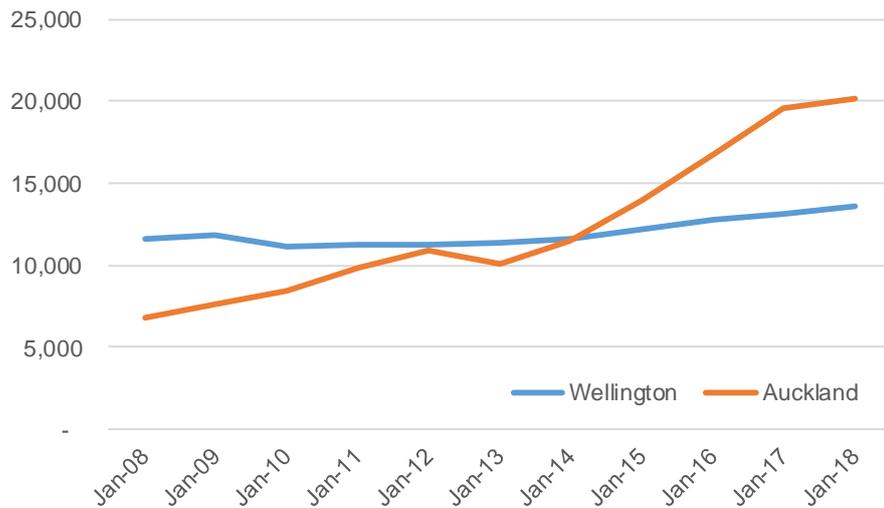
- Electrification of the Auckland rail network with new electric trains
- The duplication of the Western line from Newmarket to Swanson
- Re-opening the Onehunga line
- Construction of a new Manukau rail link
- Upgrades to the Wellington metro rail network and new rolling stock

Rail plays an important role in Auckland's transport system, particularly in providing for travel to and from the CBD. Auckland's rail patronage has increased rapidly from 6.8 million trips per year in 2007/08 to 20 million trips a year in FY18. In Wellington, Rail patronage has increased from 11.5 million a year in FY08 to 13.5 million a year in FY18.

Construction on the City Rail Link, a new underground rail line linking Britomart and the city centre with the existing western line near Mt Eden, commenced in 2016 and is due for completion in 2024. The project is jointly funded by the Government and Auckland Council.

Additional investment announced in the 2018-2021 National Land Transport Programme includes improvements to the rail link between Wairarapa and Wellington, extending rail electrification to Pukekohe, upgrades between Wiri Park and Quay Park and a proposed new light rail link between Auckland CBD and Mangere, and Auckland CBD and the north west. The 10-year Auckland Transport Alignment Project (ATAP) includes \$1.4 billion of rail network upgrades (in addition to City Rail Link) over the next decade and \$1.8 billion seed funding for the two proposed light rail corridors.

Figure 3.3: Annual Rail Passenger Patronage by City- New Zealand



Source: Auckland Transport, Metlink

Rail carries approximately 16 per cent of New Zealand's total freight task (tonnes-km) and around 25% of exports¹. Rail is a key connector for ports to regional consolidation points and has also been part of an increasing move to improve intermodal capability within the New Zealand freight market.

Volumes of freight were significantly affected by the Kaikoura earthquake in FY17 and work has since been focused on restoring the South Island Main Trunk Line. In addition, the significant levels of funding have been directed at upgrading track and replacing KiwiRail's ageing fleet.

Ministry of Transport Modelling² sees the New Zealand overall freight task increase from 237 million tonnes in FY13 to 366 million tonnes by FY43 under a range of base case assumptions for population and GDP projections. However, the rail share of the freight task is projected to fall from 6.8% to 5.6% over the same timeframe. This fall in share reflects soft growth projections in two of rail's main freight classes (logs and coal).

¹ KiwiRail, Annual Integrated Report 2017

² Ministry of Transport, The Transport Outlook: Future State

4. SKILLS FORECASTS BY JURISDICTION

4.1 SUMMARY OF FINDINGS

This section provides the graphical representations of projected labour demand for the construction and rail operation clusters over the period to FY27. The workforce gap post FY18 illustrated in the charts for each jurisdiction is based on the difference between labour demand and supply, accounting for attrition through retirements and death. New supply is not considered here as the objective of this analysis is to illustrate the potential maximum workforce gap.

While the pipeline of current and planned investment in rail across Australia and New Zealand creates immediate demands for a range of construction-related skills, this investment will also entail growing demands for a range of skills across the operations and maintenance of rail systems. The quantitative modelling shows that:

- Workforce gaps are already present in the rail operations and rail infrastructure construction sectors. Undersupply is most severe among specialist managers and professionals (engineers especially) while labourers and sales staff are in slight oversupply.
- Demand for rail construction labour will rise significantly in coming years in line with the boom in construction activity. This will increase the potential for workforce gaps.
- Workforce ageing and retirements will place further strain on some workforce gaps, most notably among machinery operators, including train drivers.

This analysis, however, is focused on the specified demands generated by the rail sector and, as such, has some limitations. For example, the model does not adequately reflect that highly experienced skills will be lost to the rail sector over the coming decade compared to the influx of new (typically lesser experienced) skills drawn from education or migration. In other words, a measure of “experience years” is likely to decline in the coming decade, even if numbers of workers in the industry rises to meet demand. Furthermore, the workforce gap itself does not take into account the demands that other industries – such as other transport segments such as roads, or industries such as mining – may pull on the rail industry over the forecast horizon. In other words, in its portrayal of workforce gaps, it is implicitly assumed that the rail industry can fill these gaps with appropriate intakes from the education sector, from migration (whether interstate in Australia, or via immigration), or from inter-industry transfers.

While a much larger quantitative model that took into account demands for all the occupations in the skills clusters considered from all industries (and all industries’ call on newly minted graduates and migrants) would help resolve some (though not all) of these issues, such a task is beyond the scope of this Report.

Table 4.1: Australian Estimated Total Rail Employment & Workforce Gap³

Occupation Name	FY18 Employment	Workforce Gap (%)			
		FY 18	FY 21	FY 24	FY 27
Managers	14,662	0.9%	26.4%	35.2%	13.7%
<i>Specialist Managers</i>	11,247	1.3%	27.1%	35.5%	12.0%
Advertising, Public Relations and Sales Managers	560	2.0%	26.5%	34.3%	8.7%
Business Administration Managers	1,207	0.7%	22.8%	30.7%	13.1%
Construction, Distribution and Production Managers	8,716	1.4%	28.3%	36.8%	12.1%
Construction Managers	7,049	1.8%	29.6%	38.2%	11.2%
Engineering Managers	409	0.1%	25.9%	33.7%	14.0%
Other/Unclassified Construction, Distribution and Production Managers	1,258	-0.3%	20.6%	29.4%	15.9%
Other/Unclassified Specialist Managers	765	0.0%	20.2%	27.5%	12.0%
<i>Hospitality, Retail and Service Managers</i>	1,835	0.2%	19.4%	28.7%	18.7%
Call or Contact Centre and Customer Service Managers	331	0.3%	18.4%	26.8%	9.4%
Rail Station, Transport Company, and Other Transport Services Managers	916	0.3%	14.6%	23.7%	27.5%
Other/Unclassified Hospitality, Retail and Service Managers	588	0.1%	26.2%	35.6%	9.3%
<i>Other/Unclassified Managers</i>	1,580	-1.3%	29.0%	40.1%	20.4%
Professionals	7,780	0.9%	22.3%	30.3%	12.5%
<i>Business, Human Resource and Marketing Professionals</i>	2,474	0.8%	21.0%	28.2%	13.2%
<i>Design, Engineering, Science and Transport Professionals</i>	3,693	1.0%	24.3%	33.0%	11.0%
Architects, Designers, Planners and Surveyors	607	0.7%	24.6%	31.5%	9.8%
Engineering Professionals	2,976	1.2%	24.3%	33.3%	11.1%
Civil Engineering Professionals	1,604	1.7%	25.3%	36.4%	10.6%
Electrical Engineers	525	0.6%	17.4%	21.8%	13.3%
Industrial, Mechanical and Production Engineers	455	1.0%	27.0%	34.1%	10.4%
Other/Unclassified Engineering Professionals	392	0.1%	25.2%	32.5%	11.4%
Other/Unclassified Design, Engineering, Science and Transport Professionals	110	-0.8%	23.9%	33.5%	13.7%
<i>Occupational and Environmental Health Professionals</i>	533	1.0%	22.5%	30.2%	15.2%
<i>ICT Professionals</i>	700	1.6%	16.1%	22.6%	12.5%
<i>Other/Unclassified Professionals</i>	380	-0.4%	20.8%	29.3%	18.1%
Technicians and Trades Workers	38,634	0.0%	15.3%	24.7%	-0.9%
<i>Engineering, ICT and Science Technicians</i>	4,893	1.1%	29.0%	36.7%	10.7%
Architectural, Building and Surveying Technicians	3,600	1.4%	30.6%	38.2%	10.7%
Other/Unclassified Engineering, ICT and Science Technicians	1,293	0.3%	24.1%	32.1%	10.5%
<i>Automotive and Engineering Trades Workers</i>	6,202	0.4%	27.7%	39.7%	11.7%
<i>Construction Trades Workers</i>	18,322	-0.4%	-0.7%	6.6%	11.4%
<i>Electrotechnology and Telecommunications Trades Workers</i>	7,683	0.0%	23.9%	34.4%	2.1%
Electricians	5,981	0.3%	23.5%	34.2%	2.0%
Electronics and Telecommunications Trades Workers	1,540	0.1%	26.1%	35.7%	3.8%
Other/Unclassified Electrotechnology and Telecommunications Trades Workers	161	-8.4%	20.2%	31.0%	-9.8%
<i>Horticultural Trades Workers</i>	483	-0.1%	4.3%	8.1%	0.9%
<i>Other/Unclassified Technicians and Trades Workers</i>	1,051	-0.1%	24.7%	33.5%	4.2%
Community and Personal Service Workers	896	-0.1%	10.8%	18.0%	14.6%
<i>Security Officers and Guards</i>	204	0.2%	15.3%	25.4%	17.9%
<i>Personal Service and Travel Workers</i>	415	-0.3%	7.8%	14.0%	16.9%
<i>Other/Unclassified Community and Personal Service Workers</i>	277	0.0%	11.7%	17.8%	8.2%
Clerical and Administrative Workers	11,234	0.2%	8.0%	16.5%	9.5%
<i>Office Managers and Program Administrators</i>	3,086	0.1%	7.8%	16.5%	6.8%
<i>Personal Assistants and Secretaries</i>	650	0.4%	10.4%	20.2%	10.2%
<i>General Clerical Workers</i>	1,775	0.3%	8.4%	17.4%	8.5%
<i>Inquiry Clerks and Receptionists</i>	836	0.2%	7.1%	15.0%	8.9%
<i>Numerical Clerks</i>	2,233	0.1%	8.9%	18.9%	6.7%
<i>Other Clerical and Administrative Workers</i>	2,431	0.1%	6.9%	13.4%	15.2%
Logistics Clerks	1,462	0.2%	6.9%	13.4%	13.7%
Other/Unclassified Other Clerical and Administrative Workers	969	0.1%	6.8%	13.4%	17.4%
<i>Other/Unclassified Clerical and Administrative Workers</i>	223	-0.2%	8.2%	16.1%	11.6%
Sales Workers	2,634	-0.9%	2.8%	9.5%	12.4%
<i>Ticket Salespersons</i>	1,334	-1.8%	5.9%	14.2%	23.1%
<i>Other/Unclassified Sales Workers</i>	1,299	0.0%	-0.4%	4.4%	0.1%
Machinery Operators and Drivers	15,328	0.1%	17.8%	30.5%	16.5%
<i>Machine and Stationary Plant Operators</i>	3,510	0.0%	22.2%	33.5%	12.2%
Train Controllers, and Railway Signal, Track Plant and Other Stationary Plant	1,572	0.2%	11.5%	20.7%	18.8%
Other/Unclassified Machine and Stationary Plant Operators	1,938	-0.1%	29.0%	41.0%	6.4%
<i>Mobile Plant Operators</i>	2,583	0.5%	27.7%	48.6%	5.2%
<i>Road and Rail Drivers</i>	8,403	0.2%	11.1%	19.6%	22.1%
Train and Tram Drivers	6,966	0.3%	7.2%	14.8%	23.1%
Truck Drivers	999	0.2%	29.4%	39.8%	12.1%
Other/Unclassified Road and Rail Drivers	438	-1.6%	19.6%	30.5%	24.9%
<i>Other/Unclassified Machinery Operators and Drivers</i>	832	-1.5%	23.9%	32.1%	8.0%
Labourers	14,722	-0.4%	30.1%	37.9%	9.7%
<i>Construction and Mining Labourers</i> 333	9,590	-0.5%	31.1%	38.6%	6.8%
Railway Track Workers	1,556	-0.1%	16.9%	25.0%	20.7%
Other/Unclassified Construction and Mining Labourers	8,034	-0.6%	33.2%	40.5%	4.0%
<i>Railways Assistants and Other Miscellaneous Labourers</i>	2,050	0.7%	19.0%	28.2%	20.9%
<i>Other/Unclassified Labourers</i>	3,081	-0.8%	33.2%	41.0%	11.2%
Total	107,205	0.1%	18.4%	27.6%	7.5%

³ The workforce gap post FY18 is based on the difference between labour demand and supply, accounting for attrition through retirements and death. New supply is **not** considered here, thus this is the potential maximum workforce gap.

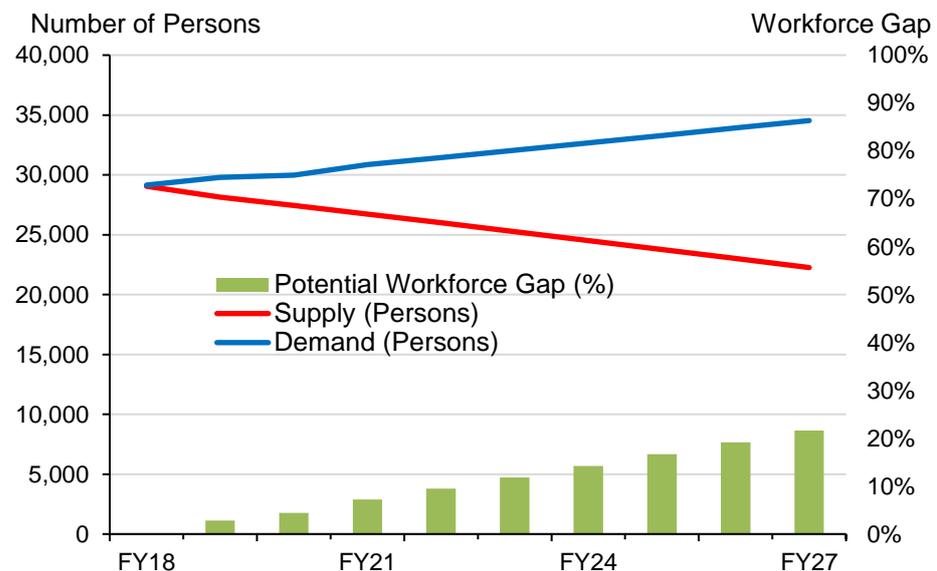
4.2 JURISDICTIONAL MODELLING RESULTS

4.2.1 Australian workforce gaps

Given the estimated age profiles of the rail workforce by occupation — and the assumed likelihood of retirement and death in each age group — we estimate that the existing Australian workforces across the occupation will shrink as shown in the charts below and the previous table. The difference between the (declining) existing workforce and total labour demand is the workforce gap. The workforce gap will need to be met by new supply (e.g. graduates, migration, or absorption from other industries) if forecast levels of end use rail sector activity are to be achieved.

The assumption of constant usage coefficients per volume of work done and the differing occupations clustered across operations (including maintenance) and construction activities results in distinct demand profile patterns for these workforces. Notably, rail construction is in the midst of a boom.

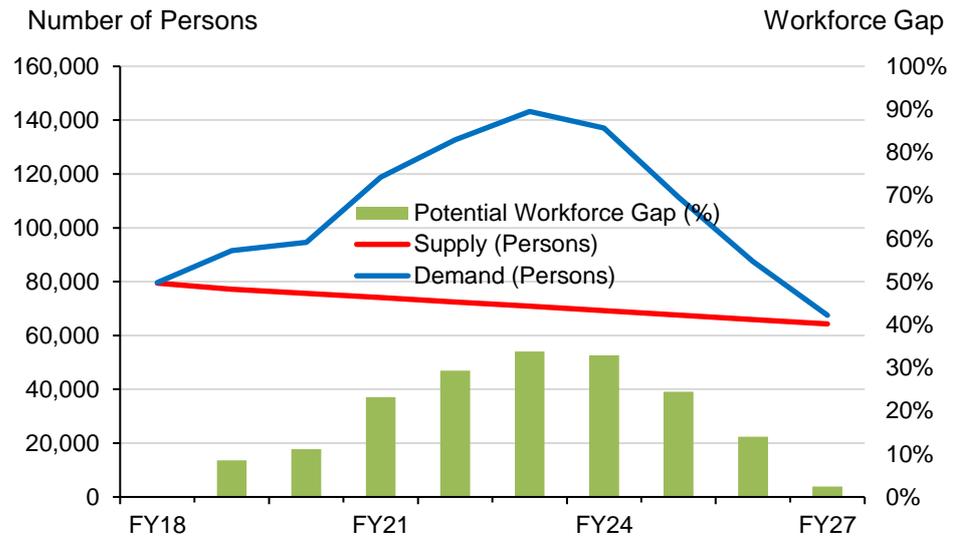
Figure 4.1: Australian Rail Workforce Gaps – Operations and Maintenance



Source: BIS Oxford Economics

Operations and maintenance workforce demand is anticipated to rise strongly over the coming decade, reflecting the needs of maintaining existing ageing rail assets, strong growth in demand for rail services (both passenger and freight), as well as strong growth in investment in new assets. Overall, maintenance and operations workforce demand is forecast to rise from just around 28,000 persons in FY18 to around 35,000 persons by FY27. Meanwhile, ageing of the existing workforce is likely to see approximately 5,600 workers leave the industry over the coming decade. The total workforce gap for operations and maintenance (demand less supply) is expected to rise to 12,300 persons by FY27, or approximately 22% of the available workforce.

Figure 4.2: Australian Rail Workforce Gaps – Construction and Manufacturing



Source: BIS Oxford Economics

Construction and manufacturing workforce demand is forecast to surge cyclically over the coming decade in line with a once in a generation lift in new rail investment, combined with policies targeting related manufacturing opportunities. Peak demand at the national level is anticipated to be in the mid-2020s, with over 140,000 workers required, up from 80,000 workers estimated in FY18. Combined with ageing effects (which drives a decline in the existing workforce over time), peak workforce gaps are also anticipated around the mid-2020s, at around 73,000 persons – or approximately 34% of the available workforce.

The rail construction sub-industry will need to draw extensively from other parts of the construction industry (and elsewhere) to resource the rail workload. The workload is forecast to peak in FY23. Easing activity in later years will see a projected negative gap emerge. At this point, other parts of the construction industry will draw these skilled resources away.

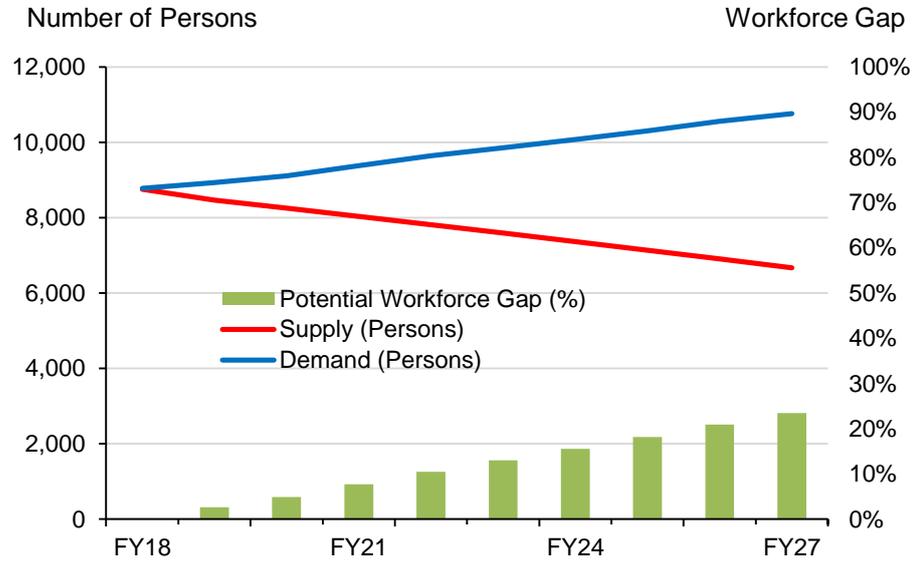
Higher skilled jobs that feature limited long-term prospects (such as train drivers due to the increasing potential for automation) and an older workforce will be notably difficult to fill. This will be especially true of jobs that are highly concentrated in one industry. Construction workers for example can be readily drawn from other parts of the heavy construction industry where demand for labour may be lower. On the other hand, train controllers and railway signal operators are specialised roles in the rail industry and this may make hiring more difficult. Similarly, lower skill occupation, though they may have a rapidly ageing workforce (such as ticket salespersons and labourers) will likely be easier to fill due to the large potential pool of workers.

At present, shortages among managers and professionals are the most evident. Workforce gaps among specialist managers, especially those managing professionals, may become deeper over the coming years due to the current shortages in their hiring pool (of professionals).

4.2.2 New South Wales workforce gaps

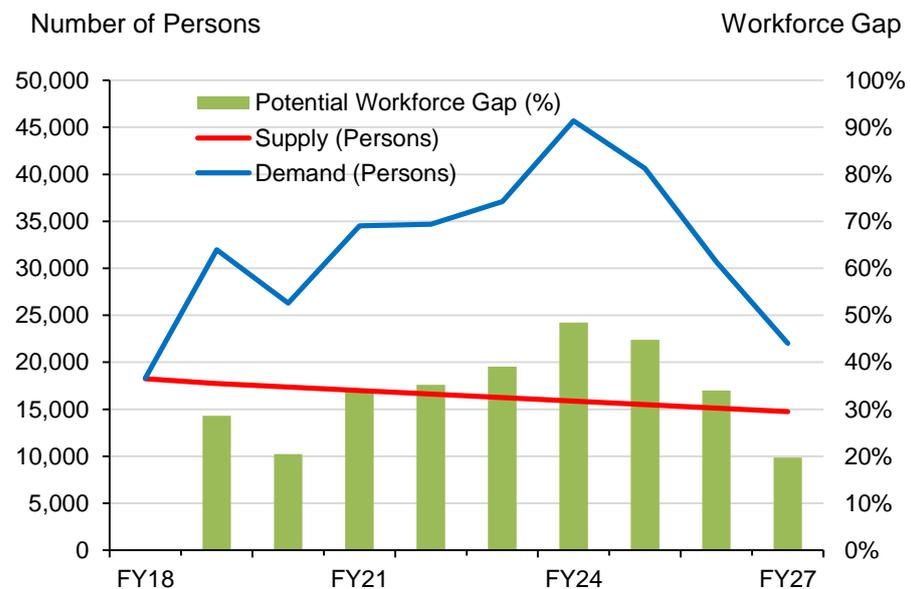
BIS Oxford Economics' outlook for rail activity in New South Wales translates into demand for labour as shown as the following figures (blue lines).

Figure 4.3: NSW Rail Workforce Gaps – Operations and Maintenance



Source: BIS Oxford Economics

Figure 4.4: NSW Rail Workforce Gaps – Construction and Manufacturing



Source: BIS Oxford Economics

Operations and maintenance rail workforce demand in New South Wales is anticipated to rise strongly over the coming decade, reflecting the needs of maintaining existing ageing rail assets, strong growth in demand for rail services (both passenger and freight), as well as strong growth in investment in new assets. Overall, maintenance and operations workforce demand is forecast to rise from just around 8,800 persons in FY18 to around 10,800 persons by FY27. Meanwhile, ageing of the existing workforce is likely to see approximately 2,100 workers leave the industry over the coming decade. The total workforce gap for operations and maintenance (demand less supply) is expected to rise to 4,100 persons by FY27, or approximately 23% of the available workforce.

From an estimate of 18,300 construction and manufacturing employees in FY18, labour demand is expected to rise sharply to 45,700 employees by FY24 as rapidly increasing rail activity more than offsets labour productivity (1.5% per annum). However, by FY27 labour demand is expected to fall back in line with weakening rail construction activity. Meanwhile, demand for operations and maintenance labour is forecast to experience a much more gradual transition.

The total skilled workforce requirement to meet future rail activity is inevitably higher than the labour demand generated by the model given attrition of the existing workforce 'base', primarily through retirement and death (but also through people leaving the workforce for other reasons).

Given the estimated age profile of the rail workforce — and the assumed likelihood of retirement and death in each age group — we estimate that the current workforce will shrink by around 20% over the period to FY27, with the highest concentration among Machinery Operators and Drivers (24% attrition, much of which consists of Train and Tram drivers). The difference between the (declining) existing workforce and total labour demand is the workforce gap. The workforce gap will need to be met by new supply (e.g. graduates, migration, or absorption from other industries) if forecast levels of end use activity are to be achieved.

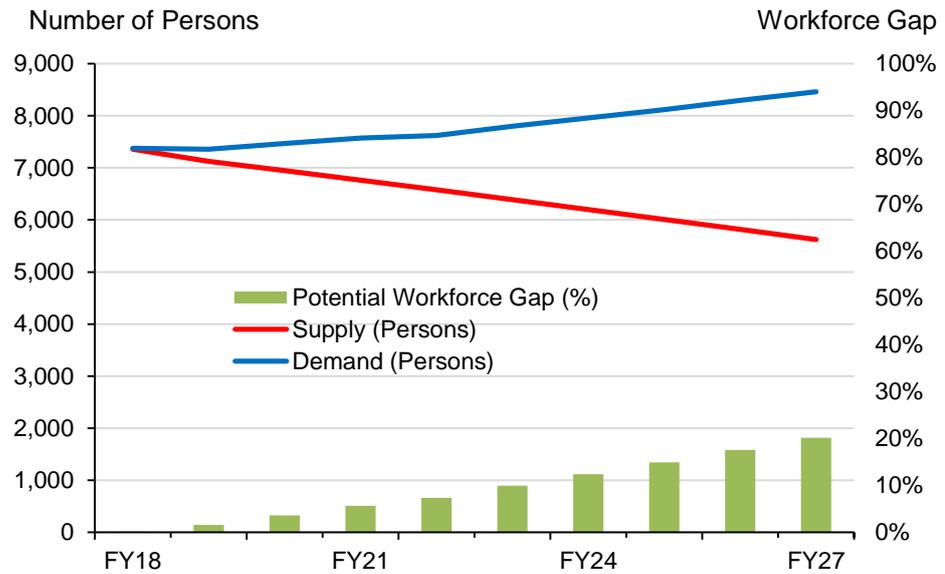
Overall, for all occupation groups in the New South Wales rail sector, modelling indicates a large maximum potential workforce gap over time as attrition of the existing workforce accompanies often growing levels of labour demand.

4.2.3 Victoria workforce gaps

BIS Oxford Economics' outlook for rail activity in Victoria translates into demand for labour as shown as the following figures (blue lines).

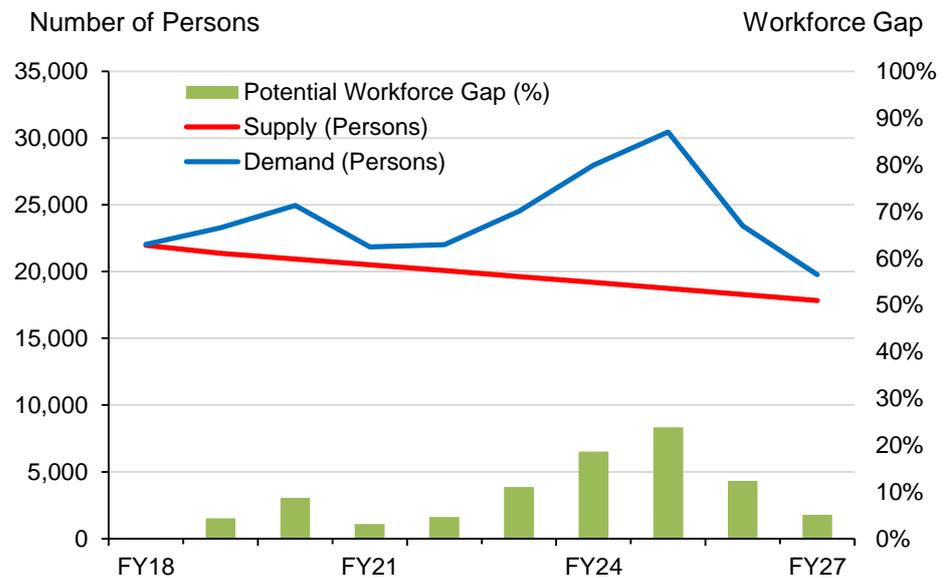
Operations and maintenance rail workforce demand in Victoria is anticipated to rise strongly over the coming decade, reflecting the needs of maintaining existing ageing rail assets, strong growth in demand for rail services (both passenger and freight), as well as strong growth in investment in new assets. Overall, maintenance and operations workforce demand is forecast to rise from just around 7,400 persons in FY18 to around 8,500 persons by FY27. Meanwhile, ageing of the existing workforce is likely to see approximately 1,700 workers leave the industry over the coming decade. The total workforce gap for operations and maintenance (demand less supply) is expected to rise to 2,800 persons by FY27, or approximately 20% of the available workforce.

Figure 4.5: Vic Rail Workforce Gaps – Operations and Maintenance



Source: BIS Oxford Economics

Figure 4.6: Vic Rail Workforce Gaps – Construction and Manufacturing



Source: BIS Oxford Economics

From an estimate of 22,000 construction and manufacturing employees in FY18, labour demand is expected to rise to 30,500 employees by FY25 as increasing rail activity more than offsets labour productivity (1.5% per annum). By FY27 labour demand is expected to fall back in line with weakening rail construction activity, but this outlook may be conservative if further rail

investment initiatives are developed beyond FY25.⁴ Together with ageing impacts on the existing workforce, this is expected to see the peak construction and manufacturing workforce gap rise to 11,700 persons by FY25, or 24% of the available workforce.

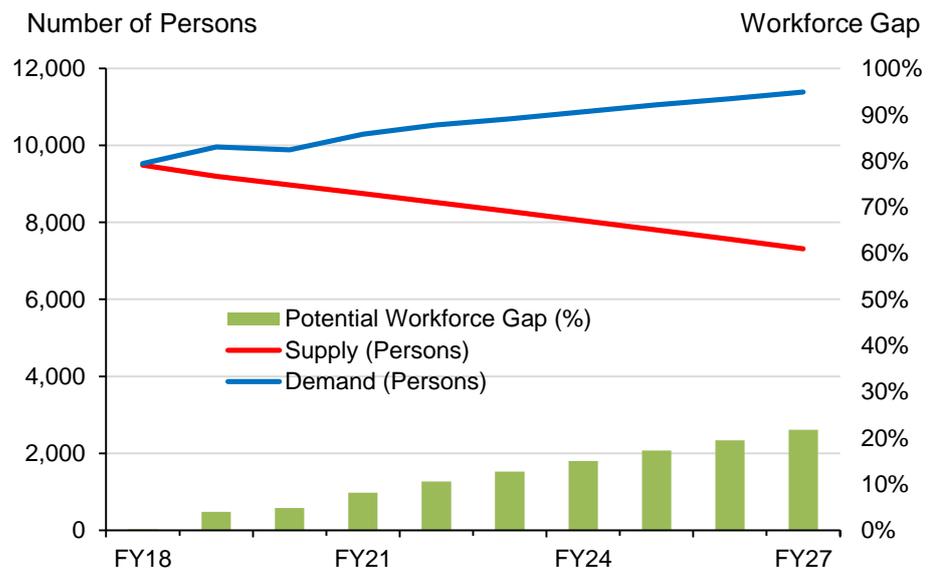
Given the estimated age profile of the rail workforce — and the assumed likelihood of retirement and death in each age group — we estimate that the current workforce will shrink by around 20% over the period to FY27, with the highest concentration among Machinery Operators and Drivers and Managers (24% attrition). The difference between the (declining) existing workforce and total labour demand is the workforce gap. The workforce gap will need to be met by new supply (e.g. graduates, migration, or absorption from other industries) if forecast levels of end use activity are to be achieved.

Overall, for all occupation groups in the Victoria rail sector, modelling indicates a moderate maximum potential workforce gap over time as attrition of the existing workforce accompanies often growing levels of labour demand.

4.2.4 Queensland workforce gaps

BIS Oxford Economics' outlook for rail activity in Queensland translates into demand for labour as shown as the following figures (blue lines).

Figure 4.7: Qld Rail Workforce Gaps – Operations and Maintenance



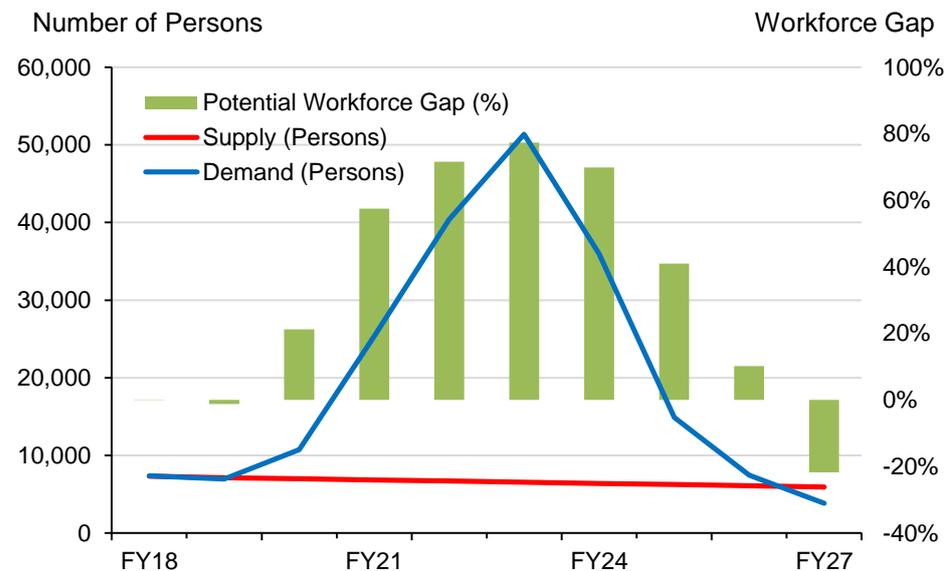
Source: BIS Oxford Economics

Operations and maintenance rail workforce demand in Queensland is anticipated to rise strongly over the coming decade, reflecting the needs of maintaining existing ageing rail assets, strong growth in demand for rail services (both passenger and freight), as well as strong growth in investment in new assets. Overall, maintenance and operations workforce demand is forecast

⁴ It is noted that since the analysis undertaken for this study, further rail projects have been announced for Victoria, including the prioritisation of further rail crossing removals. It is further noted that the mooted \$50 billion Suburban Rail Loop has not been considered in the modelling for the coming decade.

to rise from just around 9,500 persons in FY18 to around 11,400 persons by FY27. Meanwhile, ageing of the existing workforce is likely to see approximately 2,200 workers leave the industry over the coming decade. The total workforce gap for operations and maintenance (demand less supply) is expected to rise to 4,100 persons by FY27, or approximately 22% of the available workforce.

Figure 4.8: Qld Rail Workforce Gaps – Construction and Manufacturing



Source: BIS Oxford Economics

The commencement of a range of rail construction projects, including inland rail, will support significant employment in the construction, manufacturing and associated sectors. Labour demand in these sectors is expected to rise sharply from 7,400 to 50,000 employees by FY23 as rapidly increasing rail activity more than offsets labour productivity (1.5% per annum). However, by FY27 most of the work on the current pipeline of projects will have been completed, thus labour demand is expected to fall back.

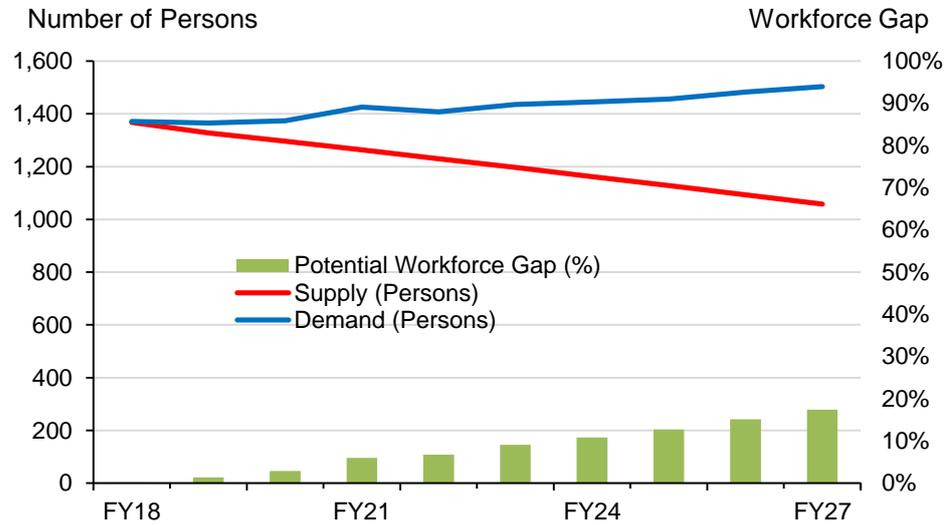
Given the estimated age profile of the rail workforce — and the assumed likelihood of retirement and death in each age group — we estimate that the current workforce will shrink by around 21% over the period to FY27, with the highest concentration among Machinery Operators and Drivers as well as managers (24% attrition). The difference between the (declining) existing workforce and total labour demand is the workforce gap. The workforce gap will need to be met by new supply (e.g. graduates, migration, or absorption from other industries) if forecast levels of end use activity are to be achieved.

Overall, for all occupation groups in the Queensland rail sector, modelling indicates a large maximum potential workforce gap over time as attrition of the existing workforce accompanies growing levels of labour demand.

4.2.5 South Australia workforce gaps

BIS Oxford Economics' outlook for rail activity in South Australia translates into demand for labour as shown as the following figures (blue lines).

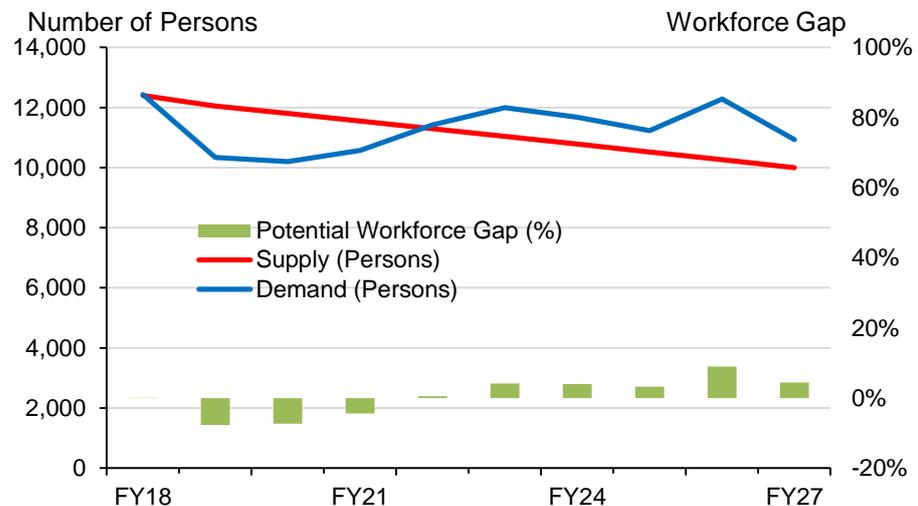
Figure 4.9: SA Rail Workforce Gaps – Operations and Maintenance



Source: BIS Oxford Economics

Operations and maintenance rail workforce demand in South Australia is anticipated to rise strongly over the coming decade, reflecting the needs of maintaining existing ageing rail assets, strong growth in demand for rail services (both passenger and freight), as well as strong growth in investment in new assets. Overall, maintenance and operations workforce demand is forecast to rise from around 1,350 persons in FY18 to around 1,500 persons by FY27. Meanwhile, ageing of the existing workforce is likely to see approximately 300 workers leave the industry over the coming decade. The total workforce gap for operations and maintenance (demand less supply) is expected to rise to 450 persons by FY27, or approximately 17% of the available workforce.

Figure 4.10: SA Rail Workforce Gaps – Construction and Manufacturing



Source: BIS Oxford Economics

Demand for rail construction and manufacturing employees over the coming decade is anticipated to cycle around current levels. Labour demand is expected to ease over the next few years, but will recover modestly through the 2020s. However, with an ageing workforce, workforce gaps in construction and manufacturing are expected to arise from FY22, rising to a peak of nearly 2,000 persons by FY26.

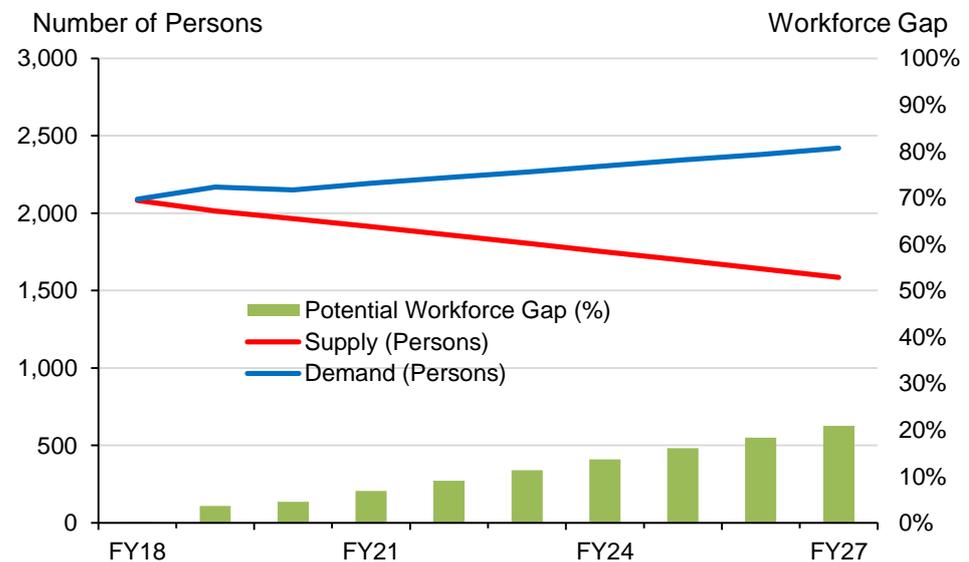
Given the estimated age profile of the rail workforce — and the assumed likelihood of retirement and death in each age group — we estimate that the current workforce will shrink by around 20% over the period to FY27, with the highest concentration among Machinery Operators and Drivers (25% attrition, much of which consists of Train and Tram drivers). The difference between the (declining) existing workforce and total labour demand is the workforce gap. The workforce gap will need to be met by new supply (e.g. graduates, migration, or absorption from other industries) if forecast levels of end use activity are to be achieved.

Overall, for all occupation groups in the South Australia rail sector, modelling indicates a mild maximum potential workforce gap over time as attrition of the existing workforce accompanies flat or falling levels of labour demand.

4.2.6 WA, Tas, NT, and ACT workforce gaps

BIS Oxford Economics' outlook for rail activity in Australia's remaining regions translates into demand for labour as shown as the following figures (blue lines).

Figure 4.11: WA, Tas, NT, ACT Rail Workforce Gaps – Operations and Maintenance

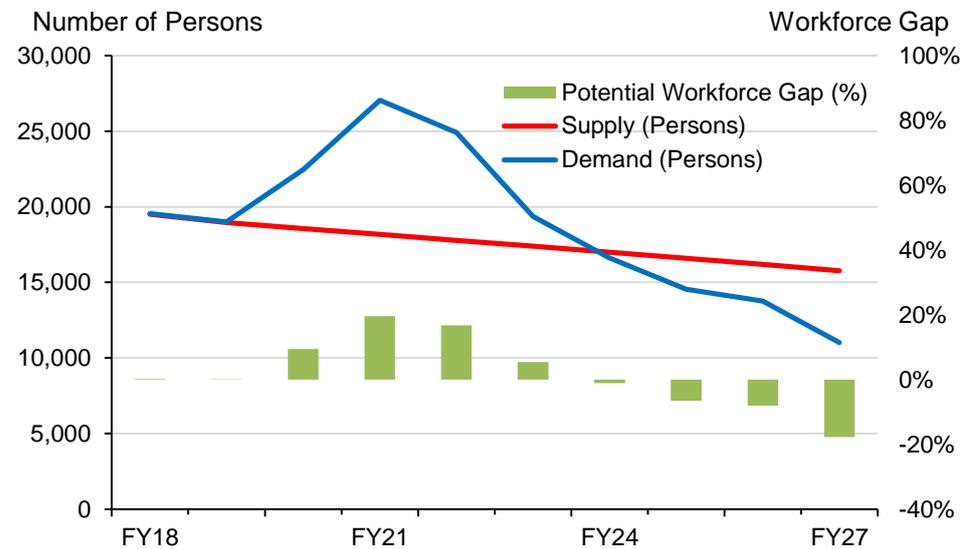


Source: BIS Oxford Economics

Operations and maintenance rail workforce demand in the remaining Australian states (including Western Australia) is anticipated to rise strongly over the coming decade, reflecting the needs of maintaining existing ageing rail assets, strong growth in demand for rail services (both passenger and freight), as well as strong growth in investment in new assets. Overall, maintenance and operations workforce demand is forecast to rise from around 2,000 persons in FY18 to around 2,400 persons by FY27.

Meanwhile, ageing of the existing workforce is likely to see approximately 500 workers leave the industry over the coming decade. The total workforce gap for operations and maintenance (demand less supply) is expected to rise to 840 persons by FY27, or approximately 21% of the available workforce.

Figure 4.12: WA, Tas, NT, ACT Rail Workforce Gaps – Construction and Manufacturing



Source: BIS Oxford Economics

From an estimate of 19,600 construction and manufacturing employees in FY18, labour demand is expected to surge over the next five years (despite the completion of the ACT Government’s Metro Project), mainly due to sharply rising rail investment in Western Australia driven by various stages of METRONET and new investments by Rio Tinto and Fortescue Metals Group in the Pilbara. This new raft of investment is anticipated to see demand for construction and manufacturing workers rise to a peak of 27,000 persons by FY21. While the Figure 4.1.2 seems to suggest that there is a drop-off in projects from FY21 it is clear that considerable planning money has been committed in WA as prelude to further project work and signalling/technology upgrades to enable passenger rail to meet increasing congestion as WA approaches 3.5 million residents. Accordingly it is not unreasonable to expect a program of ongoing and new works in rail continuing through to 2031 at higher than normal levels.

The total skilled workforce requirement to meet future rail activity is inevitably higher than the labour demand generated by the model given attrition of the existing workforce ‘base’, primarily through retirement and death (but also through people leaving the workforce for other reasons).

Given the estimated age profile of the rail workforce — and the assumed likelihood of retirement and death in each age group — we estimate that the current workforce will shrink by around 20% over the period to FY27, with the highest concentration among Managers (24% attrition). The difference between the (declining) existing workforce and total labour demand is the workforce gap. The workforce gap will need to be met by new supply (e.g. graduates,

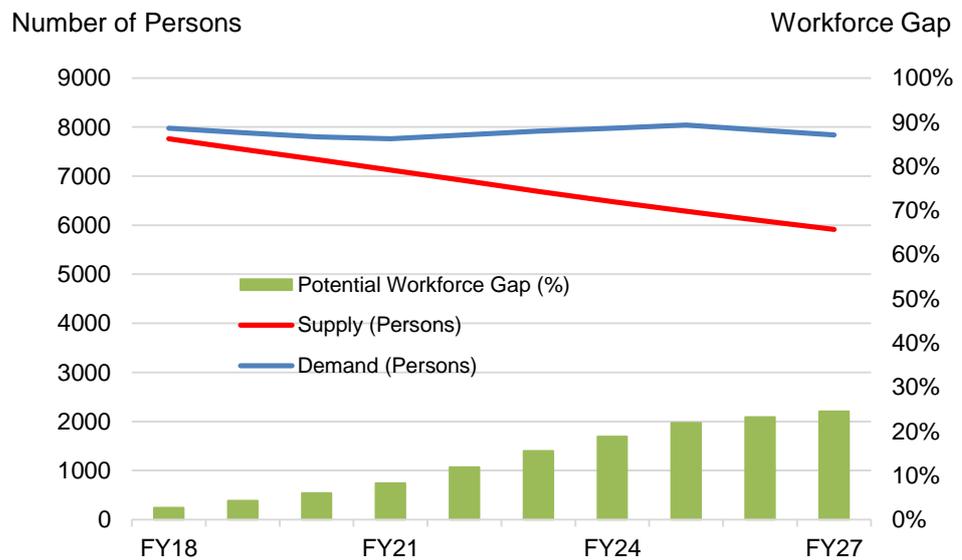
migration, or absorption from other industries) if forecast levels of end use activity are to be achieved.

4.2.1 New Zealand workforce gap assumptions

BIS Oxford Economics' outlook for rail activity in New Zealand translates into demand for labour as shown as the following figures (blue lines).

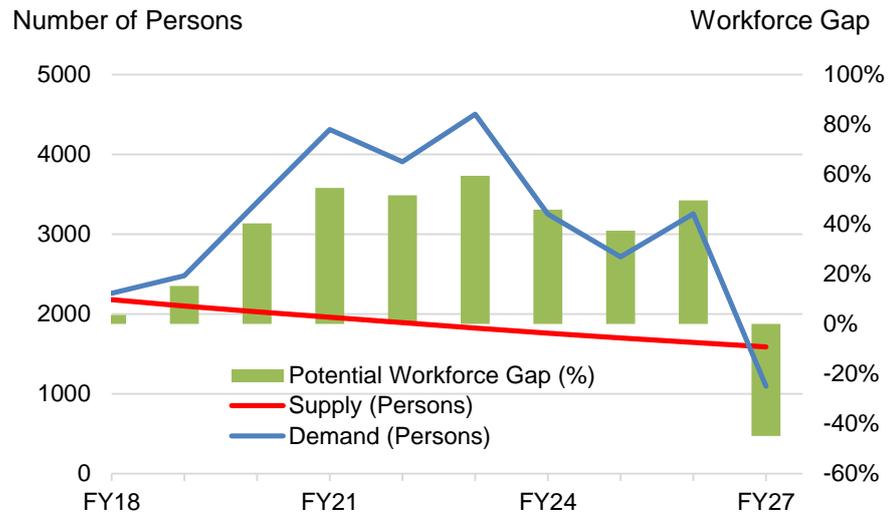
The total skilled workforce requirement to meet future rail activity is inevitably higher than the labour demand generated by the model given attrition of the existing workforce 'base', primarily through retirement and death (but also through people leaving the workforce for other reasons).

Figure 4.13: New Zealand Rail Workforce Gaps – Operations and Maintenance



Source: BIS Oxford Economics

Figure 4.14: New Zealand Rail Workforce Gaps – Construction and Manufacturing



Source: BIS Oxford Economics

New Zealand has a strong rail construction outlook over the next ten years with work on the City Rail Link still ramping up and with the expectation that work will get underway on the City to Mangere light rail link before the end of the decade. The National Land Transport Programme also includes significant levels of capacity enhancing investment on the Wellington and Auckland passenger rail services, as well as spending on upgrading track and rolling stock. While construction activity is expected to underpin strong labour force demand, particularly in the first half of the next decade, the operations and maintenance workforce is expected to see only moderate growth. The City Rail Link and Auckland light rail service will require additional operations and maintenance staff, but we expect to continue to see labour productivity improvements underpinned by the substantial levels of investment that are underway and also potentially through additional contracting out of services.

Table 4.2: New Zealand Estimated Total Rail Employment & Workforce Gap⁵

Occupation Name	FY18 Employment	Workforce Gap (%)			
		FY 18	FY 21	FY 24	FY 27
Managers	1,958	2.9%	20.9%	24.3%	15.0%
<i>Specialist Managers</i>	940	2.9%	30.2%	29.8%	12.1%
Advertising, Public Relations and Sales Managers	80	1.6%	14.5%	15.7%	8.5%
Business Administration Managers	270	2.4%	30.1%	26.9%	3.7%
Construction, Distribution and Production Managers	127	2.3%	24.5%	30.5%	19.4%
Construction Managers	103	3.8%	48.8%	43.4%	-6.7%
Engineering Managers	23	2.3%	30.5%	30.2%	13.9%
Other/Unclassified Specialist Managers	337	3.7%	27.8%	30.0%	20.6%
<i>Hospitality, Retail and Service Managers</i>	1,018	2.8%	9.9%	18.7%	17.3%
Rail Station, Transport Company, and Other Transport Services Managers	882	2.8%	10.2%	19.9%	19.7%
Other/Unclassified Hospitality, Retail and Service Managers	137	2.9%	8.4%	10.8%	1.5%
Professionals	1,137	2.6%	19.9%	19.1%	5.3%
<i>Business, Human Resource and Marketing Professionals</i>	391	2.3%	11.6%	7.6%	-10.3%
<i>Design, Engineering, Science and Transport Professionals</i>	560	3.2%	26.1%	27.6%	16.5%
Architects, Designers, Planners and Surveyors	61	2.4%	17.4%	19.3%	12.0%
Engineering Professionals	21	3.1%	20.3%	24.2%	20.0%
Civil Engineering Professionals	154	3.5%	46.6%	41.4%	-7.2%
Electrical Engineers	32	4.5%	15.9%	25.5%	30.6%
Industrial, Mechanical and Production Engineers	26	3.3%	19.2%	25.2%	23.8%
Other/Unclassified Engineering Professionals	81	2.7%	10.1%	18.6%	23.4%
Natural and Physical Science Professionals	26	2.7%	18.6%	21.1%	15.0%
Other/Unclassified Design, Engineering, Science and Transport Professionals	158	3.3%	10.9%	20.3%	26.1%
<i>Occupational and Environmental Health Professionals</i>	29	2.3%	22.8%	23.4%	12.9%
<i>ICT Professionals</i>	158	1.5%	16.4%	15.7%	4.5%
Technicians and Trades Workers	1,146	2.6%	29.7%	27.4%	7.0%
<i>Engineering, ICT and Science Technicians</i>	236	2.5%	38.7%	33.3%	-3.9%
Architectural, Building and Surveying Technicians	102	2.6%	49.0%	41.5%	-22.7%
Other/Unclassified Engineering, ICT and Science Technicians	133	2.5%	27.8%	25.6%	6.3%
<i>Automotive and Engineering Trades Workers</i>	385	2.6%	22.4%	23.5%	13.6%
<i>Construction Trades Workers</i>	95	4.9%	49.9%	43.6%	-10.4%
<i>Electrotechnology and Telecommunications Trades Workers</i>	206	2.1%	30.1%	26.6%	2.9%
Electricians	108	2.7%	17.2%	22.3%	21.0%
Electronics and Telecommunications Trades Workers	97	1.4%	40.0%	30.5%	-24.8%
<i>Horticultural Trades Workers</i>	55	4.2%	38.0%	36.3%	13.3%
<i>Other/Unclassified Technicians and Trades Workers</i>	170	1.9%	7.8%	12.9%	13.3%
Community and Personal Service Workers	384	2.5%	12.2%	17.6%	17.7%
<i>Security Officers and Guards</i>	55	5.5%	21.3%	35.2%	45.5%
<i>Personal Service and Travel Workers</i>	169	1.7%	3.6%	10.4%	13.9%
<i>Other /Unclassified Community and Personal Services Workers</i>	161	2.3%	17.2%	19.0%	12.0%
Clerical and Administrative Workers	1,214	2.9%	21.3%	23.6%	16.5%
<i>Office Managers and Program Administrators</i>	288	2.7%	33.4%	30.3%	5.4%
<i>Personal Assistants and Secretaries</i>	53	4.1%	20.1%	26.8%	27.3%
<i>General Clerical Workers</i>	189	3.4%	25.5%	26.9%	16.9%
<i>Inquiry Clerks and Receptionists</i>	98	2.6%	17.1%	20.3%	15.8%
<i>Numerical Clerks</i>	585	2.8%	12.8%	19.0%	20.0%
Logistics Clerks	166	2.1%	9.7%	15.2%	16.0%
Other/Unclassified Other Clerical and Administrative Workers	419	3.0%	14.1%	20.5%	21.7%
Sales Workers	387	2.6%	10.3%	17.7%	20.8%
<i>Ticket Salespersons</i>	138	2.8%	7.9%	18.5%	26.0%
<i>Other/Unclassified Sales Workers</i>	249	2.5%	11.5%	17.2%	17.8%
Machinery Operators and Drivers	2,658	3.2%	27.9%	32.4%	26.3%
<i>Machine and Stationary Plant Operators</i>	478	2.9%	22.7%	25.6%	18.8%
Train Controllers, and Railway Signal, Track Plant and Other Stationary Plant Op	337	3.2%	12.4%	21.9%	27.5%
Other/Unclassified Machine and Stationary Plant Operators	141	2.4%	39.1%	32.5%	-8.9%
<i>Mobile Plant Operators</i>	371	3.3%	48.3%	40.2%	-23.7%
<i>Road and Rail Drivers</i>	1,728	3.3%	23.5%	33.0%	34.8%
Train and Tram Drivers	934	2.3%	16.2%	32.1%	40.1%
Delivery Drivers	33	3.9%	17.5%	25.5%	27.8%
Truck Drivers	518	3.0%	33.7%	31.7%	9.6%
Other/Unclassified Road and Rail Drivers	242	8.0%	25.4%	41.7%	53.7%
<i>Storepersons</i>	82	1.8%	8.4%	12.8%	12.2%
Labourers	1,351	3.1%	32.3%	30.2%	8.7%
<i>Construction and Mining Labourers</i>	862	2.8%	26.1%	26.7%	14.5%
Railway Track Workers	244	1.7%	5.1%	14.6%	21.4%
Other/Unclassified Construction and Mining Labourers	618	3.3%	32.3%	30.8%	11.2%
<i>Railways Assistants and Other Miscellaneous Labourers</i>	489	3.5%	41.2%	35.6%	-3.7%
Total	10,238	2.9%	24.8%	26.6%	16.0%

⁵ The workforce gap post FY18 is based on the difference between labour demand and supply, accounting for attrition through retirements and death. New supply is **not** considered here, thus this is the potential maximum workforce gap.

5. INDUSTRY PERSPECTIVES AND CHALLENGES

5.1 KEY ISSUES IMPACTING ON WORKFORCE CAPABILITY

This Section focuses on the challenges to workforce capability that were raised during the rail industry soundings, noting where similar issues have been raised in other forums or reports and where there may be evidence to support the claims put forward.

The industry deep dive consultation process described in Section 2.2 identified a range of issues that were impacting workforce capability now, and into the future. While these issues are all very different, a common thread to the conversations came back to the ultimate consequences of failure to maintain skills in the rail sector – in particular, the strong focus on safety required in the industry given its inherent risks and dangers compared to other sectors.

“I think the skill shortage is one thing and it’s critical, but the unintended consequences of that skill shortage essentially, if we don’t get it right, we potentially will be staring down the barrel of fatalities in our industry.”

The requirement to retain a *safe* workforce, as well as *skilled* one, added an extra dimension to the discussions. The consequences of failure to meet skilled labour shortages is more than just an economic issue but has profound social implications.

Working through the agenda with each group, and collecting and organising the discussions and responses, the following themes emerged which form the structure for this Section:

- How did we get here?
- Current areas where skills shortages exist
- Future skills required in the rail industry
- Education and training challenges

5.1.1 How did we get here?

At the deep dive interviews, we initially asked about the reasons why the rail industry needed this workforce capability study in the first place – that is, why are there skills shortages or risks to shortages in the industry and how did they come about. Several interlinking reasons were proffered, including:

- Volatility and uncertainty in demand
- Lack of investment in skills
- Differences in standards constraining the transferability of skills

Volatility and uncertainty in demand

Primarily, many deep dive participants mentioned that the rail industry, for many decades, in Australia and New Zealand, had been unsustainable in terms of providing a steady environment that would encourage investment in skills. Rail investment has been sporadic, with skills moving where they could from project to project, or else exiting the industry in times of low demand, never to return. Now, with a sudden, very large infrastructure investment pipeline, the industry

has been essentially caught short of the appropriate skills. While the public and media focus may be on the ‘wave’ of rail construction currently underway, there is actually greater concerns on whether or not the industry will have the appropriate manufacturing, operations and maintenance skills to service the wave, both during the construction phase, but more importantly when the new assets are commissioned and operational:

The following statements from the industry soundings were generally indicative of this issue:

“Manufacturing [needs] a certainty of pipeline.... We're always employing people and getting rid of them, employing them and getting rid of them. It's very difficult to maintain a decent size head count...”

“I think as a broad industry we will always going to hurt. But with the unprecedented infrastructure investment our state [Victoria] and New South Wales has exacerbated the issue.”

“In Australia, we're such a small market, and the whole boom bust cycle, you can't get any economies of scale, and that's why everyone goes offshore.”

These concerns match evidence of cycles in rail construction for both Australia and New Zealand. Essentially, the unsteady demand profile has been a consequence of synchronised and unsynchronised investment decisions by both the private sector and the public sector over many decades. In Australia, rail construction activity has been through several boom bust phases in the decade alone, as described in Section 3 of this report, driven by:

- **A once in a generation resources boom (and bust)** which saw privately funded rail construction rise from \$157 million in work done in FY01 to over \$4 billion per annum by FY12 and FY13, before falling back to \$519 million by FY17.⁶ Much of this boom bust cycle took place in regional and remote areas, such as the Pilbara in Western Australia and the Bowen Basin in Queensland, adding to workforce capability challenges.
- **A boom and bust in publicly funded rail investment** in Australia between FY08 and FY15 that was initially supported by strong public sector revenues courtesy of the first stage of the resources boom, but was also driven by stimulus measures in the Federal Budget to counter the contractionary risks associated with the Global Financial Crisis (GFC) during FY09. This wave of projects, covering freight and passenger works saw publicly funded rail construction rise from \$1.8 billion in FY08 to \$4.5 billion by FY11, before retreating to \$2.4 billion by FY15 as projects were completed.⁷

⁶ BIS Oxford Economics (2018b) *Engineering Construction in Australia*, Sydney, Australia. Note that all construction work done figures used in this report are presented in constant FY16 prices, and so changes over time represent changes in the quantity of activity, not changes in the price of work.

⁷ Ibid.

- **In New Zealand, changes in the ownership of rail networks** over the 1990s and 2000s (privatisation in 1993 and re-nationalisation in 2003), combined with the rise and fall in demand for rail services during the period, also likely contributed to sharp cycles in rail investment and maintenance. Upon re-entering public ownership, significant re-investment in rail maintenance and track was required.⁸

However, the broader impact of these cycles has also been amplified by the **different procurement arrangements** adopted by different jurisdictions – and even for different projects within the one jurisdiction – across Australia and New Zealand. Here, the manufacturing industry and other suppliers to the rail industry (for example, equipment, systems and rollingstock) has been particularly affected as large shifts in activity, combined with changes in procurement policy create even larger swings in local demands for skills. Within even the east coast of Australia, public sector procurement varies substantially between Victoria, which has demanded minimum local content rules with its procurement of new rail assets, and neighbouring states. In New South Wales, for instance, procurement of rolling stock for the new Sydney Metro was mostly offshored, while much of Victoria’s requirements involve more significant works at Australian based facilities operated in the state by Bombardier, Downer and Alstom.

Table 5.1: Australian East Coast Passenger Rail Rollingstock Contracts⁹

State	Date	Project	Source	Quantity	Consortium (Manufacturer)
NSW	2016	Sydney Growth Trains (Waratah 2)	China	192 cars	Downer Edi (Changchun Railway Vehicles)
NSW	2016	New Intercity Fleet	South Korea	520 cars	RailConnect (Hyundai Rotem)
NSW	2014	Sydney Metro Stage 1	China	132 cars	Northwest Rapid Transit (Alstom)
NSW	2006	Waratah	China / Australia	626 cars	Reliance Rail (Changchun Railway Vehicles / Downer)
VIC	2019*	Next Generation Regional Train	TBD	TBD	TBD
VIC	2016	X'Trapolis	Australia	54 cars	Alstom
VIC	2016	High Capacity Metro	China / Australia	65 trains	Evolution Rail (CRRC / Downer)
VIC	2015	Vlocity Regional trains	Australia	119 cars	Bombardier
VIC	2015	E-Class Trams	Germany / Australia	70 cars	Bombardier
QLD	2016	FLEXITY 2	Germany	18 cars	GoldLinq (Bombardier)
QLD	2014	New Generation	India	450 cars	Qtectic (Bombardier)

* Likely timing

Source: Various, BIS Oxford Economics

This persistent boom-bust in investment and differences in procurement rules has led local manufacturers to disinvest in local skills and meet rapid changes in demand by sourcing equipment and rollingstock overseas, in turn turning local manufactures into “nothing more than middle men and service and warranty agents” according to evidence presented in a recent Senate inquiry.¹⁰ This has resulted in significant shifts in rail manufacturing activity over time and

⁸ Abbott, M. and B. Cohen (2016) The privatization and de-privatization of rail assets in Australia and New Zealand,” Utilities Policy, Volume 41, pp50-51

⁹ BIS Oxford Economics (2018a) NSW Construction Delivery Assessment: capability and Capacity, for Infrastructure NSW, p84.

Viewed 5th October 2018 https://insw-sis.visualise.today/documents/about/NSW_Construction_Delivery_Assessment_Capability_and_Capacity.pdf

¹⁰ Rural and Regional Affairs and Transport References Committee (2017), Australia’s rail industry, The Senate, Commonwealth of Australia, October 2017, pp68-69.

has also concentrated the location of rail industry work in this sector to where procurement favours local content.

Evidence presented by Centre for Future Works at the same Senate inquiry indicated that overall, rail equipment manufacturing employment has fallen by 40 per cent over the past decade, which will create significant challenges in meeting new demands.¹¹ IBISWorld research indicates that while rail manufacturing had contracted in recent years from boom peaks, it is forecast to rise again in coming years based on another large cycle in major project work and procurement policies targeting local content.¹²

Volatility in demand has also been caused by significant differences in the policy positions of respective political parties in Australia and New Zealand regarding procurement and local content, but also the need to invest at all. As mentioned in one of the deep dive soundings, but reflected in most others:

“You need at least a level of consistency from a policy perspective. Even if it's inside the respective state. You can't have a situation where you have a red government favouring local industry and a blue government with a very different philosophy. You are expected to be able to buy the capability every time the red state turns up. Right? Well, it doesn't exist.”

This reasserts the notion that the core ‘transmission mechanism’ of volatility in demand to workforce capability risk is, essentially, uncertainty of the future. Businesses in the rail industry will simply not invest in skills unless there is greater certainty in the forward pipeline in local work or that their investment will be rewarded.

Finally, sharp increases in work – without a corresponding increase in skills supply – is creating strong pressures on the existing workforce which will need to be managed carefully lest they also leave and exacerbate the skills issue.

“And there also comes the issue of retention, as well. You can throw money at people but that only works for so long when there is so much work. They're walking away from rail. Because they can't keep working at this level.”

Lack of investment in skills

Industry groups canvassed during the deep dive interviews pointed to a range of issues that have prevented adequate investment in skills in the rail industry over time. While the volatility of demand and an uncertain pipeline (mentioned above) played a role, there have also been other contributing factors.

A key concern was a confusion over responsibility for training, and a lack of incentives to ensure adequate training took place:

“So who's training? Where's the incentive to train? Federal government, state government? Is it operators, is it consultants, contractors, others? There's a lot of confusion about who's really in the best position to invest, to manage. But it does result in people saying there are skill shortages.”

“We'd had this conversation 10 years ago. And we tried. I went to government, and government said, ‘It's industry's problem.’”

¹¹ Ibid, p46.

¹² IBISWorld Railway Equipment Manufacturing and Repair in Australia: Market Research Report, October 2016.

The implementation of new competition frameworks in the 1980s and 1990s – where public agencies were encouraged to become leaner – was seen as a source of this confusion. Union representations to a recent Senate inquiry into the rail industry in Australia also highlighted the significant drop in apprenticeships offered by public sector rail agencies since the 1980s, while the closure of related industries as a consequence of economic reforms – such as auto manufacturing, white goods manufacturing and civilian shipbuilding – has also had a deleterious impact on the number of apprenticeship and trainee pathways that could ultimately help service the rail industry in Australia and New Zealand.¹³ With public and private organisations cutting back on their own provision of apprenticeships and cadetships, there was no adequate replacement strategy for this pathway into the industry:

“Back when I joined in 1980, State Rail was pretty good at training people, and it had large numbers of apprentices coming through. The present mix, I suspect, is in large part an unintended consequence of competitive reforms.”

Given the time it takes to develop a mastery of skills, let alone a base level of competency, the lack of investment in skills will take time to turn around, and will likely use different education pathways than in the past. With the current infrastructure pipeline also likely to lead to a substantial need for higher numbers of manufacturing, operations and maintenance staff, the time it takes to bring staff through to a recognised standard of competency will be critical.

“It’s one of those things, mastery is really, really important, and unfortunately it takes a little time to get. It’s not something that you can snap your fingers. And really, what we’re seeing now is a result of the people that probably sat around these tables before us and the lack of investment.”

Furthermore, it will also take a considerable re-focusing on career pathways and skills development within the rail industry which many deep dive participants felt was absent today compared to the 1970s and 1980s

“If you were employed as a ganger back then, you came in as entry level. And it was almost an honour to get the tap on the shoulder to go to ganger school to be a ganger or a supervisor. That level of investment in an individual’s pathway of mastery hasn’t existed for three or four decades.”

For many prospective employees, the pathways into the rail industry have become opaquer compared to the past. Furthermore, in many cases, deep dive participants said the rail industry found it difficult to attract staff into certain occupations because of the rail industry’s lack of profile (compared to, for example, Defence or mining industries), and a lack of recognition amongst students (or skilled workers in other industries) of the broader range of opportunities in rail, especially with the integration of new technologies..

“We don’t really have profile. If I look at the skills shortage list nationally or state, train driver’s not on there. Yes there’s aligned trades like electrical, mechanical, civil, but there’s nothing really with that rail focus.”

¹³ Rural and Regional Affairs and Transport References Committee (2017), pp32-33.

Indeed, the lack of an effective, modern and unified rail 'brand' was considered a critical failure which had affected the industry's ability to recruit, particularly amongst younger people and women:

"You want them to buy into the rail industry. Then we need to market it. We need to sell it. They're not going to buy anything unless we sell it right. At the moment, we're not selling anything, it just looks like it's all male dominated, everyone walking around in dirty clothes."

"Because I think a lot people, when they think about rail, they probably think about your very old styled Thomas the Tank on a large scale, round house steam engines."

This image of the industry presents challenges in recruiting for professional skills, but it presents even sterner challenges for the trades and maintenance positions which are vital for the successful and safe operation of rail networks. As indicated in several of the deep dive interviews with the rail industry, recruiting for maintenance positions was seen as one of the biggest challenges:

"I think maintenance does suffer an image problem, and we've articulated a lot therein. Because it's not a lower order part of the industry. In fact, it's the most important part...And the reality is we can't afford to have 4,000 engineers maintaining the network, we just can't afford it."

Differences in standards affecting the transferability of skills

According to the rail industry soundings, the historical, piecemeal, development of rail networks in Australia, particularly, continues to provide challenges for the adequate skilling of the rail industry workforce.

In Australia, the initial period of railways expansion occurred in the late 1800s, prior to the establishment of a national government that could have insisted on the development of the industry with national standards. With the separate colonies effectively competing against each other to develop trade and exports from agriculture and mining, they were not incentivised to develop partnerships with neighbouring jurisdictions or develop lines that even connected jurisdictions effectively.¹⁴

Even with the establishment of an Australian national government in 1901, rail was left out of its charter of responsibility as this was seen as an unwanted intrusion into state government affairs. The consequence of this constitutional separation, despite more recent efforts at developing national networks, regulatory structures and operations,¹⁵ was that many of the standards, systems and regulations used in rail remained set at the jurisdictional level.

For New Zealand, the historical development of the rail network was somewhat different. While, as in Australia, initial lines were developed provincially by the private sector for trade and export of commodities and materials (and used

¹⁴ Ibid, pp2-3

¹⁵ Including the eventual development of a single gauge rail network connecting capital cities across Australia by the mid-2000s (over 100 years after Federation), the establishment of the Australian Rail Track Corporation to manage and maintain a national freight network of over 8,500km of track, and the development of nationally-focused rail bodies including the Australasian Railway Association (ARA) and the Rail Industry Safety and Standards Board (RISSB).

differing gauges) the government took responsibility for a dramatic expansion in the rail network in the late 1800s and decided to use a single narrow gauge as the standard for all projects (given the mountainous terrain) to accelerate construction and minimise costs.¹⁶ While New Zealand's choice of gauge matched that in use in Queensland, Tasmania, Western Australia and parts of South Australia, it did not match that used in New South Wales or Victoria. Together with different systems and procurement policies, there exists differences in the rail standards adopted between Australia and New Zealand.

As discussed heavily in industry soundings, differences in standards and systems historically developed by the different jurisdictions in Australia and New Zealand have had the following impact on skills development and hence workforce capability:

- The different systems and skillsets required means that rail workers need to either learn more than is strictly necessary to operate in their jurisdiction to meet national competency guidelines, or not learn enough to be able to move readily between jurisdictions to meet localised skills shortages. Consequently, when making moves in careers or locations, rail workers are more likely to opt for similar positions in other industries rather than staying within the rail industry than if a single national standard was used.
- Secondly, by effectively breaking up the Australasian market into much smaller jurisdictional markets, differences in standards and systems do not provide economies of scale in manufacturing, operations and maintenance, reducing benefits from economies of scale.¹⁷ It also impacts on economies of scale in the training of skills, affecting the commercial viability of training itself.
- Training, skills development and assessment can be very different by jurisdiction, presenting challenges to the effective utilisation of the Australasian pool of trainers through both public and private sector registered training organisations (RTOs), as well as developing national frameworks for the delivery of training around new technologies.

For the rail industry, this deficiency in uniform standards and systems ultimately presents a market failure in terms of the high barriers to transferring skills – either geographically within Australia or between Australia and New Zealand, or when trying to bring skills in from other industries (or overseas). In many discussions, the different jurisdictions were compared to as different countries, not different states, given their unique systems, regulations and definitions. This common refrain is reflected in the following statements made during the deep dive interviews:

“As an industry we don't encourage transferability across state borders. There are different systems, different standards that you need to learn.”

¹⁶ <http://www.kiwirail.co.nz/about-us/history-of-kiwirail/1850-1900.html>

¹⁷ The Taig Review: TTAC Limited, Review of the Rail Industry Safety and Standards Board and its MOU with the Governments, June 2012, p. 14.

“There is a genuine shortage of the engineering skills in areas we want it. But we’ve made it worse by putting barriers to entry.”

“We need to work towards interjurisdictional hybridisation in the rail tech, harmonisation and transparency with other sectors... There are so many common skills, but we create many barriers to entry.”

While different systems, regulations and skills requirements makes it more difficult to move skills locally, it also presents significant barriers in to transferring skills from overseas. For Australia, particularly, this can present challenges to the delivery and implementation of new rail technologies and systems associated with new investment. Given greater economies of scale overseas, much of the research and development, industry knowledge and ‘know how’ in rail is generated offshore and needs to be ‘imported’ into Australia alongside the new technologies being used. This is to both deliver on specific projects, but also to assist in training up the local workforce in new technologies and systems. Again, the challenge is recognising skills and qualifications which do not come from within specific jurisdictions, even if they have worked on delivering the same systems overseas.

“These signalling engineers have been commissioning railway assets over in southeast Asia on really high-complex rail projects [but] because of the local domain rules, and the local operators, they won’t recognise their training, their credentials from overseas. So [they are] doing really low-level tasks. But their full skill set isn’t being utilised because their competency is not being acknowledged.”

“Their definition of engineer doesn’t necessarily match with the work that people do in the industry. The barriers to entry that have been created by the rail operators are pushing people out of the industry that would otherwise have a great deal to contribute, from a capability perspective. They are more than capable of doing the job, but they cannot get authority to work.”

The transfer of skills from overseas is also constrained by ongoing changes to immigration processes and visa conditions. In Australia, the Temporary Work (Skilled) visa (subclass 457) – the most common visa for Australian or overseas employers to sponsor skilled overseas workers to work temporarily in Australia, and which was heavily used to meet surging demand for skills during the resources boom – been abolished and replaced by a more restricted Temporary Skill Shortage (TSS) visa. The tighter conditions involve stricter English language requirements, more work experience and qualification for a narrower range of skills than previously considered. There are also lengthened timeframes for eligibility for permanent residency.¹⁸ In New Zealand, changes to visa conditions for lower-skilled workers in 2017 require applicants to either leave the country for a year after three years or apply for a higher skilled role, and this is anticipated to have impacts on some rail-related industries, including construction, in coming years.

For the Australasian rail industry, these changes to immigration rules, and uncertainty over what other changes will be made, introduce further challenges in recruiting ‘ready to go’ skills:

¹⁸ <https://www.homeaffairs.gov.au/trav/work/457-abolition-replacement>

“You can attract people from countries like India. It's easy. They want to come to Australia. The life here is much better. But you have challenges with immigration barriers that are now being put in place. More and more they are making it difficult to bring people in from overseas.”

“There's no short pathway to permanent residency anymore, or it's much tougher. It's at four years now rather than two years, and it's not guaranteed.”

Demand growth elsewhere

Closely linked with the ability to transfer skills from offshore is the increasing belief, expressed in the rail industry soundings that it is becoming harder to attract skills from overseas in any case, given rising demand for rail skills globally. Indeed, with other countries such as the United Kingdom putting forward their own rail skills development plans to meet perceived shortages,¹⁹ many participants in the deep dive discussions thought the risks were balanced towards *losing* local staff to service overseas demand, rather than the other way around, particularly given the high cost of living in Australia:

“Massive new construction programs in the same sector in Europe, and most particularly in the UK, so in markets that would have been traditional sources of capability for us, and I think you'll see a reverse trend. I think you'll see opportunities for intelligent, energetic, young Australian engineers and the like who are going to basically see the opportunity to make a headway to Europe.”

“They're now finding a very interesting market in the Asia Pacific and Far East, but not in Australia, where they're making pretty much the same income they would make in Australia, but with a much cheaper cost of living. They actually live like kings, and there's plenty of opportunities out there right now... Sydney and Melbourne [are] recognized as one of the most expensive places in the world. I guess Brisbane's not too far behind.”

But this is also a risk more locally, given rising demand in other industries – such as mining, shipbuilding, defence, or technology – within Australia and New Zealand:

“Look what's happening in mining again. We're trying to get qualified machinists and ... everyone's flat out in supporting the mines and what they need... and shipbuilding is coming up.”

“Because as we've become more technological it also means that skills become so much more transferable. Google comes along and says, ‘Hey, I have a very nice job for you which is very creative,’ and she's, ‘Oh, fantastic. It sounds like the dream job.’ They go. Now you've lost a rail professional.”

Deep dive participants also claimed that the rail industry was falling behind other industries in terms of adapting training approaches to leverage efficiencies and techniques from new technologies. Part of the reason for this was put down to challenges in developing a national approach to training in Australia.

¹⁹ Such as the Rail Sector Skills Delivery Plan developed by the National Skills Academy Rail viewed 8th October
https://www.nsar.co.uk/wp-content/uploads/2017/02/Rail-Sector-Skills-Delivery-Plan_2017_V8.pdf

“There hasn’t been a lot of investment in some of the new methods of skill development as well in the industry in the last 10 years. There have been massive steps forward in other industries in Australia but not in rail ... because there are not national recognised training courses.”

Overall, the different rail systems adopted by each Australian jurisdiction (and differences again to New Zealand rail systems) has engendered a piecemeal approach to training, certification and regulation in the rail industry. For skills development and retention, the overall impact of the lack of standardisation and harmonisation is that it has created large barriers. While the Taig Review of the Rail Industry Safety and Standards Board in 2012 acknowledged that lack of full harmonisation in standards has added a significant cost to the provision of rail goods and services in Australia,²⁰ it has also been noted that full harmonisation in rail is unlikely to occur given the sheer cost of moving all systems to the one standard.²¹

However, with decreasing asset life durations, as a result of the progressive replacement of mechanical with electronic components, the ability to harmonise increases. Industry discussions conducted as part of this Report indicate that there are still significant gains to be made by moving towards greater harmonisation, particularly with regard to building adequate workforce capability in the rail industry.

5.1.2 Areas of skills shortage now

A key question asked during the rail industry soundings – as well as in surveys – was whether the broader rail industry already experiences difficulty in retaining or attracting skills or if shortages of skills or capabilities were already perceived to exist.

As noted by Richardson²² there is no simple single reliable measure for the existence of a skills shortage, and the usual practice is to rely on a range of indicators. Not only that, the term ‘skills shortage’ itself is difficult to define given that demand and supply of skills can be hard to measure. A good working definition suggested by Richardson is as follows (as a Level 1 shortage):

“There are few people who have the essential technical skills who are not already using them and there is a long training time to develop the skills.”

Government agencies in both Australia and New Zealand undertake research to determine occupations where skills shortages exist, although in some cases the shortage may only be at a regional level. These occupations are consistent with the standard ANZSCO classifications used in Australia and New Zealand (and also utilised in this research). However, on these lists there is little focus on rail-specific occupations; as noted by many rail industry participants, rail-

²⁰ The Taig Review: TTAC Limited, Review of the Rail Industry Safety and Standards Board and its MOU with the Governments, June 2012, p. 14.

²¹ RISSB (2017), Submission to Senate Rural and Regional Affairs and Transport References Committee into The State of Australia’s Rail Industry, p2.

²² Richardson (2007: p9). Level 2 shortages are defined as those where a short training time is required to develop the skills.

specific industry skillsets tend to be ‘invisible’ to government workforce agencies (as well as prospective employees):

“You won’t find [drivers] on the skills list because its not really recognised there. Rail is invisible in some respects.”

“It’s an invisible industry. That a lot of people don’t really aspire to do this when they’re at school and that’s when you do get the best work forces, is when you get them as a pathway from that.”

For Australia,²³ the key ‘rail related’ or potentially related occupations which are already deemed to be in shortage at the national level include:

- Electrical engineer
- Mechanical engineer
- Motor mechanics
- Metal trades workers
- Fabricators
- Welders
- Telecommunications trades workers

For New Zealand, the Immediate Skills Shortage List²⁴ contained the following ‘rail related’ or potentially related occupations:

- Civil engineering draftsperson
- Electrical engineering draftsperson
- Mechanical engineering draftsperson
- Mechanical engineering technician
- Cablers and telecommunications technicians
- Electronic equipment trades worker
- Metal fabricator
- Motor mechanic
- Sheetmetal tradesworker

Meanwhile, the Australian Industry Standards Skills Forecast 2018 report notes, via an online survey of all rail stakeholders between December 2017 and January 2018, revealed the following, more rail-specific areas to be in skills shortage:²⁵

- Train drivers
- Signalling technicians
- Educators, trainers and assessors
- Train controllers
- Track workers

Perhaps unsurprisingly, the rail industry soundings for this study came to very similar results to the AIS study in terms of identifying current skills shortages – given they were both based on a similar pool of rail organisation respondents – although for some respondents, the question should probably have been phrased as where skills shortages are *not* apparent:

²³ <https://www.jobs.gov.au/national-state-and-territory-skill-shortage-information>

²⁴ <http://skillshortages.immigration.govt.nz/immediate-skill-shortage-list.pdf>

²⁵ Australian industry Standards (2018) Skills Forecast 2018: Rail, p23.

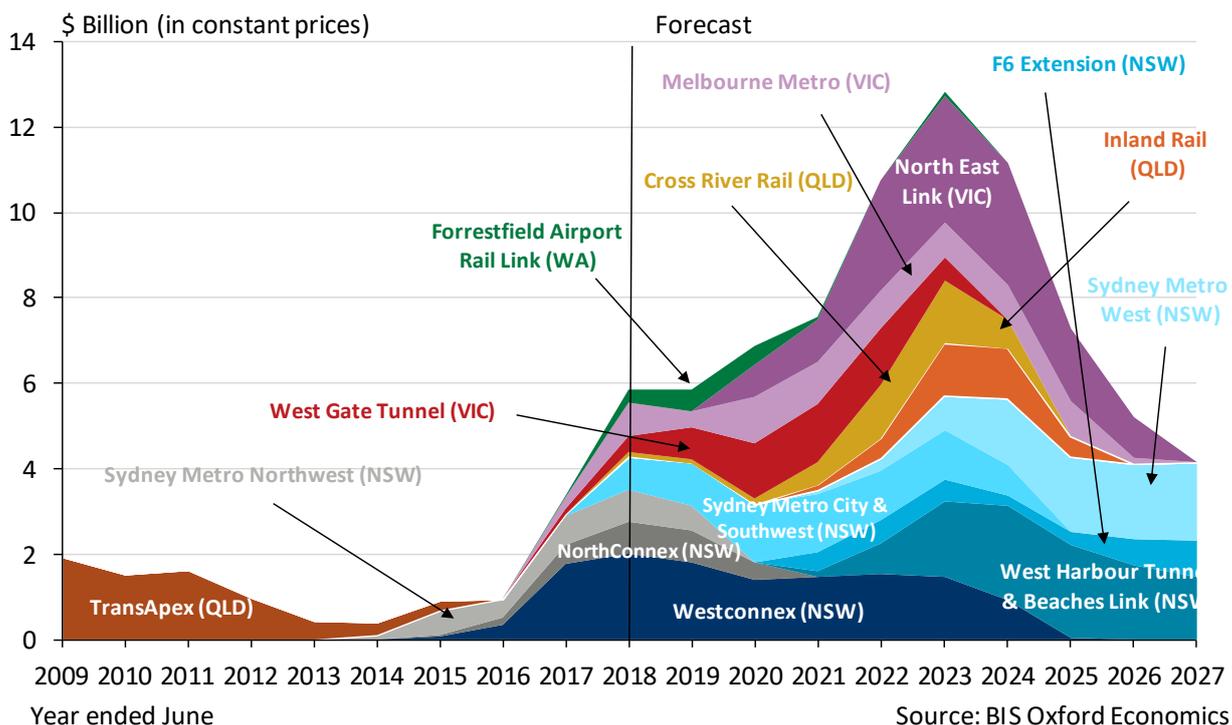
“The short answer to your question, when you ask where are the skill shortages? They're everywhere.”

However, at a more practical level, the rail industry soundings noted several distinct areas and occupations as being in more or less immediate shortage:

- Railway signalling engineers and maintenance workers
- Overhead wiring / electrical
- Tunnelling
- Train drivers
- Trainers and assessors
- Safety and track force protection
- Community engagement

While the ‘tsunami’ of rail infrastructure investment shown below may suggest that the current skills concerns are on the construction side of the rail industry – and there certainly are concerns, particularly regarding signalling, tunnelling and trackwork – what may be more surprising to the broader public, governments and procurers, is that the greatest current workforce shortages was considered to be in operations and maintenance positions, as well as trainers of skills themselves.

Figure 5.1: Major Known Tunnelling Projects: Australia 2009 to 2027



Chief amongst these were occupations related to signalling, as well as the operation and maintenance of the electrical network.

“Railway signalling is a particular focus for us, there are definite challenges that might fall in major projects in terms of having enough signalling engineers in terms of the whole breadth of the design right through to the testing and commissioning of signalling systems out on the rail environments.”

“Over the next 10 years, we will be looking for 110 signal maintenance technicians to be able to run the networks”

Having enough drivers also rated very strongly amongst deep dive participants, with technologies such as driverless trains – while now a reality in the Pilbara²⁶ and by May 2019 in a metropolitan passenger setting for the Sydney Metro – not likely to diminish growth in demand significantly over the coming decade.

“They can't get enough train drivers. So they've instituted their own training program. They're nationally accredited. They're looking at needing 50-100 drivers over the next 3-5 years. And they're looking at a diverse workforce as well.”

“The industry big issue is around drivers as well. So getting enough drivers for this growth is quite difficult. I mean, at the moment we're really thinking about poaching out of Metro and into the line. But that doesn't do any of us any good because the whole industry gets depleted. We might need an extra 60 drivers in the next 12 months.”

However, the greater challenge here may not be attracting people into the train driving roles, but rather having enough trainers and training environments to grow the pool of drivers to cater for strong growth in demand:

“We've just done an intake in Queensland for 24 drivers. And there's no problem in attracting people...it's a well-paid job. The challenge is the training component.”

Indeed, the greatest current skills challenge of all, according to many participants, was having an adequate number of trainers to meet demand – across a range of occupations and roles. In part this is due to wage disparities in training versus non-training roles, the perceived lack of a career path as a trainer, and perhaps an unwillingness to become part of a HR team. But it was also recognised that it is rare to find highly competent staff who also have the strong communication and mentoring skills to become good trainers.

“Do we have enough people that can actually deliver the appropriate levels of training? No.”

“Physically there are constraints to how many people we can train and develop because we just have a lack of trainers. It's not attractive financially typically to become a trainer. It's often a lifestyle choice. So, we'll get younger ones who are having children because they want weekends.”

“I would also say, in my experience, the personal characteristics and attributes that makes a great say track worker, is almost the opposite of what makes a great trainer, so there's not too many of them. You know, they might be really, really good at doing the work, but conveying that to a group of people in a way that they can understand...It's such a rare mix to have.”

“If you want to try to deliver safer working... it's not just finding someone that's qualified as a trainer. It takes six months of up scaling them and making sure

²⁶ Hastie, H. (2018) “One HAL of a ride: Rio's Pilbara robot makes first iron ore delivery”, Sydney Morning Herald, 13th July 2018, viewed online 20th September <https://www.smh.com.au/business/companies/one-hal-of-a-ride-rio-s-pilbara-robot-makes-first-iron-ore-delivery-20180713-p4zrb1.html>

they can move from a competence perspective [to] a training perspective... It's difficult to attract an infrastructure worker back into a training business because then you've got wage disparities."

On the building and asset side, the rail industry soundings revealed that a key concern right now is having adequate track force protection staff...

From a safety perspective we – and all in industry that build things at the moment – are really struggling with competent track force protection people. At the moment we're getting people that have done two weeks training at a college and have very, very little industry experience."

"Track force protection is in critical shortage, particularly New South Wales. Right now."

... whereas in manufacturing, skills shortages were considered right across the board as the sector tries to gear up to meet a new boom in rail infrastructure investment.

"We're a manufacturer and this is infrastructure war. There's a high requirement on local manufacturing. There's a lot of skills that we can't get in the manufacturing space."

"Just general skills, mechanical, technical skills, I think, particularly in the rolling stock space. Getting people to understand that is hard, and then having those people who can also apply themselves to looking at IT hardware, effectively, and some of the coding pieces as well that now come along with the locomotives. Having those combined skillsets, again, very much rarer still."

Meanwhile, occupations which weren't considered to be in skills shortage were generally lower or semi-skilled, such as conductors.

"Semi-skilled or low skilled station staff, conductors, we're fine with being able to generate those sort of people... The training requirements for those skills is quite low."

5.1.3 Future skills required in the rail industry

The rail industry deep dive discussions also canvassed which skills would likely see stronger demand over the next decade. While each deep dive discussion involved people from different parts of the rail industry, several common themes emerged, with the following 'hard' skill sets identified specifically by the rail industry as likely to experience shortages in future:

- Systems engineering
- Cloud-based signalling
- Cyber security
- Remote condition monitoring
- Simulator and virtual reality (VR) trainers
- Different customer service skills (for autonomous services)
- Risk and assurance professionals
- Big data analytics

On top of these, there was also considered a class of more generic, ‘softer’ skills which the rail industry believes will also be required over the coming decade as rail transforms into a more modern, technological-driven industry with stronger links and integration with “whole of transport” networks, education providers, manufacturing and various layers of government. Here, the industry soundings mentioned:

- Problem solving skills
- Communication skills
- Partnering skills

New technologies will drive demand for new rail industry skills

As the lists of ‘future skills’ above indicate, a key driving force for future *new* skills in the rail industry is technological innovation, which can deliver more optimised asset management and operations, offer greater energy efficiency, and can deliver stronger safety outcomes. New technologies, including automation, digitisation and ‘big data’, remote operations and augmented or virtual reality systems have the capacity to change, significantly, the type of skills required by the rail industry. New technologies are likely to constrain demand for ‘hands on’, labour intensive operations and maintenance activities in rail, with new systems favouring less direct intervention through enhanced monitoring, diagnostics and communications which will lead to an uplift in preventative rather than reactive measures, and a focus on digital rather than physical rail infrastructure and learning techniques.

While this may be a challenging transition in terms of skills, it may also provide opportunities for increasing the diversity of the rail workforce. The new skill sets required are likely to involve higher level analytics which are more likely to favour professional skills pathways, with the trades themselves likely to require a certain level of upskilling:

“When we start talking about blue collar workforce, whether they are in construction, manufacturing or maintenance, it is inevitable that there’ll be a shift away from that type of labour to a smarter blue-collar labour force. I think it’s inevitable that you’ll end up with better utilisation of mathematicians and analysts and engineering than what we see today.”

As noted by several organisations in the recent rail industry soundings for this project:

“With those technology changes, you no longer should need to get off the train to throw a very heavy switch; we don’t want people picking up heavy stuff from an engineer’s standpoint anyway... They’re going to be using screens. Like we do with our phones every day. And that opens it up to so many more groups.”

“There will be a massive skill migration as skills replacement effectively program over time. So it will be taking personnel off the tracks. Infrastructure workers ... will be replaced by the people who are looking at videos of what goes on onboard.”

Dealing with an explosion in new data from remote sensors and communications systems will be a core challenge. The sheer volume of new data has the potential to overwhelm operators and asset owners, who would

require a new breed of 'big data' analysts to sift through the information and recognise what was valuable, or themselves train machines to identify patterns and useful information from the 'noise'. While industry recognises that "data is the new oil", it may be more of a case of "data being the new pollution" if it is not captured well, synthesised or interpreted meaningfully.

In some industry soundings, it was noted that data scientists or analysts could come from a range of backgrounds, and not necessarily have a history of working in rail, or even the transport sector. However, the dominant view was that data analytics would still require people with more 'traditional' training and skills in engineering and spatial sciences so that characteristics or patterns in the data that were most crucial to decision-making were recognised.

"If you look at big data, someone who's with a mathematics degree or economics or someone with a statistical background that is looking at that data set, and the data set is looking for patterns and how you can apply to your operations."

"We know for example we need data analysts, we need people who can run the tracking management systems, complex software and to see projects in transport. We are at the bottom of the world, so what we're buying is probably typically happened in other places. We need universities to ... go global and look at how are these skills are built in other countries where they have these systems. It's 5 to 10 years, but we should start that long term skills planning."

Indeed, as the new technologies filter through, they are likely to come from overseas – and in particular, from large multinational companies that have the economies of scale to invest in them. Australia and New Zealand are increasingly "technology takers" from overseas,²⁷ but will need the skills to use these technologies on the ground here. This will mean importing skills from overseas to help develop and operate rail networks here, as well as to train local workforces – however that will be achieved.

"The more complex the system becomes, the more they belong to a limited number of companies ... So we will have to bring somebody from Germany or from some other place."

"Engineering technical staff is effectively all off shored now. You're going to need more and more of those skillsets here on the ground though because as we know, things don't run perfectly all the time. Whether it's applied technologists, applied engineering, that sort of thing."

Blending the various technological systems and ensuring it all works, is expected to drive strong demand for systems engineers, particularly, according to feedback during the industry consultation process. Making electrical, communications and other networked systems work harmoniously together (often from different manufacturers and suppliers), with appropriate safeguards and redundancies for when failures occur, is already becoming a critical skill set

²⁷ For example, in utilising European rail models and the European Train Control System (ETCS), while the new Sydney Metro – Australia's first automated passenger rail network – is using automation technologies already used in systems operating in over 25 cities worldwide.

within the rail industry and is expected to grow in demand strongly through the coming decades.

“Systems engineers... go from someone that integrates different technologies to a designer, for example. How do we fit all these systems together? Technologies together?”

“Your next generation hardware and software is communications based. And there are multiple systems. You've got to have a system engineering area branch where you've got an overall system made up of multiple subsystems.”

“Then there are third party subsystems that feed in as well. So it could be at nearly 15 different systems you're dealing with overall. So you've got to have people in these kind of skill sets. Certain people, they can picture all that working together.”

The new communication systems will eventually see large changes to the way signalling networks operate, and the mix of skills required to operate and maintain them. While the changes will take place over many years, there will be a greater trend towards 'in-cab' digital communications technologies and away from physical signalling infrastructure. Over time, this will see relatively weaker growth in demand for electrical and signalling engineers and maintenance staff, and stronger growth in demand for digital technologists and systems engineers:

“We're all complaining about signalling people now but somewhere down the track, the signals actually disappear. So what does that dynamic actually start to look like in the longer term?”

“You won't have electrical isolation people. Look how the grid works today. It automatically isolates load sheds, it re-routes. This is why our lights stay on. If something fails in the network, the generator goes down, it routes another one through or it load sheds.”

But alongside the benefits of internet-connected communications systems comes additional risks, particularly in terms of security, which will see new technological roles open up, with an ability to take on board lessons learned overseas.

“Signalling used to be regarded as an isolated system completely closed, no links to the world. Now, it won't be. It's completely connected to the internet because that's the protocol for you to communicate. So there's a whole new threat arena ... So there's a lot of people around the world with that same problem much more advanced. They've already got networks that can be hacked.”

Softer skills will also be required in the rail industry in future

Another aspect of the rail industry soundings was a desire for non-technical skill sets and capabilities to meet future rail workforce capability. While having technical STEM skill sets was seen as most important, having a mix of 'soft' skills was also seen as desirable. Here, it was considered important that there were strong, positive attitudes in the workplace towards flexibility, being accepting of change, and a commitment to ongoing learning given the range of technologies expected to impact the industry in coming years. In turn, leaders

of rail organisations will need to be skilled in effective change management strategies to navigate through the uncertainties and risks.

Apart from ‘change’ attitudes, the other key non-STEM skill set mentioned in industry interviews as being vital for the future was that of communication. This skill can be considered in two ways – as a distinct discipline in its own right or as a ‘soft’ skill which aids the transfer of knowledge and information within rail organisations (and particularly from potentially non-communicative technical staff).

Driving demand for communications skills in the former case is the ongoing evolution of rail in becoming more client and stakeholder focused and becoming more enmeshed with broader transport solutions in Australia and New Zealand. Here there was considered to be a distinct need to raise the profile and brand of the rail industry – that is, to effectively communicate the benefits of rail to the broader economy, the benefits of working in the rail industry, and the need the rail industry has for skills going forward.

However, some rail organisations also mentioned communications skills as part of a multi-disciplinary skill set. In these cases, the communications skill itself was not necessarily taught, but could be included in some ways to engineering-focused degrees and courses to balance the technical rigour of the subject. Having innovative ideas on optimising maintenance strategies, or route planning, from examining trends in ‘big data’, for instance, would not be very useful unless these ideas could be communicated effectively within rail organisations.

Finally, communication skills were also seen as important not just in terms of being able to communicate new data insights to improve operations and maintenance strategies, but also to more effectively manage change and disruption in the rail industry over the coming decade, particularly regarding meeting industrial relations challenges:

“If we’re talking moving to ETCS, is it de-skilling drivers? If it is, what sort of battles are we going to have industrially? It’s still an important job, it’s not de-skilling. It’s changing skill sets. That whole change management piece is critical. And that comes back to your communication.”

Finally, having a collaborative or partnering mindset was seen as vital for the rail industry, now and in the future. As discussed below and in Section 6 of this report, partnering is seen as critical to solving rail’s myriad education and training issues, where no one part of the training system (operators, asset owners, contractors, VET and governments) will be able to deliver ‘whole of industry’ solutions unilaterally. Furthermore, meeting the challenges of volatile demand and jurisdictional differences in standards, systems and training approaches will require *increasing* coordination between rail organisations and governments in order to maximise benefits of new rail investment and make the most of the skills base available in the industry.

5.1.4 Education and training challenges

According to recent rail industry soundings, current education and training processes and outcomes presented perhaps the single key risk to existing and

future workforce capability. In particular, the following were seen as challenging rail workforce capability now and into the future:

- A shortage of trainers (including a pervasive attitude in industry and government as viewing training as a cost rather than an investment)
- The time taken to train people for key roles, and meeting interjurisdictional competency requirements
- Lack of scale in training courses which made them uncommercial
- Risks to the quality of training, particularly in periods of high demand

However, more positively, there was also a sense of optimism that the large pipeline in rail investment now planned or underway in Australia and New Zealand represented a rare opportunity to address long standing education and training issues.

“We have an opportunity now to set industry up. Not only do we have to make sure the market is open for the traditional systems of today, but that we also start to train for the next generation now.”

What follows here is a brief recount of some of the rail organisation responses regarding education and training in the recent soundings that were generally reflective of an ‘industry view’ but also noting where there may have been some differences in opinion.

Shortage of trainers and assessors

As noted above, the rail industry has already identified a shortage of trainers and assessors in industry surveys, including for this report as well as the AIS Skills Outlook. In many rail organisations, training may only be a part of a role, but in some larger rail organisations, especially those that are accredited as Registered Training Organisations (RTOs), training and assessing may be a fulltime role. Recent industry soundings suggested that growing the pool of trainers and assessors is challenging given the typical treatment of training as a ‘cost centre’ within most rail organisations as opposed to a ‘revenue centre’. Consequently, trainers and assessors (who also need to keep up to date with their own competencies) can often be pulled back into the ‘revenue’ side of organisations, particularly where there are shortages of skills there. As one rail organisation noted when soliciting for training resources:

“We just did an engagement: “Would you put your hand up to do work for the organisation if asked?” And the [response was] that we are just that stretched at the moment, we can’t.”

Industry soundings revealed the difficulty, too, in finding people who had the right ‘mix’ of competency and communication skills to make effective trainers. However, even if this were not a problem, another core challenge with boosting the number of trainers and assessors is identifying roles with a strong career path that is financially rewarding. As explained by one rail operator in recent industry soundings – but repeated in many more:

“It’s simply not attractive financially typically to become a trainer. It’s often a lifestyle choice. So, we’ll get younger ones who are having children because they want weekends.”

And in regard to future career development beyond training:

“Again, in my experience, until recently I would say you almost just pigeonhole yourself. You’re a trainer for life.”

Time taken to train for key roles

Another core concern regarding training revolved around the rigidity of the existing system of developing and certifying competency coupled with the issue of trying to satisfy multiple jurisdictions’ competency requirements led to longer training times than necessary.

During recent industry soundings, there was a sense that traditionally there has been a degree of ‘overtraining’ as staff needed to reach high (but possibly unused) levels of competency – or remaining challenges with harmonisation of skills requirements which prevented the ready transfer of skills from one jurisdiction to another.

“We still have an insistence on competencies that are actually unnecessary to deliver what has to be done.”

“It’s a complete and utter nonsense to think that it takes you a year plus to be able to train one of those drivers if you don’t think outside of the box and start to use non-traditional methods around training. They’re way more effective anyway. They’d be way more effective. But we can’t look beyond what we’ve done for 175 years.”

Central to this view was the sense amongst many industry participants in recent soundings that many units of learning may not actually be required for specific roles:

“The point is, though, for these mechanical, electrical skills, we need people with four to five years degree. But you don’t necessarily need that high a level of skillset. It’s just what’s being regulated... There are these people who come up on the tools, and then they move up through to the next level, and they don’t necessarily have those graduate qualifications. And they’re often the most competent. That’s who you want running your shop.”

“15 years ago I disconnected the requirement to actually physically do overhead line work from the requirements ... Yet, what I’m hearing is that we still have got an insistence on competencies that are actually unnecessary to deliver what has to be done.”

Despite concerns over the time to deliver training and bring new skills onboard, there was still a healthy recognition of the need to ensure that there was quality in the training programs and that graduates from the system had a ‘defensible’ level of competence, particularly given the safety focus of the industry. Consequently, there may be limits to how quickly competency can be earned:

“There’s this perception that there’s not a whole lot of skillset required to be a train driver. So that also needs to be counted as well because there’s a Certificate IV level qualification that’s now required to be a train driver.... Then there’s learning the routes, the traction qualifications, the wagons, the safe working rules. There’s this perception that these skills are easy and hence, it shouldn’t take too long to train somebody. But that’s not the case.”

Lack of commercial scale in training programs

Another core issue raised in the industry soundings is that training itself is a cost to many businesses, not an investment, and that many enterprise-critical

training programs are not commercially viable (even if they had appropriate numbers of trainers and assessors).

“One of the reasons the tertiary educations are falling over, as I understand it, is just lack of ... there's not enough headcount.”

“In terms of increasing capacity to our industry ... the government solution in terms of vocational education is the TAFE system. Now the TAFE system is problematic for any industry that would be regarded as a niche... we can't give the volume of people within job roles to make it commercially viable for TAFE to deliver the training programs which are absolutely enterprise critical.”

Paradoxically, competent *publicly funded* training providers are in some jurisdictions are actively *prevented* from developing sustainable training courses because they can't be seen to be undercutting the private training market.

“One of the biggest issues that we had is we've been told that we can't undercut the commercial market, as we're fully funded by government... At the end of the day ... we can't be seen to be doing anything that undercuts a commercial imperative.”

“When I showed our CEO some of the forecast modelling that I had done on the qualification programs that we're running through the RTO at that time, he was highly encouraged at the breakeven point and then the profit margin per student in relation to those programs. And when we explored running those programs commercially, once again, government came back to us and said, 'You're fully funded by the Department of Treasury and Finance. You cannot commercialise your programs.’”

Risks to training quality in periods of high demand

The combination of poor commerciality of training courses, coupled with the pressure to deliver skills quickly given the volatility, led many rail organisations in the industry soundings to express concerns that “corners will be cut” by some training organisations that could have deleterious implications for safety.

“Once you get a massive investment, people will be attracted. And they'll start doing these kind of cowboy operations.”

Several rail organisations in the soundings provided examples where training quality was already problematic and creating significant safety concerns, such as this example:

“They were operating a smaller capacity backhoe than the one that they were trained on at this particular RTO. And rolled it off our tracks and caused ... an incident. When I spoke to the CEO of that contractor she told me that she was aware that there was no practical element to that training that she enrolled her staff onto. She was quite happy with that, because it meant that her people were job-ready a lot faster... Its negligent.”

In a related discussion, there were also particular concerns about the increasing casualisation of the labour force within the rail industry, and whether they had appropriate skills training. Here, again, market failures in the provision of training (when the benefits of training cannot be captured by those funding the training) is a core part of the problem:

“Track force protection skills suppliers are primarily third party labour hire. Because they're a transient workforce, they could work for me today, they could work for you tomorrow. Who pays for their training? And if you're going to pay, why should I pay if you're going to benefit from it? So I'm only going to give you the absolute minimum, I'm not investing anymore than I have to in that individual. Because I don't reap the benefits. ... So that's the whole challenge around in quality training and quality investment in people, because of the casualisation of the workforce.”

“And we will face this with digital systems. We're spending a fortune training people on ATP and they could get cherry picked and move across the border.”

6. SOLUTIONS AND ACTIONS

6.1 INTRODUCTION

Apart from identifying the risks and challenges discussed in the previous section, the industry consultation round also yielded potential solutions and actions to minimising risks and securing a positive legacy for workforce development and capability in coming decades. This is the objective of this Section: given the nature of the challenges ahead, what can the rail industry do to prepare and implement actions that will best ensure long-term workforce capability across the sector.

Through the qualitative and quantitative components of this study, the rail industry itself has voiced many ideas for improving current skills outcomes in the rail industry and leaving a positive legacy for future generations.

“It’s about creating a sustainable legacy, which includes the skills in mentoring that you leave behind. You leave the place behind, not just the concrete and steel, and the systems, but the people, the skills, the community benefits.”

The need to address existing market failures

By and large, the research and industry consultation undertaken for this study indicate that key risks to workforce capability have been driven by the **presence of market failures** in the industry now, and over previous decades. This includes:

- **The historical development of rail in Australia as local monopolies**, with the consequent development of separate jurisdictional standards and systems which, despite movements towards harmonisation, continue to impact on Australian workforce capability today.
- **Lack of economies of scale** which prevents the domestic rail industry from effectively competing with larger overseas-based suppliers. This itself is compounded by different procurement policies by jurisdiction in Australia and in New Zealand, and the generally uncertain ‘stop start’ nature of investment in rail and rail equipment over previous decades which had negative impacts on investing in local capacity and scale. In turn, the lack of scale in industry also manifests as a lack of scale demand for training which can render training schemes uneconomic.
- **Externalities which may result in market under-provision of training**, particularly if the training organisations cannot capture the full economic benefit of the training provided (e.g. if trained staff leave to other companies, or where there is a direct and high opportunity cost to the training company in providing training) or if firms do not invest in new technologies that demand higher workforce skills.

- **The presence of market failures in competing industries.** For example, the lack of a fully functioning market price mechanism for road transport which takes into account negative externalities such as congestion, safety, pollution and the need to repair and maintain road assets distorts efficient transport decisions in favour of that sector at the expense of rail. Strong growth in road transport's modal share, in turn, has encouraged much higher levels of public investment in road assets at the expense of rail which, over time, may have also contributed to the lack of scale in the local rail industry.

The presence of market failures in the rail (and broader transport) industry, suggests that there is a for government or an appropriate interjurisdictional agency to redress resulting suboptimal market outcomes.

In the context of rail workforce capability, these actions may include:

- Directly funding an expansion in training places and facilities, and reforming training systems
- Further harmonisation in standards or establishment of minimum transferable standards to break down barriers to entry between jurisdictional markets
- Guaranteeing a share for the domestic industry in future rail developments to provide confidence to invest in local capacity and capability to build scale, and
- The development of a national rail pipeline and plan to help smooth out program volatility and spikes in demand for rail workforce skills

In these circumstances, the challenge for the rail industry is not just outlining the problem and its scale, but also incentivising governments to act and the actions and steps that need to be taken to achieve this.

However, there are also a range of actions that can be done by rail industry participants themselves to help mitigate workforce capability risks.

While this study has also been concerned with the rise of 'new technology' skills demand within the rail industry, a key finding remains that existing skills sets remain at the forefront of workforce capability pressures now and in the coming decade. In turn, these pressures are being driven by:

- **A large investment phase across all types of rail** (both freight and passenger) now rapidly ramping up which will drive rising demand for skills across construction, operations and maintenance through the coming decade and beyond. While much of this is focused in Australia, New Zealand too is planning to increase rail investment (at the expense of roads).
- **Sustained high levels of competitive demands.** Domestically, this is coming from the road industry initially (particularly for construction-oriented and data skills), but also potentially from other sectors such as mining. There is also strong growth in rail investment globally which also provides competition for skills in Australia and New Zealand.

- **High rates of rail industry workforce attrition** as highly experienced 'baby boomers' move into retirement, both in Australia and New Zealand. Quantitative modelling for this report suggests that around 20 per cent of the existing workforce will be lost through retirement in the coming decade.
- **Difficulties in retaining existing staff**, particularly in regional areas and smaller jurisdictions, as well as the broader issue of retaining new, younger employees (particularly, the so-called 'millennials').
- **Challenges in augmenting skills supply via education and migration pathways** given constraints in the timely provision or recognition of required skills.

In meeting these 'traditional' workforce capability challenges, BIS Oxford Economics research, coupled with the many positive ideas that emerged from the consultation process, offer a way forward for the rail industry to consider. While not 'silver bullets' individually, together the following solutions may provide ways to minimise the risks surrounding rail industry workforce capabilities, particularly over the coming decade. These are:

- Smoothing the rail pipeline
- Reforming the current system of education and training
- Enhancing productivity of the existing workforce
- Using procurement as a skills strategy
- Strengthening workforce retention strategies
- Meeting challenges in developing 'non-traditional' skills
- Developing a stronger and younger rail 'brand'

Recommendation 1

Market failures in the rail industry are hindering the provision of a sustainable, sufficiently skilled workforce. A taskforce – supported by the development of a national rail ministerial portfolio – should be established, with representations from all state jurisdictions, the national governments of Australia and New Zealand, the VET and Higher Education sectors, and the private sector, to drive a workforce capability program.

Recommendation 2

The lack of harmonisation in determining workforce capabilities requirements for different occupations is an impediment to industry productivity. A taskforce should work towards a unified approach to skills development, building on the successful elements of existing industry practices and mapping skills demand to training competencies.

6.1.1 Smoothing the rail pipeline

In all recent rail industry soundings, the existence of a known and quantifiable pipeline of infrastructure projects was considered crucial to investing in industry

capacity and capability. For private industry, having long lead times and greater certainty on projects was an important first step in planning for labour and non-labour resources and ‘getting things done’.

On the project delivery side, having a known project pipeline, coordinated across all jurisdictions (recognising the challenge of getting multiple projects designed, procured and delivered simultaneously) was considered crucial. Harmonisation of different procurement rules and processes across jurisdictions was also considered to be very important, to the extent possibly permitted given remaining differences in rail systems and operations.

In the rail industry, unfortunately, recent history is replete with examples where there has simply not been a reliable or steady forward pipeline of work, and the industry has not had adequate time to invest in skills to meet sudden surges in demand. The resources boom in Australia, for instance, saw rail construction activity suddenly surge to \$8 billion per annum, up from the approximately \$2-3 billion per annum through the late 1990s and early 2000s.²⁸ Between FY12 (the peak) and FY16, rail construction halved as both the public sector and the private sector pulled back on investment. Currently, rail construction in Australia is rising sharply again as various levels of government invest simultaneously in the new rail networks for freight and passenger movements. According to the BIS Oxford Economics forecasts used in this report, annual Australian rail construction activity will reach a peak of over \$10 billion by FY24.

A similar experience can be seen in New Zealand, where shifting ownership of rail infrastructure between the public and private sectors,²⁹ coupled with natural disasters (e.g. the Kaikoura earthquake)³⁰ and swift changes in political imperatives,³¹ have seen significant sharp shifts in rail investment and construction activity over time.

While infrastructure project pipeline visibility has improved in some jurisdictions, it is not consistently so across all. Many public sector funded projects appear in Budget forward estimates, but are still subject to sudden shifts in timing or the sudden introduction of new projects and removal of others, even where there is co-funding between tiers of government for procurement and delivery. Traditional construction programs rely heavily on effective and early communication with industry for skills and resources to be ensured.

Furthermore, even if contractors are able to marshal the necessary skills to deliver rail infrastructure construction projects, there is no guarantee that there will be an adequate number of skilled people in operations and maintenance – or in local rollingstock manufacture – to ensure the sustainable operation of the new rail investments. Ideally, according to recent industry soundings, planning

²⁸ ABS (2018) *Engineering Construction Survey*, Cat. No. 8762.0.

²⁹ Heatley, D. and M Schwass (2011) “Rail Transport in New Zealand”, printed in APEC (2011) *The Impacts and Benefits of Structural Reforms in Transport, Energy and Telecommunications Sectors*, p230

³⁰ Lewis, O. (2017) “Earthquake repairs biggest South Island railway project in ‘generations’”, *stuff.co.nz*, viewed 27th September 2018 <https://www.stuff.co.nz/national/88392039/earthquake-repairs-biggest-south-island-railway-project-in-generations>

³¹ Trevett, C. (2018) “Jacinda Ardern sets out Government’s transport plan, including nationwide fuel tax”, 3rd April 2018, *nzherald.co.nz*, viewed 29th September 2018 https://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=12025268

for operational skills should be undertaken side-by-side with rail investment given the lead times required to develop additional operation skills – and so the project pipeline should also become an important part of planning for non-construction rail skills. A recent example hinting at this issue was the opening of the Redcliffe Peninsula line in Queensland in 2016, where 36 per cent of services were cancelled due to driver shortages.³²

“But what’s not being considered... is the consequence once these things are built. What is the operation and maintenance demand on the back of that.”

As described in the previous Section, the sharp volatility in rail investment does not provide industry the confidence to invest in long term capacity and capability and has likely contributed to a lack of scale within the local rail industry. Relatedly, the need for ‘fast’ investment solutions, from both the public and private sectors, then tends to favour non-local suppliers who already have scaled operations to meet demand.

Recognising that increased local participation in rail developments has strong economic and social benefits, as well as quality benefits in many cases,³³ the rail industry proposed in recent soundings that efforts should be made not only to establish a *clearer long-term* pipeline of projects, but to also *smooth* growth in demand so that the local industries in Australia and New Zealand had time to invest in skills and grow domestic capability. Over time, steady growth in activity, rather than a ‘stop start’ investment approach could reinvigorate local industry, provide new opportunities for skilled employment, and open potential export opportunities.³⁴

While laudable in theory, however, achieving this aim in practice is unlikely to succeed without considerable national coordination. The current ‘wave’ of rail infrastructure projects planned or underway in Australia and New Zealand is the consequence of decisions made by many state jurisdictions in Australia as well as national governments and the private sector. Smoothing the pipeline entails making conscious decisions to delay currently planned approved projects – in other words, reducing potential investment now – to provide a ‘higher tide’ of work, rather than a ‘wave’, in the future.

While there is little experience of governments in Australia making coordinated, conscious decisions to smooth infrastructure investment, it is not completely unheard of internationally. The large rail programme developed in the United Kingdom in the late 2000s, for example, was deliberately re-phased once it was recognised that the large volume of work threatened existing capacity and capability to deliver. The advantage held by the UK was the more centralised control and decision-making regarding the overall rail investment program,

³² (2018) “Queensland unlikely to return to full train timetable until at least late 2018, report finds”, ABC News, viewed 5th October 2018 <http://www.abc.net.au/news/2017-02-06/qr-driver-shortage-means-full-train-timetable-unlikely-late-2018/8245714>

³³ In Australia, evidenced by the Australasian Railway Association (2011) *The True Value of Rail*, which identifies and quantifies, where possible, the benefits from rail transport that are not captured in prices and which accrue to the community at large. A study for New Zealand was prepared by Ernst and Young (2016) *The Value of Rail in New Zealand* for the NZ Transport Agency.

³⁴ Rural and Regional Affairs and Transport References Committee (2017), Australia’s rail industry, The Senate, Commonwealth of Australia, October 2017, pp68-69

compared to Australia's more decentralised investment program amongst multiple tiers of government and across multiple state jurisdictions.

In any case, after many decades of perceived *underinvestment* in rail in Australia and New Zealand, it would appear strange to outside observers that the rail industry is proposing cutbacks to rail investment, no matter how temporary:

"Do we really want to be saying, "Please don't invest," after years of underinvestment? There's a balance though. If we continue to ramp up quickly as we're ramping now, there's no time ... to prepare the people to do the job."

There is a case for arguing, however, that uncoordinated and sudden investment in infrastructure, without due consideration for the pressure that creates on demand for skills – which may move from jurisdiction to jurisdiction or across national borders – can lead to inefficient outcomes. Recent history in Australia and New Zealand shows that sharp increases in demand for infrastructure services has squeezed capacity and capability to deliver, resulting in shortages of high skilled labour and rapid increases in costs. In some cases these skills shortages have been exacerbated by the need for public agencies to increase their own internal capability to be 'informed purchasers' of services – by hiring directly from industry.³⁵ The prospect or recognition of higher costs and capability and project risks by governments could itself act as a 'natural' brake to infrastructure spending

Even so, the private sector and elected jurisdictional governments with a mandate and finance for infrastructure investment, are very likely to proceed with signature projects even when there are challenges to capacity and capability present. At least in New South Wales and Victoria – the Australian jurisdictions where growth in new rail investment is expected to be strongest in the coming decade – there appears to be increasing recognition of the issue. Whereas the immediate post-resource boom environment – with seemingly limitless industry excess capacity to exploit – likely encouraged governments to take a somewhat relaxed view of the risks to capacity and capability, the wheel has now turned. Both New South Wales and Victoria are increasingly recognising capability risks in project delivery (if not, yet, project operations)³⁶, have moved towards a more collaborative approach with the private sector regarding infrastructure procurement³⁷ (as potentially, may be New Zealand³⁸) whilst also announcing a range of measures designed to boost industry training and education.³⁹

³⁵ See, for example, BIS Oxford Economics (2018a) NSW Construction Delivery Assessment: capability and Capacity, for Infrastructure NSW. Viewed 5th October 2018 https://insw-sis.visualise.today/documents/about/NSW_Construction_Delivery_Assessment_Capability_and_Capacity.pdf

³⁶ Ibid

³⁷ Such as the NSW Government Action Plan: A 10 Point Commitment to the Construction Sector, June 2018. Viewed October 5th 2018 <http://www.infrastructure.nsw.gov.au/media/1649/10-point-commitment-to-the-construction-industry-final-002.pdf>

³⁸ Coughlan, T. (2018) "Saving the construction industry", newsroom.co.nz, viewed 14th October 2018 <https://www.newsroom.co.nz/2018/08/16/195217/saving-the-construction-industry>

³⁹ Such as the *Infrastructure Skills Legacy Program* (ISLP) and the development of Infrastructure Skills Centres in New South Wales, as well as various Victorian skills initiatives.

Even so, new skilling initiatives on their own may not be enough to deal with the pace of growth in demand, particularly if other jurisdictions are looking to increase investment to meet election pledges or private industry demands.

In these circumstances, there still may be steps taken in the short term and long term to help smooth rail pipeline pressures. In the short term, this may include the following initiatives:

- In Australia, developing a collaborative Rail Industry Plan between national and sub-national rail agencies to coordinate and oversee investment decisions. Such an approach was outlined by the Australasian Railway Association in its submission to a Senate References Committee in 2017,⁴⁰ with the possibility of the Plan being overseen by the Transport and Infrastructure Council (TIC). In New Zealand, there could also be increased collaboration between the national government and regional governments such as Auckland and Wellington in planning rail developments.
- A coordinated Plan could potentially see multiple simultaneous rail projects ranked and prioritised by a range of criteria including access and availability of finance, measures taken to support skills development and the local rail industry, and net economic benefit. Alternatively, national governments may take the approach of viewing their own projects through a broader national net economic benefit lens which also takes into account the pressures being brought to bear on the national rail industry in terms of availability and access to skills and other inputs. This may mean, for example, in the Australian context, delaying tranches of specific projects where it is considered to create additional costs and project risks (in construction or operation) for other significant rail projects occurring simultaneously, or where it might 'fill a gap' or sudden void in work as state jurisdiction projects are completed.

⁴⁰ Senate Estimates (2017) p75.

Recommendation 3

A managed Rail Pipeline needs coordination of national, state and private sector investment plans, as well as agreed steps to meeting capacity and capability concerns. The taskforce should work with stakeholders to consider options for smoothing the pipeline.

Recommendation 4

Investment plans need to be visible, and major projects' direct impacts on skills mapped. A dynamic database of all major (>\$50 million) public and private sector rail projects in Australia should be established and updated regularly, with clear links to their specific demand for skills in the construction and operations phases, including manufacturing and maintenance skills for rollingstock. Plans can be published regularly by the taskforce through consultation with its stakeholders

Recommendation 5

Advice should be provided to relevant national governments and other stakeholders where demands from the pipeline lead to capability risks. The taskforce can provide advice to governments based on evidence from regular analysis and monitoring of the rail pipeline.

In the long run, efforts should also be directed towards measures which promote less cyclical revenue generation by governments (which historically have been the largest drivers of rail investment and operations in Australia and New Zealand) which, itself, may tend to promote lumpy cycles in infrastructure investment, including rail.

6.1.2 Reforming education and training for the rail industry

A strong and steadily growing rail project pipeline, led by significant signature projects, could help promote skills development – not just for delivery, but also for the long-term operations and maintenance across the rail industry. Here, according to recent industry soundings, having a long, sustainable pipeline was seen as vital for giving industry confidence to make long term decisions to invest in training.

Considerable engagement is needed with Australian Industry Standards, funded by the Commonwealth Department of Education and Training, to facilitate the Rail Industry Reference Committee, which provides priorities for review and development of training packages to ensure they address the needs of employers, employees, training organisations and students.

However, there was also a strong and agreed sense as to what could be done to improve education and training outcomes in Australia and New Zealand. Here, the solutions were focused on the following actions:

- Creating stronger partnerships between operators, the education sector and government
- Streamlining what needs to be learned
- Providing training in different ways
- Providing more pathways for trainees and trainers in the rail industry (apprentices / cadets/ putting skills in school subjects)

Creating stronger partnerships

One of the most significant challenges to education and training referenced by the industry soundings was the lack of scale in the industry which in many cases made quality training uncommercial. Operators are best placed to deliver hands on training given access to rail equipment and track, but are pressed financially to deliver training on top of their operational requirements, whilst their many high quality trainers are also in high demand in industry. The VET sector has quality and rigour in their training programs, but suffers from a lack of access to critical training environments and also current industry knowledge and skills. Both public and private training organisations are challenged by a lack of scale (i.e. enrolment numbers) in their training programs – due to ‘free rider’ attitudes (i.e. fear that the purchasers of training services will not ultimately realise a benefit on their own investment) – which can either render courses commercially unviable or have significant ramifications for training quality, impacting on safety.

According to industry soundings, these market failures in training (monopolisation of training sites coupled with lack of scale and ‘free rider’ tendencies towards training itself) provides a case for direct government intervention in training markets beyond existing approaches.

Recommendation 6

With some exceptions, the switch from operator to contractor delivered training has negatively impacted on quality of training provision. The taskforce needs to examine ways of building closer partnerships between funders and providers of rail education and training – and consider the provision of incentives for companies undertaking training in areas of particular need.

Recommendation 7

Most training providers don’t have an authentic learning environment. While a number of specialist facilities have been successfully established to provide rail skills training with backing from state/territory governments and/or industry, the taskforce should examine what additional private sector training programmes will be required to meet the projected demand for skills and these will need to be carefully regulated to ensure that they meet competency requirements.

Recommendation 8

There is a safety-risk associated with workers having the necessary qualifications but no real-life experience and through interaction with new technologies. The combination of strong demand for workers, the increasing casualisation of the workforce, the introduction of new technologies and the lack of harmonisation between operating environments requires careful management to ensure safety standards are maintained.

Recommendation 9

There is insufficient demand for some specialised rail training for commercially viable VET provision. Rail organisations should work more closely with the VET sector to provide critical mass for key training programs to ensure their sustainability.

In particular, it was felt that while partnerships between operators, contractors and the VET system such as TAFE was vital...

“This is where the solution is. It is almost like a three-way investment from government to TAFE and industry. So in order for that to work, industry have to release people, and they have to allow TAFE access to the networks. None of the three key players – operators, contractors and TAFE – can do it on their own and we need to come together to find a solution.”

... only governments had the scale and ‘policy power’ to make this happen.

“There’s a big role for government in realising that they’re the only ones who are big enough who can implement the policy; who have a mandate to do that rather than to return money to their shareholders.”

While there was no direct avenue for intervention which arose from the industry soundings for this report, several avenues were hinted at, which may provide steps for further actions. These included:

- **Mandating education and training targets within all rail contracts procured by jurisdictional or national governments.** This avenue is discussed further below in Section 6.2.4. Essentially, procurement itself can be a major ‘lever’ by which governments could influence or achieve longer term economic or industry goals, including skills development, but too often is based on minimising upfront capital costs. However, as emphasised by one rail contractor during the recent industry soundings:

“Training, along with safety, should be seen as a cost of doing business. It is not a nice to have. It’s a non-negotiable, it’s a compliance.”

- **Public sector rail agencies to provide critical mass for key training programs**, increasing their commercial viability. While much learning is done ‘on the job’, public sector rail agencies can provide a boost to the education sector by setting targets for the education of their own staff – as well as contractors and subcontractors which have procured work from them.

Case Study – Victorian Rail Academy

The Rail Academy (RA) is an educational governance framework that provides a cohesive and consistent approach to support the rail industry build, operate and maintain capability safely and efficiently for the people of Victoria. It is led by the Level Crossing Removal Authority in collaboration with Rail Projects Victoria, Transport for Victoria, Public Transport Victoria, VicTrack, V/Line, Metro Trains Melbourne and Yarra Trams. RA’s primary purpose is to:

- Manage and coordinate the development of sustainable training industry-wide;
- Develop state-of-the-art training facilities accessible to all industry providers; and
- Develop high-quality training products and resources.

The RA provides a holistic coordinated approach to address capability challenges of the Victorian rail sector. It identifies and manages current workforce development constraints and actively addresses these with industry led solutions. Together with the support of LXRA’s program partners and the broader industry, the RA: facilitates growth of career succession pathways; supports industry training leadership capabilities; creates innovative solution for learner engagement and experience; engages with, and improves quality and compliance of, training providers; delivers new modern rails training facilities; and actively seeks and undertakes opportunities for collaborative working relationships.

Currently, the RA, in collaboration with industry, is systematically developing training programs to address critical skills shortage areas and ensure new entrants to our industry have access to the highest quality in training courseware resources. These 37 critical skills shortage roles represent 33 qualifications and 4 short courses that require a strategic approach to address labour shortfalls. Some of the critical skill shortage programs developed/currently in progress include: Rail Signalling program; OHS Advisors program; Communications Advisor program; Overheads Linesman program; Rail Supervisors program; and Track Protection program.

- **Increase direct investment in training facilities or the funding of training programs and staff.** In order to build scale quickly to meet rapidly rising demand for rail industry workers – as well as meet the longer-term operations and maintenance workforce requirements – it will likely be necessary for governments to increase their direct investment in education and training, in partnership with operators, contractors and the education sector. This may take the form of a contribution towards the investment in new or upgraded training facilities, similar to recent initiatives such as the establishment of Infrastructure Skills Centres in New South Wales, or the recently announced Victorian Tunnelling Centre, as well as direct funding of courses or trainers where skills are considered critical.

Recommendation 10

Individual rail training facilities and organisations have insufficient incentive/capability to invest in new capacity and programs. Government needs to provide incentives/support to facilitate increased direct investment in training facilities or the funding of training programs and staff.

Recommendation 11

New technologies, systems and processes will change the mix of skills required. The rail industry should engage more closely with universities and the VET sector – as well as high schools – to promote rail as a destination, but also to ensure the right types of skills are being developed.

A greater partnership approach between the rail industry and universities and colleges can also create greater awareness of rail as a skills destination, whilst also rehabilitating its image in the minds of the younger generation. Here, key rail organisations and authorities have a role to play to engage more closely with universities and the VET sector – as well as high schools – to promote rail as a destination, but also to ensure the right types of skills are being developed. As discussed further below, this may include visits to schools and campuses, establishing rail events in partnership with the education sector, being more directly involved in setting rail-oriented challenges within courses, or even sponsoring courses or awards for high achievers.

Streamlining what needs to be learned

Another key reform area within education and training is to streamline more effectively what really needs to be learned, so that skills can be learned more quickly and furthermore, could be more mobile across jurisdictions (given appropriate ‘top up’ training above a core set of minimum standards. Given an increasingly younger and *transient* workforce coming through current training systems, having a more streamlined, faster training system is seen as increasingly important to keeping qualified skills in the rail industry for longer, rather than seeing qualified people leave soon after completing their training requirements.

During recent industry soundings, there was a sense that traditionally there has been a degree of ‘overtraining’ as staff needed to reach high (but possibly unused) levels of competency – or remaining challenges with harmonisation of skills requirements which prevented the ready transfer of skills from one jurisdiction to another.

“We still have an insistence on competencies that are actually unnecessary to deliver what has to be done.”

By contrast, most rail industry deep dive participants believed that, for key risk occupations in operations and maintenance, particularly, the best approach is to establish national minimum standards that would have to be met by prospective rail employees that were transferable across all jurisdictions, but which could be ‘topped up’ at the jurisdiction level for specific roles. This would

help speed the training of new employees, eliminate unnecessary duplication in training (and call on trainers) and reduce barriers to the transferability of skills.

As noted by one rail operator:

“There's no reason why there couldn't be a small ... national curriculum ... that could give a person that basic industry information and help them get a job and skill up from whatever space they come from.”

Also, while there may be challenges in seeking agreement from different jurisdiction, industry consultation suggested that there may still be significant gains to be made from speeding training itself through innovative approaches (for example, by utilising new technologies or systems that achieve the same level of competency) – or simply concentrating on core tasks.

One example of this, repeated in several industry interviews, was in the training of train drivers. While a Certificate IV in Train Driving in Australia, involving 21 units of competency,⁴¹ has traditionally taken two years or more to complete, innovative approaches by operators such as Pacific National in Australia, as well as Kiwirail in New Zealand, have allowed drivers to be qualified in as little as nine months. Having the “right people” at the start is vital to achieving accelerated training results, according to industry. This includes people aged over 21, can deal effectively with fatigue, had already experienced working shift work and generally had an exposure to industry, thus bringing with them a more diverse skillset. This means that bringing on train driving skills faster will typically involve greater up-front investment in the way train driving is promoted or advertised as a career, as well as eliminating unlikely candidates through thorough pre-training assessments.

In the case of train drivers, route knowledge and a shortage of trainers is seen as a key barrier to reducing training times further. In Queensland Rail alone, there are 19 routes and seven complexes that drivers need to call independently to be qualified. However experience internationally, and in New Zealand, suggests that drivers can be qualified for one route within seven months. Adopting approaches that reduce training times will need to satisfy safety concerns, but more importantly will require adopting a different mindset regarding the skills that are actually required to do the job safely and focusing training in those areas.

While streamlined, faster training is seen as an important strategy to minimise risks to rail workforce capability, the rail industry in recent soundings expressed concerns whether it could really be achieved given it would require (almost unparalleled) agreement from the different jurisdictions to work across borders and would also likely be challenged in the industrial relations space. Consequently, achieving progress on training reforms will need to be a collaborative exercise, and ideally headed by an independent agency that can facilitate a consensus. Ultimately, abiding by potentially outdated industrial relations rules may mean the rail industry is overemploying people and not getting the best use from them. But setting standards requires an intergovernmental response and likely requires a set change in Australia and New Zealand.

⁴¹ <https://training.gov.au/Training/Details/TLI42615>

Recommendation 12

Some qualifications are overly prescriptive and not all units are relevant. Where appropriate, qualifications should be modularised so that there is a 'building block' approach to training, allowing workers and employees to only acquire the units necessary for a required competency.

Recommendation 13

Project/operator specific training requirements are not always necessary from a competency perspective. Modularisation of qualifications would allow greater transferability of skills within the industry, allowing similar qualifications to comprise a number of standard foundation units and, if required, a number of additional project/operator specific units.

Recommendation 14

There is a lack of transferability of skills between jurisdictions. The modularisation of qualifications should be applied at a national level, whilst efforts to standardise minimum requirements across jurisdictions should remain an ongoing process

Recommendation 15

VET sector resources are stretched by the need to provide competencies which may not be necessary in some jurisdictions. Courses provided by the VET sector should focus on foundation skills for entry into the rail sector and a range of 'top-up' skills required to keep workers' qualifications current.

Recommendation 16

There is an element of unnecessary duplication of knowledge in meeting competency requirements across industry. Industry should work towards effective recognition of harmonised competency standards – separating core competency requirements from domain specific knowledge requirements and continue to develop national matrices.

Interestingly, the Commonwealth Government's Inland Rail project – itself spanning three states – was seen as an opportunity to not only continue a focus on harmonisation of industry standards, but also training for key roles, particularly in operations and maintenance, that will be consistent along its length.

Providing training in different ways

Related to the previous point, the rail industry will likely need to adjust to new ways of delivering training to ensure it remains relevant and attractive for younger, mobile, industry prospects, as well as to learn the new skills being wrought by new technologies and systems. Furthermore, training itself needs to be conveniently supplied to ensure continued learning:

“Training is divided up more and more these days. It’s not necessarily just bringing people to a central location to deliver the training... Increasingly, the delivery is a mix of technology.”

“The way people learn is different. Apprenticeships are over four years now, but there’s so much we need to talk about in terms of technology and how do we get people to defensible competence”

Learning key, hands on skills, for example will typically require a practical workshop location where these skills are best taught. But there should be an expansion of potential locations to make it more convenient for trainees (and trainers) to attend. New technologies, such as virtual reality and other forms of augmented learning, may make it possible for trainees to practice techniques or learn systems remotely. Theoretical knowledge can be increasingly taught online or through webinars.

Tunnelling may be an area where the rail industry can learn and train skills ‘on the job’ given the range of road and rail tunnel projects underway now and planned across Australia over the coming decade. As noted in the previous Section, meeting demand for high quality skills in tunnelling and tunnel fitout is likely to be a key risk to capability in coming years. Major tunnel-based construction work done across Australia rose from under \$1 billion in FY15 to over \$6 billion per annum by FY18. Here, industry soundings reveal significant capacity and capability risks, with the impact on costs potentially magnified by the sheer number and complexity of these projects, and the sequential nature of the construction process itself.

In the UK, an innovative approach was adopted by the rail industry to boost tunnelling skills by embedding rail staff into road tunnelling contractors, who could then move on and train the next generation of rail tunnellers. The road contractors also benefitted from arrangement as an employer-based assessor. As explained by a key consultant involved as part of recent industry soundings (and now working on Australian projects):

“When we set up the Tunnelling and Underground Construction Academy (TUCA), we had to get the equivalent of paid staff trained up in that type of work and so we made agreements with employers to actually embed them into their workforces, so we chucked them on tunnel road projects and got them to do tunnel road toll tickets. We got them shop experience. We chucked them in with the workforce to learn that skill and then we did team teaching, team assessing so that we got an industry expert working with our TAFE equivalent trainer side by side ... and eventually built the capacity of our trainers at the same time.”

Given the large number of road (and rail) tunnel projects underway in Australia, similar systems could be established for the training and accreditation of tunnelling skills. Indeed, Victorian Government’s recently announced plan to build a \$16 million Victorian Tunnelling Centre at Holmesglen Institute’s Chadstone campus is modelled on TUCA, which was established as part of the Crossrail project in the UK.⁴² This demonstrates again that there is a strong role

⁴² <https://www.premier.vic.gov.au/tunnelling-centre-to-train-thousands-of-local-workers/>

for government in partnering with industry to develop stronger skills outcomes – and modelling actions based on positive overseas experiences.

Creating stronger pathways for trainees and trainers

As in many other industries – including electricity, telecommunications and roads in Australia and New Zealand – where there was or is predominant public sector ownership, there used to be a stronger government commitment to providing cadetships and apprenticeships as a pathway into the industry. These entrants, even if eventually leaving the public sector, would tend to stay in the industry or related industries, thereby maintaining a skills base.

“When I joined in 1980, State Rail was pretty good at training people, and it had large numbers of apprentices coming through, and significant numbers of electrical engineers, and it was pipeline, and many of those people left, and they went other organizations that provided services back to the railway.”

However, increasing corporatisation and/or privatisation of government owned enterprises – which focused more on efficiency and operating results – during the 1990s and 2000s, saw the role of these agencies and enterprises as ‘skills developers’ through apprentices and cadetships diminish.⁴³ These decades also saw considerable deskilling in public sector agencies as technical and management functions including were increasingly outsourced to the private sector.⁴⁴

“The national competition policy had a lot of good things going for it. But when utilities generally were told you’re going to be corporatised, privatised, you need to get mean and lean and commercial, the number of apprentices and pavilion engineers that had been hired just fell off a cliff.”

Recent industry interviews conducted for this study – along with recent shifts in government hiring and training policies – suggests that the wheel has now turned full circle. Public sector agencies have had to hastily re-develop its own skills base to be an ‘informed purchaser’ of a large and growing volume of infrastructure investment, including both hiring directly from the private sector as well as subcontracting tasks directly to private sector organisations.⁴⁵

It is now recognised that both the public and private sectors can play a greater role in fostering industry skills through apprenticeships, trainees and cadetships pathways. This is evidenced by the New South Wales Infrastructure Skills Legacy program (ISLP) which, amongst other criteria, targets 20 per cent of the total workforce on a project to be made up of ‘learning workers’ and 20 per cent of the trades workforce to be made up of apprentices. Projects included in the first trial of the ISLP included Sydney Metro as well as Lismore Base Hospital.⁴⁶ Similar schemes have been announced in Victoria through the Major Projects

⁴³ Yates. A (2000) Government as an informed buyer: Recognising technical expertise as a crucial factor in the success of engineering contracts, The Institution of Engineers, Australia, Canberra, p5.

⁴⁴ Ibid.

⁴⁵ BIS Oxford Economics (2018a: p69)

⁴⁶ <https://www.industry.nsw.gov.au/business-and-industry-in-nsw/assistance-and-support/infrastructure-skills-legacy-program>

Skills Guarantee (requiring 10 per cent of total project hours to be from local apprentices, trainees or engineering cadets).⁴⁷

However, this response is very much focused on the *construction* skills required to meet the ‘wave’ of infrastructure demands – including rail – over the coming decade. So far there has been very little focus on a skills legacy program for the range of skills needed for ongoing operations, manufacturing and maintenance works from an expanded rail network – including for instance electrical, signalling and trackwork trades.

Consequently, there remains a need to develop clear pathways for cadetships, apprenticeships and internships, so that a local rail skills workforce can develop alongside the rollout of new infrastructure, rather than following behind:

“The rail metro projects are a 10 to 15 year deployment? The average age of people in the rail industry is nearing 50 years old. You look at the turnover that will happen and why we need to grow the nursery...to replace those people.”

Linking apprenticeships and training policies with working on rail megaprojects such the Metros is an important first step, however, this again demonstrates the power of using large iconic projects in driving industry reform and change. The challenge will be to extend such policies to other rail projects, and to extend the range of skills being covered, drawing attention to operations, manufacturing and maintenance skills which are likely to be in short supply as the new rail systems are eventually commissioned.

Pathways for trades

Having the right mix of professional and vocational skills from the education system will also be vital for the rail industry looking forward. Evidence from rail industry soundings and surveys suggested that up to 90 per cent of the rail workforce is comprised of blue collar employees with trades competencies developed through the VET system, with the remainder made up of professionals who come through universities. While new technologies and systems will see an increasing role for data, electrical and communications-based professionals in the rail industry – and limit growth in some maintenance trades – there will most likely remain a dominant demand for in rail for trades skills across construction, operations, manufacturing and maintenance.

The challenge is that student demand for some trades relevant to the rail industry is not rising strongly enough to meet projected industry demand. For instance, recent data collected from NCVER (National Centre for Vocational Education Research) for the VET system in 2017 as part of BIS Oxford Economics’ analysis of the construction industry for Infrastructure NSW showed a potential for declining completions in key construction-related VET programs given weak or plateauing enrolments.⁴⁸ As also highlighted in the industry soundings for this study, this likely reflects changing aspirations, with “parents wanting a better career for their children than they had”.

⁴⁷ <https://jobs.vic.gov.au/about-jobs-victoria/major-projects-skills-guarantee>

⁴⁸ BIS Oxford Economics (2018: p78)

“In terms of training, we are turning out too many graduates and not enough trades. If you haven’t got the trades, the whole quality of our life will collapse.”⁴⁹

Getting the mix of trades and professional skills right in the rail industry over the coming decade will require more than the skills legacy programs described above. It will require the industries such as rail (and perhaps partnering with other industries such as Defence and roads) working more to shift attitudes towards the trades to encourage the greater take up of apprenticeships and traineeships in the near term that will boost trades qualifications in the medium to longer term following an appropriate level of training and development. Rail industry soundings proposed a range of measures to boost trades:

- **Greater direct interaction with schools and high schools now to leverage from the ‘brand exposure’ of iconic rail projects to promote careers in trades.** While there are some examples of Australasian projects, such as Sydney Metro’s *FastTracking the Future*,⁵⁰ engaging with schools near its route, ostensibly more could be done at an industry level to promote the benefits of trades careers, and particularly trades in the rail industry given its strong role in current and future infrastructure investment.
- **Promoting the inclusion and studying of trades-related courses as part of high school qualifications.** New South Wales TAFE, for example, offers courses that can be completed by students for the Higher School Certificate in that state as well as counting towards a nationally recognised Vocational Education and Training (TVET) qualification,⁵¹ and there are similar schemes in other jurisdictions, but it is not consistent. Here, the rail industry could focus on the trades skills it requires and work with VET institutions such as TAFE, and governments, to ensure these courses are available and promoted.
- **Government subsidising of apprenticeships and traineeships more broadly**, as well as providing assistance to private companies who take on apprentices and trainees.

Recommendation 17

Many students are unaware of the benefits of learning trades for the rail industry. The taskforce should advocate that rail megaprojects (> \$1 billion) – potentially partnering with other industries, such as roads, defence and mining – should promote trades careers to primary and high school students.

⁴⁹ Ibid.

⁵⁰ <https://www.sydneymetro.info/education/fasttracking-future-program>

⁵¹ <https://www.tafensw.edu.au/study/types-courses/tvet>

Recommendation 18

There is a need to accelerate trades training to meet high demands currently and in the near future. The taskforce should investigate, develop and promote rail-usable trades courses for studying as part of high school qualification.

Recommendation 19

Apprenticeships and cadetships traditionally offered a route into industry, although this pathway weakened following competitive reforms in the 1980s and 1990s. Public and private sector rail organisations should raise the number of traineeships, cadetships and apprenticeships made available each year.

Recommendation 20

Current government initiatives to boost apprentices and traineeships are focused on construction skills, not operations, maintenance and manufacturing. Existing state government skills programs that demand inclusion of apprentices and trainees on major projects could be expanded to look beyond construction and also consider operations and manufacturing skills.

Recommendation 21

Market failures in the provision of training, and low pay for trainees and apprentices may limit growth in new skills. Existing incentive schemes for companies to take on apprentices and trainees are considered difficult to access and are not generally well understood. There is a need to improve visibility and accessibility of schemes and potentially extend and expand coverage. The taskforce should review the existing schemes to establish a uniform system and identify gaps.

Pathways for professional skills

While the trades will likely dominate rail skills demands over the coming decade, more will also need to be done to ensure the rail industry has access to an appropriate level of professional skills, particularly engineers (across an increasing range of fields), analysts and technologists. There remains a risk that focusing exclusively on trades pathways into rail will entrench a 'blue collar' image for the sector, potentially limiting its attractiveness to those seeking professional careers. Consequently, it will be important to improve and highlight pathways for rail in the university system also.

Furthermore, growing the future supply of professionals in the rail industry involves more than just growing the number of people with degree qualifications – it will also require these people to move into jobs relevant to their qualification. For instance, as at 2015, only 60 percent of engineering graduates were employed in engineering occupations, down on the 63 per cent

recorded in 2010 (during the resources investment boom).⁵² Consequently, an important part of any policy aimed at boosting engineering skills capacity in the rail industry should target the retention of engineers within the engineering profession, such as offering cadetships and other career pathways with both the public and private sectors, recognising that the “bulk of engineering professional skills formation is acquired on-the-job”.⁵³

Case Study – Rail Signalling Engineer Cadetship

In an Australian first, the Victorian rail industry, through LXRA’s Rail Academy, has developed a vocational Graduate Diploma in Railway Signalling Systems.

Despite rail signalling engineering being a highly technical and specialised role, a rail signalling engineering qualification was not available for many years. This limited the ability to bring new talent into the sector, creating a shortage worldwide. Through a co-ordinated approach across industry and government, the Graduate Diploma in Railway Signalling Systems was developed, addressing this skills shortage, creating a capable and diverse workforce for the Victorian rail industry. Some key statistics include:

- Female participation increased from 10% in the first cadet cohort in 2016, to 33% in the most recent intake of cadets in February 2018.
- Participation has also been extremely culturally diverse, with participants from a wide range of culturally diverse backgrounds including the Philippines, India, Iraq and the republic of Congo.

After successfully completing their first five weeks of training, the 2018 cadets accepted certificates marking the milestone and will now go on to their first industry placements with program partners, including: Melbourne Metro Rail Authority, Lendlease, Coleman Rail, Opus, MTM, John Holland, Aurecon and V/Line.

Recent rail industry soundings also highlighted that there should not be complete demarcation of trades and professional roles in rail organisations: professionals will still need to get ‘their hands dirty’ in the field to fully understand networks and systems and ‘how things get done’ at a practical level. In this, rail agencies offer important practical ‘hands on’ experiences that will improve the quality of professional skills in the industry.

“I think the philosophy that there are areas engineers shouldn’t get into is actually dangerous. We can’t [develop them] without some front line experience. They’re not subjected to the 2 o’clock in the morning phone calls in the pouring rain... that breadth of experience shapes the way I design. Because I understand what’s got to be done to operate and maintain it.”

⁵² Engineers Australia (2017), The Engineering Profession: A Statistical Overview, p6.

⁵³ BIS Oxford Economics (2018a: p79)

Recommendation 22

Engineering students may have limited exposure and opportunities to rail applications at university. The rail industry should work with universities and institutes in promoting rail-oriented professional skills development at the tertiary level, including expanding the number of rail engineering courses.

Clear and rewarding trainer and assessor pathways are also vital

With trainers and assessors themselves in short supply according to industry soundings as well as feedback from surveys (including the AIS Skills survey) – potentially lengthening the time it takes to achieve competency across a range of rail skills – there is also a need to improve pathways for trainers in the rail industry.

A core issue is that trainers and assessors (who also need to keep up to date with their own competencies) can often be pulled back into the ‘revenue’ side of organisations, particularly where there are shortages of skills there. Part of the solution in boosting the numbers of trainers should be, therefore, to change the treatment of education and training from being a cost centre within most organisations, to being an investment – and being core to everyday business operations. As discussed earlier in this Section, this could be achieved through appropriate adjustments to procurement and contracting criteria by governments so that training targets must be maintained – as well as possibly targeting growth in the trainer workforce.

However, as highlighted in the previous Section the core challenge with boosting the number of trainers and assessors is identifying roles with a strong career path that is financially rewarding.

Given existing market failures in providing optimal numbers of trainers, one solution may be to provide a ‘top up’ payment to prospective trainers to encourage the transfer of skills from industry into an expanded education base, or provide other benefits to contractors and operators to release staff for training others. For public rail agencies, it may be necessary to raise the base remuneration offered to trainers to make it attractive for skilled staff to consider training as a career or pathway to other roles, including supervision and management. But it will also be incumbent on rail organisations to work with their trainers to keep their development pathways open.

Recommendation 23

There is a shortage of educators and trainers. Employers need to enhance the attractiveness of training to employees as a complementary or alternative career path.

Recommendation 24

It is difficult to attract infrastructure workers into becoming trainers. There is a need to incentivise employees to become trainers by providing appropriate remuneration, enhancing the status of training, and giving workers the option to continue in their existing role.

Recommendation 25

Trainers often have insufficient experience of a live environment. Industry experts could work alongside educators, enabling them to learn from each other. This would fast track the trainers from a competency perspective and the experts from a training perspective.

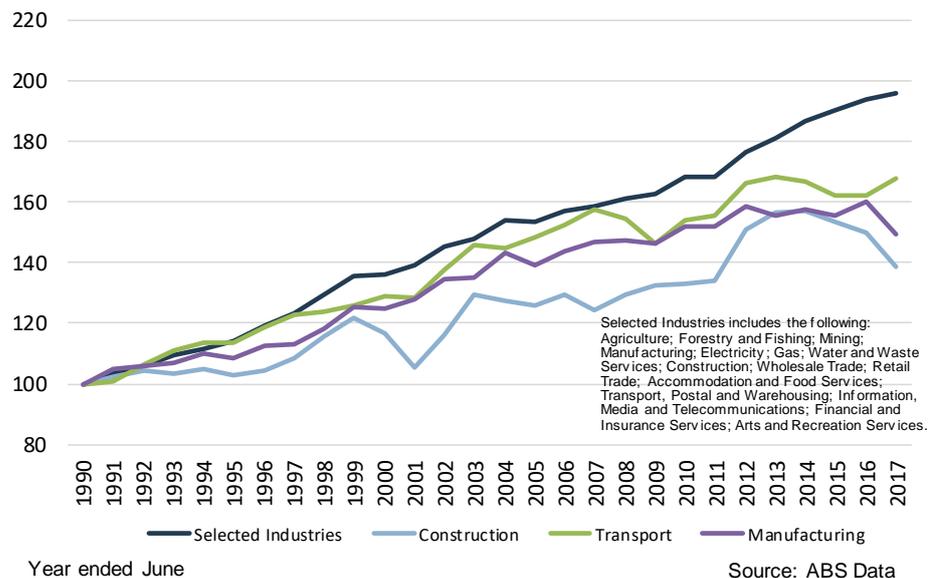
Recommendation 26

It is difficult for industry to release trainers. There needs to be a balance between not impacting delivery schedule, whilst being innovative about the ways people are brought in and supported. Greater co-operation required to prevent a myopic approach to meeting demand.

6.1.3 Enhancing productivity of the existing rail workforce

In a world where labour and capital inputs are limited, and where demand for rail services is rising strongly, productivity improvements offer an important route to minimising the risk of workforce capability constraints. However, productivity performance over time has not been spectacular. The Australian construction, transport and manufacturing sectors, for example – each with an important link to the rail industry – has generally lagged other industries in terms of labour productivity growth.

Figure 6.1: Labour Productivity Indexes, Australia, 1989-90=100



The challenge for the rail industry and government is to look at ways in which labour productivity can be improved, such as through higher quality supervision and project management, harnessing new technologies and processes, and adopting a more “innovation friendly” culture. For governments, this may involve giving contractors more room to innovate in the procurement phase, and encouraging the development and adoption of new processes and systems amongst operators, manufacturers and owners.

Based on recent industry soundings, as well as further research, achieving stronger rail industry productivity outcomes ultimately depends on:

- Reducing current sources of inefficiency in rail practices and activities
- Harnessing new productivity enhancing technologies and processes
- Boosting the transferability and mobility of skills
- Adopting a more innovation-friendly culture

Reducing current sources of inefficiency

A consistent theme which emerged during rail industry soundings was that current inefficient practices and processes should be improved to boost productivity in the sector. These ideas were wide ranging and included the following suggestions (also covered elsewhere in this report):

- Boosting education and training of current employees
- Minimising unnecessary tasks (in training, planning and procurement)
- Using procurement methods which encourage innovation
- Actually measuring and benchmarking productivity performance
- Reducing administrative tasks and “red tape”

Some of these issues are amenable to government policy, while others require industry itself to lift its performance, including their own approaches to workforce development and supply chain management.

Investing in new technologies offers productivity and ‘brand’ benefits

New technologies were also seen as potentially labour saving, so long as there was the intention to invest in them. With so many legacy assets still in operation in many jurisdictions across Australia, this maintains pressure to provide all the skills relevant to those assets, despite their age.

“There is a point where we have to turn around and say ... Based on the operational and the maintenance cost for these assets, we need to upgrade the entire network... because of the economies of scale, the efficiencies that we're going to afford. From a training perspective alone you have to train that last 100 years' worth of kit that's sitting out on that network. Government needs to put a price on that and say, "This is what it's costing us!"

In the construction industry alone, the Productivity Commission (2014)⁵⁴ as well as other industry reports in Australia⁵⁵ and overseas⁵⁶ point to a range of new technologies emerging in the sector which can potentially provide step-change productivity outcomes over the coming decade that would benefit the delivery new rail infrastructure, including:

- Prefabrication and modularisation
- Robotics and automation
- Use of advanced materials or processes
- Digital technologies [including BIM]

But there is also much that can be done specifically in the rail industry in the manufacturing, operations and maintenance phases to improve productivity outcomes through technology take up, including operational automation, the use of augmented reality (AR) and virtual reality (VR) in manufacturing and maintenance, intelligent communications and signalling systems, digital engineering, and new propulsion and energy systems. Indeed, investing in new technologies (such as autonomous trains and Metros) was seen in recent industry soundings as a strong positive for the industry in terms of modernising its brand and making it more attractive to future workers.

“Is the rail industry as attractive as the aviation industry? How do we make the industry more attractive? The engineers that come into our business, they want to deal with technology. They want to deal with digital engineering. That’s the space they want to be in, not sort of hanging wires, throwing an overhead system.”

Boosting the transferability and mobility of skills

Another key requirement for boosting the productivity of the rail workforce and making the most of the existing skills base, is that labour skills be both transferable and mobile.

Transferability refers to the idea that skills can be applied equally in different contexts (e.g. public versus private sector) across industries (e.g. automotive and rail manufacturing) or under different industrial rules or settings. **Mobility**, on the other hand, more specifically refers to the ability for skills to move *geographically* (e.g. into New South Wales from other states or between Australia, New Zealand, and the rest of the world). It is possible for skills to be transferable but not mobile, as well as vice versa, but taking full advantage of latent rail industry skills capability generally requires both criteria to hold simultaneously.

Unfortunately, while some progress has been made in addressing transferability and mobility issues, the rail industry maintains many barriers to the effective transfer of skills, mostly as a consequence of the historical differences in rail systems developed by separate colonies in Australia and New Zealand during the 1800s and 1900s. These constraints to the

⁵⁴ Productivity Commission (2014), Public Infrastructure Inquiry Report, Volume 1, p392.

⁵⁵ For example, Quezada G, Bratanova A, Boughen N and Hajkowics S (2016) *Farsight for construction: Exploratory scenarios for Queensland’s construction industry to 2036*, CSIRO, Australia.

⁵⁶ National Research Council (United States), 2009, *Advancing the Competitiveness and Efficiency of the U.S. Construction Industry*, National Academies Press, Washington D.C.

transferability and mobility of labour suggest that emerging skills gaps will not easily be closed through simply hiring labour from other regions (either within Australasia or externally), from other sectors or even from other parts of the rail industry. Rather, training tends to be more localised to take account of specific jurisdictional requirements, and there tends to be a range of challenges in importing skills from overseas.

Skills migration is linked closely with reducing barriers to skills transferability. As the rail industry struggles to keep up with rising demands, it was recognised in rail industry soundings that the migration of skills (from outside current jurisdictions, from overseas, or from other industries) will have a role to play in meeting workforce gaps. In the short term – given the time it takes to develop competence, as well as the new technologies being employed – the solution cannot simply be to train locally to meet skills shortages. The key challenges here are that bringing people in from ‘outside’ is often costly, and that in many cases their skills and qualifications are simply not recognised.

“It’s really costly to bring in expatriates. And given the challenge that we have, we’ve grown mindful. It’s probably not something that you could afford.”

“There are also some roles where it’s just not technically ... endorsed by the rail operators.”

Recommendation 27

There are barriers to the international immigration of skills which may affect best practices and transfer of industry knowledge. The taskforce should work with national governments and accreditation agencies to improve recognition of international qualifications and minimise unnecessary retraining.

Increasing the recognition of qualifications and experience earned overseas will be important – suggesting the need to consult broadly with accrediting organisations – as well as re-loosening some of the tighter visa requirements. But there was also a need to allow for an easier migration of people from other sectors which had related skillsets – particularly in the areas of signalling, electrical systems, data analysis and computer science – through appropriate ‘gap training’ that would re-orientate their skills towards rail applications:

“We can attract people in from other industries and we can teach them a little bit about the specific environment called ‘rail’. But that same person could be working autonomous mining equipment. That same person could be working in aviation. You’ve got a common skill in these next-generation systems.”

“For years I’ve heard that signalling was a black art... but it’s not. We could bring people in from other industries to retrain, or train them up. Train the gap. From car industries... aviation, mining and defence. Because what they’re doing is the same thing, it’s just different. They just need a little bit of gap training.”

There has been some success here recently, with innovative construction procurement policies producing Skills Exchange programs that have retraining

workers moving away from the declining automotive manufacturing sector.⁵⁷ Similarly, the Automotive Industry Transition Plan – a \$58.5 million initiative by the Victorian State Government⁵⁸ – has seen former automotive workers retrained and move into jobs related to the large Level Crossings removal program located in that state. Again, however, the major focus of governments in dealing with skills shortages has been on the immediate rail infrastructure *construction* requirement, although there should also be opportunity to retrain automotive workers in rail manufacturing and maintenance, particularly given that state’s commitment to a high proportion of local content and participation.

Overall, achieving greater harmonisation of rails skills requirements across jurisdictions in Australia and New Zealand is key to achieving greater transferability and mobility of skills, and this challenge featured prominently amongst the solutions to workforce capability challenges suggested by industry – due to the market failures (jurisdictions operating as separate monopolies, high barriers to entry, and lack of effective scale in training and development leading to suboptimal training outcomes).

However, participants were also under no illusions about how difficult this is to achieve in practice, given the legacy of separate and uncoordinated rail development in each state and territory, and related cultural and attitudinal differences in the transfer of knowledge that have also evolved over time. It was noted that some jurisdictions, for instance, publish their standards which make it easier for contractors and operators to work effectively and plan for the skills they need, but this is not universal across all jurisdictions.

Even so, there was still a sense that an independent overarching organisation should be enabled to review existing differences in requirements between jurisdictions in conjunction with their training systems – with a view to streamlining skills requirements and systems of training to minimum defensible common standards:

“At the end of the day, a train is a train, a piece of track is a piece of track. Overhead wiring is overhead wiring. So why are all states in Australia operating like they’re separate countries?”

“That goes across whether it’s operations, maintenance or whatever. It is an issue, the lack of consistency, the lack of standardisation Australia-wide, and that was one of the things that I found quite amazing when I got here that you can be in Queensland and then you weren’t qualified to operate in New South Wales.”

Interestingly, the Inland Rail project (spanning Victoria, New South Wales and Queensland) was singled out as a good national opportunity to enforce inter-jurisdictional standards, which if successful, could be extended over time to cover a wider range of training and operating systems, roles and extended to other jurisdictions.

⁵⁷ As, for example, for the Northern Connector road project in South Australia and referenced in the next section.

⁵⁸ <https://www.premier.vic.gov.au/helping-ex-automotive-workers-find-new-jobs/>

Recommendation 28

Historical differences in rail standards and systems prevent transfer and mobility of rail workforce across jurisdictions. There needs to be a continued focus on further harmonisation in standards and systems used across rail jurisdictions in Australia and New Zealand, as well as more effective recognition of existing standards which are harmonised.

Recommendation 29

Different jurisdictions continue to adopt different technologies and systems which will require different training and competencies. As new technologies are developed, there needs to be a focus on increasing the harmonisation of technological systems and approaches across jurisdictions.

Creating an innovation-friendly culture

Ultimately, the degree to which current inefficient workforce practices are reformed, or new productivity-enhancing technologies adopted, depends on fostering an innovation-friendly culture. In such a culture, firms in the industry are encouraged to undertake research and development and promote new products, systems and methods because, crucially, rail agencies are willing to reward and accept them.

Innovative solutions may provide immediate benefits for rail construction projects, particularly when they are complex and amenable to improvement through industry “smarts”. Even when innovation does not necessarily offer the lowest price in the short term for a project, it can often promise a lower long run cost to governments and asset owners – such as through promoting new “lower maintenance” materials and technological systems, utilising new construction processes which can then be replicated on other projects, or promoting industry training which can leave a skills legacy for the future.

In practice, however, recent industry soundings indicate that the rail industry usually relies on “tried and true” approaches which leave little room for innovation. Unlike some other industries, such as roads, there is also a very tight focus on safety. Whilst safety is a non-negotiable criterion, this does create additional hurdles if new systems or approaches are to be adopted. In this respect, a significant driver of productivity going forward – and hence the degree to which the rail industry meets workforce capability challenges – may well be how successfully industry and government foster innovation that does not impinge on the industry’s safety credentials.

Here, it is often the procurement process itself, with its focus on short term price instead of longer-term benefits, which is perhaps one of the greatest inhibitors of innovation in the rail industry. In the context of construction:

“The government talks a lot about wanting innovation, but in reality there is no mechanism to buy that innovation. The government wants cheapest price and commercial compliance.”

This issue, however, not only affects construction projects, but also other procurement decisions, ranging through operations and maintenance as well as decisions to procure rolling stock and other equipment. Here, there are a range of steps which government can take to encourage innovation, including:

- **Using procurement processes and government buying power as an enabler** to incentivise innovation in the rail industry. Governments should also be prepared to pay more for innovation and higher quality outcomes, recognising their longer term benefits at the project and industry level.
- **Increase coordination across jurisdiction governments and the private sector** for the take up of technological innovations, systems and processes, ranging from digital technologies used in the construction phase (e.g. Building Information Modelling or BIM) through to operations and maintenance technologies
- **Recognise the impact of new technologies on demands for skills and plan accordingly.** The increasing use of robotics, automation and digital systems will require new competencies and strengths in digital technologies, new manufacturing processes, and artificial intelligence, while repetitive and dangerous tasks will become more automated.
- **Pursue policies which will make it easier for the local rail industry to adopt innovative 'best practices' from overseas.** This means taking measures in our migration and accrediting agencies that encourage bringing in skills from overseas that can help deliver innovative solutions in Australia and New Zealand and train up local workforces to develop expertise.

6.1.4 Using procurement as a skills strategy

Throughout much of the discussion, reforming procurement strategies has been highlighted as a core tool to boosting skills outcomes in the rail industry, across construction, manufacturing (e.g. rollingstock), operations and maintenance. While public sector procurement has traditionally focused heavily on meeting “lowest capital cost” criteria, recent industry soundings in the rail industry suggested that the procurement process itself should include broader measures of “value for money”, including industry sustainability or a greater emphasis on workforce development. This mirrors findings in research previously undertaken by BIS Oxford Economics for Infrastructure NSW which sought solutions for building a positive skills legacy for the construction industry in New South Wales.⁵⁹ There, contractors asked:

“Where is the value for the taxpayer... in just looking at the capex? Surely the Government can lead the way in having a more sustainable approach to this. But if you are going down this path, you need to look at the procurement process itself. Because if you want to get the greatest benefit out of it, then it needs to be some sort of partnership as to how you get the best value out of the investment.”

Examples of this approach included the Northern Connector Road Project in South Australia where the South Australian government worked in partnership (and shared the costs) with the winning tenderer to establish a Skills Exchange for the project so that local workers in steel production and auto manufacturing (who were located close to the project) could be retrained and employed onsite in the construction sector. In turn, the benefits for the contractor and the broader industry is that these people could then be moved onto other construction jobs on the completion of the project. Similar Skills Exchanges were established at other large construction projects including Barangaroo, Darling Harbour Live and NorthConnex, albeit at the contractors cost.

Using capital expenditure as a tool to achieve broader policy outcomes is not limited to procurement, nor limited to jurisdictional governments. For example, the Australian Government in the 2005-06 Commonwealth Budget demanded from their State Government counterparts an acceptance of a National Code of Conduct for the Construction Industry⁶⁰, – essentially reforms to workplace relations that aimed to increase the sector’s productivity – if they were to receive Commonwealth funding on major land transport projects under *AusLink*.⁶¹ Given the Australian Commonwealth’s increasing interest in urban congestion and city-shaping (increasingly resulting in *rail* as opposed to *road* solutions) on top of its traditional role in developing efficient freight transport networks, it would be worthwhile to examine if conditions relating to rail skills development could be attached to the provision of Commonwealth rail funding. Similarly, skills-oriented conditions could be attached for national rail funding in New Zealand, particularly with the development of urban rail systems in Auckland and Wellington.

The key point is that governments, in financing large investments in rail, can use their power to demand more from industry than merely achieving lowest upfront cost outcomes. Rather, governments should be thinking about longer term value for money and leaving a lasting skills legacy for the future. While many large rail projects have already been procured, there is still a long pipeline of rail projects which have not, and therefore it is not too late to reform procurement of these projects to achieve better workforce skills outcomes, not just for construction, but also operations, maintenance and manufacturing.

Given the increasing role of the Commonwealth Government in Australia, and the national New Zealand government, in offering direct funding for rail projects – whether alone or in partnership with other tiers of government and the private sector – it would make sense to start with the relevant national government departments in seeking new skills development criteria that should be satisfied by winning tenderers of government contracts.

Recommendation 30

Current contracting arrangements based on lowest price do not support long term investment in skills. Leadership is required at the Australasian level to highlight to procuring governments the importance of longer-term value in contracting which includes the provision of training which will leave employees with skills that can be transferred from construction to operations activities.

6.1.5 Strengthening rail workforce retention strategies

Apart from improving the productivity of the existing workforce, another core strategy that mitigates against skills shortages in the rail industry is skills retention – essentially, keeping hold of the skills already in the industry. Here, there are three large challenges facing the industry that have the potential for driving a significant loss of rail industry skills over coming decades:

⁵⁹ BIS Oxford Economics (2018) NSW Construction Delivery Assessment: capability and Capacity, for Infrastructure NSW, pp80-81. Viewed 5th October 2018 https://insw-sis.visualise.today/documents/about/NSW_Construction_Delivery_Assessment_Capability_and_Capacity.pdf

⁶⁰ Commonwealth Budget 2005-06 (2005), Ministerial Statements, Transport, viewed 14th October 2018 <https://www.budget.gov.au/2005-06/ministerial/html/dotars-19.htm>

- **The high average age of the rail industry workforce** which will drive significantly higher rates of retirement in the coming decade.
- **The increasingly ‘transient’ behaviours of younger generations** now entering the workforce which increases the likelihood they will not accept training and apprenticeship programs which demand they are ‘locked into’ employment for many years, and will leave existing positions earlier, and more often, than previous generations.
- **Related to this, the increasing risk of losing staff with “middle-range” levels of experience** particularly given sunk investment in on-the-job education and training and high competition for this level of skill. As skills in rail become, ideally, increasingly transferable and mobile (which will help attract skills into the industry from elsewhere), the risk also rises that these skills will be attracted into other industries that are looking at similar skill sets, from roads, manufacturing, defence, aviation and utilities.

For smaller and more regional employers in the rail industry, another challenge was seen as keeping (mainly younger) staff who wanted to move to bigger cities or sectors either to boost their incomes or further their career development opportunities.

Each of these categories represents a different workforce career stages, and so potential solutions to strengthening rail workforce retention strategies will likely be different at each stage. At the entry level, solutions will involve not only increasing the number of traineeships, apprenticeships and cadetships offered, but also finding quality roles for these individuals when they complete their programs. Having more dynamic ‘starter’ roles that allow them to experience a wider range of works is generally desirable. Competitive compensation packages (including superannuation) are also seen as important, as are having access to further training and development.

Recommendation 31

Apprentices, trainees and cadets may not necessarily be offered employment upon completion of their training period. Public and private sector rail organisations should quantify and target growth in graduate retention rates.

For more “middle skilled” workers, a range of strategies may be required to improve retention rates. This may include strengthening options for ongoing training and development (e.g. access to highly experienced mentors, further learning, ability to attend conferences in their field, ability to be seconded into other organisations, or vice versa), maintaining a workplace culture that rewards success, innovation, collaboration and teamwork, strong communication and feedback, and promotes a healthy work/life balance. Retention in smaller, regional areas may also be assisted by more effective promotion of lower costs of living (particularly housing) and other non-salary lifestyle benefits compared to major capitals – as well as promoting a typically more diverse range of tasks (i.e. generalist) rather than being cornered into specialisation in a very large organisation.

Recommendation 32

The industry faces a significant loss of skills through retirement in the coming decade. Older workers should be provided opportunities to extend their careers through more flexible working arrangements, mentoring and training.

Recommendation 33

Loss of key personnel has the potential to affect business unit capability. Rail organisations should increase the robustness of their 'knowledge management' systems so capability is retained despite staffing changes.

Finally, at the very end of spectrum is the loss of very highly skilled staff through retirement. While not all potential retirees (i.e. those aged 60+) may yet be in a strong financial position to retire, this may change in coming decades given the operation of compulsory superannuation guarantees in Australia and New Zealand. Here, it will become increasingly important for organisations in the rail industry to codify the opportunity for highly skilled older staff to continue in ongoing part-time or mentorships roles. This will not only retain their skills to the agency, but the presence of mentors is also likely to increase the attractiveness of staying within the agency for graduates and staff with “middle level” skills.

The Millennials Issue

During rail industry soundings, there was a strong concern regarding how to retain younger, more transient, employees within rail organisations – the so-called ‘Millennials Issue’ (although it applies equally to all younger employees).

According to a recent study for the Foundation of Young Australians (FYA), today’s careers are often not so linear as in the past; that is, starting with a ‘training cubicle and ending up in executive offices’.⁶² Instead of training for a particular occupation and working in that area for life, studies have estimated that Australians will make up to seventeen changes in employers across five different careers.⁶³ Compounding the uncertainty is the reality that many jobs of the future don’t exist today. The World Economic Forum has argued that “in many industries and countries, the most in-demand occupations or specialties did not exist ten years ago.”⁶⁴

According to the FYA report, however, the dynamism and uncertainty of work represents a potentially exciting opportunity for young people because many skills for jobs are more related or ‘portable’ to other jobs. On average, when an individual trains or works in one job, they acquire skills for 13 other jobs. This is because, for many jobs, employers demand very similar skills. While the rail

⁶² FYA (2016) The New Work Mindset: 7 new job clusters to help young people navigate the new work order, AlphaBeta, Sydney.

⁶³ McCrindle Research (2014) “Job mobility in Australia” using HILDA and Department of Employment data. Available at: <http://mccrindle.com.au/the-mccrindle-blog/jobmobility-in-australia>

⁶⁴ World Economic Forum (January 2016) “The Future of Jobs: Employment, skills and workforce strategy for the Fourth Industry Revolution” Available at http://www3.weforum.org/docs/WEF_Future_of_Jobs.pdf

industry may place barriers in the way of attracting skills into the sector, many other industries do not, presenting risks of skills outflow, particularly amongst younger generations. So, rather than choosing an occupation with an unbroken path to seniority, a young person could think about developing a portfolio of skills that opens doors to a group or ‘cluster’ of jobs.⁶⁵

For the rail industry, it will become increasingly important to recognise what these portable job clusters are – that is, in training people for positions in rail, what are the potential other occupations that could also be being trained for? Conversely, what are the occupations, with just a little additional training or new skill acquisition, could be fertile grounds for recruiting high quality rail staff? The FYA analysis develops seven broad job clusters – artisans, generators, designers, informers, coordinators, technologists and carers – based on an analysis of 4,600 different skills requested by employers across online job advertisements for over 1000 occupations. With the possible exception of carers, the rail industry is likely to be well-represented in occupations grouped in this cluster framework.

In practice, dealing with this “career portability” amongst so-called “Millennials” could involve several strategies, as highlighted in rail industry soundings. Firstly, there is the view that increasing transferability and mobility is inevitable. Consequently, rail organisations should undertake workforce planning which explicitly factors in a loss in younger staff over time

“With the Millennials, we’re going to have a more transient workforce. We need to factor in that people are going to move around... that it won’t become a core problem that the business is going to collapse if 25 per cent of your workforce changes over every five years. Its knowledge management.”

This strategy involves establishing more rigorous ‘knowledge management’ systems within rail organisations so that the remaining staff are trained enough to cover for losses in positions until new hires can be made, whilst avoiding the need for immediate re-skilling. It also implies that entry training systems should be accelerated as much as possible (as noted earlier) to achieve a defensible standard of competence so that the most can be made of the transient workforce before they move on to other positions or careers.

However, there were also other strategies noted by rail organisations to deal with the younger, more transient workforce. In particular, it is believed that providing younger people with a more diverse range of roles within the business – and building ‘connectivity’ within the business rather than maintaining a ‘siloes’ working environment – will help retain skills.

“It may not be that you are moving from a rail operator to a train driver, but why don’t you look across the business? What could you be doing in a mechanical engineering space, what about infrastructure? There’s many disciplines within our business that we can be moving people around far more than what we are.”

Rather than looking to move to a different company or a different industry for their next occupation or career move, it would be better to encourage an internal move. A potential advantage of the rail industry is the diversity of work

⁶⁵ FYA (2016), p7.

within many organisations; the challenge is tapping this diversity to retain skills. The key to this challenge, however, will be in retaining good communications with staff, holding regular development meetings, having pathways to different parts of the organisation and highlighting the range of options available.

Furthermore, given the potential for significant loss of rail industry skills capability as the current, experienced workforce retires over the coming decade – coupled with the more transient workforce behaviours of ‘millennials’ – effective knowledge management will be increasingly vital. The challenge will be to retain the industry knowledge as people exit the industry to reduce re-skilling requirements.

Recommendation 34

New young employees ('millennials') are more likely to leave their employer seeking diversity in skills development. Rail organisations should target the development of more dynamic 'starter' roles for trainees, apprentices and cadets that allows them to have a more diverse experience of the industry within their first 2 years.

Recommendation 35

Younger employees, including 'millennials' may be unaware of the variety of roles available with rail organisations or across the rail industry. Rail organisations should establish connectivity as a core function of human resource systems, to encourage younger employees to move within rail businesses rather than exit the business or industry for a career change.

6.1.6 Meeting future skills challenges

This study primarily seeks to understand the skills shortages facing the rail industry over the next 10 years. New technologies are increasingly being adopted by the rail industry and will influence the future skills requirements for the sector.

The single biggest technology advancement for the industry will be the merging of the digital and physical railway. This includes the new high capacity signalling systems for the new generation of digital train control; the move towards remote condition monitoring; and the increasing level of automated systems across customer service interaction, train control, traffic management, maintenance and system wide optimisation.

Big data analytics will be applicable across all parts of the rail system, from operations and maintenance, to how customers interact with the rail networks and services. The development of data analytics is the start of a larger requirement to transform the industry into a significant developer and employer of Artificial Intelligence, starting with Machine Learning and other Computational Intelligence technologies. The interface with the digital railway (AI specialists) and the physical railway (Process experts) will be key to the development of useful and relevant information and knowledge. It would be anticipated that the two groups would learn from each other about what works with the disparate data sources available for the railway operations.

The ARA together with the Rail Manufacturing Cooperate Research Centre (RM CRC), supported by Deakin University, have designed a **Smart Rail Route Map**, a 30-year technology neutral framework which ‘...defines the rail industry direction, development initiatives and research programs for integration and support of next-generation digital and telecommunications technologies in the Australasian rail environment.’⁶⁶

While many of the proposed changes in skills-base will occur beyond this study’s 10-year forecast horizon, the planning and strategy for attracting key talent to the sector needs to start now. The Smart Rail Route Map is the first part of the strategy for managing the technological disruption developing in the wider transport sector and the associated skills that will be required to manage the disruption.

The ARA Board is in the process of establishing an executive committee to guide the long-term implementation of the Smart Rail Route Map.

Stronger engagement with the education sector

Industry soundings revealed that the education and training sector continues to adapt to develop core skills useful for the rail industry.

Arguably, however, the rail industry will need to do more to engage with educational institutions to help shape the development of skills they will need, when they need them, as well as to increase student awareness of the varied careers that are now available.

Here, the rise of ‘big data’ and new rail technology challenges could be seen as an opportunity to partner with relevant tertiary educational institutions and courses (ranging from transport, economics, engineering to computer science, IT and statistics) in developing innovative and practical education programs that could provide the long term mix of the ‘non-traditional’ skill sets that the rail industry may need. Given constraints on education budgets, it may be worthwhile to consider whether rail (or broader transport) agencies could even sponsor specific existing or new courses, or at the least, target numbers of agency staff that would benefit from studying to provide the education sector with a certain baseload funding. Sponsorship of courses would also help provide rail organisations and firms with a direct promotional route to students studying ‘non-traditional’ subjects, and position them as being dynamic, leading centres in their own right in this space.

Taking a collaborative approach

Finally, as with more ‘traditional’ skill sets and functions, a collaborative approach will be required between the public sector, private industry and education providers. While industry will be a key player in the solution to the rail industries looming skills gaps, it will require assistance from the government and the training sector to deliver the solution.

⁶⁶ Smart Rail Route Map Interim Report, October 2018 (draft)

6.1.7 Developing a stronger and younger rail brand

While mention has already been made of the perceived ‘negatives’ of the existing rail brand – and how it might be detracting potential new entrants to the industry – participants of the deep dive discussions also thought this represented fertile ground for improvement, with the many ‘positive’ messages of rail needed to be better communicated through a national, modern branding strategy, as what has been done in other industries such as defence and mining. For one thing, rail was seen as a more steady and reliable employer than tech companies, when competing for ‘future skills’ in data analysis, management and engineering:

“Rail doesn't have a brand if you ask me. If you look at the two biggest drivers of the NASDAQ, its high-tech companies, right? There's brand and IP, intellectual property. Rail is stable to start with. Rail networks don't disappear overnight, high tech companies can.”

And the industry should also take advantage of the modern, new infrastructure being delivered, to boost their brand to a young audience:

“One of the biggest brand opportunities that we've got now is around the Metro... The Metro is different. It's attractive, it's sexy. And that gives you the avenue to go and work in any major cities around the world at the moment.”

Recommendation 36

The rail industry does not have a brand which attracts the best talent and a diverse workforce. An industry level approach is required to develop and lead marketing and branding for all rail organisations.

Here, it was felt that other industries, such as defence, had shown the way for the rail industry by establishing a national, coordinated highly visible (radio, print, television and cinema) marketing plan targeted at young people to highlight the benefits of working in that industry, with a particular focus on access to training, adventure, travel, financial rewards and a healthy and varied lifestyle. The dynamic jobs website portal for defence, www.defencejobs.gov.au, includes a promotion for leaving high school students to experience a ‘gap year’ in defence, with further information for students from high school through to university graduates as well as positive information for their parents and guardians who are seen as key influencers.

While there is online information on career pathways in rail through <http://www.railcareerpathways.net.au/> and www.railcareers.net.au there appears very little coordination in terms of a jobs portal or website for rail in Australia and New Zealand that convincingly promotes the benefits of a modern rail industry to young people. As noted in one industry sounding:

“I don't think it's any more complicated than having a joint kind of advertising portal or website, where we all post all our jobs on a rail industry website, so we've got a bigger magnet to draw more talent in. We all subscribe to it, we all pay for it.”

While a national marketing strategy was seen as important to building the brand, participants also believed that better branding could also take place within the education system by promoting rail in STEM subjects at high school:

"In terms of creating a pipeline that brings more young people, more girls, into engineering...Imagine if government or the ARA or somebody big enough to actually do this, said, "Okay. We're going to award the prize to the top student in every high school across state in the STEM subjects."

Recommendation 37

The rail sector is not on the radar of most school leavers and graduates. The industry should seek inclusion on curricula within TAFE and universities and highlight rail sector skills shortages which should be on industry skill shortages lists.

Recommendation 38

The Rail Careers website needs to be better utilised as a 'one stop shop' which promotes rail as a distinct industry and links to job opportunities. A whole of Australia and New Zealand railways career opportunities and jobs portal should be developed, similar to those created by other successful brands such as defence and mining.

Recommendation 39

Existing pathways information available online needs to be linked to promotional industry material and jobs portal. All existing education pathways information for the rail industry should be updated and consolidated and linked to an Australasian career and jobs portal.

Promoting rail to high school and university students could also be achieved through exhibiting some of the 'shinier' new technologies that the rail industry has to offer, including the new train driving simulators in Australia and New Zealand, new advanced maintenance facilities and control facilities for autonomous trains (as part of Sydney Metro, as well as Rio Tinto's Operations Centre in Perth). While many industry participants as part of this research had plans on their agenda to do this, very little is actually being done.

Overseas experience shows that effective promotion of the rail industry to students does not take a huge budget or human resources. The *Young Crossrail Programme* in the United Kingdom, for example, was run out of the project's Talent and Resources Directorate (who were also responsible for the project's Skills and Employment and Equality strategies) and consisted of two staff members: a programme manager and a programme coordinator. They were responsible for developing and delivering all Young Crossrail activities, engaging with partner schools and managing the Young Crossrail Ambassadors (volunteers from across the project helping to support Young Crossrail activities).

Recommendation 40

There remains a low tech, and male dominated, image of the industry amongst younger people. All rail 'megaprojects' (> \$1 billion) should be bound to develop strategies to engage with the community and education sectors as part of their operations, with senior executives taking the lead to volunteer their time.

A key lesson learned from the Young Crossrail Programme was that success, to a large degree, hinged on senior management buy-in to the programme and willingness to be volunteers in reaching out to schools and students. Both the project's Chairman and Chief Executive volunteered at events and this positivity towards engagement with students and teachers became embedded in the organisational culture.⁶⁷

Case Study – Sydney Metro Skills and Employment Advisory Group

Sydney Metro Northwest established the 'Skills and Employment Advisory Group' (SEAG), a strategic stakeholder forum, to support the delivery of the WFD strategy and associated programs

The SEAG members includes a mixture of Industry, Government, Peak Body, Employer and Training Organisations, all having a mutual interest in the delivery of Sydney Metro workforce objectives and can provide expertise and funding to support delivery. The collaborative delivery model developed with SEAG partners brings together demand and supply sides, through government agencies and peak bodies working with international joint ventures and domestic supply chains.

The resultant Sydney Metro Northwest programs are unique in scale and scope. They provide for new entrants through to skilled workers, and across strategic skills sets and occupations required for Sydney Metro and other future projects. Examples include:

- Tunnel competency program developed in partnership with SkillsDMC and Thiess, John Holland, Dragados JV (TJHD), providing the first accredited induction training, and transferable skills and competencies for all 1000 operatives.
- Pre-employment training programs developed in partnership with Department of Employment, TAFE NSW and Sydney Metro contractors, providing skills and employability training for unemployed local people, leading to job outcomes with Sydney Metro contractors. The program currently has a 95% completion rate and a 78% employment rate.
- Addition of Process Manufacturing traineeship to NSW Skills List and subsequent delivery of new program at Sydney Metro pre-cast yard.
- Development of Industry Skills Fund application following Sydney Metro-led negotiations with Commonwealth Department of Education and Training, to extend the fund to consortia applications.
- Work experience opportunities for TAFE students and apprentices with Sydney Metro contractors.

⁶⁷ Hillier, L (2016) *Young Crossrail Programme*, Crossrail Learning Legacy. Viewed 8th October
<https://learninglegacy.crossrail.co.uk/documents/young-crossrail-programme/>

Branding partnerships with other industries

Finally, the rail industry may or may not be aware that it is *not the only* transport sector with skills risks which believes it is struggling to project a stronger, attractive brand to future employees.

Recent workforce capability modelling and industry soundings undertaken by BIS Oxford Economics for Austroads⁶⁸ – the umbrella group representing all jurisdictional road authorities in Australia and New Zealand as well as local government – reveals similar concerns in the Australian and New Zealand roads industry. As with the rail industry, the roads sector is also facing challenges in terms of the delivery of infrastructure, meeting changing skills requirements wrought by new technologies (including autonomous vehicles, intelligent communications systems, smart motorways and an explosion in big data), as well as changes to the function of roads agencies themselves as their higher strategic functions are absorbed into broader transport agencies. As with rail, the roads industry also sees technological change not only as a route towards improvements in productivity and efficiency (which may help mitigate against future workforce capability challenges), but also an opportunity to diversify its workforce.

Consequently, as the rail industry works on improving its brand, there may be benefits and ‘economies of scale’ in working with other large industries such as roads, and also mining, whilst also pursuing distinctly rail branding exercises. This may involve the development of a “Future Transport” portal, for example to attract digital and technological skills into both road and rail industries from the education sector. Branding partnerships could also be developed with the mining industry, given the strong take up of new rail technologies in that sector and its importance and high profile in the Australian economy.

Recommendation 41

There is scope to leverage marketing and branding with related industries facing similar challenges. Partnerships should be sought with related industries, such as roads and mining, to produce joint branding campaigns that highlight new technologies and promote a more diverse workforce.

6.2 SUGGESTED ACTIONS

According to quantitative modelling of demands, as well as feedback from the rail industry in recent soundings, the rail industry in Australia and New Zealand faces significant risks to workforce capability over the coming decade.

Through the findings of this workforce capability analysis, both quantitative and qualitative, a range of actions have been identified which can assist the rail industry in navigating these risks to workforce capability, now and through the coming decade, although the likely benefits of these actions will be accrued in the years beyond the scope of this report.

Achieving these actions will likely require ‘industry champions’ to step up and take responsibility. Given the themes developed, the key actions recommended

include the development of an over-arching taskforce with inter-jurisdictional and cross portfolio government membership, as well as industry and education representation, with a charter to cover the three critical areas of need:

- **Developing and regularly maintaining a rail project pipeline** and providing advice to governments regarding the impact of the pipeline on demands for skills across construction, operations, maintenance and manufacturing over the coming decade so appropriate skills targets can be set or other pipeline actions taken.
- **Advocating for education reform and fit-for-purpose training**, working closely with the states and industry to coordinate their needs and avoid duplication. The function of the taskforce here will include identifying the need for additional centres of excellence and skills academies, stripping out unnecessary training requirements, addressing inconsistencies between the states to aid transferability of skills and reducing barriers for international workers.
- **Enhancing the attractiveness of working in the rail industry.** Working with industry to help facilitate improving the attractiveness for entrants into apprenticeships and cadetships and raising the profile of the rail industry at schools and higher education institutions.
- **Working with industry to boost the attractiveness of the sector**, helping to develop a consistent, strong brand for the rail industry across Australia and New Zealand. An immediate task here should be to develop a rail careers portal showcasing the industry and linking to all jobs available across the industry in Australia and New Zealand.

These actions are shown in the following table and are organised by theme, with a suggested time period where this action will become critical. It should be noted that, as arising from industry consultation, some actions similar to those proposed are already in progress, and some similar recommendations may have arisen from other recent industry reviews.

However, these actions may not be occurring consistently across all jurisdictions in Australia and New Zealand, and there may also be differences in the capability of some jurisdictions to undertake some of these recommendations. Given this it would be important for the over-arching taskforce to work with all industry stakeholders to regularly review progress on capability-enhancing initiatives and identify where there are barriers to implementation.

Table 6.2: Challenges and Suggested Actions

Item #	Issue	Proposed Action	Responsibility / Approaches	Priority / Timing
Establish taskforce to drive workforce capability program				
1	Market failures in the rail industry, including monopoly characteristics, lack of economies of scale, externalities in training and operations and network effects are hindering the provision of a sustainable, sufficiently skilled workforce.	A taskforce should be established, with representations from all state jurisdictions, the national governments of Australia and New Zealand, representatives from the VET and Higher Education sectors, as well as the private sector. This is a broader version of a Commonwealth coordinating body that was recommended by the Senate References Committee in its 2017 Report.	The ARA should engage with Transport and Infrastructure Council members in Australia and counterparts in New Zealand to form a taskforce, supported by the development of a national rail ministerial portfolio.	Immediate
2	The lack of harmonisation in determining workforce capabilities requirements for different occupations is an impediment to industry productivity.	A unified approach to skills development building on the successful elements of existing industry practices and mapping skills demand to training competencies.	The taskforce should work towards developing an overarching rail skills strategy.	0-2 years
Smoothing the rail investment pipeline				
3	A managed Rail Pipeline needs coordination of national, state and private sector investment plans, as well as agreed steps to meeting capacity and capability concerns.	The different jurisdictions should work together to consider the implications of the rail investment pipeline – and the broader infrastructure pipeline – for workforce capacity and the opportunities to avoid the emergence of significant capacity constraints resulting in lengthy delays and cost blowouts for the industry.	The taskforce should work with stakeholders to consider options for smoothing the pipeline.	Immediate
4	Investment plans need to be visible, and major projects' direct impacts on skills mapped.	A dynamic database of all major (>\$50 million) public and private sector rail projects in Australia should be established and updated regularly, with clear links to their specific demand for skills in the construction and operations phases, including manufacturing and maintenance skills for rollingstock.	Plans can be published regularly by the taskforce through consultation with its stakeholders using Infrastructure Partnerships Australia's Australia and New Zealand Infrastructure Pipeline (ANZIP) as a base. Impacts on skills demand, by project, can be undertaken in conjunction with industry experts.	0-2 years

Item #	Issue	Proposed Action	Responsibility / Approaches	Priority / Timing
5	Advice should be provided to relevant national governments and other stakeholders where demands from the pipeline lead to capability risks.	Growth in skills demand determined by the pipeline should be closely monitored at regular intervals, and new rail projects added to the pipeline assessed in terms of their impact on skills.	The taskforce can provide advice to governments based on evidence from analysis.	0-2 years
Reforming current systems of education and training				
Creating Stronger Education Partnerships				
6	With some exceptions, the switch from operator to contractor delivered training has negatively impacted on quality of training provision.	Need stronger partnerships with operators as they have the access to the critical learning environments. Industry needs to play a key role in skills training to ensure that trainees are job ready. Consider the provision of incentives for companies undertaking training in areas of particular need.	<p>Taskforce function to establish / call on expert input to:</p> <p>a) foster closer partnerships between funders and providers of rail education and training, across the private and public sector</p> <p>b) establish a committee to review and develop minimum standards for competency for rail occupations that will apply across all jurisdictions and to eliminate unnecessary competencies</p> <p>c) seek out the most effective methods for</p>	Immediate
7	Most training providers don't have an authentic learning environment.	A number of specialist facilities have been successfully established to provide rail skills training with backing from state/territory governments and/or industry. However, additional private sector training programmes will be required to meet the projected demand for skills and these will need to be carefully regulated to ensure that they meet competency requirements.		Immediate
8	Safety-risk associated with workers having the necessary qualifications but no real-life experience and through interaction with new technologies.	Adherence to ONRSR requirements and participation in the Rail Industry Worker process will help mitigate safety risks. However, the combination of strong demand for workers, the increasing casualisation of the workforce, the introduction of new technologies and the lack of harmonisation between operating environments requires careful management to ensure safety standards are maintained.		Immediate
9	There is insufficient demand for some specialised rail training for commercially viable VET provision.	Rail organisations should work more closely with the VET sector to provide critical mass for key training programs to ensure their sustainability.		0-2 years

Item #	Issue	Proposed Action	Responsibility / Approaches	Priority / Timing
10	Individual rail training facilities and organisations have insufficient incentive/capability to invest in new capacity and programs.	Government needs to provide incentives/support to facilitate increased direct investment in training facilities or the funding of training programs and staff.	ensuring competency standards are maintained	0-2 years
11	New technologies, systems and processes will change the mix of skills required.	Rail industry to engage more closely with universities and the VET sector – as well as high schools – to promote rail as a destination, but also to ensure the right types of skills are being developed.		0-5 years
Streamlining what needs to be learned				
12	Some qualifications overly prescriptive; not all units relevant.	Where appropriate, qualifications should be modularised so that there is a 'building block' approach to training, allowing workers and employees to only acquire the units necessary for a required competency.	Taskforce in conjunction with AIS Rail Industry Reference Committee to establish / call on expert input to: <ul style="list-style-type: none"> a) foster closer partnerships between funders and providers of rail education and training, across the private and public sector b) establish a committee to review and develop minimum standards for competency for rail occupations that will apply across all jurisdictions and eliminate unnecessary competencies c) seek out the most effective methods for ensuring competency standards are maintained 	0-2 years
13	Project/operator specific training requirements not always necessary from a competency perspective.	Modularisation of qualifications would allow greater transferability of skills within the industry, allowing similar qualifications to comprise a number of standard foundation units and, if required, a number of additional project/operator specific units		0-2 years
14	There is a lack of transferability of skills between jurisdictions.	The modularisation of qualifications should be applied at a national level, whilst efforts to standardise minimum requirements across jurisdictions should remain an ongoing process		0-2 years
15	VET sector resources are stretched by the need to provide competencies which may not be necessary in some jurisdictions.	Courses provided by the VET sector should focus on foundation skills for entry into the rail sector and a range of 'top-up' skills required to keep workers' qualifications current.		0-2 years
16	There is an element of unnecessary duplication of knowledge.in meeting competency requirements across industry.	Industry should work towards harmonising competency standards – separating core competency requirements from domain specific knowledge requirements and continue to develop national matrices.		Taskforce to work with stakeholders to meet this action.

Item #	Issue	Proposed Action	Responsibility / Approaches	Priority / Timing
Creating stronger pathways for workers and trainers				
17	Many students are unaware of the benefits of learning trades for the rail industry.	Use rail megaprojects (> \$1 billion) and potentially partner with other industries, such as roads, defence and mining, to promote trades careers to primary and high school students.	Taskforce should advocate for publicly funded rail initiatives to internalise the costs of promoting rail and rail skills in the areas they are taking place and consideration should be given to whether industry should establish a career promotion fund.	Immediate
18	There is a need to accelerate trades training to meet high demands currently and in the near future.	Investigate, develop and promote rail-usable trades courses for studying as part of high school qualification.	Taskforce to work with stakeholders to develop recommendations.	Immediate
19	Apprenticeships and cadetships traditionally offered a route into industry, although this pathway weakened following competitive reforms in the 1980s and 1990s.	Public and private sector rail organisations to raise the number of traineeships, cadetships and apprenticeships made available each year.	ARA and RWDC to work with stakeholders to develop template to facilitate companies offering cadetships.	Immediate
20	Current government initiatives to boost apprentices and traineeships are focused on construction skills, not operations, maintenance and manufacturing.	Existing state government skills programs that demand inclusion of apprentices and trainees on major projects could be expanded to look beyond construction and also consider operations and manufacturing skills.	Governments should extend current skills programs to further rail projects and across a wider range of disciplines beyond construction.	0-2 years
21	Market failures in the provision of training, and low pay for trainees and apprentices may limit growth in new skills.	Existing incentive schemes for companies to take on apprentices and trainees are considered difficult to access and are not generally well understood. Need to improve visibility and accessibility of schemes and potentially extend and expand coverage.	Taskforce to review the existing schemes to establish a uniform system and identify gaps.	0-2 years
22	Engineering students may have limited exposure and opportunities to rail applications at university.	Work with universities and institutes in promoting rail-oriented professional skills development at the tertiary level, including expanding the number of rail engineering courses.	Taskforce to work with stakeholders to meet this action.	0-2 years
23	There is a shortage of educators and trainers.	Employers need to enhance the attractiveness of training to employees as a complementary or alternative career path.	Taskforce to work with stakeholders to meet this action.	0-2 years

Item #	Issue	Proposed Action	Responsibility / Approaches	Priority / Timing
24	Difficult to attract infrastructure workers into becoming trainers.	Need to incentivise employees to become trainers by providing appropriate remuneration, enhancing the status of training, and giving workers the option to continue in their existing role as well – if desired.	Taskforce to work with stakeholders to meet this action.	0-2 years
25	Trainers often have insufficient experience of a live environment.	Industry experts could work alongside educators enabling them to learn from each other. This would fast track the trainers from a competency perspective and the experts from a training perspective.	Taskforce to work with stakeholders to meet this action.	0-2 years
26	Difficult to get industry to release trainers.	Needs to be a balance between not impacting delivery schedule, whilst being innovative about the ways people are brought in and supported. Greater co-operation required to prevent a myopic approach to meeting demand.	Taskforce to work with stakeholders to meet this action.	0-2 years
Enhancing productivity of the existing workforce				
27	There are barriers to the international immigration of skills which may affect best practices and transfer of industry knowledge.	Reform migration and accreditation policies so that 'best practices' and innovative technologies from offshore can be more readily deployed in Australian and New Zealand rail systems.	Taskforce should work with national governments and accreditation agencies to improve recognition of international qualifications and minimise unnecessary retraining.	Immediately
28	Historical differences in rail standards and systems prevent transfer and mobility of rail workforce across jurisdictions.	Continue to focus on further harmonisation in standards and systems used across rail jurisdictions in Australia and New Zealand.	Rail Industry Safety and Standards Board (RISSB) to action this point.	0-5 years
29	Different jurisdictions continue to adopt different technologies and systems which will require different training and competencies.	As new technologies are developed, focus on increasing the harmonisation of technological systems and approaches across jurisdictions.	Rail Industry Safety and Standards Board (RISSB) to action this point.	0-5 years
Using procurement as a skills strategy				
30	Current contracting arrangements based on lowest price do not support long term investment in skills.	Leadership at the Australasian level to highlight to procuring governments the importance of longer term value in contracting which includes the provision of training which will leave employees with skills that can be transferred from construction to operations activities.	ARA and Industry Capability Network bodies in each state, coordinated by ICN nationally, to advocate for skills targets to be included in success criteria for tendering major rail projects.	0-2 years

Item #	Issue	Proposed Action	Responsibility / Approaches	Priority / Timing
Strengthening workforce retention strategies				
31	Apprentices, trainees and cadets may not necessarily be offered employment upon completion of their training period.	Public and private sector rail organisations to quantify and target growth in graduate retention rates.	Individual rail organisation responsibility. RWDC to provide recommendations.	Immediately
32	The industry faces a significant loss of skills through retirement in the coming decade.	Older workers to be provided opportunities to extend their careers through more flexible working arrangements, mentoring and training.	Individual rail organisation responsibility. RWDC to provide recommendations.	Immediately
33	Loss of key personnel has to potential to affect business unit capability	Increase the robustness of 'knowledge management' systems within rail organisations so capability is retained despite staffing changes.	Individual rail organisation responsibility. RWDC to provide recommendations.	Immediately
34	New young employees ('millennials') are more likely to leave their employer seeking diversity in skills development	Rail organisations to develop more dynamic 'starter' roles for trainees, apprentices and cadets that allows them to have a more diverse experience of the industry within their first 2 years.	Individual rail organisation responsibility. RWDC to provide recommendations.	Immediately
35	Younger employees, including 'millennials' may be unaware of the variety of roles available with rail organisations or across the rail industry.	Establish connectivity as a core function of human resource systems within rail organisations, to encourage younger employees to move <i>within</i> rail businesses rather than exit the business or industry for a career change.	RWDC to investigate interest from industry in establishing group training programs which allow trainees to transition between employers.	Immediately
Developing a stronger rail brand and visibility for the sector				
36	The rail industry does not have a brand which attracts the best talent and a diverse workforce.	An industry level approach is required to develop and lead marketing and branding for all rail organisations.	ARA and RWDC to investigate options for establishing an industry wide marketing function to be funded by ARA members, but staffed by professionals with expertise in branding, marketing and promotion.	Immediately
37	The rail sector is not on the radar of most school leavers and graduates.	Seek inclusion on curricula within TAFE and universities and highlight rail sector skills shortages which should be on industry skill shortages lists.		0-2 years
38	The Rail Careers website needs to be better utilised as a 'one stop shop' which promotes rail as a distinct industry and links to job opportunities.	Develop a whole of Australia and New Zealand railways career opportunities and jobs portal, similar to those created by other successful brands such as defence and mining.		0-2 years

Item #	Issue	Proposed Action	Responsibility / Approaches	Priority / Timing
39	Existing pathways information available online needs to be linked to promotional industry material and jobs portal.	Update and consolidate all existing education pathways information for the rail industry and link to an Australasian career and jobs portal.		0-2 years
40	There remains a low tech, and male dominated, image of the industry amongst younger people.	All rail 'megaprojects' (> \$1 billion) should be bound to develop strategies to engage with the community and education sectors as part of their operations, with senior executives taking the lead to volunteer their time.		0-5 years
41	There is scope to leverage marketing and branding with related industries facing similar challenges.	Partnerships should be sought with related industries, such as roads and mining, to produce joint branding campaigns that highlight new technologies and promote a more diverse workforce.		0-5 years

7. APPENDIX - MODELLING METHODOLOGY

The methodology used in the quantitative analysis in Section 4 involves, firstly, the estimation of a skilled (rail) labour ‘usage coefficient’. This is the amount of labour that is currently required to perform a certain volume of rail-related activity. Then, projections of end use sector activity over the decade to 2027 have been translated, using these coefficients, into forecasts of future skilled labour demand.

Given the timeframe of the study, attrition of the existing workforce through ageing (e.g. via retirement and death) also becomes an important issue. The existence of workforce attrition means that the total additional skilled labour workforce requirement will end up higher than the total labour demand estimated by changed end use sector activity alone. This is because skilled labour also must be found to replace existing skills lost because of the ageing workforce.

The second step therefore involves the comparison of the expected *demand* for skilled labour with our projected levels of labour *supply*. The difference between the total labour demand and the size of the existing workforce is referred to as the ‘workforce gap’. This gap, when positive, will need to be met by additional supply if projected levels of end use sector activity are to be achieved.

7.1.1 Defining the rail sector

The task of identifying a rail workforce is complicated by the fact that there is no precise ABS definition of a ‘rail’ industry sector. While ABS Census data does have ‘Rail Transport’ as an industry category, the reality is that using only Census data from this industry sector would, in our view, severely underestimate the size of the rail workforce.

Consequently, BIS Oxford Economics considers that the rail sector not only includes the ‘Rail Transport’ sector but also a proportion of people employed in Construction, Manufacturing, and Freight/Transport Services. The size of the rail industry labour force has been estimated based on the 2016 Census for Australia and 2013 Census for New Zealand. To bring the New Zealand Census data and our rail industry estimates up to date, we have estimated data for New Zealand guided by known changes in industry sector activity since 2013.

7.1.2 Forecasting future skilled labour demand

The approach taken by BIS Oxford Economics to forecast future skilled labour demand is similar to other demand forecasting exercises we have undertaken for clients operating in the roads and the building and construction sector. That is, we firstly relate our estimates of ‘base year’ demand to an appropriate ‘base year’ activity indicator to derive a ‘usage coefficient’ per unit of end use sector activity. We then apply this usage coefficient to our forecasts of the activity indicator to derive forecasts of future demand.

In this case:

- Base year demand is estimated skilled employment in the rail sector in FY18.
- “End use” activity indicators chosen for the sector are:
- Construction activity
- Rail capital stock (in terms of track length)⁶⁹

That is, the model assumes that future changes in demand for skilled labour in the rail sector are driven by changes in rail construction activity and maintenance/operations activity via the size of the capital stock.

Activity indicator Data Sources

End use activity indicator data is drawn from the ABS, BITRE, company annual reports, as well as BIS Oxford Economics estimates.

Rail construction data is sourced from the ABS category of engineering construction — railways and tramways from the ABS publication: Engineering Construction Activity, Australia (Cat. No. 8762.0). Forecasts of rail construction activity to FY27 are sourced from BIS Oxford Economics’ regular multi-client report, Engineering Construction in Australia 2018. This report uses both bottom up (e.g. project lists, Federal and State Budget papers, capital programs of state authorities etc.) and top down approaches to reconcile the forecasts. The top-down modelling ensures the forecasts are consistent with historical levels of investment and with our assumptions of the economic environment, public sector capital expenditure cycle and the private investment cycle.

Historical rail track length figures have been sourced from BITRE’s infrastructure yearbook and validated against published annual reports and our own estimates. Forecasts to 2027 have been estimated by BIS Oxford Economics for each Australian state and territory using as an input the detailed projects lists from our report Engineering Construction in Australia 2018. These project lists detail new track additions and upgrades, allowing us to examine expected changes to the asset stock.

Usage Coefficients

Usage coefficients were derived, firstly, by apportioning the estimated base year rail workforce, by occupation, across the relevant activity indicators. That is, the model assumes that demand for a set proportion of each occupation of the workforce is driven by changes in either construction activity or changes in the net capital stock of rail track.

It is important to note that changes in the value of usage coefficients can affect the size of the perceived workforce deficit or surplus quantified by the model. This is because the choice of coefficient changes the degree to which workforce demand is altered by an activity indicator such as, say, rail construction activity (which is relatively volatile from year to year) as compared

⁶⁹ While ABS data on rail industry employment is noisy and difficult to compare over time due to changes in methodology, it is clear rail operations had undergone a period of significant transition in the 1980s and 1990s, seeing significant reductions in employment. This occurred despite continued growth in the rail freight and passenger task. Automation and mechanisation were key factors in this shift. Over the 2000s and 2010s, rail operations employment has remained trend flat, again despite significant growth in the freight and passenger task. As a result of this we have chosen to avoid using the rapidly growing freight/passenger task as an ‘end use’ activity indicator, opting instead for the more stable track length measure.

to rail maintenance or operations work (which generally exhibits a slow change over time). A strong and increasing outlook for rail construction activity, for example, coupled with a high coefficient of workforce demand allocated to construction activity will drive a stronger overall demand for labour than if the coefficient allocated to construction were lower.

Once usage coefficients are determined, forecasts of future skilled labour demand are then generated by applying these “fixed” coefficients to BIS Oxford Economics’ projections of future activity in each end use activity segment.

7.1.3 Modelling workforce attrition

The total rail workforce requirement to meet future rail activity will inevitably be increased by the attrition of the existing workforce through ageing effects; particularly through retirement and death. In order to augment the model to allow for workforce attrition, we include assumptions regarding the approximate age profile of the workforce (based on ABS census data), and the likelihood of retirement or death of persons in each age group (based on various ABS civilian population data series).

The figure below provides estimates of the current rail workforce age composition for the broad occupation clusters used in this analysis. The Machinery Operators and Drivers group has the greatest share of workforce aged over 54 years (25.3%), followed by Managers (22.3%) and then Sales Workers (22.3%). These occupation groups will tend to feature greater rates of attrition than the other groups considered in this analysis. However, this is likely less of an issue for managers (as seniority is to be expected to a large degree).

Table 7.1: Estimated Age Profile of the Rail Construction and Operations Workforce by Group

Occupation Group	Age Bracket							
	15-24	25-34	35-44	45-54	55-59	60-64	65-69	70+
Managers	4%	19%	27%	27%	11%	7%	3%	2%
Professionals	6%	31%	27%	19%	7%	5%	2%	1%
Technicians and Trades Workers	15%	28%	21%	20%	8%	5%	2%	1%
Community and Personal Service Workers	16%	26%	21%	20%	8%	5%	3%	1%
Clerical and Administrative Workers	8%	21%	24%	26%	11%	7%	3%	1%
Sales Workers	19%	16%	19%	23%	11%	7%	3%	1%
Machinery Operators and Drivers	4%	18%	22%	30%	14%	8%	3%	1%
Labourers	15%	24%	21%	22%	10%	6%	2%	1%
Total	11%	24%	23%	23%	10%	6%	3%	1%

7.1.4 Broad assumptions

The baseline scenario used here is described as “The Business as (Almost) Usual” scenario. Under this scenario there is only very gradual development in new technologies which take much longer to disrupt the rail transport industry. Agencies will still need to plan for technological change, but these changes do not create significant impacts over the next decade. With little relative change in transport technologies, there are expected to be only minor changes to rail funding through existing regimes and therefore it is assumed that the current agency roles to delivery, asset management and regulation are largely maintained. As a consequence, ‘baseline’ usage coefficients are assumed to remain steady.

The projections are calculated based on BIS Oxford Economics’ baseline rail construction forecasts and assumes a 1.5 per cent annual improvement in labour productivity across all construction related skills.

The model attempts to focus on persistent skill gaps. These are skills gaps that are unlikely to be filled by simply raising wages due to industry and economy wide shortages of staff that meet minimum certification/skills requirements. In this case, raising wages would simply shift the skill gap elsewhere unless minimum requirements are made laxer or supply is increased. In this “Business as (Almost) Usual” scenario we have assumed the former approach is not feasible.

7.1.5 Limitations of the model

A key limitation of the model is that the measurement of requirements in terms of labour or ‘personnel’, not necessarily skills and experience. Obviously, the role of a retiring skilled professional with many years of experience cannot be matched by a new graduate. This is particularly true when supply is focused on new graduates, but the impact may be lessened by the hiring of personnel from other industries, or via immigration, where existing skills and experience may be higher.

Another key limitation concerns the resolution of the model. We have estimated the existing employment gap by occupation by modelling a combination of ABS census data, ABS employment data and the Department of Jobs and Small Business’ Internet Vacancy Index. This is to avoid the assumption that demand and supply are perfectly matched in the base year. Supporting this approach is that the aggregate results are in line with surveys conducted among the rail industry participants. However, we noted higher uncertainty among many of the smaller, more detailed occupation groups. To overcome this, we needed to impose a limitation on the model by limiting the level of occupational detail presented by aggregating occupation groups into broader categories where appropriate

7.1.6 Workforce composition and gap projections

In the tables following, along with the total employment for each occupation, we present our estimates of the workforce gap in FY18 for the individual Australian states and territories. We also present the projected gap into the future under the assumption that no new hiring is conducted to replace retirements. This is to illustrate the impact of retirements on future hiring considerations.

Table 7.2: New South Wales Estimated Total Rail Employment & Workforce Gap⁷⁰

Occupation Name	FY18 Employment	Workforce Gap (%)			
		FY 18	FY 21	FY 24	FY 27
Managers	4,013	0.9%	28.1%	40.9%	-2.6%
<i>Specialist Managers</i>	3,112	1.2%	28.9%	41.2%	-5.5%
Advertising, Public Relations and Sales Managers	143	2.0%	29.1%	42.1%	-9.3%
Business Administration Managers	359	0.7%	22.7%	33.8%	-0.1%
Construction, Distribution and Production Managers	2,354	1.4%	30.8%	43.3%	-6.9%
Construction Managers	1,855	1.8%	32.9%	45.5%	-10.0%
Engineering Managers	110	0.1%	28.6%	39.4%	-5.3%
Other/Unclassified Construction, Distribution and Production	389	-0.3%	19.5%	31.3%	5.7%
Other/Unclassified Specialist Managers	255	0.0%	18.3%	27.9%	0.3%
<i>Hospitality, Retail and Service Managers</i>	541	0.3%	18.5%	31.0%	10.2%
Call or Contact Centre and Customer Service Managers	91	0.3%	18.0%	31.7%	-0.3%
Rail Station, Transport Company, and Other Transport Services	316	0.3%	12.0%	20.3%	20.5%
Other/Unclassified Hospitality, Retail and Service Managers	135	0.1%	30.3%	46.2%	-10.6%
Other/Unclassified Managers	360	-1.3%	33.3%	49.7%	2.3%
Professionals	2,196	0.9%	23.0%	33.6%	-0.8%
<i>Business, Human Resource and Marketing Professionals</i>	688	0.8%	21.6%	31.7%	-0.2%
<i>Design, Engineering, Science and Transport Professionals</i>	1,035	1.0%	25.6%	36.8%	-2.9%
Architects, Designers, Planners and Surveyors	174	0.7%	25.9%	35.9%	-6.4%
Engineering Professionals	828	1.2%	25.6%	37.1%	-2.3%
Civil Engineering Professionals	443	1.7%	26.5%	39.5%	-1.0%
Electrical Engineers	155	0.6%	17.6%	25.5%	1.9%
Industrial, Mechanical and Production Engineers	133	1.0%	28.2%	38.4%	-8.1%
Other/Unclassified Engineering Professionals	97	0.1%	29.4%	40.1%	-8.2%
Other/Unclassified Design, Engineering, Science and Transport	34	-0.6%	22.4%	33.1%	-1.5%
<i>Occupational and Environmental Health Professionals</i>	83	1.0%	34.8%	46.5%	-7.2%
<i>ICT Professionals</i>	260	1.6%	12.7%	20.4%	4.3%
Other/Unclassified Professionals	130	-0.4%	18.2%	28.2%	5.4%
Technicians and Trades Workers	8,355	0.0%	15.0%	37.3%	-7.9%
<i>Engineering, ICT and Science Technicians</i>	1,083	1.1%	36.2%	47.9%	-16.8%
Architectural, Building and Surveying Technicians	793	1.4%	38.4%	49.8%	-19.7%
Other/Unclassified Engineering, ICT and Science Technicians	290	0.3%	29.1%	41.9%	-9.9%
<i>Automotive and Engineering Trades Workers</i>	1,302	0.3%	33.9%	48.5%	-6.3%
<i>Construction Trades Workers</i>	4,010	-0.4%	-13.6%	21.2%	-2.8%
<i>Electrotechnology and Telecommunications Trades Workers</i>	1,634	0.0%	26.5%	47.8%	-17.3%
Electricians	1,256	0.3%	25.7%	47.9%	-16.4%
Electronics and Telecommunications Trades Workers	339	0.1%	30.1%	48.2%	-18.5%
Other/Unclassified Electrotechnology and Telecommunications	39	-8.4%	21.0%	43.0%	-35.6%
<i>Horticultural Trades Workers</i>	106	-0.1%	1.0%	19.4%	2.6%
Other/Unclassified Technicians and Trades Workers	221	-0.1%	30.5%	46.8%	-17.6%
Community and Personal Service Workers	220	-0.1%	10.4%	19.4%	10.3%
Security Officers and Guards	54	0.2%	13.6%	26.0%	11.5%
Personal Service and Travel Workers	130	-0.3%	5.3%	10.9%	12.4%
Other/Unclassified Community and Personal Service Workers	36	0.0%	21.2%	33.6%	-0.3%
Clerical and Administrative Workers	2,914	0.2%	4.8%	19.6%	8.9%
<i>Office Managers and Program Administrators</i>	830	0.1%	4.7%	20.3%	7.5%
<i>Personal Assistants and Secretaries</i>	209	0.4%	6.4%	21.8%	10.6%
<i>General Clerical Workers</i>	475	0.3%	4.9%	20.9%	9.1%
<i>Inquiry Clerks and Receptionists</i>	224	0.2%	3.9%	17.2%	7.9%
<i>Numerical Clerks</i>	502	0.1%	4.9%	26.0%	7.4%
<i>Other Clerical and Administrative Workers</i>	623	0.1%	4.6%	12.2%	11.4%
Logistics Clerks	393	0.2%	4.4%	12.4%	10.1%
Other/Unclassified Other Clerical and Administrative Workers	230	0.1%	4.9%	11.7%	13.5%
Other/Unclassified Clerical and Administrative Workers	52	-0.2%	6.2%	19.3%	9.5%
Sales Workers	733	-1.1%	-0.2%	9.0%	12.8%
Ticket Salespersons	450	-1.8%	3.6%	10.2%	18.5%
Other/Unclassified Sales Workers	283	0.0%	-6.8%	7.3%	3.6%
Machinery Operators and Drivers	4,011	0.1%	17.1%	32.1%	11.2%
<i>Machine and Stationary Plant Operators</i>	750	0.1%	26.5%	42.1%	0.0%
Train Controllers, and Railway Signal, Track Plant and Other	389	0.2%	10.0%	21.0%	13.0%
Other/Unclassified Machine and Stationary Plant Operators	361	-0.1%	38.4%	54.7%	-18.1%
<i>Mobile Plant Operators</i>	533	0.5%	29.3%	54.5%	9.2%
<i>Road and Rail Drivers</i>	2,509	0.2%	9.1%	17.8%	16.3%
Train and Tram Drivers	2,201	0.3%	4.6%	10.6%	18.4%
Truck Drivers	222	0.2%	35.2%	51.4%	-13.9%
Other/Unclassified Road and Rail Drivers	86	-1.6%	24.8%	39.6%	16.1%
Other/Unclassified Machinery Operators and Drivers	219	-1.9%	26.3%	39.0%	-10.3%
Labourers	3,648	-0.4%	34.8%	47.2%	-18.7%
<i>Construction and Mining Labourers</i>	2,126	-0.5%	38.3%	50.8%	-30.6%
Railway Track Workers	340	-0.1%	20.3%	29.4%	7.2%
Other/Unclassified Construction and Mining Labourers	1,786	-0.6%	40.7%	53.2%	-39.9%
<i>Railways Assistants and Other Miscellaneous Labourers</i>	637	0.7%	17.8%	29.2%	12.5%
Other/Unclassified Labourers	886	-0.8%	35.0%	46.5%	-18.6%
Total	26,441	0.2%	18.9%	34.7%	-2.4%

⁷⁰ The workforce gap post FY18 is based on the difference between labour demand and supply, accounting for attrition through retirements and death. New supply is not considered here, thus this is the potential maximum workforce gap.

Table 7.3: Victoria Estimated Total Rail Employment & Workforce Gap⁷¹

Occupation Name	FY18 Employment	Workforce Gap (%)			
		FY 18	FY 21	FY 24	FY 27
Managers	4,062	0.9%	10.7%	24.9%	10.0%
<i>Specialist Managers</i>	3,134	1.3%	10.9%	25.1%	9.3%
Advertising, Public Relations and Sales Managers	177	2.0%	8.6%	21.1%	3.9%
Business Administration Managers	316	0.7%	8.7%	21.7%	8.8%
Construction, Distribution and Production Managers	2,463	1.4%	11.6%	26.2%	9.9%
Construction Managers	2,040	1.8%	12.2%	27.0%	9.8%
Engineering Managers	106	0.1%	10.4%	25.9%	12.9%
Other/Unclassified Construction, Distribution and Production	317	-0.3%	7.9%	20.5%	9.2%
Other/Unclassified Specialist Managers	177	0.0%	7.6%	20.3%	7.4%
<i>Hospitality, Retail and Service Managers</i>	431	0.2%	7.8%	20.0%	9.9%
Call or Contact Centre and Customer Service Managers	108	0.3%	4.6%	14.2%	2.1%
Rail Station, Transport Company, and Other Transport Services	189	0.3%	8.6%	18.4%	20.8%
Other/Unclassified Hospitality, Retail and Service Managers	135	0.1%	9.4%	26.1%	0.1%
Other/Unclassified Managers	497	-1.3%	12.0%	27.6%	15.2%
Professionals	1,976	1.0%	9.7%	21.4%	8.2%
<i>Business, Human Resource and Marketing Professionals</i>	643	0.8%	8.3%	19.7%	8.4%
<i>Design, Engineering, Science and Transport Professionals</i>	997	1.1%	10.9%	22.7%	7.8%
Architects, Designers, Planners and Surveyors	157	0.7%	9.3%	22.6%	6.7%
Engineering Professionals	829	1.2%	11.0%	22.4%	8.0%
Civil Engineering Professionals	465	1.7%	13.1%	23.3%	7.4%
Electrical Engineers	131	0.6%	4.9%	15.7%	7.7%
Industrial, Mechanical and Production Engineers	136	1.0%	9.7%	23.1%	8.2%
Other/Unclassified Engineering Professionals	98	0.1%	10.5%	25.1%	10.5%
Other/Unclassified Design, Engineering, Science and Transport	11	-0.8%	21.3%	41.3%	11.7%
<i>Occupational and Environmental Health Professionals</i>	111	1.0%	10.8%	25.4%	12.9%
<i>ICT Professionals</i>	146	1.6%	6.7%	15.7%	4.5%
Other/Unclassified Professionals	79	-0.4%	9.2%	22.7%	11.5%
Technicians and Trades Workers	10,939	0.0%	1.2%	8.8%	-19.1%
<i>Engineering, ICT and Science Technicians</i>	1,286	1.2%	11.9%	27.8%	10.4%
Architectural, Building and Surveying Technicians	976	1.4%	12.7%	29.1%	11.7%
Other/Unclassified Engineering, ICT and Science Technicians	311	0.3%	9.0%	23.7%	6.1%
<i>Automotive and Engineering Trades Workers</i>	1,377	0.3%	16.5%	31.2%	8.3%
<i>Construction Trades Workers</i>	5,816	-0.3%	-7.4%	-11.0%	-39.5%
<i>Electrotechnology and Telecommunications Trades Workers</i>	2,057	0.1%	3.8%	18.9%	-17.6%
Electricians	1,630	0.3%	3.5%	18.1%	-19.0%
Electronics and Telecommunications Trades Workers	389	0.1%	5.9%	22.7%	-10.0%
Other/Unclassified Electrotechnology and Telecommunications	37	-8.4%	-4.2%	15.6%	-40.1%
<i>Horticultural Trades Workers</i>	143	-0.1%	-0.9%	-1.2%	-12.0%
Other/Unclassified Technicians and Trades Workers	259	-0.1%	7.2%	22.5%	-4.6%
Community and Personal Service Workers	123	-0.1%	6.3%	13.8%	5.3%
Security Officers and Guards	28	0.2%	9.5%	21.1%	5.1%
Personal Service and Travel Workers	45	-0.3%	4.7%	9.7%	8.7%
Other/Unclassified Community and Personal Service Workers	50	0.0%	6.0%	13.1%	2.3%
Clerical and Administrative Workers	2,931	0.1%	2.3%	6.8%	-1.8%
<i>Office Managers and Program Administrators</i>	743	0.1%	1.3%	5.9%	-6.9%
<i>Personal Assistants and Secretaries</i>	144	0.4%	3.5%	9.5%	-5.7%
<i>General Clerical Workers</i>	399	0.3%	1.9%	6.8%	-6.9%
<i>Inquiry Clerks and Receptionists</i>	238	0.2%	1.9%	5.9%	-0.5%
<i>Numerical Clerks</i>	608	0.1%	2.1%	7.1%	-7.0%
<i>Other Clerical and Administrative Workers</i>	742	0.1%	3.3%	7.0%	8.0%
Logistics Clerks	314	0.2%	2.6%	6.3%	4.2%
Other/Unclassified Other Clerical and Administrative Workers	427	0.1%	3.8%	7.6%	10.7%
Other/Unclassified Clerical and Administrative Workers	57	-0.2%	3.0%	7.9%	2.8%
Sales Workers	892	-1.1%	1.2%	4.4%	6.0%
Ticket Salespersons	527	-1.8%	3.4%	9.0%	15.6%
Other/Unclassified Sales Workers	365	0.0%	-2.2%	-2.5%	-9.4%
Machinery Operators and Drivers	3,596	0.1%	10.1%	20.2%	8.6%
<i>Machine and Stationary Plant Operators</i>	779	0.0%	11.1%	24.7%	6.1%
Train Controllers, and Railway Signal, Track Plant and Other	380	0.2%	5.2%	12.7%	10.4%
Other/Unclassified Machine and Stationary Plant Operators	399	-0.1%	16.0%	33.2%	1.9%
<i>Mobile Plant Operators</i>	646	0.5%	21.1%	30.4%	-9.1%
<i>Road and Rail Drivers</i>	1,972	0.2%	5.5%	13.2%	14.8%
Train and Tram Drivers	1,660	0.3%	4.3%	9.4%	15.6%
Truck Drivers	240	0.2%	11.4%	30.4%	6.9%
Other/Unclassified Road and Rail Drivers	71	-1.3%	11.6%	27.8%	19.0%
Other/Unclassified Machinery Operators and Drivers	200	-1.2%	8.2%	23.8%	4.7%
Labourers	3,683	-0.4%	10.3%	29.3%	7.8%
<i>Construction and Mining Labourers</i>	2,461	-0.5%	9.8%	29.1%	4.9%
Railway Track Workers	300	-0.1%	8.5%	21.6%	17.7%
Other/Unclassified Construction and Mining Labourers	2,161	-0.6%	9.9%	30.0%	3.1%
<i>Railways Assistants and Other Miscellaneous Labourers</i>	508	0.7%	8.4%	20.9%	15.3%
Other/Unclassified Labourers	715	-0.8%	13.1%	34.7%	12.4%
Total	28,501	0.1%	5.6%	15.6%	-3.2%

⁷¹ The workforce gap post FY18 is based on the difference between labour demand and supply, accounting for attrition through retirements and death. New supply is not considered here, thus this is the potential maximum workforce gap.

Table 7.4: Queensland Estimated Total Rail Employment & Workforce Gap⁷²

Occupation Name	FY18 Employment	Workforce Gap (%)			
		FY 18	FY 21	FY 24	FY 27
Managers	2,027	0.6%	46.2%	59.7%	13.0%
<i>Specialist Managers</i>	1,384	1.0%	49.6%	62.8%	10.0%
Advertising, Public Relations and Sales Managers	75	2.0%	48.5%	60.2%	4.4%
Business Administration Managers	193	0.7%	38.0%	50.7%	13.3%
Construction, Distribution and Production Managers	955	1.2%	53.8%	66.9%	9.0%
Construction Managers	655	1.8%	59.3%	71.7%	5.3%
Engineering Managers	69	0.1%	40.2%	52.7%	15.4%
Other/Unclassified Construction, Distribution and Production	230	-0.3%	32.6%	45.4%	16.5%
Other/Unclassified Specialist Managers	162	0.0%	29.4%	41.2%	13.8%
<i>Hospitality, Retail and Service Managers</i>	454	0.3%	26.6%	38.7%	21.1%
Call or Contact Centre and Customer Service Managers	44	0.3%	39.0%	50.8%	5.7%
Rail Station, Transport Company, and Other Transport Services	307	0.3%	15.2%	24.9%	27.5%
Other/Unclassified Hospitality, Retail and Service Managers	103	0.1%	43.3%	55.8%	7.1%
Other/Unclassified Managers	189	-1.3%	52.6%	66.0%	14.4%
Professionals	1,646	0.8%	31.9%	46.0%	15.2%
<i>Business, Human Resource and Marketing Professionals</i>	574	0.8%	28.6%	40.1%	16.2%
<i>Design, Engineering, Science and Transport Professionals</i>	630	0.9%	39.0%	55.3%	13.1%
Architects, Designers, Planners and Surveyors	107	0.7%	38.4%	50.6%	11.7%
Engineering Professionals	479	1.1%	40.3%	57.4%	13.2%
Civil Engineering Professionals	218	1.7%	46.3%	66.9%	12.4%
Electrical Engineers	123	0.6%	23.2%	25.8%	15.8%
Industrial, Mechanical and Production Engineers	72	1.0%	43.3%	55.6%	11.1%
Other/Unclassified Engineering Professionals	66	0.1%	39.8%	52.4%	13.4%
Other/Unclassified Design, Engineering, Science and Transport	45	-1.0%	22.3%	36.5%	15.5%
<i>Occupational and Environmental Health Professionals</i>	139	1.0%	27.6%	39.7%	18.1%
<i>ICT Professionals</i>	178	1.6%	21.6%	31.4%	14.5%
Other/Unclassified Professionals	124	-0.4%	22.0%	33.1%	19.4%
Technicians and Trades Workers	4,563	0.1%	44.3%	55.6%	-12.4%
<i>Engineering, ICT and Science Technicians</i>	654	0.9%	49.6%	62.2%	9.3%
Architectural, Building and Surveying Technicians	366	1.4%	57.7%	69.5%	6.7%
Other/Unclassified Engineering, ICT and Science Technicians	288	0.3%	33.9%	46.1%	12.3%
<i>Automotive and Engineering Trades Workers</i>	986	0.3%	46.8%	67.6%	11.3%
<i>Construction Trades Workers</i>	1,638	-0.4%	35.0%	30.4%	-57.2%
<i>Electrotechnology and Telecommunications Trades Workers</i>	1,127	0.0%	49.1%	59.8%	-5.6%
Electricians	829	0.3%	50.4%	61.0%	-6.1%
Electronics and Telecommunications Trades Workers	270	0.1%	45.4%	56.2%	-3.7%
Other/Unclassified Electrotechnology and Telecommunications	28	-8.4%	43.6%	54.3%	-10.3%
<i>Horticultural Trades Workers</i>	36	-0.1%	31.1%	24.0%	-12.4%
Other/Unclassified Technicians and Trades Workers	122	-0.1%	52.0%	63.5%	-8.7%
Community and Personal Service Workers	221	-0.1%	15.4%	26.5%	16.6%
<i>Security Officers and Guards</i>	52	0.2%	20.9%	35.4%	17.4%
<i>Personal Service and Travel Workers</i>	128	-0.3%	9.0%	16.0%	16.9%
Other/Unclassified Community and Personal Service Workers	41	0.0%	25.2%	39.7%	14.4%
Clerical and Administrative Workers	1,931	0.2%	20.3%	31.4%	8.7%
<i>Office Managers and Program Administrators</i>	492	0.1%	22.5%	34.3%	4.3%
<i>Personal Assistants and Secretaries</i>	101	0.4%	26.5%	39.3%	8.4%
<i>General Clerical Workers</i>	299	0.3%	22.2%	33.7%	6.4%
<i>Inquiry Clerks and Receptionists</i>	120	0.2%	20.8%	31.7%	6.8%
<i>Numerical Clerks</i>	296	0.1%	28.9%	41.8%	-1.2%
<i>Other Clerical and Administrative Workers</i>	574	0.1%	10.8%	18.7%	16.8%
Logistics Clerks	416	0.2%	10.7%	18.6%	16.2%
Other/Unclassified Other Clerical and Administrative Workers	159	0.1%	11.0%	19.1%	18.4%
Other/Unclassified Clerical and Administrative Workers	48	-0.2%	16.2%	26.6%	13.2%
Sales Workers	425	-1.1%	8.8%	15.0%	13.6%
<i>Ticket Salespersons</i>	259	-1.8%	7.2%	15.4%	23.6%
Other/Unclassified Sales Workers	166	0.0%	11.3%	14.3%	-5.1%
Machinery Operators and Drivers	3,222	0.2%	28.4%	50.0%	16.3%
<i>Machine and Stationary Plant Operators</i>	710	0.1%	34.9%	53.7%	11.5%
Train Controllers, and Railway Signal, Track Plant and Other	455	0.2%	15.1%	26.9%	19.3%
Other/Unclassified Machine and Stationary Plant Operators	254	-0.1%	53.9%	71.7%	-6.0%
<i>Mobile Plant Operators</i>	371	0.5%	55.1%	80.6%	-17.6%
<i>Road and Rail Drivers</i>	2,031	0.2%	14.3%	24.2%	22.7%
Train and Tram Drivers	1,875	0.3%	8.3%	16.0%	23.6%
Truck Drivers	106	0.2%	57.7%	70.0%	-1.5%
Other/Unclassified Road and Rail Drivers	50	-1.4%	37.8%	52.9%	25.8%
Other/Unclassified Machinery Operators and Drivers	109	-1.4%	45.7%	58.4%	5.3%
Labourers	2,384	-0.2%	48.0%	59.1%	6.9%
<i>Construction and Mining Labourers</i>	1,498	-0.4%	50.5%	61.1%	2.2%
Railway Track Workers	661	-0.1%	15.2%	25.3%	21.6%
Other/Unclassified Construction and Mining Labourers	837	-0.6%	62.4%	71.1%	-17.6%
<i>Railways Assistants and Other Miscellaneous Labourers</i>	473	0.7%	25.6%	37.5%	21.7%
Other/Unclassified Labourers	413	-0.8%	54.9%	65.4%	5.1%
Total	16,634	0.2%	36.1%	49.6%	5.4%

⁷² The workforce gap post FY18 is based on the difference between labour demand and supply, accounting for attrition through retirements and death. New supply is **not** considered here, thus this is the potential maximum workforce gap.

Table 7.5: South Australia Estimated Total Rail Employment & Workforce Gap⁷³

Occupation Name	FY18 Employment	Workforce Gap (%)			
		FY 18	FY 21	FY 24	FY 27
Managers	1,779	1.0%	-3.0%	7.6%	9.1%
<i>Specialist Managers</i>	1,411	1.4%	-3.4%	7.1%	8.2%
Advertising, Public Relations and Sales Managers	73	2.0%	-4.4%	5.0%	4.9%
Business Administration Managers	106	0.7%	-5.4%	6.5%	7.9%
Construction, Distribution and Production Managers	1,167	1.6%	-3.0%	7.4%	8.6%
Construction Managers	1,028	1.8%	-2.8%	7.3%	8.3%
Engineering Managers	34	0.1%	-8.5%	7.1%	8.3%
Other/Unclassified Construction, Distribution and Production	106	-0.3%	-3.6%	8.1%	10.9%
Other/Unclassified Specialist Managers	64	0.0%	-5.8%	5.1%	6.4%
<i>Hospitality, Retail and Service Managers</i>	163	0.2%	-3.0%	5.9%	7.5%
Call or Contact Centre and Customer Service Managers	44	0.3%	-3.7%	2.9%	3.5%
Rail Station, Transport Company, and Other Transport Services	17	0.3%	-2.4%	14.7%	20.0%
Other/Unclassified Hospitality, Retail and Service Managers	102	0.1%	-2.9%	5.8%	7.2%
<i>Other/Unclassified Managers</i>	205	-1.3%	-0.1%	12.9%	17.1%
Professionals	571	1.0%	-6.5%	6.2%	6.4%
<i>Business, Human Resource and Marketing Professionals</i>	189	0.8%	-4.7%	6.4%	7.4%
<i>Design, Engineering, Science and Transport Professionals</i>	288	1.1%	-8.0%	5.6%	5.0%
Architects, Designers, Planners and Surveyors	61	0.7%	-6.3%	4.5%	4.2%
Engineering Professionals	222	1.3%	-8.4%	5.9%	5.2%
Civil Engineering Professionals	138	1.7%	-6.9%	5.8%	4.9%
Electrical Engineers	36	0.6%	-6.9%	4.8%	4.8%
Industrial, Mechanical and Production Engineers	31	1.0%	-11.7%	7.1%	6.5%
Other/Unclassified Engineering Professionals	18	0.1%	-19.1%	6.9%	4.9%
Other/Unclassified Design, Engineering, Science and Transport	5	-1.3%	-15.8%	7.3%	6.6%
<i>Occupational and Environmental Health Professionals</i>	48	1.0%	-4.6%	6.3%	7.7%
<i>ICT Professionals</i>	37	1.6%	-4.8%	6.5%	7.5%
<i>Other/Unclassified Professionals</i>	9	-0.5%	-14.1%	16.4%	16.3%
Technicians and Trades Workers	5,765	0.0%	-3.5%	2.4%	2.8%
<i>Engineering, ICT and Science Technicians</i>	642	1.2%	-5.1%	5.9%	6.3%
Architectural, Building and Surveying Technicians	529	1.4%	-4.5%	6.1%	6.6%
Other/Unclassified Engineering, ICT and Science Technicians	113	0.3%	-8.2%	4.9%	5.0%
<i>Automotive and Engineering Trades Workers</i>	844	0.3%	-4.5%	4.7%	5.8%
<i>Construction Trades Workers</i>	2,867	-0.4%	-1.6%	0.5%	0.8%
<i>Electrotechnology and Telecommunications Trades Workers</i>	1,121	0.1%	-7.5%	3.2%	3.1%
Electricians	874	0.3%	-7.0%	3.5%	3.5%
Electronics and Telecommunications Trades Workers	228	0.1%	-8.1%	3.1%	2.6%
Other/Unclassified Electrotechnology and Telecommunications	19	-8.4%	-22.7%	-6.0%	-8.6%
<i>Horticultural Trades Workers</i>	90	-0.1%	1.7%	4.3%	6.4%
<i>Other/Unclassified Technicians and Trades Workers</i>	201	-0.1%	-4.1%	3.0%	3.4%
Community and Personal Service Workers	198	-0.1%	2.4%	5.9%	9.3%
<i>Security Officers and Guards</i>	7	0.2%	-7.7%	6.7%	7.3%
<i>Personal Service and Travel Workers</i>	80	-0.3%	5.0%	9.1%	14.2%
<i>Other/Unclassified Community and Personal Service Workers</i>	111	0.0%	1.1%	3.4%	5.6%
Clerical and Administrative Workers	1,288	0.2%	1.2%	5.8%	8.7%
<i>Office Managers and Program Administrators</i>	379	0.1%	0.1%	4.5%	6.8%
<i>Personal Assistants and Secretaries</i>	80	0.4%	2.3%	7.9%	10.9%
<i>General Clerical Workers</i>	229	0.3%	1.3%	5.8%	8.5%
<i>Inquiry Clerks and Receptionists</i>	94	0.2%	0.4%	4.2%	6.2%
<i>Numerical Clerks</i>	344	0.1%	1.9%	6.9%	10.0%
<i>Other Clerical and Administrative Workers</i>	145	0.1%	2.6%	7.0%	11.0%
Logistics Clerks	94	0.2%	1.7%	6.0%	9.5%
Other/Unclassified Other Clerical and Administrative Workers	52	0.1%	4.1%	8.8%	13.8%
<i>Other/Unclassified Clerical and Administrative Workers</i>	17	-0.2%	-0.3%	4.8%	7.1%
Sales Workers	249	-0.2%	0.9%	2.3%	3.6%
<i>Ticket Salespersons</i>	16	-1.8%	4.4%	10.1%	17.3%
<i>Other/Unclassified Sales Workers</i>	233	0.0%	0.7%	1.8%	2.6%
Machinery Operators and Drivers	1,704	-0.1%	-0.4%	7.7%	11.6%
<i>Machine and Stationary Plant Operators</i>	460	0.0%	-3.3%	5.7%	8.1%
Train Controllers, and Railway Signal, Track Plant and Other	160	0.2%	1.9%	8.9%	14.4%
Other/Unclassified Machine and Stationary Plant Operators	300	-0.1%	-6.3%	3.9%	4.5%
<i>Mobile Plant Operators</i>	408	0.5%	-3.3%	5.2%	6.6%
<i>Road and Rail Drivers</i>	731	-0.2%	3.9%	11.1%	17.6%
Train and Tram Drivers	397	0.3%	6.2%	11.9%	19.5%
Truck Drivers	169	0.2%	-3.4%	7.8%	10.6%
Other/Unclassified Road and Rail Drivers	165	-1.9%	5.0%	12.8%	19.8%
<i>Other/Unclassified Machinery Operators and Drivers</i>	105	-1.7%	-7.3%	3.3%	4.4%
Labourers	1,888	-0.5%	-9.2%	3.4%	3.1%
<i>Construction and Mining Labourers</i>	1,293	-0.6%	-10.2%	2.4%	1.6%
Railway Track Workers	81	-0.1%	-4.0%	9.2%	13.6%
Other/Unclassified Construction and Mining Labourers	1,213	-0.6%	-10.6%	2.0%	0.8%
<i>Railways Assistants and Other Miscellaneous Labourers</i>	126	0.7%	-4.8%	8.1%	10.7%
<i>Other/Unclassified Labourers</i>	469	-0.8%	-7.8%	4.9%	5.4%
Total	13,600	0.1%	-3.3%	4.4%	5.5%

⁷³ The workforce gap post FY18 is based on the difference between labour demand and supply, accounting for attrition through retirements and death. New supply is **not** considered here, thus this is the potential maximum workforce gap.

Table 7.6: Other Australian Regions Estimated Total Rail Employment & Workforce Gap⁷⁴

Occupation Name	FY18 Employment	Workforce Gap (%)			
		FY 18	FY 21	FY 24	FY 27
Managers	2,690	0.9%	27.0%	0.5%	-12.4%
<i>Specialist Managers</i>	2,156	1.3%	26.9%	-1.2%	-14.3%
Advertising, Public Relations and Sales Managers	88	2.0%	30.7%	-2.1%	-26.9%
Business Administration Managers	218	0.7%	23.4%	0.4%	-9.2%
Construction, Distribution and Production Managers	1,753	1.5%	27.2%	-1.2%	-14.1%
Construction Managers	1,464	1.8%	28.0%	-2.0%	-15.9%
Engineering Managers	88	0.1%	23.9%	-0.3%	-9.1%
Other/Unclassified Construction, Distribution and Production	202	-0.3%	22.9%	3.7%	-4.5%
Other/Unclassified Specialist Managers	98	0.0%	25.9%	-4.0%	-18.6%
<i>Hospitality, Retail and Service Managers</i>	218	0.2%	25.6%	5.6%	-5.3%
Call or Contact Centre and Customer Service Managers	39	0.3%	26.7%	0.9%	-24.2%
Rail Station, Transport Company, and Other Transport Services	67	0.3%	22.2%	15.6%	22.2%
Other/Unclassified Hospitality, Retail and Service Managers	112	0.1%	27.0%	1.0%	-20.6%
<i>Other/Unclassified Managers</i>	316	-1.3%	28.7%	8.5%	-3.5%
Professionals	1,314	1.0%	22.5%	-3.5%	-13.2%
<i>Business, Human Resource and Marketing Professionals</i>	351	0.9%	24.7%	-1.1%	-12.8%
<i>Design, Engineering, Science and Transport Professionals</i>	714	1.1%	21.8%	-6.4%	-16.3%
Architects, Designers, Planners and Surveyors	105	0.7%	26.0%	-3.9%	-17.3%
Engineering Professionals	594	1.2%	20.9%	-6.6%	-15.7%
Civil Engineering Professionals	330	1.7%	18.8%	-13.0%	-21.8%
Electrical Engineers	74	0.6%	23.7%	6.8%	-0.6%
Industrial, Mechanical and Production Engineers	80	1.0%	28.3%	-4.1%	-19.5%
Other/Unclassified Engineering Professionals	110	0.1%	18.7%	-1.2%	-7.9%
Other/Unclassified Design, Engineering, Science and Transport	15	-0.7%	25.5%	-14.8%	-30.7%
<i>Occupational and Environmental Health Professionals</i>	148	1.0%	16.8%	2.5%	0.1%
<i>ICT Professionals</i>	69	1.6%	23.2%	-1.8%	-14.9%
<i>Other/Unclassified Professionals</i>	32	-0.4%	33.5%	-0.6%	-14.9%
Technicians and Trades Workers	8,945	0.1%	13.9%	0.9%	-15.4%
<i>Engineering, ICT and Science Technicians</i>	1,216	1.2%	24.4%	-1.5%	-11.8%
Architectural, Building and Surveying Technicians	933	1.4%	25.2%	-1.6%	-11.6%
Other/Unclassified Engineering, ICT and Science Technicians	282	0.3%	21.7%	-1.1%	-12.2%
<i>Automotive and Engineering Trades Workers</i>	1,668	0.5%	17.3%	-11.2%	-15.1%
<i>Construction Trades Workers</i>	3,991	-0.4%	2.6%	4.9%	-12.9%
<i>Electrotechnology and Telecommunications Trades Workers</i>	1,717	0.0%	23.5%	2.8%	-26.0%
Electricians	1,370	0.3%	22.7%	3.2%	-25.1%
Electronics and Telecommunications Trades Workers	309	0.1%	27.3%	1.9%	-28.0%
Other/Unclassified Electrotechnology and Telecommunications	38	-8.4%	19.2%	-6.5%	-44.0%
<i>Horticultural Trades Workers</i>	108	-0.1%	4.8%	4.4%	0.0%
<i>Other/Unclassified Technicians and Trades Workers</i>	245	-0.1%	22.5%	0.0%	-17.9%
Community and Personal Service Workers	123	0.1%	11.2%	4.8%	5.9%
<i>Security Officers and Guards</i>	60	0.2%	11.3%	9.6%	12.3%
<i>Personal Service and Travel Workers</i>	26	-0.3%	9.7%	7.2%	10.2%
<i>Other/Unclassified Community and Personal Service Workers</i>	37	0.0%	12.0%	-5.8%	-9.8%
Clerical and Administrative Workers	2,061	0.2%	7.7%	5.9%	-0.1%
<i>Office Managers and Program Administrators</i>	624	0.1%	7.1%	4.4%	-2.7%
<i>Personal Assistants and Secretaries</i>	113	0.4%	10.5%	7.5%	-2.4%
<i>General Clerical Workers</i>	361	0.3%	7.9%	6.4%	-0.1%
<i>Inquiry Clerks and Receptionists</i>	149	0.2%	7.0%	5.7%	0.4%
<i>Numerical Clerks</i>	475	0.1%	8.7%	7.1%	-1.7%
<i>Other Clerical and Administrative Workers</i>	294	0.2%	6.3%	6.3%	7.0%
Logistics Clerks	224	0.2%	6.0%	6.1%	6.5%
Other/Unclassified Other Clerical and Administrative Workers	70	0.1%	7.1%	7.2%	8.3%
<i>Other/Unclassified Clerical and Administrative Workers</i>	46	-0.2%	6.3%	4.1%	1.1%
Sales Workers	280	-0.2%	1.6%	6.3%	1.0%
<i>Ticket Salespersons</i>	32	-1.8%	5.7%	13.7%	22.1%
<i>Other/Unclassified Sales Workers</i>	249	0.0%	1.0%	5.3%	-2.1%
Machinery Operators and Drivers	2,571	0.0%	13.7%	-4.8%	-9.3%
<i>Machine and Stationary Plant Operators</i>	780	-0.1%	16.7%	-4.8%	-13.5%
Train Controllers, and Railway Signal, Track Plant and Other	157	0.2%	14.8%	7.1%	5.7%
Other/Unclassified Machine and Stationary Plant Operators	623	-0.1%	17.2%	-8.2%	-19.3%
<i>Mobile Plant Operators</i>	618	0.5%	7.1%	-45.6%	-70.9%
<i>Road and Rail Drivers</i>	979	0.1%	13.5%	11.3%	15.1%
Train and Tram Drivers	657	0.3%	6.9%	13.9%	22.0%
Truck Drivers	261	0.2%	24.8%	3.2%	-9.6%
Other/Unclassified Road and Rail Drivers	61	-1.6%	23.9%	13.2%	12.8%
<i>Other/Unclassified Machinery Operators and Drivers</i>	195	-1.4%	20.7%	-2.6%	-13.5%
Labourers	3,050	-0.5%	29.7%	-1.4%	-21.8%
<i>Construction and Mining Labourers</i>	2,190	-0.6%	29.0%	-2.0%	-23.2%
Railway Track Workers	153	-0.1%	24.8%	3.0%	1.5%
Other/Unclassified Construction and Mining Labourers	2,037	-0.6%	29.3%	-2.4%	-25.2%
<i>Railways Assistants and Other Miscellaneous Labourers</i>	268	0.7%	22.9%	4.3%	-4.0%
<i>Other/Unclassified Labourers</i>	592	-0.8%	34.7%	-1.3%	-24.7%
Total	21,320	0.2%	17.4%	0.1%	-13.1%

⁷⁴ The workforce gap post FY18 is based on the difference between labour demand and supply, accounting for attrition through retirements and death. New supply is **not** considered here, thus this is the potential maximum workforce gap.

7.1.7 New Zealand workforce gaps

The approach used to estimate the New Zealand rail workforce is broadly similar to that used for Australia. The construction workforce estimates for New Zealand relate to persons engaged on major capital projects. The 10-year forecast for construction activity was based on information in the following documents:

- National Land Transport Programme
- The 2018 New Zealand Budget
- Auckland Transport Alignment Project

The construction workforce for the identified major projects was estimated using reported estimates where available, benchmark studies and construction sector employment multipliers.

The baseline direct rail workforce estimate is based on KiwiRail and Transdev New Zealand reported figures and the 2017 Business Demography Statistics employment counts. The New Zealand 2013 Input-Output Tables from the National Accounts were used to estimate the proportion of the workforce of other industries directed at rail activity. These shares were then applied to the latest employment by sub-industry data from the Business Demography Statistics to estimate the current workforce engaged in operations and maintenance activity.

For Australia, the projected outlook for operations and maintenance activity was based on the projected growth in track km factoring in potential increases in labour productivity. For New Zealand, estimates were made for the operations and maintenance staff required for new additions to the rail network, with a labour productivity improvement factor applied.

7.1.8 Occupations covered

The occupation breakdowns were calculated using the same approach as Australia. However, the 2018 Census data for New Zealand has not yet been released, therefore the occupation breakdown from the 2013 Census had to be used. While the data is five years old the structure of employment within rail activity is assumed to be broadly similar. The occupation ratios from the 2013 Census were therefore adopted and applied to the 2017 estimates for employment by industry sector.

Demand and supply were modelled initially at the 4-digit level and subsequently rolled up into a number of occupations classes. These occupation classes were classified under the following broad occupation categories: managers; professionals; technicians and trades workers; community and personal service workers; clerical and administrative workers; sales workers; machinery operators and drivers; and labourers.

7.1.9 Modelling workforce attrition

The total rail workforce requirement to meet future rail activity will inevitably be increased by the attrition of the existing workforce through ageing effects; particularly through retirement and death. In order to augment the model to allow for workforce attrition, we include assumptions regarding the approximate age profile of the workforce (based on census data), and the likelihood of retirement or death of persons in each age group.

The figure below provides estimates of the current rail workforce age composition for the broad occupation clusters used in this analysis. The average age for rail activity in both construction and operations and maintenance is estimated at 45 years.

The Machinery Operators and Drivers group has the greatest share of workforce aged over 54 years (30%), followed by Labourers (28%). The higher the share the other 54 years category, the greater rates of attrition will be over the 10-year forecast horizon. However, this is likely less of an issue for managers (as seniority is to be expected to a large degree).

Table 7.7: Estimated Age Profile of the Rail Construction and Operations Workforce by Group

Occupation Group	Age Bracket						
	15-24	25-34	35-44	45-54	55-59	60-64	65+
Managers	4%	14%	25%	30%	12%	10%	6%
Professionals	6%	21%	25%	24%	9%	8%	6%
Technicians and Trades Workers	10%	18%	23%	25%	11%	8%	6%
Community and Personal Service Workers	17%	19%	20%	21%	9%	8%	6%
Clerical and Administrative Workers	9%	17%	23%	26%	10%	8%	7%
Sales Workers	15%	20%	19%	22%	10%	9%	6%
Machinery Operators and Drivers	6%	14%	19%	30%	13%	10%	8%
Labourers	18%	16%	17%	23%	11%	9%	8%
Total	9%	16%	22%	27%	11%	9%	7%

The total skilled workforce requirement to meet future rail activity is inevitably higher than the labour demand generated by the model given attrition of the existing workforce 'base', primarily through retirement and death (but also through people leaving the workforce for other reasons).

Given the estimated age profile of the rail workforce — and the assumed likelihood of retirement and death in each age group — we estimate that the current workforce will shrink by around 25%. The difference between the (declining) existing workforce and total labour demand is the workforce gap. The workforce gap will need to be met by new supply (e.g. graduates, migration, or absorption from other industries) if forecast levels of end use activity are to be achieved.

Overall, for all occupation groups in the New Zealand rail sector, modelling indicates a sizeable maximum potential workforce gap over time as attrition of the existing workforce accompanies strong growth in rail construction activity.

Table 7.8: Major Rail Project Assumptions for Australia

Sector details	Project details	Project Size \$m			Engineering construction work done - year ended June (\$m)									
State	Project	Total value	Engineering construction component	EC ratio	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
ACT	Canberra Light Rail Stage 1 (City to Gungahlin)	783	591	76%	290	94								
ACT	Canberra Light Rail Stage 2 (Parliamentary Triangle)	850	595	70%				140	190	220	45			
NSW	Inland Rail - Narrabri to North Star	730	584	80%		80	200	200	104					
NSW	Maldon-Dombarton Rail Link	700	630	90%				90	180	225	135			
NSW	Inland Rail - North Star to QLD Border	350	263	75%					50	120	93			
NSW	Inland Rail - Narromine to Narrabri	2800	1960	70%			120	400	400	400	400	240		
NSW	Inland Rail - Parkes to Narromine	420	336	80%	15	140	140	41						
NSW	Inland Rail - Stockinbingal to Parkes	690	552	80%			80	180	180	112				
NSW	Inland Rail - Illabo to Stockinbingal	330	231	70%				40	120	71				
NSW	Inland Rail - Albury to Illabo	740	592	80%					80	180	180	152		
NSW	ATP Projects Railcorp / Novo Rail Alliance	457	389	85%	70	70	70							
NSW	CBD and South East Light Rail project (CSELR)	2100	1365	65%	400	353								
NSW	Digital Train Radio (Civil - Installation of 10-30metre masts)	358	107	30%	10	7								
NSW	Fixing Country Rail Program	400	300	75%	30	30	30	30	30	30	30	30	20	
NSW	Newcastle Light Rail	510	408	80%	148	100								
NSW	Sydney Metro City & Southwest	13000	7800	60%	800	1020	1400	1400	1200	1200	738			
NSW	Sydney Metro Northwest	8300	3100	37%	660	888								
NSW	Liverpool Ranges - Hunter Valley Rail - Passing Loops	215	215	100%				17	141	35				
NSW	Parramatta Light Rail - Stage 1	2200	1540	70%		75	320	450	450	200	50			
NSW	Parramatta Light Rail - Stage 2	1300	910	70%						110	300	300	200	
NSW	Sydney Metro West (Parramatta to CBD)	15000	8250	55%				80	300	800	1600	1800	1800	1870
NSW	Sydney Rail Future Stage 2 Program	1000	800	80%			80	160	160	160	160			
NSW	Upgrade main north freight line (Syd-Newcastle)	160	111	69%		30	26	45	10					
NSW	Southern Sydney Freight Line: Duplication Moorebank to Macarthur	772	618	80%						100	200	200	118	
QLD	Cross River Rail	5400	4400	81%	100	100	150	550	1300	1500	700			
QLD	Blackwater-Moura-Surat Coal Rail System	150	105	70%		52	53							
QLD	Goonyella Coal Rail System - 3 track duplications & 4 passing loops	500	350	70%		120	120	110						
QLD	Inland Rail - Kagaru to Acacia Ridge & Bromelton	150	100	67%				20	50	30				

Sector details		Project Size \$m			Engineering construction work done - year ended June (\$m)									
State	Project	Total value	Engineering construction component	EC ratio	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
QLD	Inland Rail - Gowrie to Kagaru	3500	3150	90%				125	405	1121	1053	446		
QLD	Inland Rail - NSW Border to Gowrie	1600	1350	84%						100	300	400	400	150
QLD	Varsity Lakes to Elanora extension	859	601	70%						130	180	160		
QLD	Gold Coast Light Rail - Stage 3	500	300	60%			50	200	50					
QLD	Beerburum to Nambour duplication	551	375	68%			75	150	150					
QLD	European Rail Control System (upgrade signalling)	634	317	50%	3	45	140	90	28	15				
QLD	Ipswich rail line - Darra-Redbank 3rd track	250	175	70%				57	57	56	5			
QLD	Townsville Eastern Access Rail Corridor	250	200	80%			40	100	60					
QLD	North Coast Line Capacity Improvement (passing loops)	100	70	70%	7	36	27							
SA	Adelaide-Tarcoola Rail Improvements	252	189	75%	65	124								
SA	AdeLINK network light rail expansion	500	360	72%	80	125	125	30						
SA	Gawler Line Modernisation - Adelaide to Salisbury (Stage 1)	152	106	70%	42	42	23							
SA	Gawler Line Modernisation - Salisbury to Gawler (Stage 2)	463	324	70%		133	135	56						
SA	Rail Revitalisation (Gawler Line Electrification)	142	100	70%	42	26								
SA	North - South Corridor - Northern Connector (rail freight component)	500	350	70%						90	150	110		
VIC	Level Crossing Removal Program - 20 remaining level crossings	2292	1719	75%		280	480	490	369	100				
VIC	Inland Rail - Tottenham to Albury	1200	960	80%				75	240	240	240	165		
VIC	Level Crossing Removal Program - Frankston railway line	588	441	75%	60	120	120	110	31					
VIC	Level Crossing Removal Program - Bayswater	177	133	75%	38									
VIC	Level Crossing Removal Program – Campbellfield, Frankston	170	128	75%	100	28								
VIC	Level Crossing Removal Program - Caulfield to Dandenong Corridor	1600	1000	63%	435	235								
VIC	Level Crossing Removal Program – incl. Hurstbridge Corridor	500	350	70%	150	120	20							
VIC	Level Crossing Removal Program - Williamstown North	120	90	75%	60	30								
VIC	Ballarat Line Upgrade - Deer Park West to Melton	516	361	70%	82	150	129							
VIC	Conventional signalling upgrade - Caulfield to Dandenong	360	288	80%	143	28								
VIC	Melbourne Metro Rail	11000	7200	65%	814	400	1120	1028	910	840	840	840	140	
VIC	Melbourne City Loop Fire and Safety Upgrades Stage 2	132	92	70%	20	20	19							
VIC	Melbourne Airport Link	7500	5625	75%					50	350	600	800	1000	1000
VIC	Mernda Rail - Extension of South Morang Train Line to Mernda	596	300	50%	277	70								
VIC	Murray Basin Rail Project	427	320	75%	90	41								

Sector details	Project details	Project Size \$m			Engineering construction work done - year ended June (\$m)									
State	Project	Total value	Engineering construction component	EC ratio	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
VIC	Cranborne, Pakenham and Sunbury line upgrades	540	378	70%	58	220	100							
VIC	Gippsland Line Upgrade	435	305	70%	10	70	80	80	65					
VIC	Gippsland Line Upgrade Stage 2 (Avon River Bridge)	95	67	71%						30	36			
VIC	Shepparton Line Upgrade - Stage 2	312	218	70%		50	75	75	18					
VIC	Warrnambool Line Upgrade	100	70	70%		20	20	20	10					
VIC	Geelong-Waurn Ponds line (Duplication)	110	77	70%						27	27	27		
VIC	Geelong Rail Line Upgrades	160	70	44%						25	25	20		
VIC	Surf Coast Rail Project Stage 1	110	44	40%			22	22						
WA	Metronet: Morley to Ellenbrook line	863	432	80%			200	290	200					
WA	Metronet: Yanchep Rail Extension on the Joondalup Line	520	260	80%		90	150	106	70					
WA	Metronet: Cockburn to Thornlie line	536	268	80%		100	140	120	69					
WA	Metronet: Byford Extension	491	246	80%				100	208	85				
WA	Metronet: Signalling upgrade	120	36	30%		8	15	9	4					
WA	Rio Tinto Rail Expansion	250	225	90%			50	150	25					
WA	Eliwana Rail	200	180	90%	50	100	30							
WA	Forrestfield Airport Rail Link	1961	1373	70%	310	380	330	96						

Source: BIS Oxford Economics' project listings from Engineering Construction in Australia 2018-2033. N.B. This project list was current at the time of the modelling undertaken for this report in August 2018.

Table 7.9: Major Rail Project Assumptions for New Zealand

Project details	Project Size \$m		Engineering Construction \$m									
	Value \$m	\$EC value	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Wairarapa track infrastructure	50	38	0	11	19	8	0	0	0	0	0	0
Extra track between Trentham and Upper Hutt	46	35	0	10	17	7	0	0	0	0	0	0
Hutt and Kapiti rail	100	75	0	23	38	15	0	0	0	0	0	0
Replace overhead lines in Hutt Valley	49	37	7	11	15	4	0	0	0	0	0	0
Extend rail electrification to Pukekohe	189	142	0	0	0	28	43	43	28	0	0	0
Britomart remodelling	150	113	0	0	0	23	34	34	23	0	0	0
Rail level crossing improvements	200	150	0	0	0	0	30	45	45	30	0	0
Track upgrades between Wiri and Quay Park	200	150	0	0	0	0	30	45	45	30	0	0
Rail network resilience improvements	200	150	0	0	0	0	0	30	45	45	30	0
new trains and stabling	500	75	0	0	0	0	0	0	0	0	0	0
Auckland Light Rail - north west	1100	825	0	0	0	0	0	0	165	248	413	83
Auckland Light Rail - city to mt Roskill	550	413	0	83	124	206	41	0	0	0	0	0
Auckland Light Rail - Mt Roskill to airport	550	413	0	0	0	83	124	206	41	0	0	0
CRL - Western line at Mt Eden station	200	150	0	0	0	0	0	0	0	0	0	0
CRL - Stations and tunnels	1393	1045	0	104	157	209	261	209	104	0	0	0
CRL - system, integration etc	300	225	0	23	34	45	56	45	23	0	0	0
CRL - Britomart East	130	98	20	0	0	0	0	0	0	0	0	0

Source: BIS Oxford Economics, National Land Transport Programme, 2018 New Zealand Budget, Auckland Transport Alignment Project.

8. APPENDIX – ARA MEMBER SURVEY

8.1 SURVEY OBJECTIVES

To gather information from railway service providers on the following:

1. Location of rail services provided
2. Types of services and role in the rail sector
3. Railway work done in-house vs contracted out
4. Estimated number of qualified engineers, technicians, professional staff, operations staff and corporate staff in the organisation's workforce
5. Difficulties experienced in recruitment
6. Future workforce concerns and risks for the next 10 years
7. Training and development practices

Responses were collected between 26th June to 6th August 2018. A total of 46 responses were collected, though some of them were partially completed. Below is a brief summary of findings. 'future skills' in data analysis, management and engineering:

8.2 LOCATION OF RAIL SECTOR SERVICES PROVIDED

Of the 46 collected responses:

1. New South Wales (34%)
2. Victoria (27%)
3. Queensland (25%)
4. Western Australia (23%)
5. South Australia (11%)
6. Tasmania (5%)
7. Australian Capital Territory (5%)
8. Northern Territory (2%)

15 respondents (34%) indicated they provide rail sector services Australia-wide. 12 respondents (27%) indicated providing services in New Zealand.



8.3 SERVICE TYPE AND ROLE IN RAIL SECTOR

9 respondents (20%) identify themselves as manufacturer / fabricators /suppliers. The main services they provide include:

- signalling equipment manufactures (44%)
- Points and crossings manufactures (33%)
- Telecommunications equipment manufactures (33%)
- Rolling stock manufactures (11%)
- Other (78%)
- Electronic control and monitoring systems
- Rail wheels and axles
- Rollingstock components manufacturer
- Integrator and supplier (Thales)
- Haulage service provider
- Wayside and trackside control systems
- Rail tools and tool management systems

9 respondents (21%) reported to provide consultancy services.

Main consultancy services include: Safety and systems assurance, asset management, transport needs analysis and modelling, stakeholder management, concept design, design, RAM management

When asked to describe their role(s) in the rail sector, of the 34 completed responses:

- 44% identify as rail track owners/managers
- 32% identify as passenger rail operators
- 24% identify as freight rail operators
- 24% identify as contractors (building and maintaining rail infrastructure)

8.4 WORK DONE IN-HOUSE VS CONTRACT

Respondents were asked to estimate the type of activities undertaken in-house versus undertaken by contractors (see complete results below). We received 26 responses.

The top 5 reported Install / Construction activities completed in-house were:

1. Track infrastructure
2. Asset management services
3. signalling
4. Civil and related engineering
5. Systems engineering and assurance services

The top 5 reported Install / Construction activities undertaken by contractors were:

1. Track infrastructure
2. Civil and related engineering
3. Systems engineering and assurance services
4. Stations and buildings
5. Control systems

The top 5 reported Operator / Maintain activities completed in-house were:

1. Track infrastructure
2. Asset management services
3. Communications
4. signalling
5. Control systems

The top 5 reported Operator / Maintain activities undertaken by contractors were:

1. Rolling stock
2. Communications
3. signalling
4. Civil and related engineering
5. Control systems

	Install or construct (in-house)		Install or construct (contract in)		Operate or maintain (in-house)		Operate or maintain (contract in)	
Track infrastructure	77%	17	73%	16	86%	19	45%	10
Rolling stock	35%	7	50%	10	65%	13	60%	12
Signalling	67%	14	52%	11	76%	16	48%	10
Traction power	69%	9	69%	9	69%	9	46%	6
Electrification	69%	9	85%	11	54%	7	54%	7
Communications	62%	13	57%	12	81%	17	48%	10
Control systems	55%	11	65%	13	80%	16	50%	10
Civil and related engineering	74%	14	74%	14	58%	11	53%	10
Stations and buildings	65%	11	76%	13	71%	12	53%	9
Systems engineering and assurance services	72%	13	72%	13	72%	13	39%	7
Asset management services	80%	16	55%	11	85%	17	45%	9

8.5 EXISTING WORKFORCE

8.5.1 Qualified Engineers

Number of qualified engineers in rail maintenance and operations (including contractors)

We received 32 responses on the number of qualified engineers (including contractors) employed to undertake rail maintenance and operations.

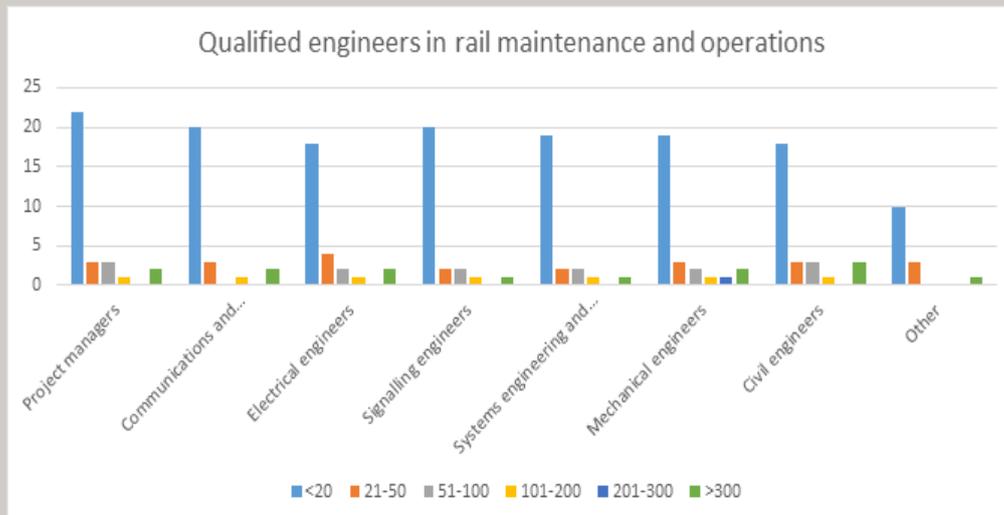
Survey results indicate a relatively small number of qualified engineers employed in rail maintenance and operations, with 71% of respondents employing less than 20 qualified engineers for each type of engineering activities (civil, mechanical, electrical etc.).

The general summary of engineers employed in rail maintenance and operations is as follow:

- 71% employ less than 20 engineers from each discipline.
- 11% employ 21-50 engineers from each discipline.
- 7% employ 51-100 engineers from each discipline.
- 3% employ 101-200 engineers from each discipline.
- 7% employ 200+ engineers from each discipline.

Ranking of engineering disciplines employed in rail maintenance and operations (from most to least):

1. Civil
2. Mechanical
3. Electrical
4. Project Managers
5. Communications and control systems
6. Other
7. Systems engineering and assurance
8. Signalling



Number of qualified engineers in rail construction and installation (including contractors)

We received 30 responses on the number of qualified engineers (including contractors) employed to undertake rail construction and installation.

Survey results also show that rail service providers generally employ a small number of engineers across all engineering disciplines in rail construction and installation.

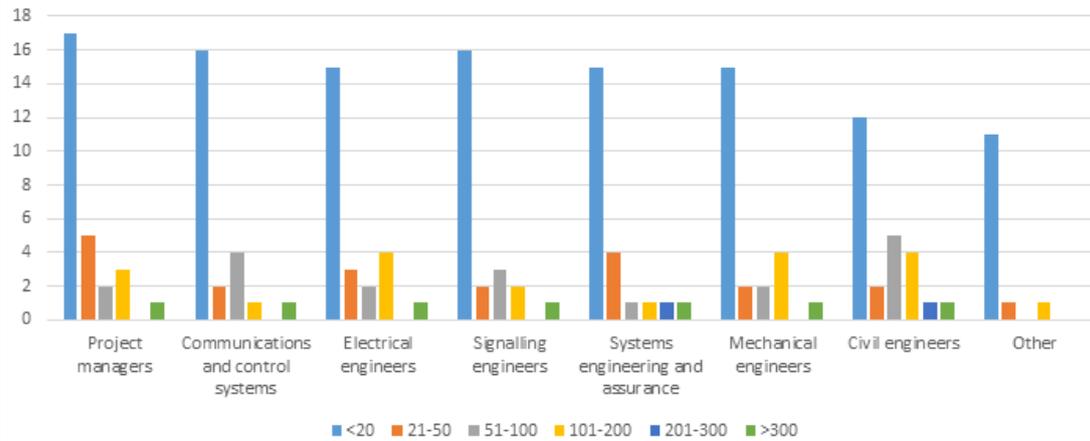
The general summary of engineers employed in rail construction and installation is as follow:

- 63% employ less than 20 engineers from each discipline.
- 11% employ 21-50 engineers from each discipline.
- 10% employ 51-100 engineers from each discipline.
- 11% employ 101-200 engineers from each discipline.
- 5% employ 200+ engineers from each discipline.

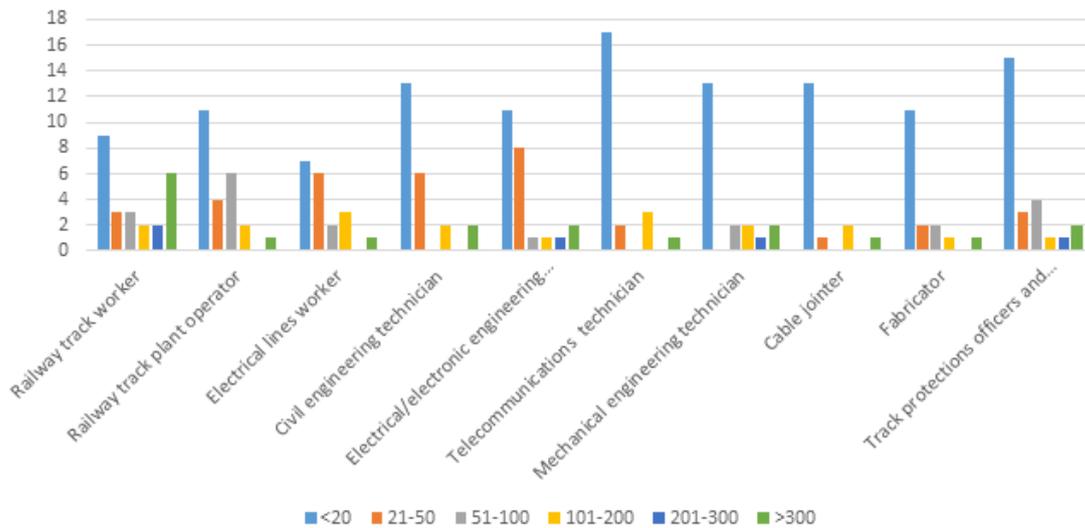
Ranking of engineering disciplines employed in rail construction and installation (from most to least):

1. Civil
2. Electrical
3. Mechanical
4. Project Managers
5. signalling
6. Systems engineering and assurance
7. Communications and control systems
8. Other

Qualified engineers in rail construction and installation



Trades and technicians in rail maintenance and operations



8.5.2 Trades and technicians

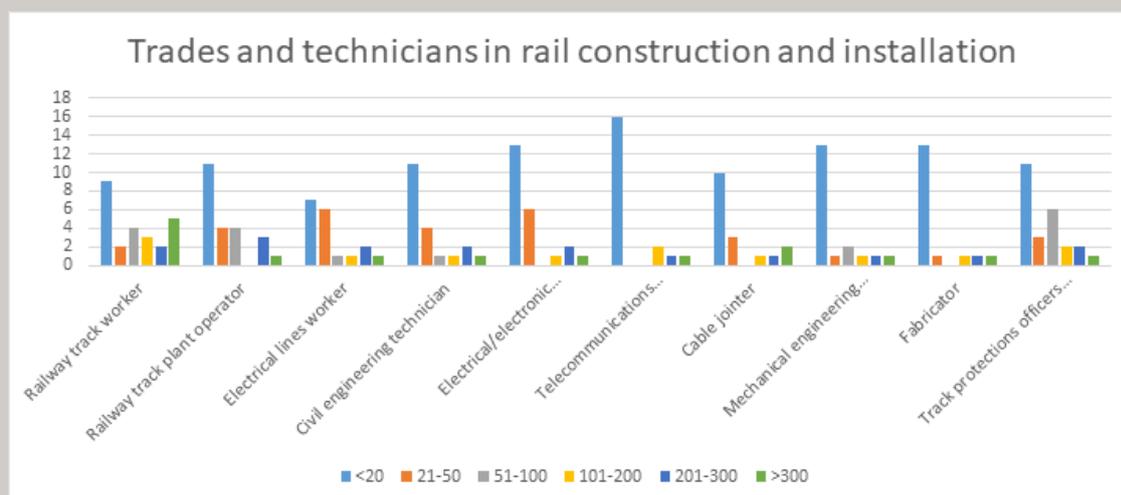
We received 28 responses on the number of trades and technicians (including contractors) employed to undertake rail maintenance and operations.

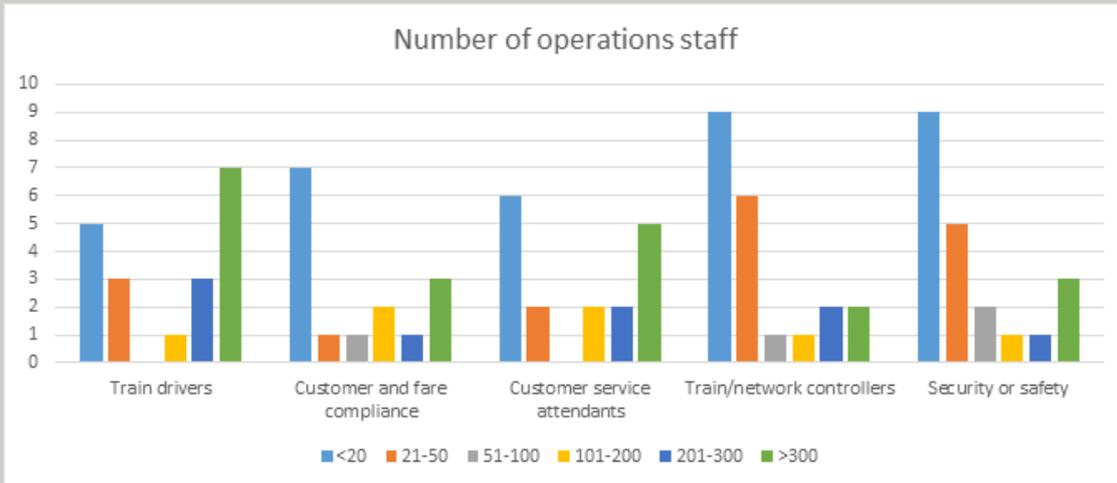
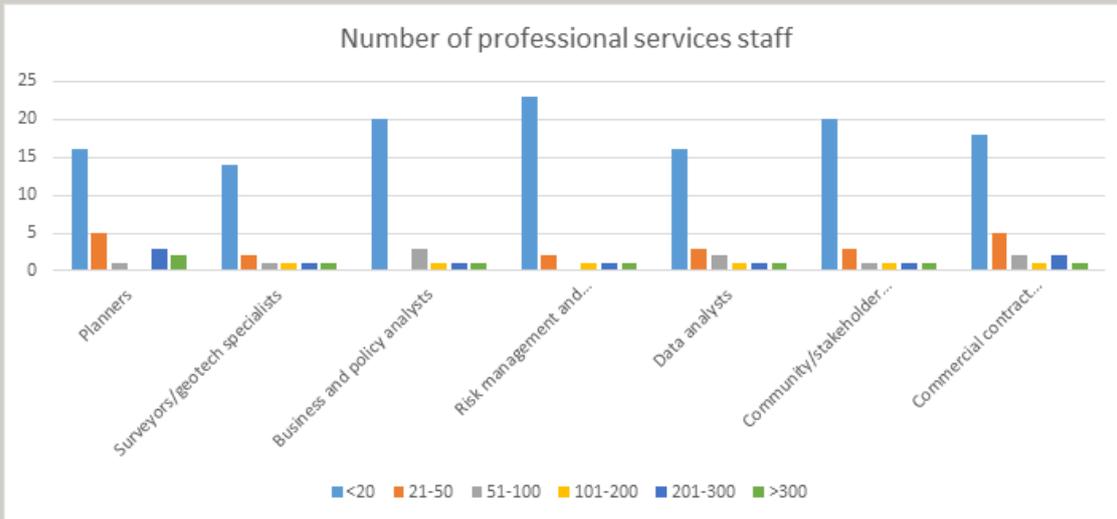
The general summary of trades and technicians employed in rail maintenance and operations is as follow:

- 55% employ less than 20 trades and technicians from each occupation type.
- 16% employ 21-50 trades and technicians from each occupation type.
- 9% employ 51-100 trades and technicians from each occupation type.
- 9% employ 101-200 trades and technicians from each occupation type.
- 11% employ 200+ trades and technicians from each occupation type.

Ranking of technician occupation type employed in rail maintenance and operations (from most to least):

1. Railway track worker
2. Electrical lines worker
3. Mechanical engineering technician
4. Railway track plant operator
5. Electrical/electronic engineering technician
6. Track protections officers and safe workers
7. Civil engineering technician
8. Fabricator
9. Cable jointer
10. Telecommunications technician





8.5.3 Professional service staff

We received 31 responses on the number of professional services staff employed in their organisation. The general summary of professional services staff employed in rail services is as follows:

- 69% employ less than 20 staff from each professional occupation.
- 11% employ 21-50 staff from each professional occupation.
- 5% employ 51-100 staff from each professional occupation.
- 3% employ 101-200 staff from each professional occupation.
- 9% employ 200+ staff from each professional occupation.

Ranking of types of professional service occupation employ in rail services (from most to least):

1. Planners
2. Surveyors/Geotech specialists
3. Business and policy analysts
4. Risk management and assurance analysts
5. Data analysts
6. Community/stakeholder engagement
7. Commercial contract managers

8.5.4 Operations staff

We received 25 responses on the number of operations staff employed in their organisation. The general summary of operations staff employed in rail services is as follows:

- 37% employ less than 20 staff in each type of operations.
- 17% employ 21-50 staff from in type of operations.
- 4% employ 51-100 staff from in type of operations.
- 7% employ 101-200 staff from in type of operations.
- 29% employ 201+ staff from in type of operations.

Ranking of types of operation staff employed in rail services (from most to least):

1. Train drivers
2. Customer service attendants
3. Customer and fare compliance
4. Security or safety
5. Train/network controllers

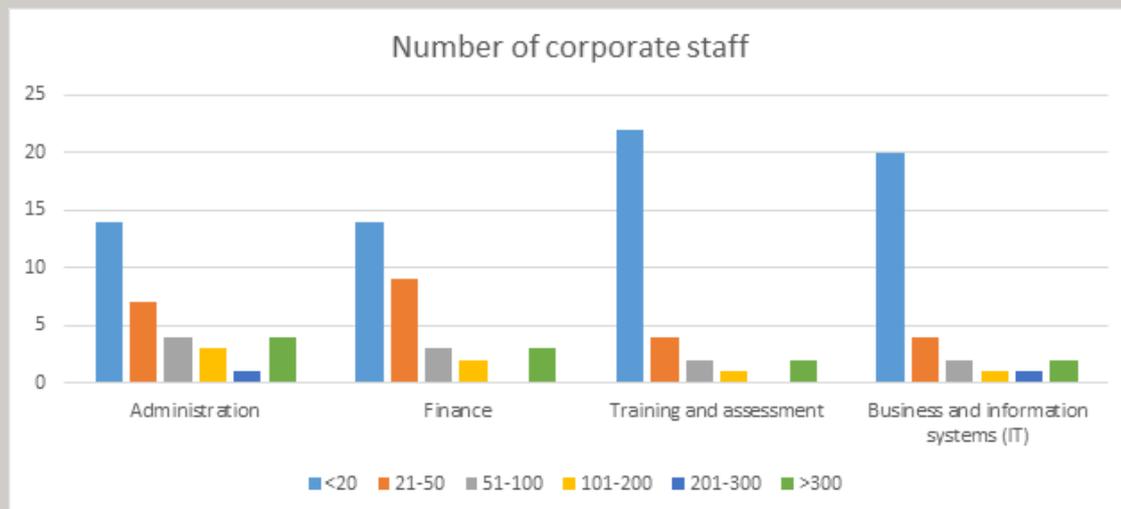
8.5.5 Corporate staff

We received 33 responses on the number of corporate staff employed in their organisation. The general summary of corporate staff employed in rail services is as follow:

- 55% employ less than 20 staff in each corporate occupation.
- 19% employ 21-50 staff in each corporate occupation.
- 9% employ 51-100 staff in each corporate occupation.
- 6% employ 101-200 staff in each corporate occupation.
- 11% employ 201+ staff in each corporate occupation.

Ranking of types of corporate occupation employed in rail services (from most to least):

1. Administration
2. Finance
3. Business and information systems (IT)
4. Training and assessment



8.6 DIFFICULTIES IN RECRUITMENT

8.6.1 Recruitment difficulties by occupation type

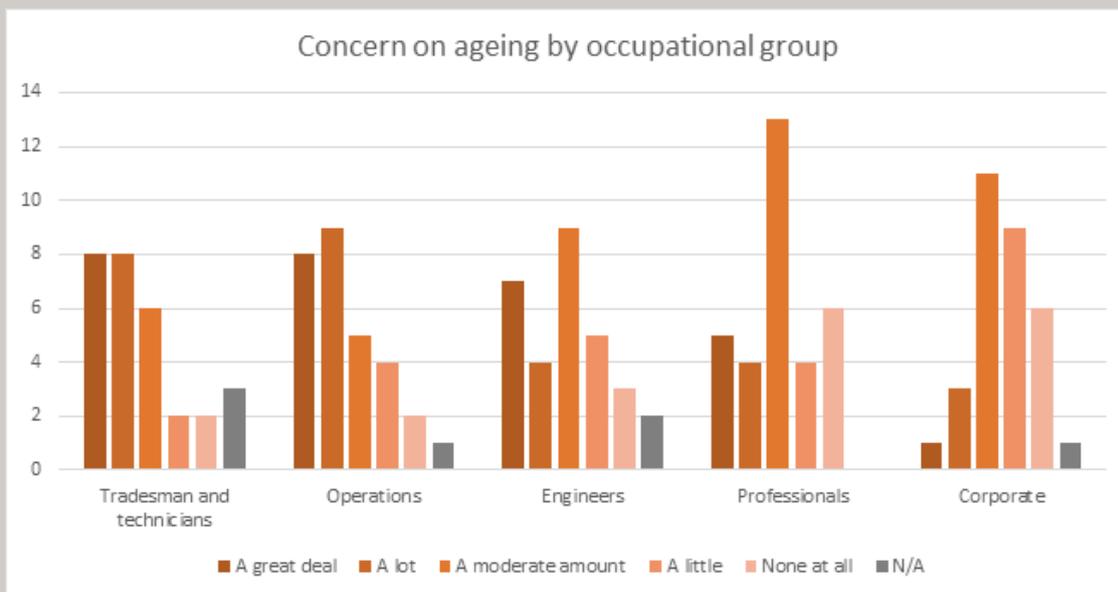
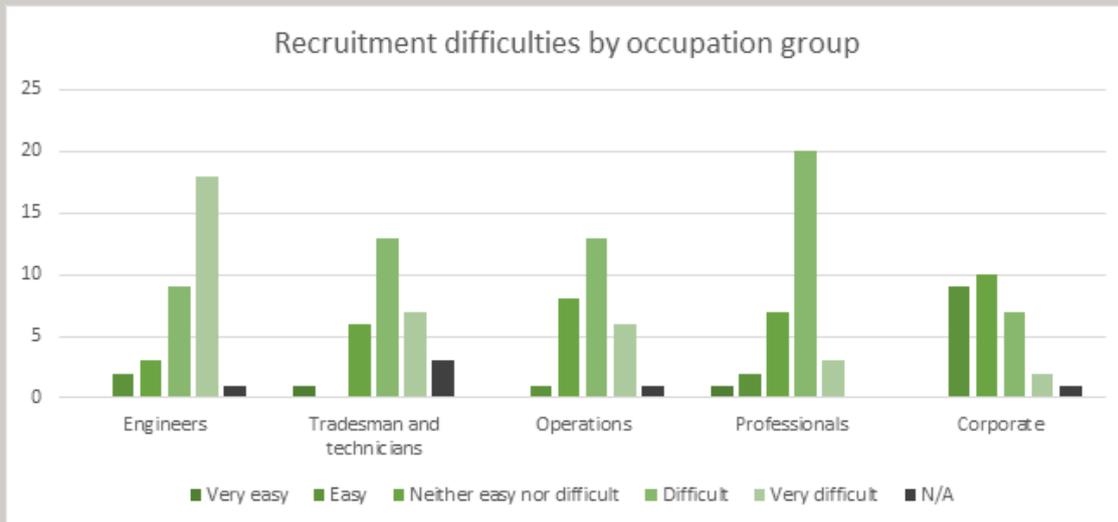
We received 34 responses on the recruitment difficulties experienced in each occupation group. Generally, 10% reported 'Very easy' or 'Easy' in recruiting across all occupation groups, 22% reported facing neither ease or difficulty, and 64% reporting 'Difficult' and 'Very difficult' in recruiting across all occupation groups.

Ranking of occupation group by recruitment difficulties (from most difficult to least):

1. Engineers
2. Tradesman and technicians
3. Operations
4. Professionals

5. Corporate

As shown above, recruiting engineers is currently the most difficult for rail service providers, with 82% indicating 'Difficult' or 'Very difficult' in hiring engineers. This is followed by tradesman and technicians (67%).



8.6.2 Main reasons of difficulties in hiring

The respondents indicated the following main reasons of difficulties in hiring:

1. Candidates do not have the required work experience (79%)
2. Candidates do not have the right technical skills (76%)
3. Local market not producing enough qualified candidates (76%)
4. Competition from other employers (71%)
5. Low number of applicants (56%)
6. Salaries not being competitive for the market (56%)
7. Other (21%)

Other reasons include location, restrictive qualification requirements, IR issues and competition in general construction market with concurrent major infrastructure projects.

8.7 FUTURE CONCERNS AND RISKS

8.7.1 Concerns on ageing workforce over the next 10 years

33 respondents indicated their level of concern on the impact of ageing workforce in each of their occupational group. In general, 38% indicated 'A great deal' or 'A lot' of concern across all occupational groups in their workforce. 45% indicated moderate or little concern and 13% indicated no concern.

Ranking of most-concerned occupational group as a result of ageing (from greatest to least):

1. Trades and technicians
2. Operations
3. Engineers
4. Professionals
5. Corporate

8.7.2 Workforce capability risk factors for the next 10 years

Respondents were asked to rate several risk factors for their organisations' workforce capability over the next decade. The ranking of risk factors is (from greatest to least):

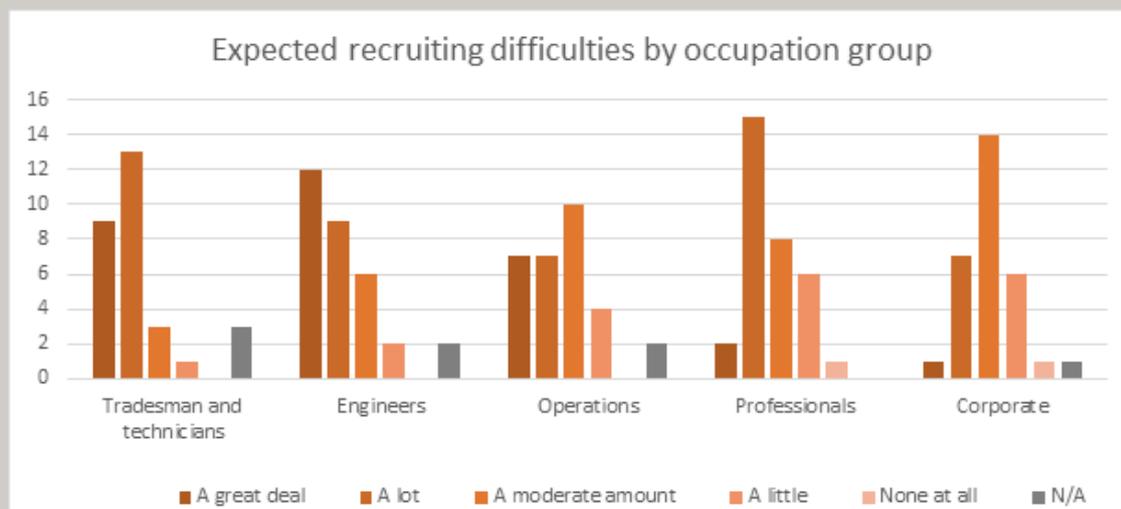
1. Difficulty in attracting experienced staff
2. Volume of work anticipated
3. Retaining skilled staff with 4-5 years' experience
4. Ability to transfer skills from other sectors
5. Adoption of new technologies
6. Loss of capability in regional areas
7. Restrictions to hiring from overseas

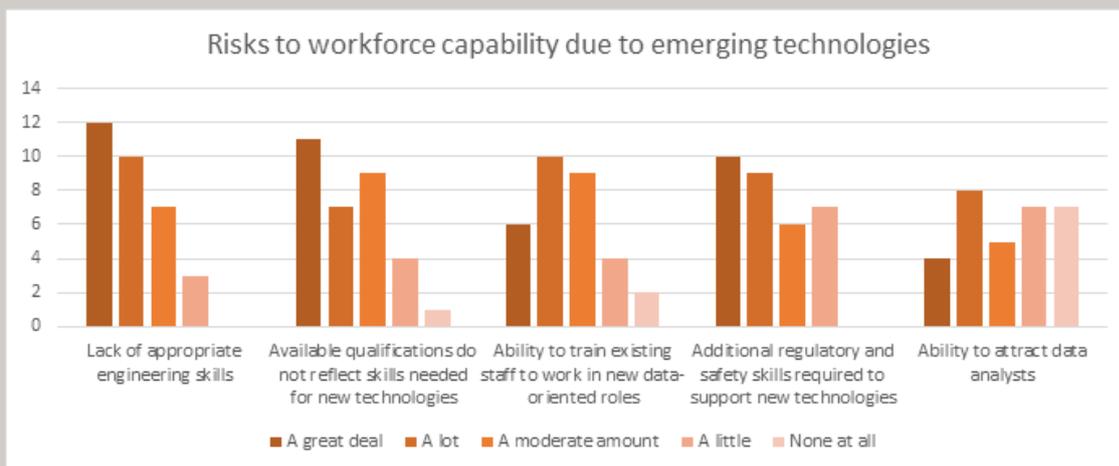
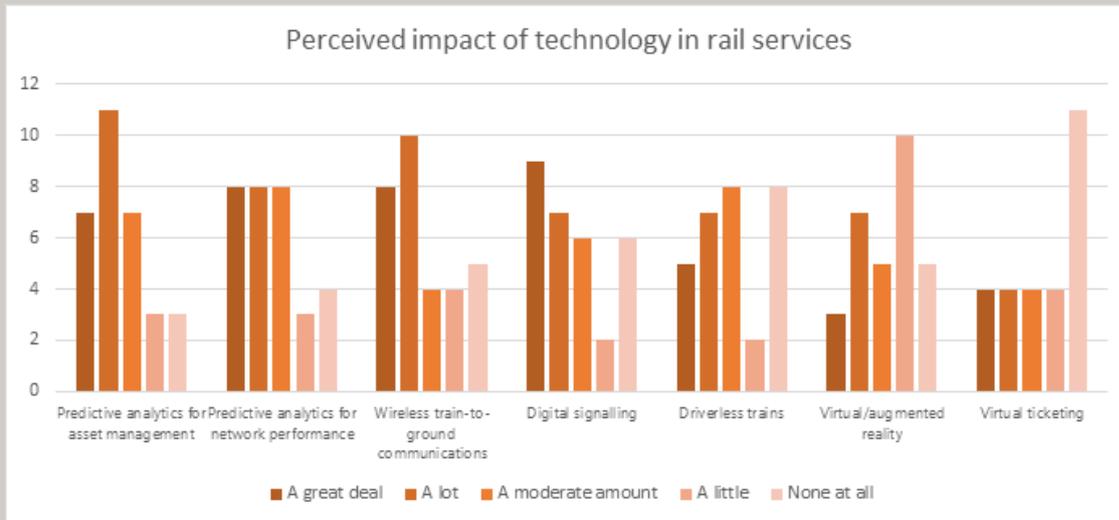
8.7.3 Expected recruiting difficulties over the next 10 years by occupation group

Respondents were asked to anticipate the expected recruitment difficulties for each occupation group. In general, 54% expect 'A great deal' or 'A lot' of difficulty in recruiting staff across all groups for the next 10 years. 39% expect moderate or little difficulty, and 1% expect no difficulty in recruitment.

Ranking of occupation groups by anticipated recruitment difficulty (from greatest to least):

1. Tradesman and technicians
2. Engineers
3. Operations
4. Professionals
5. Corporate





8.7.4 Impact of technology over the next 10 years

Our survey results show that 47% of employers expect technology to bring 'A great deal' or 'A lot' of impact on rail services generally. 33% expect moderate or little general impact and 20% expect no impact as a result of technology.

The most impacted areas of rail services anticipated by respondents are (from greatest to least):

1. Predictive analytics for asset management
2. Predictive analytics for network performance
3. Wireless train-to-ground communications
4. Digital signalling
5. Driverless trains
6. Virtual/augmented reality
7. Virtual ticketing

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BIS Oxford Economics was commissioned by the Australasian Railway Association to produce this Report on behalf of the rail industry in Australia and New Zealand to address major industry concerns regarding current and deepening skills shortages in infrastructure, operations and maintenance.

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**BIS OXFORD
ECONOMICS**



**AUSTRALASIAN
RAILWAY
ASSOCIATION**

Global headquarters

Oxford Economics Ltd
Abbey House
121 St Aldates
Oxford, OX1 1HB
UK
Tel: +44 (0)1865 268900

London

Broadwall House
21 Broadwall
London, SE1 9PL
UK
Tel: +44 (0)203 910 8000

New York

5 Hanover Square, 8th Floor
New York, NY 10004
USA
Tel: +1 (646) 786 1879

Singapore

6 Battery Road
#38-05
Singapore 049909
Tel: +65 6850 0110

Belfast

Tel: + 44 (0)2892 635400

Paarl

Tel: +27(0)21 863-6200

Frankfurt

Tel: +49 69 95 925 280

Paris

Tel: +33 (0)1 78 91 50 52

Milan

Tel: +39 02 9406 1054

Dubai

Tel: +971 56 396 7998

Philadelphia

Tel: +1 (610) 995 9600

Mexico City

Tel: +52 (55) 52503252

Boston

Tel: +1 (617) 206 6112

Chicago

Tel: +1 (773) 372-5762

Los Angeles

Tel: +1 (424) 238-4331

Florida

Tel: +1 (954) 916 5373

Toronto

Tel: +1 (905) 361 6573

Hong Kong

Tel: +852 3103 1096

Tokyo

Tel: +81 3 6870 7175

Sydney

Tel: +61 (0)2 8458 4200

Melbourne

Tel: +61 (0)3 8679 7300

Email:

mailbox@oxfordeconomics.com

Website:

www.oxfordeconomics.com