

# Process Manufacturing, Recreational Vehicle and Laboratory Industry Reference Committee

## Skills Forecast and Proposed Schedule of Work 2019–2023



# Administrative Information

**Name of Industry Reference Committee (IRC):**

Process Manufacturing, Recreational Vehicle and Laboratory (PMRVL)

**Name of Skills Service Organisation (SSO):**

Innovation and Business Skills Australia (IBSA Manufacturing)

## About the Industry Reference Committee

The **Process Manufacturing, Recreational Vehicle and Laboratory** Industry Reference Committee comprises nine members and was constituted in May 2017.

The 2019 Industry Skills Forecast and Proposed Schedule of Work was reviewed and approved by the membership below:

Mr Keith Monaghan (Chair)

Mr Ian Curry

Mr Stuart Lamont

Ms Leah Simmons

Mr Nigel Haywood

Mr Han Michel

Mr Grahame Aston

Ms Julie Warren

## About the Skills Forecast

The Industry Reference Committee (IRC) Skills Forecast and Proposed Schedule of Work identifies priorities for training package development work to meet the needs of industry. This document is based on research, analysis and consultations with IRC members and industry stakeholders and provides evidence of current and emerging industry skills needs.

# Industry Reference Committee Signoff

This 2019 return of the Process Manufacturing, Recreational Vehicle and Laboratory IRC Skills Forecast and Proposed Schedule of Work for the PMA Chemical, Hydrocarbons and Refining Training Package was agreed as the result of a properly constituted IRC decision and was approved by:

**IRC Chair:** Mr Keith Monaghan

**Date:** April 2019

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This IRC Skills Forecast and Proposed Schedule of Work has been prepared on behalf of the PMRVL Industry Reference Committee for submission to the Australian Industry and Skills Committee (AISC).

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# Executive Summary

Chemical, Hydrocarbons and Refining (CHR) are a diverse group of industry sectors covering the production of chemicals, petroleum, coal products, and metals product manufacturing and refining.<sup>1</sup> Although the industry covers three distinct sub-sectors, some jobs and skills have crossover between the sectors.

While the number of businesses involved in the CHR industry has remained relatively steady in the last three years, training enrolments continue to decline, and employee numbers are projected to decrease slightly in the five years through to 2023. In large part, this is a result of increasing automation in larger CHR businesses and increasing competition from overseas competitors, particularly in Asia.

The skills development needs of the CHR industry are currently being progressed through the Chemical, Hydrocarbons and Refining 2017 project. This Industry Skills Forecast highlights where future skills development work is likely to be needed (in terms of both increasing digital skills, and in potential changes to higher level qualifications in the PMA Chemical, Hydrocarbons and Refining Training Package) and suggests further work will be needed at a later date, to test and validate feedback from industry.

## Training Package Priorities

The Proposed Schedule of Work 2019–2020 to 2022–2023 was developed by the IRC, with support from IBMA Manufacturing, based on identified industry trends. The [Schedule](#) lists the priorities over the next four years, the rationale and the proposed timeframes for these activities.

The IRC has identified the following activity to be considered in 2020–2021:

**Redevelopment of Chemical, Hydrocarbons and Refining Qualifications:** Review three Chemical, Hydrocarbons and Refining qualifications to ensure they align to current job role requirements.

<sup>1</sup> Australian Apprenticeships Pathways, Industry Information, <https://www.aapathways.com.au/industries/chemical-hydrocarbons-and-refining>, accessed on 30 September 2018.

# Sector Overview

The CHR industry is diverse with a broad range of business sizes and people employed.

Most industry sub-sectors are defined as being either mature or facing challenges. The industry is trade exposed and subject to global economic trends, including:

- the impact of overseas competition and cheaper imports
- international companies moving production offshore based on global decisions
- continued uncertainty of energy pricing (especially on Australia's Eastern seaboard)
- customers increasingly seeking green and environmentally friendly products.

Despite these challenges and threats, the industry still makes a very important contribution to the Australian economy, making the following contribution in 2016-2017.<sup>2</sup>



**\$72.358 Billion Sales and Service Income**

Revenue earned from the CHR industry is dominated by the oil and gas extraction sector. Oil and gas contributed 33% of total industry revenue in 2017–2018.<sup>3</sup> This sector is experiencing strong growth, which is anticipated to continue through to 2023, with Gross Domestic Product (GDP) growth likely to be higher than for the Australian economy for the same period.<sup>4</sup> In states like Queensland, coal seam gas is becoming increasingly important.<sup>5</sup>

By contrast, in terms of business numbers, the iron smelting and steel manufacturing businesses are the most numerous (40% of the 2,852 businesses in the CHR sector).

All sectors of the industry are subject to stringent government regulations.

<sup>2</sup> Australian Bureau of Statistics, 2018, 8155.0 – Australian Industry, 2016–17 (released 25 May 2018) – Manufacturing industry dataset (includes unspecified sales and service income from manufacturers categorised as 2122 Steel Pipe and Tube Manufacturing and 2149 Other Basic Non-Ferrous Metal Product Manufacturing, which cannot be separately disaggregated in this analysis).

<sup>3</sup> Ibid.

<sup>4</sup> Alen Allday, 'Exploring new horizons: Large-scale LNG production and exports will boost revenue' (IBISWorld Industry Report B0700 Oil and Gas Extraction in Australia, January 2017), p 12.

<sup>5</sup> <https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Electricity-Forecasting-Insights/2017-Electricity-Forecasting-Insights/Key-component-consumption-forecasts/Business-consumption/CSG>, accessed .3/12/2018.

Contribution to the Australian Economy by the CHR Industry



97,100

People employed in 2018

Source: ABS 6291.0 55,003 Labour Force, Australia, May 2018.



2,862

Number of businesses

Source: ABS 8165.0 Counts of Australian Businesses, including Entries and Exits.



Business locations

NSW	845	SA	165
VIC	848	TAS	42
QLD	564	ACT	19
WA	361	NT	18

Source: ABS 8165.0 Counts of Australian Businesses, including Entries and Exits.

The PMA Chemical, Hydrocarbons and Refining Training Package contains five qualifications ranging from Certificate II to Advanced Diploma.

Within the PMA Chemical, Hydrocarbons and Refining qualifications there are 162 native units of competency and 13 skill sets. These are detailed in [Qualifications Available](#).

The types of roles a person may expect to work in after they have completed a qualification in the PMA Chemical, Hydrocarbons and Refining Training Packages are shown below in Table 1.

Table 1 – Jobs available after training in the CHR industry

Stream	Certificate II	Certificate III	Certificate IV	Diploma	Advanced Diploma
<b>Chemical</b>	Chemical Process Plant Operator	Process Plant Operator (Chemical)	Chemical Plant Technician	Chemical Plant Technician	Senior Plant Technician
		Process Plant Operator (Emergency Support)	Plant Technician (Emergency Response)	Process Plant Project Coordinator	
<b>Hydrocarbons</b>	Process Plant Operator (CSG Sector)	Plant Operator (CSG Plant)	Hydrocarbons Plant Technician	Chemical Plant Technician	Senior Plant Technician
	Process Plant Operator (Hydrocarbons Extraction)	Process Plant Operator (Emergency Support)		Process Plant Project Coordinator/Central Control Room Operator	
	Process Plant Operator (Hydrocarbons Transmission)	Process Plant Operator (Hydrocarbons Extraction)			
		Process Plant Operator (Hydrocarbons Transmission)			
<b>Refining</b>		Process Plant Operator (Emergency Support)	Plant Technician (Emergency Response)	Chemical Plant Technician	Senior Plant Technician
		Process Plant Operator (LNG Plant)	LPG Plant Technician	Process Plant Project Coordinator	
			Oil Refinery Plant Technician		
		Process Plant Technician			

Source 'The Australian Apprenticeships & Traineeships Information Service (aapathways.com.au/jpc) funded by the Australian Government Department of Education and Training'. Accessed on 5 October 2018.



## Critical Workforce Challenges and Opportunities

The CHR industry is subject to increasing competition from offshore operators, particularly in Asia. It is also impacted by the changing levels of demand from the resources sector, environmental regulations and community concerns about the safety of some CHR processes (onshore gas in particular). In addition, larger CHR companies are automating to transform their business practices.<sup>6</sup> Collectively, all of these forces have an impact on workforce demand for skills.

The growing use of remote operations in the oil and gas sector was identified by stakeholders as a key issue in the industry. The sector is seen to be following the productivity gains the mining sector achieved from automating their operations and controlling them remotely.

Job opportunities for workers displaced by automation are emerging in other parts of the manufacturing sector, although workers with specific experience and defined skills may not transition easily into sectors requiring new competencies.<sup>7</sup> Labourers, machine operators and drivers are at particular risk of automation. CHR workers (along with other workers in the broader manufacturing sector) are also ageing. For example, the average age of plant operators is 46.5 years old. This creates further workforce challenges.<sup>8</sup>

In 2016, each job in the oil and gas sector supported a further 10 jobs in the wider economy.<sup>9</sup> The Liquefied Natural Gas (LNG) industry sub-sector is growing and continues to provide future opportunities for skilled workers, especially in Western Australia. By the end of 2017, four major construction projects had all-but-moved into production phases. One site alone, the Ichthys Explorer, is currently anticipated to require a workforce of 200 that will be constant and ongoing for the duration of the 40-year project.<sup>10</sup>

The employment projections of the Australian Government Department of Jobs and Small Business indicate that job opportunities for technicians and managers will increase, in contrast to the projections for lower level positions. Industry stakeholders have provided feedback that not all CHR process workers are defined within the Australian and New Zealand Standard Classification of Occupations (ANZSCO) four-digit analysis, and any decline in the workforce may not be as dramatic; but rather the trend will be a slower decrease. A full list of CHR occupations within the four-digit ANZSCO level framework is available at [Appendix A](#).

6 Developing the Workforce for a Digital Future: Addressing critical issues and planning for action (Australia, Australian Industry Group, 27 March 2018), pp 4, 5 and 13.

7 Dr Tanya Carney and Dr Jim Stafford, Advanced Skills for Advanced Manufacturing: Rebuilding Vocational Training in a Transforming Industry (Australia: The Centre for Future Work at the Australia Institute, June 2018) p 10.

8 Australian Government, Job Outlook, <https://joboutlook.gov.au/occupation.aspx?code=3992>, accessed on 5 October 2018.

9 Preparing Australia's future oil and gas workforce (Australia, National Energy Resources Australia, July 2018), p 10.

10 Peter Milne, 'WAs top mega projects of 2017', The West Australian, 30 December 2017, available from <https://thewest.com.au/business/mining/was-top-mega-projects-of-2017-ng-b88701110z>, accessed on 31 August 2018.

Despite the following limitations, the data can be useful in highlighting recent trends and when supplemented with qualitative advice from industry, this data helps to develop a useful picture of current and prospective industry conditions.

- There are inherent difficulties in identifying industry and occupational data relevant to each Training Package. This report provides selected data from the Australian Bureau of Statistics (ABS), including counts of Australian businesses and labour force information. This data is based on two hierarchical classification systems – the Australian and New Zealand Standard Industrial Classification<sup>11</sup> (ANZSIC) and ANZSCO.<sup>12</sup> A list of ANZSCO and ANZSIC codes that have been identified by key industry stakeholders as relevant to the PMA Chemical, Hydrocarbons and Refining Training Package are provided at [Appendix A](#) and [Appendix B](#), respectively.
- Census data, the most recent being from 2016, can generally be broken down to the four-digit levels of these classifications. However, annual data is only available at the three-digit levels. Some of the industries or occupations that are included at the available level of aggregation may not be specifically relevant to this Training Package. To support the analysis of annual data included in the report, [Appendix C](#) provides a more detailed breakdown of occupational data based on the 2016 Census.
- Furthermore, the ANZSIC and ANZSCO classification systems were introduced in 2006, with minor revisions incorporated into the ANZSCO structure in 2009 and 2013. Industry has noted that some ANZSIC and ANZSCO codes are now outdated and do not represent some emerging industries or occupations. In addition, the classification systems may not be sensitive to localised specialisations.

<sup>11</sup> ABS Cat.no.1292.0.55.002 Australian and New Zealand Standard Industrial Classification (ANZSIC), 2006 – Codes and Titles.

<sup>12</sup> ABS Cat.no.1220.0 ANZSCO – Australian and New Zealand Standard Classification of Occupations, 2013, Version 1.2.

# Industry Snapshot

## Chemical

Chemical manufacturing takes organic and inorganic materials and manufactures products with them through a scientific process. Within the sub-sector, there are 12 industry classifications.<sup>13</sup> These are listed at [Appendix B](#).

Current trends in the industry show:

- The chemical sector is expected to maintain existing levels of employment in the five years from 2018 through to May 2023 (32,000 people projected to be employed).
- Within the different sub-sectors, employment levels in the basic chemical and chemical product manufacturing (nfd<sup>14</sup>) sector is expected to increase by 5.7% to May 2023, whereas cleaning compound and toiletry preparation manufacturing employment numbers are expected to decline by 7.4%.
- Previous Skills Forecasts noted high electricity prices were challenging businesses to remain globally competitive. A recent Commonwealth Scientific and Industrial Research Organisation (CSIRO) report has highlighted an opportunity for Australia to use hydrogen gas to assist in the transfer from highly priced natural gas and variable renewable energy to lower cost hydrogen for some industrial processes.<sup>15</sup>
  - The CSIRO notes this could reduce greenhouse gas emissions and allow Australia to become less reliant on imported liquid fuels.
  - It may also lead to a new export industry, as the global market for hydrogen is likely to increase due to countries committing to greater use of gas to assist in reaching Paris Agreement emission targets.

<sup>13</sup> ABS 8165.0 Counts of Australian Businesses, including Entries and Exits, Jun 2013 to Jun 2017 (ANZSIC – Australian and New Zealand Standard Industrial Classification – 4-digit industry class 2017).

<sup>14</sup> nfd = not further defined

<sup>15</sup> National Hydrogen Roadmap: Pathways to an economically sustainable hydrogen industry in Australia (Australia: Energy and Futures CSIRO, 2018) pp 3–4.

## Hydrocarbons

The Petroleum Refining and Petroleum Fuel Manufacturing sector 'primarily refines crude oil or condensate (a light form of oil) to produce petrol, fuel oil, aviation fuel, grease base stock, petroleum gases and other petroleum products. Companies also blend materials into petroleum fuels and manufacture fuels from liquefaction of petroleum gases.'<sup>16</sup> Within the sub-sector, there are three industry classifications<sup>17</sup>, which are listed at [Appendix B](#).

Current trends in this industry sub-sector are:

- Employment in the petroleum refining sector has been volatile over the last five years – with numbers fluctuating from a high of 11,000 workers in 2015 to 6,100 in 2017 – and current levels at 7,600.
- Employment demand in the next five years is expected to decrease by 7.4% with 7,100 people projected to be employed in the industry in May 2023.
- Electricity pricing impacts the sector, as well as major companies within the sector taking global decisions on production sites.
- Lubricants and other petroleum manufacturing is declining due to competition from imports and business amalgamation.<sup>18</sup> Large, low-cost refineries are being built across Asia, allowing most fuel to now be imported into Australia.
- The next decade is expected to see a decrease in the number of petrol and diesel cars as advances in new technology continue.
- Within the oil and gas extraction sub-sector, although there are a total of 384 businesses, the sector is dominated by five major companies – Woodside Petroleum, BHP Billiton, Chevron Australia Holdings, ExxonMobil Australia and Santos.<sup>19</sup>
- Research by National Energy Resources Australia notes an increase from 9,000 to 19,000 workers in the natural gas industry between 2006 and 2016.<sup>20</sup>
- Growth in coal seam gas (CSG) in Queensland has been rapid for more than a decade, reaching a peak of 1,634 wells in 2013–14. This has helped to place Australia as a leading supplier of LNG.<sup>21</sup>

16 Jason Aravanis, 2018, 'Fuel Up: The industry has recently returned to growth, as crude oil prices have recovered' (IBISWorld Industry Report C1701).

17 Australian Bureau of Statistics, 1292.0 – Australian and New Zealand Standard Industrial Classification (ANZSIC), <http://www.abs.gov.au/ausstats/abs@nsf/0/EE2ABD0FBCEE30B5CA25711F00146ECC?opendocument>, accessed on 26 Oct 2018.

18 Alen Allday, 2017, 'Elbow grease: Increasing import penetration has caused revenue to decline' (IBISWorld Industry Report C1709).

19 Alen Allday, 2017, 'Exploring new horizons: Large-scale LNG production and exports will boost revenue' (IBISWorld Industry Report B0700 Oil and Gas Extraction in Australia).

20 National Energy Resources Australia, 2018, Preparing Australia's Future Oil and Gas Workforce.

21 <https://www.business.qld.gov.au/industries/mining-energy-water/resources/petroleum-energy/outlook-statistics/petroleum-gas>, accessed 4/12/2018.

## Refining

Refining involves the purification process of an impure metal. It is similar to the process of smelting. The refining sector covers the refining and smelting of metals such as iron, alumina, copper, silver, lead, zinc, gold and other non-ferrous metals. The sub-sector has 10 industry classifications<sup>22</sup> listed at [Appendix B](#).

The industry is experiencing the following trends:

- Collectively across this industry sub-sector, employment has declined in the past five years by 27% to just 57,700. Overall projections for the five years to May 2023 is for a further 4% decrease.
- Whilst iron smelting and steel manufacturing dominate employment for this sub-sector, they are both in serious decline. Worker numbers are expected to decline from 15,170 to 11,972 from 2016–2017 to 2021–2022.<sup>23</sup>
- However, in the past 18 months:
  - BlueScope Steel has continued to improve its production since the Global Financial Crisis, recording \$1.6B profit for its most recent trading year with no worker lay-offs since 2014.<sup>24</sup>
  - The Whyalla steelworks, in administration two years ago, was bought in July 2017 by a British billionaire who has maintained the current workforce and is now set on improving the long-term profitability of the plant through building alternative energy sources.<sup>25</sup>
- These two companies comprise a significant proportion of the sector; if they remain resilient, employee numbers may increase.

<sup>22</sup> ABS 8165.0 Counts of Australian Businesses, including Entries and Exits, Jun 2013 to Jun 2017.

<sup>23</sup> Nathan Cloutman, 2017, 'Iron out the kinks: Falling demand and rising competition have significantly reduced revenue' (IBISWorld Industry Report C2110 Iron Smelting and Steel Manufacturing in Australia).

<sup>24</sup> Stephen Letts, Peter Ryan, David Chau and Nick McLaren, 2018, <http://www.abc.net.au/news/2018-08-13/bluescope-profit-up-119pc-for-best-result-in-a-decade/10112820>, accessed on 25 August 2018.

<sup>25</sup> Whyalla: the town that saved itself, ABC Australian Story, 2018 <http://www.abc.net.au/news/2018-09-24/whyalla-steelworks-how-a-town-saved-itself/9984998>, accessed on 30 September 2018.

## Business Landscape

The CHR industry in Australia is coded within the ANZSIC in Division C Manufacturing. The following subdivisions cover the CHR industry in Australia.

**Table 2 – ANZSIC subdivisions that cover the CHR industry**

ANZSIC Subdivision		Not including	
17	Petroleum and Coal Product Manufacturing (hydrocarbons)		
18	Basic Chemical and Chemical Product Manufacturing (chemical)	<b>Group 182</b>	Basic Polymer Manufacturing (excluding 1821 and 1829) <sup>26</sup>
		<b>Group 184</b>	Pharmaceutical and Medicinal Product Manufacturing
		<b>Class 1852</b>	Cosmetic and Toiletry Preparation Manufacturing
21	Primary Metal and Metal Product Manufacturing (refining)	<b>Class 2122</b>	Steel Pipe and Tube Manufacturing
		<b>Class 2142</b>	Aluminum Rolling, Drawing, Extruding
		<b>Class 2149</b>	Other Basic Non-Ferrous Metal Product Manufacturing

<sup>26</sup> The following two industry classes are included for the PMA forecasts (previously they were only included for PMB): Class 1821 Synthetic Resin and Synthetic Rubber Manufacturing; and Class 1829 Other Basic Polymer Manufacturing.

The number of businesses within the CHR industry based on the ANZSIC four-digit industry class are shown in Table 3.<sup>27</sup>

**Table 3 – Business landscape**

Industry Sub-sector	Number of businesses at 30 June 2017	% Change from 30 June 2015	Largest state by businesses	Business Type <sup>28</sup>
Chemical	1,091	+1.47%	New South Wales 332	42% non-employing 45% small 9% medium 2% large
Hydrocarbons	138	+1.21%	Victoria 42	56% non-employing 36% small 4% medium 2% large
Refining	1,623	-6.07%	Victoria 488	38% non-employing 52% small 9% medium 2% large

The significant businesses in the CHR industry are very large multinationals, many of which are household names. However, in terms of business numbers, there are a lot of small and non-employing businesses which tend to be involved in activities such as the recovery of oil and grease, mineral turpentine manufacturing, soap and cleaning compound manufacturing, veterinary product manufacturing, and basic organic and inorganic chemical manufacturing (e.g. dyes and pigments), amongst others.

<sup>27</sup> Source: ABS 8165.0 Counts of Australian Businesses, including Entries and Exits, Jun 2013 to Jun 2017.

<sup>28</sup> In terms of business type, small is defined as employing 1–19 people, medium as employing 20–199 and large as employing more than 200 people. Note the component values in tables will not always sum to the total due to a confidentialising process that perturbs the data.

## Key Industry Stakeholders

The breadth of the CHR industry is highlighted by the very broad range of industry stakeholders across the different sub-sectors.

As noted earlier, many parts of the CHR industry are highly regulated due to both domestic safety concerns, e.g. gas explosions, paint contamination, and international requirements based around issues such as emission targets. Increasingly, therefore, the Australian public are also key stakeholders within the CHR industry. As consumers, they are more demanding; buying products that suit their environmental and social credentials and becoming more vigilant in actions against an industry or sector that they may consider is damaging the environment. This has meant some of the CHR sub-sectors are now reviewing the raw materials they use in production, including soap and cleaning compound manufacturing.

### Chemical

The main stakeholders include industry associations and regulators, and are:

- Australia New Zealand Industrial Gas Association
- Accord Australasia
- Animal Health Australia
- Animal Medicines Australia
- Australian Fertiliser Services Association
- Australian Institute of Health and Welfare
- Australian Mining
- Australian Packaging Covenant
- Australian Paint Approval Scheme
- Australian Paint Manufacturers' Federation
- Australian Pesticides and Veterinary Medicines Authority
- Australian Self Medication Industry
- Australian Veterinary Association
- Chemistry Australia (formerly Plastics and Chemical Industries Association)
- Complementary Medicines Australia
- CropLife Australia
- Fertiliser Australia
- Generic and Biosimilar Medicines Association
- International Fertilizer Association
- International Paint and Printing Ink Council
- Master Painters Australia
- Medicines Australia
- National Industrial Chemicals Notification and Assessment Scheme
- National Pollutant Inventory
- Office of the Gene Technology Regulator
- The Australian Explosive Industry Safety Group
- The Institute of Quarrying Australia
- The Veterinary Manufacturers and Distributors Association Ltd.



## Hydrocarbons

The main stakeholders include industry associations and regulators, and are:

- Australasian Convenience and Petroleum Marketers Association
- Australian Petroleum Production and Exploration Association
- Australian Institute of Petroleum
- Geoscience Australia.

## Refining

The main stakeholders include industry associations and regulators, and are:

- Australian Aluminium Council Ltd
- International Copper Association Australia
- Australian Steel Association
- International Copper Study Group
- Australian Steel Institute
- International Lead and Zinc Study Group
- Copper Development Association Inc.
- International Nickel Study Group
- International Aluminium Institute
- World Gold Council.

## Forecasting Skills Priorities

The level of government regulation in the sector means that there is a high degree of training undertaken right across the CHR industry. Much of this training data is not collected in official statistics, as it is non-accredited.

Identified priorities for the PMA Chemical, Hydrocarbons and Refining Training Package (particularly the Certificate III) have been captured in the Chemical, Hydrocarbons and Refining 2017 project, and this work is underway.

Industry stakeholders consider that future priorities for the sector and its skills needs will include a review of the content with a focus on the two higher level qualifications in Process Plant Technology. Specifically, it was agreed that the generic nature of the qualifications and their broad focus on continuous improvement contrasts with the actual job roles available in industry at these occupational levels.

Given the increasing pace of automation in the industry, the need for induction training on automation for new entrants to the industry was also recognised. The changing work of tradespersons, operators and control room operators is also a focus for the industry and stakeholders who contributed to this Skills Forecast. Automation and optimisation were identified as drivers for skills development (particularly for control room operators). Industry stakeholders noted the accredited courses being developed by South Metropolitan TAFE in partnership with Rio Tinto (through the Australian Centre for Energy and Process Training (ACEPT) to support Rio Tinto's training needs in areas such as data analytics to support remote operations.

Industry figures also note that future training will need to emphasise troubleshooting, identifying, monitoring and understanding. The importance of '5 whys', process safety, data analytics and productivity skills are also increasingly recognised as 'must have' skills by the industry. The need for these skills arises from the way in which decision-making in organisations has shifted down from managers to control room operators, which means there is a significant need to reinforce the analytical skills of people in these roles.

Many of the skills identified by industry were captured in the scope of IBSA's Digital Skills Cross Sector Project Case for Change. While there were no recommendations for immediate training package changes, future training package development should take the report's findings into consideration.<sup>29</sup>

29 IBSA, 2017, Digital Skills Cross Sector Project: Case for Change <https://ibsa.org.au/wp-content/uploads/2018/01/IBSA-Digital-Skills-Final-Case-for-Change-Nov-2017.pdf>, accessed 25/1/2019.

# Training Snapshot

In 2017, a learner enrolled in a qualification from the PMA Chemical, Hydrocarbons and Refining Training Package was most likely to be:



ENROLLED IN CERTIFICATE III IN  
PROCESS PLANT OPERATIONS  
55% of total enrolments

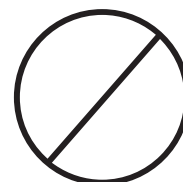


STUDYING IN QUEENSLAND  
43% of total enrolments

IN THE 30-39-YEAR-OLD AGE  
BRACKET  
26% of total enrolments



NOT IN AN APPRENTICESHIP  
OR TRAINEESHIP

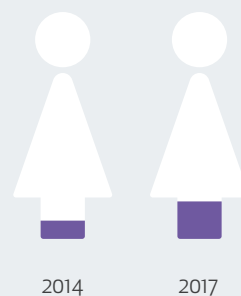


ENROLLED WITH TAFE



MALE  
85% of students

While 85% of students enrolled in the PMA Chemical, Hydrocarbons and Refining Training Package in 2017 were male, the proportion of female enrolments increased from 6% in 2014 to 16% in 2017.



## Training Delivery

A total of 31 Registered Training Organisations (RTOs) have the current PMA Chemical, Hydrocarbons and Refining Training Package on their scope. With such a high proportion of learners enrolled in the Certificate III qualification, it is unsurprising that it is also the most popular qualification in the PMA Chemical, Hydrocarbons and Refining Training Package offered by providers.

**Table 4 – Number and type of RTOs with PMA Chemical, Hydrocarbons and Refining qualifications on scope<sup>30</sup>**

Qualification name	No. of RTOs with the qualification on scope
Certificate II in Process Plant Operations	15 (8 TAFEs, 2 universities, 5 private RTOs)
Certificate III in Process Plant Operations	26 (1 industry association, 1 enterprise RTO, 7 TAFEs, 1 university, 16 private RTOs)
Certificate IV in Process Plant Technology	15 (6 TAFEs, 1 university, 8 private RTOs)
Diploma of Process Plant Technology	8 (5 TAFEs, 3 private RTOs)
Advanced Diploma of Process Plant Technology	4 (4 TAFEs)

Source: Training.gov.au. RTOs approved to deliver this qualification. Accessed 5 October 2018.

Only three of the 31 RTOs with PMA qualifications on scope offer all five PMA qualifications. They are all TAFE Institutes: Box Hill TAFE, South Metropolitan TAFE (WA) and TAFE Queensland.

Rio Tinto's work with South Metropolitan TAFE (through ACEPT) featured a number of times in discussions with industry stakeholders associated with the development of this Industry Skills Forecast.

The geographic spread of RTOs by state shows a widespread distribution across all states and territories.

<sup>30</sup> National Register of Vocational Education and Training (VET) available at [www.training.gov.au](http://www.training.gov.au), accessed on 5 October 2018.

## Qualifications Available

The PMA Chemical, Hydrocarbons and Refining Training Package contains five qualifications that are contextualised by training providers based on the sub-sector of the industry. They range from Certificate II to Advanced Diploma; focused on Process Plant Operations and Technology.

- Certificate II in Process Plant Operations
- Certificate III in Process Plant Operations
- Certificate IV in Process Plant Technology
- Diploma of Process Plant Technology
- Advanced Diploma of Process Plant Technology.

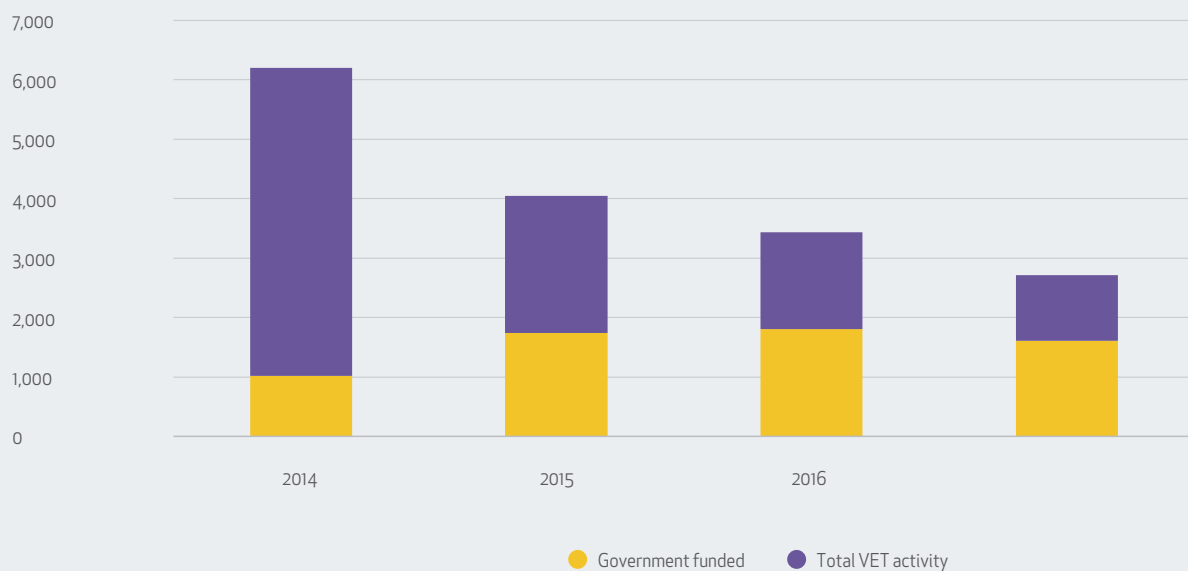
Within the PMA Chemical, Hydrocarbons and Refining qualifications there are 162 native units of competency and 13 skill sets. The skill sets provide specialised training for the following specific areas:

- Pipeline liquids transmission
- Pipeline gas transmission
- Workplace assessor, trainer, coach
- Confined space work team
- Contractor induction
- Emergency centre team
- Hot work observer
- Incident response commander
- Incident response team leader
- Incident response team member
- Offshore crane driver
- Offshore incident response team member
- Offshore operator safety induction.

## Qualification Uptake

The number of students enrolled in the PMA Chemical, Hydrocarbons and Refining Training Package continues to decline. Enrolments peaked in 2014 at 6,202 and have now declined to 2,718 in 2017 (a decrease of 56%). Even more concerning, the decline may in fact be larger than reported, as 2014 was the first year of collecting data in the Vocational Education and Training (VET) system on Total VET Activity and may be less complete than other years (some providers were granted exemptions from reporting and others did not report). Industry representatives advise that the significant amount of fee-for-service activity in 2014 was due to LNG companies upskilling workers in advance of major new projects coming on line.

**Figure 1 – Total program enrolments in PMA Chemical, Hydrocarbons and Refining qualifications**



Source: NCVER VOCSTATS, extracted on 15/08/2018.

The number of students receiving government funding to undertake training has grown since 2014, from 1,014 students in 2014 to 1,610 in 2017.

Figure 2 – Enrolments in PMA Chemical, Hydrocarbons and Refining qualifications by funding source (TAFEs and private providers)



Source: NCVER VOCSTATS, extracted on 15/08/2018.

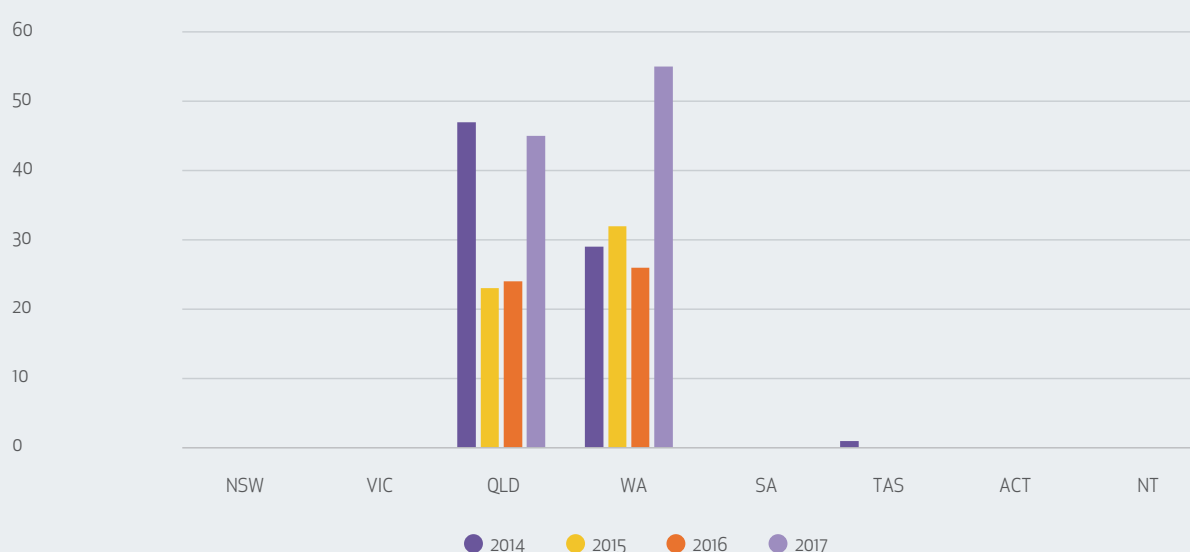
Enrolments in the PMA Chemical, Hydrocarbons and Refining Training Package are dominated by TAFEs and private RTOs.

There have been only a small number of enrolments in enterprise RTOs (64 enrolments in 2017) and universities (34 in 2017) in the past four years.

While TAFEs secured most of the enrolments in the peak of 2014, since then the enrolment patterns across both TAFE and private training providers have been largely similar – with both provider types also having a similar level of government funded students.

Given the highly technical nature of work in the CHR industry, it is unsurprising that those enrolled in VET delivered to secondary students (formerly VET in Schools) programs do not undertake their VET studies at school and instead study via other VET providers. Queensland and Western Australia dominate VETiS activity, which is a small component of the overall enrolment profile for the PMA Chemical, Hydrocarbons and Refining Training Package (just 100 students in 2017). The most popular qualification is the Certificate II in Process Plant Operations, which enrolls 96% of all VETiS students in this industry.

**Figure 3 – VET delivered to secondary students enrolments in PMA Chemical, Hydrocarbons and Refining qualifications**



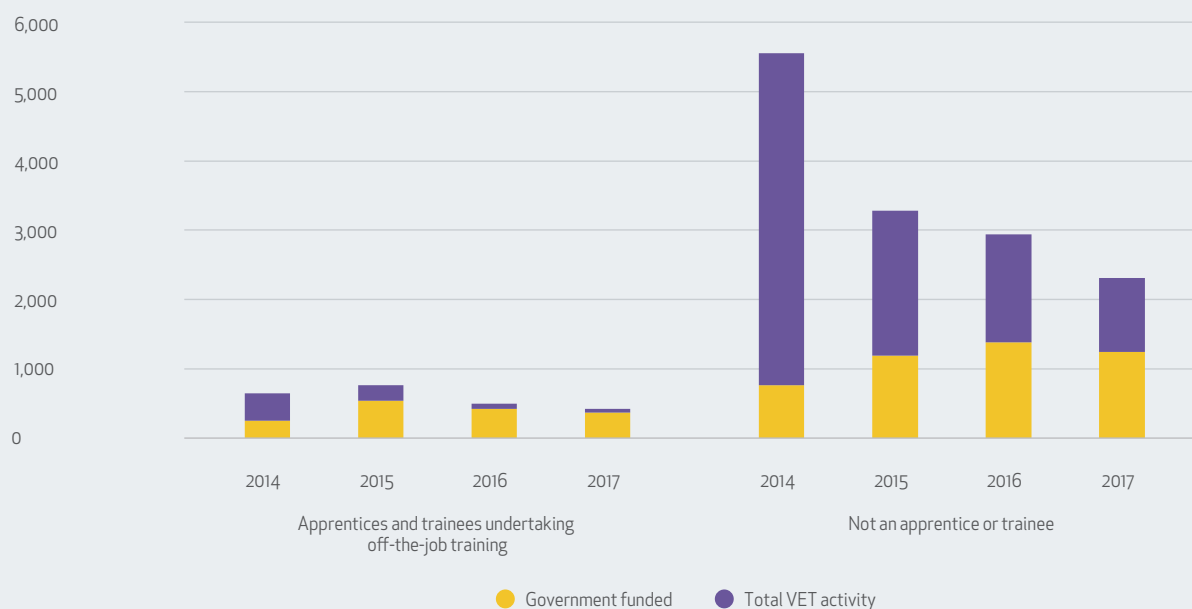
Source: NCVER VOCSTATS, extracted on 15/08/2018.

In terms of the CHR industry's use of apprenticeships and traineeships:

- Almost one quarter of students receiving government funding for a CHR qualification in 2017 were undertaking an apprenticeship.
- The proportion of government funded students undertaking a CHR apprenticeship has grown by 44% since 2014.
- As a proportion of enrolments, total apprentices and trainees represented only 15% of total training package enrolments in 2017.
- There are differences between jurisdictions in their treatment of apprenticeships and traineeships in the CHR industries, as shown in Table 5.



Figure 4 – PMA Chemical, Hydrocarbons and Refining Training Package course enrolments by apprenticeship status



Source: NCVET VOCSTATS, extracted on 15/08/2018.

**Table 5 – Apprenticeships and traineeships by nominal duration, funding source and state or territory**

Qualification	NSW	VIC	QLD	WA	SA	TAS	ACT	NT
Certificate II in Process Plant Operations	T	~	T	T	~	*	~	T
Available (nominal duration – months)	12	N	12	18	N	24	N	18
Funded	N	N	Y	Y	N	Y	N	Y
Certificate III in Process Plant Operations	T	T	T	T	T	*	~	T
Available (nominal duration – months)	24	24	24	24	36	N	N	36
Funded	N	Y	Y	Y	N	N	N	Y
Certificate IV in Process Plant Technology	Y	Y	Y	Y	~	*	~	T
Available (nominal duration – months)	36	36	36	36	N	N	N	36
Funded	N	Y	N	Y	N	N	N	Y
Diploma of Process Plant Technology	T	~	~	T	~	*	T	T
Available (nominal duration – months)	24	N	N	12	N	N	24	24
Funded	N	N	N	Y	N	N	Y	N
Advanced Diploma of Process Plant Technology	~	~	~	~	~	*	~	~
Available (nominal duration – months)	N	N	N	N	N	N	N	N
Funded	N	N	N	N	N	N	N	N

Source: NCVER VOCSTATS, extracted on 15/08/2018.

\* Tasmania does not differentiate between apprenticeships and traineeships, ~ qualification cannot be undertaken as Apprenticeship or Traineeship.

T = traineeship.

Across all qualification levels in the CHR Training Package, the annual National Centre for Vocational Education Research (NCVER) Student Outcomes Survey shows graduates have high levels of post-study employment and/or further training.

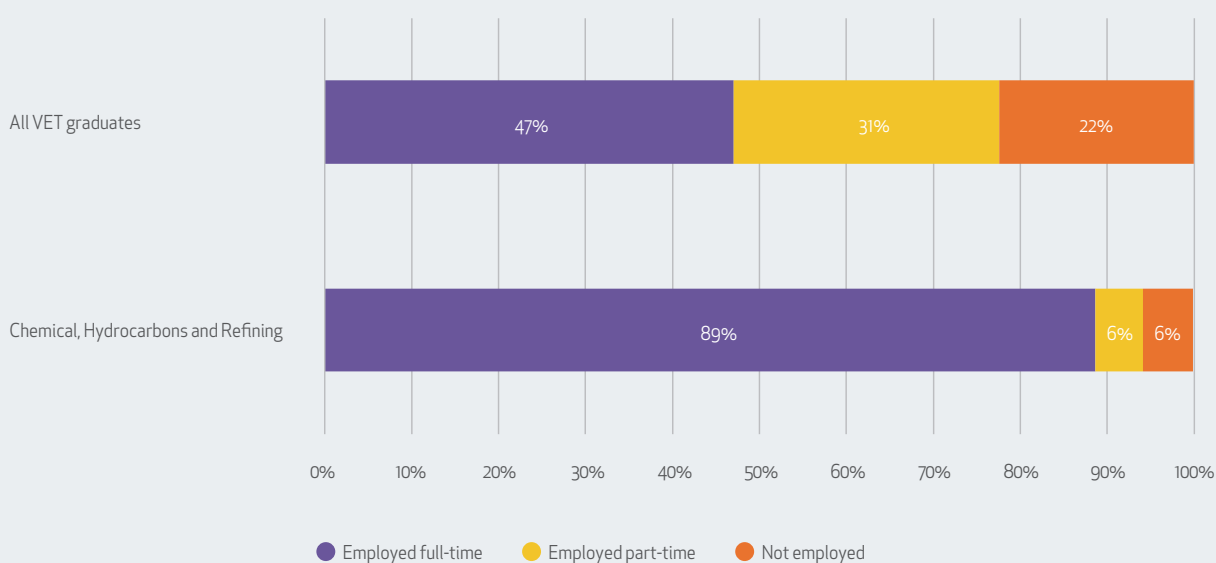
Table 6 – Proportion of surveyed VET graduates in work or further study in 2018

Qualification	% of surveyed graduates in work or further study
Certificate II in Process Plant Operations	86.2%
Certificate III in Process Plant Operations	92.2%
Certificate IV in Process Plant Technology	98%
Diploma of Process Plant Technology	92%
Advanced Diploma of Process Plant Technology	92%

Source: [www.myskills.gov.au](http://www.myskills.gov.au) accessed on 7 October 2018.

Viewed against the performance of the entire VET sector, graduates from the PMA Chemical, Hydrocarbons and Refining Training Package have significantly better post-study outcomes (see Figure 5).

Figure 5 – VET Graduate employment outcomes after training<sup>31</sup>

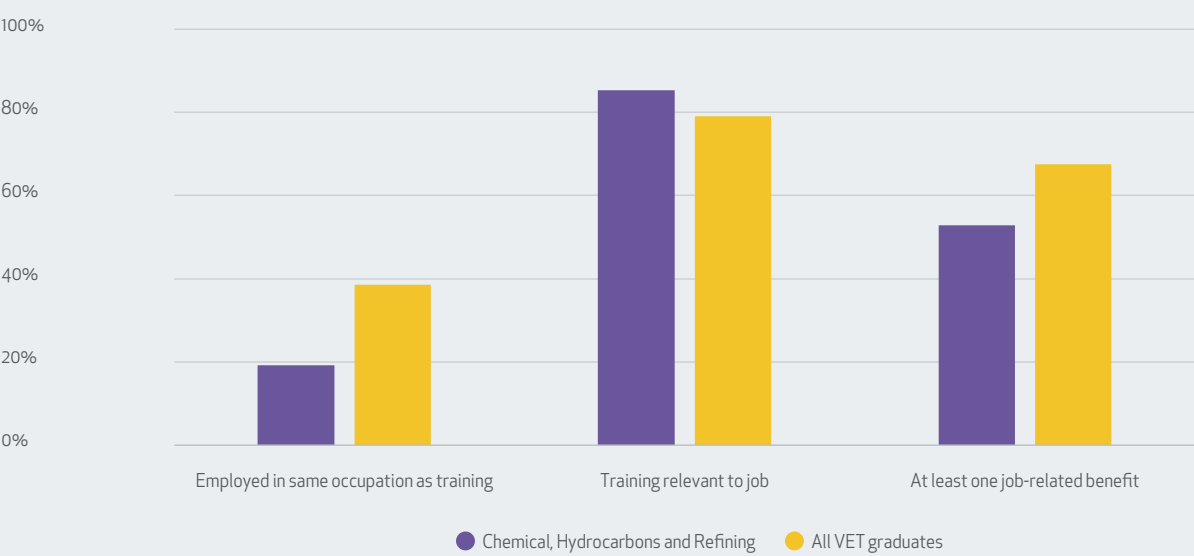


Source: NCVET VET student outcomes 2017, Data visualisation – VET graduate outcomes, all VET graduates.

<sup>31</sup> Survey findings presented here relate to all VET graduates – i.e. those who completed their training qualification. It should be noted that the survey results may be subject to sampling errors based on the comparison of CHR to the overall VET training sector.

Interestingly, despite the very strong employment outcomes for PMA graduates, and the preponderance of enrolments in the Certificate III qualification, they have a much lower rate of employment in the industry sector in which they trained. That is, students completing PMA qualifications are much less likely to work in the CHR industry than other VET graduates are to work in the industry for which they trained.

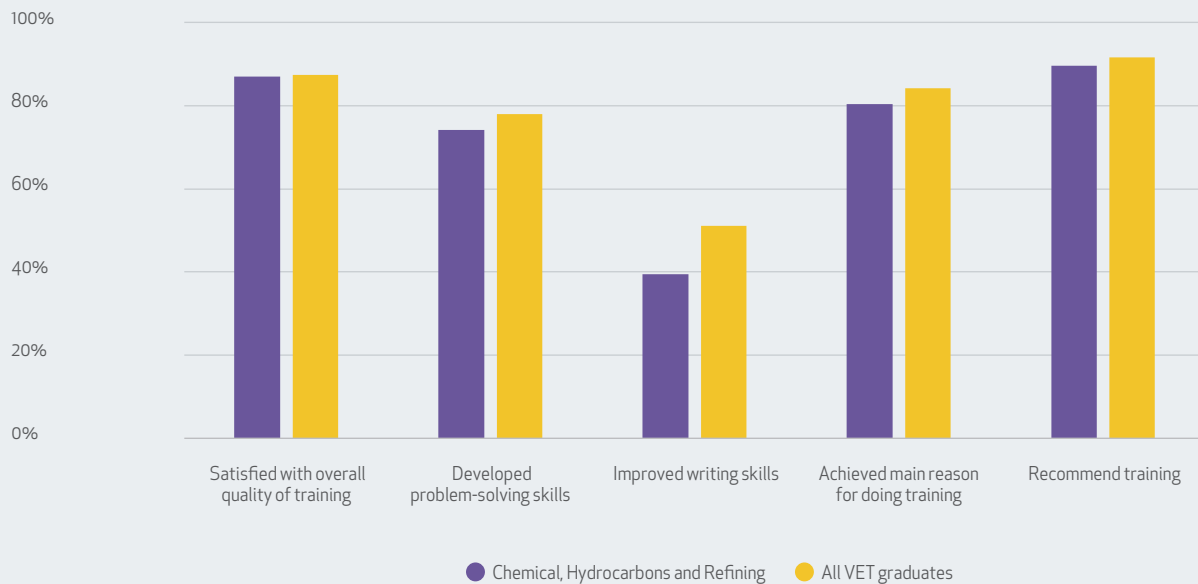
Figure 6 – Outcomes for VET graduates employed after training<sup>32</sup>



PMA graduates have similar levels of satisfaction with their training as other VET graduates.

32 Survey findings presented here and in Figure 8 relate to all VET graduates – i.e. those who completed their training qualification. It should be noted that the survey results may be subject to sampling errors based on the comparison of CHR to the overall VET training sector.

Figure 7 – VET graduates, satisfaction with training



Source: NCVET VET student outcomes 2017, Data visualisation – VET graduate outcomes, all VET graduates.

# Challenges and Opportunities

## For Industry and Employers

As identified in the Process Manufacturing, Recreational Vehicle and Laboratory IRC report on Future Skills Workshop Outcomes,<sup>33</sup> the following issues are considered significant challenges for the CHR industry, and the Process Manufacturing, Recreational Vehicle and Laboratory industry more broadly.

### Technology

Technology will have an extreme impact on the Process Manufacturing, Recreational Vehicle and Laboratory industry and will change the sectors, as well as influencing learning and creating knowledge.

The key trends affecting the sectors are as follows.

**Artificial Intelligence (AI) and Machine Learning:** AI technologies are now an established trend and are being implemented across the sectors in various ways. A significant challenge is for policy and regulation to keep up with the pace of change and implementation.<sup>34</sup> Industry may need to do more to promote the employment and skilling opportunities of technology adoption.

Cross-Disciplinary Science is an emerging trend whereby individuals and teams of workers will require functional knowledge across several disciplines.

The CHR industry is directly and heavily impacted by global competition, with large employers increasingly investing in automation to improve productivity. Across those large businesses that are automating their work, the need for training on automation for new entrants to the industry has been identified as important.

While larger businesses in the sector are moving to automate, the large proportion of businesses in the CHR industry that are small or micro (i.e. five employees or fewer) means many do not have the funds available to invest in new technologies, leaving them vulnerable to global competitors and cheaper imports.

33 <https://ibsa.org.au/wp-content/uploads/2018/06/Process-Manufacturing-Recreational-Vehicle-Laboratory-Future-Skills-Outcomes.pdf>, accessed 25/10/2018.

34 Ibid.

## Society and Culture

Key trends affecting the Process Manufacturing, Recreational Vehicle and Laboratory industry include the following.

**Changing Work and Career Values:** an emerging trend that may become more prevalent in workplaces, especially with technology expansion and a broader acceptance of automation. Workers may have the flexibility to undertake roles that interest them, but if workplace changes are imposed on them, they may not react positively.

**Global and Social Mobility:** are allowing Australians with higher skill levels and industry knowledge to travel overseas knowing they will gain work. Where lower level technical skills are still required, these jobs are increasingly being filled by new Australians and this poses language, literacy and numeracy (LLN) challenges in the workplace.<sup>35</sup> Social mobility, enhanced by social media and the internet, is having a significant impact on how people learn and how they make their career choices.

The oil and gas industry is transitioning to the production phase, which is expected to lead to an increased demand for skilled process workers and technologists. Further demand from Asia is also likely as the middle class continues to grow and their energy demands increase. Despite renewables growing at the fastest rate of all energy sources, the International Energy Agency forecasts<sup>36</sup> demand for liquid fuels and natural gas will continue to increase.

## Political and Institutional

Process Manufacturing industries operate in highly regulated environments with workplaces required to adhere to stringent workplace health and safety (WHS) requirements; and many workers needing licences to undertake their job roles. However, frequent changes of government have impacted the implementation of reform agendas that are important for industry sustainability. In addition, governments need to ensure funding for VET is provided to the appropriate skill areas, especially where workers require training to meet regulatory and/or licensing requirements.

## Resources and Environment

International regulations are becoming a key driver for change, including Australia's work in developing emission targets that will harmonise with international standards.

The resources sector, where many workers who have trained in the PMA Chemical, Hydrocarbons and Refining Training Package hold jobs, is becoming increasingly concerned with its industry 'footprint', including waste disposal, energy use and recreating landscapes 'pre-process work'. Finally, younger and not-so-young Australians are showing more concern for environmental issues.<sup>37</sup>

35 <https://ibsa.org.au/wp-content/uploads/2018/06/Process-Manufacturing-Recreational-Vehicle-Laboratory-Future-Skills-Outcomes.pdf>, accessed 25/10/2018.

36 International Energy Agency, 2016, IEA sees major shifts in global gas trade over next five years, IEA, Brussels, 8 June 2016.

37 <https://ibsa.org.au/wp-content/uploads/2018/06/Process-Manufacturing-Recreational-Vehicle-Laboratory-Future-Skills-Outcomes.pdf>, accessed 25/10/2018.

## Business and Economics

The key trends affecting the Process Manufacturing, Recreational Vehicle and Laboratory sectors are as follows.

**Empowered (Informed and Demanding) Customers:** As noted above in relation to environmental concerns, informed consumers and changing consumer demands are having an impact on the CHR industry.

**Changing Workplace Dynamics:** There is an emerging trend of teams becoming increasingly fluid in terms of size, interactions and tasks. This will see an increased demand for skills like teamwork and emotional intelligence, in addition to purely technical skills. A tension also exists between increasing levels of innovation and the need for standardisation in the manufacturing sector. Some industry figures consider that 'structured flexibility' will therefore become increasingly prevalent.<sup>38</sup>

**Financial Viability:** As noted earlier, the financial viability of some of the smaller businesses in the sector is an issue. Financial pressures also exist amongst larger companies as they face the threat of global competition and are impacted by access to and cost of resources.<sup>39</sup>

## Supply-side Challenges and Opportunities

With employment in the industry paying well and employment projections predicting a modest decline in overall employment numbers, no specific supply-side challenges were identified.<sup>40</sup>

38 <https://ibsa.org.au/wp-content/uploads/2018/06/Process-Manufacturing-Recreational-Vehicle-Laboratory-Future-Skills-Outcomes.pdf>, accessed 25/10/2018.

39 Ibid.

40 Ibid.



## For Learners and Training Package Development

Industry demand for skill sets and 'just in time' training is increasing. Industry require workers to have developed strong underpinning skills and knowledge through a qualification, with skill sets then proving a vehicle to upskill in other key aspects of the role. As a consequence, full qualifications have a declining relevance for employers. The Diploma and Advanced Diploma in the PMA Chemical, Hydrocarbons and Refining Training Package are considered by industry as being too generalist and, therefore, not reflective of the specific para-professional job roles in the industry.<sup>41</sup> Increasing the number of workers with higher level PMA qualifications will also remain a challenge while funding for Diplomas and Advanced Diplomas is less generous than the funding available for university study. Industry feedback suggests that the mismatch between the higher level VET qualifications and identified industry job roles has contributed to poor take-up of these qualifications as they are not considered relevant.

## Cross-industry Challenges and Opportunities

As the Australian Industry and Skills Committee (AISC) currently has nine cross sector projects in progress or completed,<sup>42</sup> future opportunities for the CHR industry will be to work with other groups, not only in the broader manufacturing space, but also other IRCs, to continue to identify and apply transferable skills for 'more mobile' future workers.

Opportunities may also exist through existing cross sector projects (e.g. Teamwork and Communication). The IRC will engage with cross sector projects to provide input on the skill needs and experiences of the manufacturing industry. See the [Cross Sector Projects](#) section for more details.

<sup>41</sup> <https://ibsa.org.au/wp-content/uploads/2018/06/Process-Manufacturing-Recreational-Vehicle-Laboratory-Future-Skills-Outcomes.pdf>, accessed 25/10/2018.

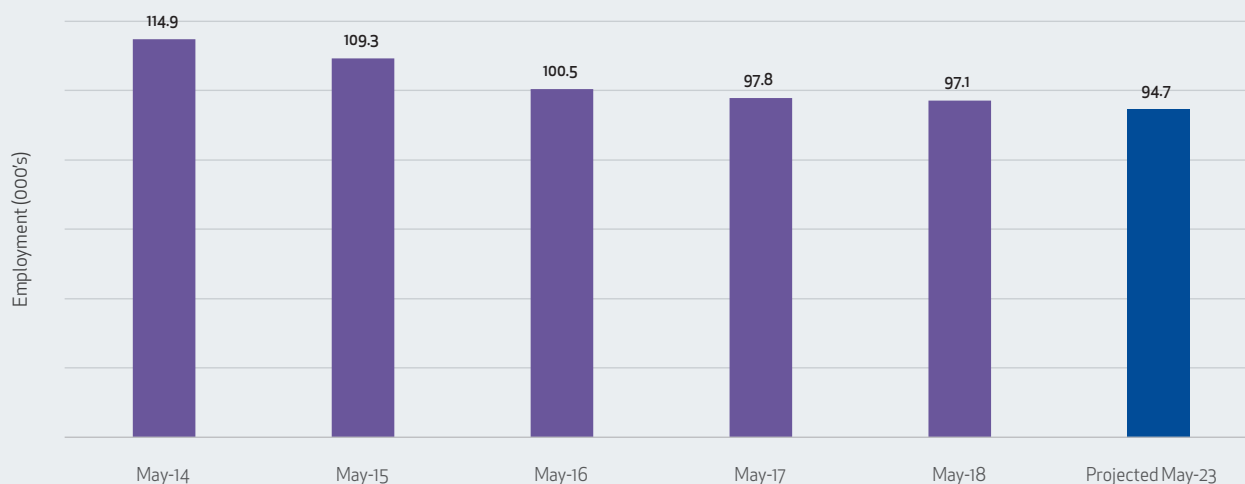
<sup>42</sup> <https://www.aisc.net.au/content/cross-sector-projects>, accessed October 2018.

# Employment and Skills Outlook

## Employment Outlook

Employment within the CHR industry has declined in the last five years by 15%. In the next five years it is predicted that employment will decline by a further 2.5%.

Figure 8 – Employment estimates and projections across the CHR industry<sup>43</sup>



Source: Department of Jobs and Small Business, Labour Market Information Portal.

Occupation time series data (May 2014 to May 2017) has been sourced from the ABS 6291.055.003 Labour Force, Australia, Detailed, Quarterly, May 2018. Figures are average of preceding 4 quarters, whereas May 2018 and projection to May 2023 figures are seasonally adjusted and trended as sourced from LMIP.

<sup>43</sup> The 2018 employment projections are based on the forecasted and projected total employment growth rates published in the 2018–2019 Budget, the Labour Force Survey (LFS) data (June 2018) for total employment, and the quarterly detailed LFS data (May 2018) for industry employment.

Looked at by occupational sector, it is clear that some job roles will experience growth while those more vulnerable to automation will decline. The following is a snapshot of some of the job profiles within the CHR industry.

### Chemical, Gas, Petroleum and Power Plant Operators

Chemical, Gas, Petroleum and Power Generation

Plant Operators control the operation of chemical production equipment, pump gas and oil from wellheads, refine and process petroleum products, and operate boilers, turbogenerators and associated plant to generate electrical power.



**\$2,023**  
Weekly Pay



**Stable**  
Future Growth



**Medium Skill\***  
Skill Level

\* Consultations indicate that that a 'medium' skill level does not accurately reflect the skill required to operate plants at the complex end of the scale, for which a 'high' skill level would be more accurate.

### Drillers, Miners and Shot Firers

Drillers, Miners and Shot Firers assemble, position and operate drilling rigs and mining plant, and detonate explosives to extract materials from the earth and demolish structures.



**\$2,102**  
Weekly Pay



**Moderate**  
Future Growth



**Lower Skill\***  
Skill Level

\* Consultations indicate that that the skill required for a driller, which is a Certificate III occupation (trade equivalent), can be higher than a 'lower' skill level.

### Other Factory Process Workers

Other Factory Process Workers includes a number of occupations such as Cement and Concrete Plant Workers, Chemical Plant Workers, Clay Processing Factory Workers, Fabric and Textile Factory Workers, Footwear Factory Workers, Glass Processing Workers, Hide and Skin Processing Workers and Recycling Workers.



**\$999**  
Weekly Pay



**Decline**  
Future Growth

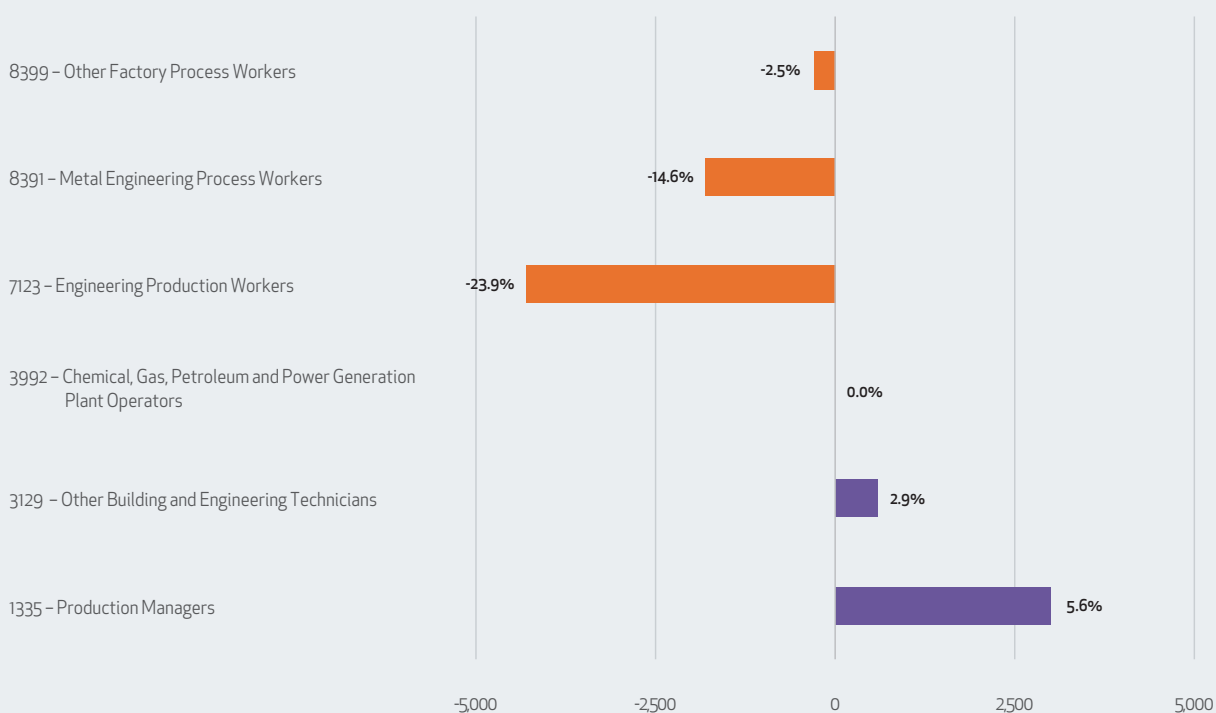


**Entry Level**  
Skill Level

<https://joboutlook.gov.au/> accessed on 6 October 2018.

At a more detailed occupational level, the forecast employment projections for the industry for the next five years are shown below.

Figure 9 – Projected five-year employment growth patterns to 2023 by occupation (ANZSCO four-digit)<sup>44</sup>



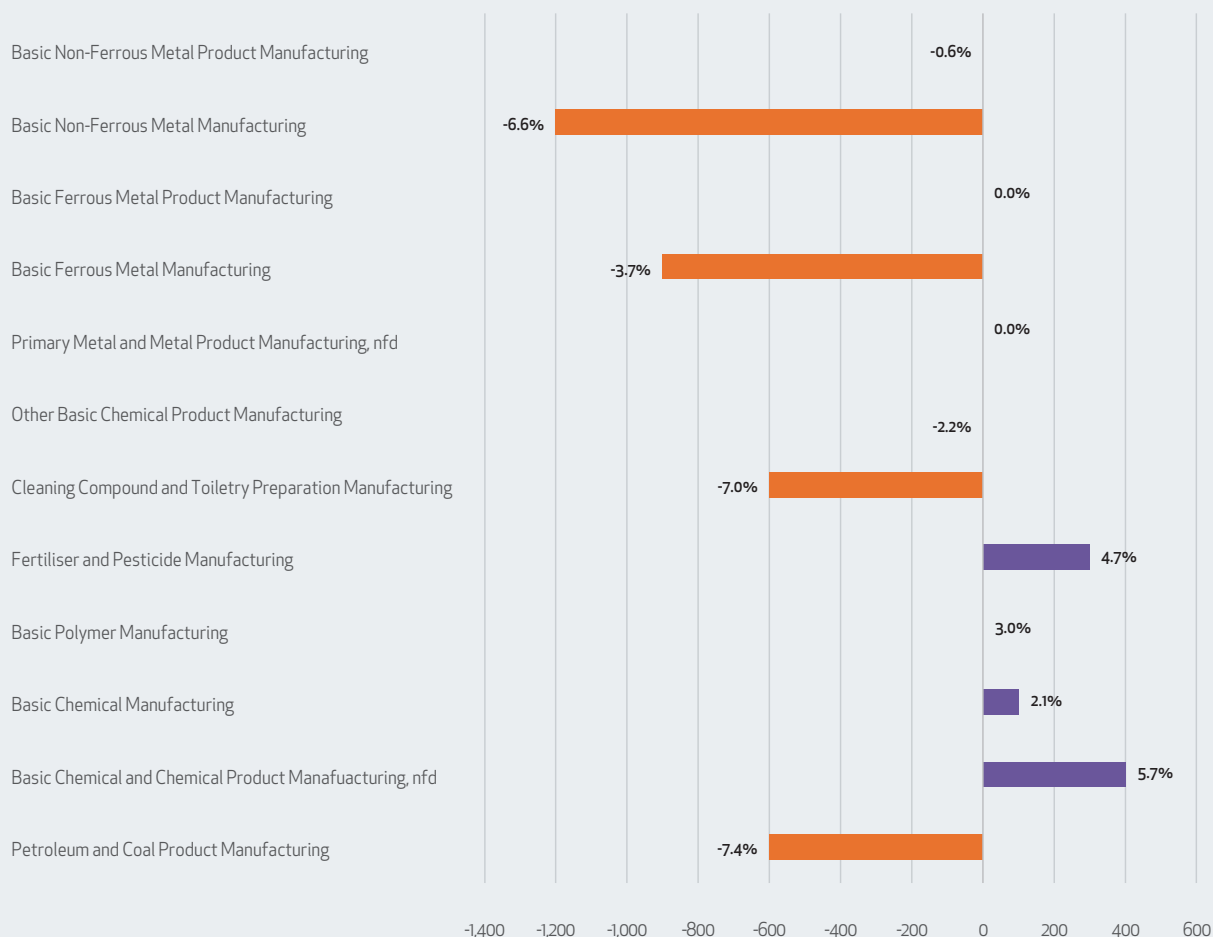
Source: Department of Jobs and Small Business, Labour Market Information Portal.

Occupation time series data (May 2014 to May 2017) has been sourced from the ABS 6291.0.55.003 Labour Force, Australia, Detailed, Quarterly, May 2018. Figures are an average of preceding 4 quarters, whereas May 2018 and projection to May 2023 figures are seasonally adjusted and trended as sourced from LMIP.

In the same way that there are differences by occupation in the likely future employment demand, there are also differences at the industry sub-sector level within the broader CHR industry. Ferrous and non-ferrous metal manufacturing are predicted to lose workers in the next five years, while chemical manufacturing and fertiliser and pesticide manufacturing are predicted to grow.

<sup>44</sup> The 2018 employment projections are based on the forecasted and projected total employment growth rates published in the 2018–2019 Budget, the Labour Force Survey (LFS) data (June 2018) for total employment, and the quarterly detailed LFS data (May 2018) for industry employment data.).

Figure 10 – Projected five-year employment patterns to 2023 by industry group



Source: Department of Jobs and Small Business, Labour Market Information Portal.

Occupation time series data (May 2014 to May 2017) has been sourced from the ABS 6291.055.003 Labour Force, Australia, Detailed, Quarterly, May 2018. Figures are average of preceding 4 quarters, whereas May 2018 and projection to May 2023 figures are seasonally adjusted and trended as sourced from LMIP.

## Workforce Supply Challenges

As noted earlier, the focus of the industry at present is on the delivery of the Chemical, Hydrocarbons and Refining 2017 project to maintain the relevance of the Training Package and assist employers with their workforce supply challenges. However, future redevelopment work will need to look at the skills required to work in an automated environment and the impact on skills from the changing locus of decision-making within CHR organisations (moving away from management and down towards the plant floor).

# Skills Outlook

## Key Generic Skills

In developing their Industry Skills Forecasts and Proposed Schedules of Work, Manufacturing IRC members have ranked the importance of key generic workforce skills in the table below:

Table 7 – Key Generic Workforce Skills

Combined Manufacturing IRCs		Process Manufacturing, Recreational Vehicle and Laboratory IRC	
1	Design mindset/Thinking critically/Systems thinking/ Problem solving skills	1	Technology use and application skills
2	Technology use and application skills	2	Design mindset/Thinking critically/Systems thinking/ <b>Problem solving skills</b>
3	Learning agility/Information literacy/Intellectual autonomy and self-management skills	3	Managerial/ <b>Leadership skills</b>
4	Communication/Collaboration including virtual collaboration/Social intelligence skills	4	LLN skills
5	Science, Technology, Engineering and Mathematics (STEM) skills	5	STEM skills
6	LLN skills	6	<b>Learning agility/Information literacy/Intellectual autonomy and self-management skills</b>
7	Data analysis skills	7	<b>Customer service/Marketing skills</b>
8	Managerial/Leadership skills	8	<b>Communication/Collaboration</b> including virtual collaboration/Social intelligence skills
9	Customer service/Marketing skills	9	Data analysis skills
10	Environmental and Sustainability skills	10	Environmental and Sustainability skills
11	Entrepreneurial skills	11	Financial skills
12	Financial skills	12	Entrepreneurial skills

Demand for generic skills may vary considerably between industry sectors, regions and individual businesses. Employers may prioritise some generic skills over others depending on their particular context, workforce and business imperative. All of the identified generic skills are important throughout the workforce. This ranking represents the importance of generic skills across an industry but should not be expected to reflect the specific experience of every business and employer within that industry.

Through the research and consultation processes for the development of this Industry Skills Forecast, the Process Manufacturing, Recreational Vehicle and Laboratory IRC has identified the priority areas for training package development, listed in Table 8 below.

**Table 8 – Priority areas for training package development**

Rank	Skill	How identified
1	Less generic skills in Diploma and Advanced Diploma	Industry Consultation
2	Understanding/working with automation	Industry Consultation
3	Process safety	Industry Consultation
4	LLN	Peak Body Reports
5	Environmental sustainability	Cross-Industry project

# Key Drivers for Change and Proposed Responses

The challenges and opportunities and the employment and skills outlook described in this report indicate the need for skill development solutions in a number of priority areas. These are outlined in Table 9 below.

**Table 9 – Priority skills and key drivers for change**

Priority Skills	Key Driver for Change	Proposed Response
<b>Changing Job Roles</b>		
Automation Increased use of remote operations	Growing use of remote operations in the oil and gas sector following the productivity gains in the mining sector. The changing work of control room operators, with automation and optimisation as drivers for different skills.	To be addressed through the development of the Certificate IV Operator
Increasing specificity in higher level job roles	Low level enrolments in the Diploma and Advanced Diploma. Industry consultations have identified the generic nature and broad focus on continuous improvement in the current Diploma and Advanced Diploma as being in contrast to the actual job roles available in industry at these occupational levels.	To be addressed through a review of the Diploma and Advanced Diploma
<b>Industry Specific – Coal Seam Gas</b>		
The continued development of the coal seam gas sector – particularly in Queensland	Queensland's coal seam gas sector continues to grow and requires additional skills to support this growth.	Ensure training components support workers in the coal seam gas sector



# Training Product Review

## Current Activities

### Chemical, Hydrocarbons and Refining 2017 Project Progress

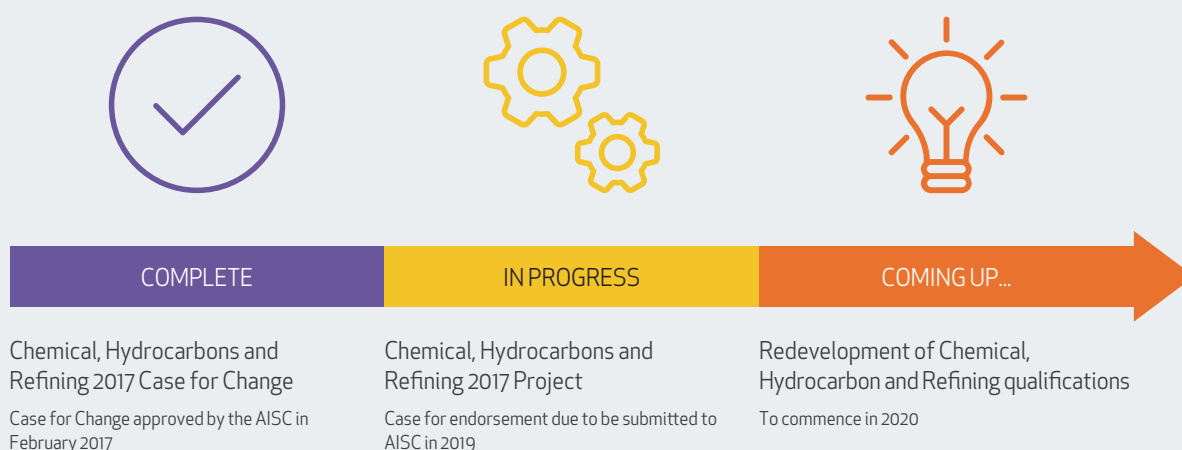
In February 2017, IBSA Manufacturing was commissioned to undertake training package development work on the PMA Chemical, Hydrocarbons and Refining Training Package.

The Case for Change identified that current qualifications at Certificate III and IV level require redevelopment to bring them in line with current industry needs. Industry has indicated a review of the Certificate III in Process Plant Operations is an imperative.

The LNG industry had recognised the need to undertake a job role analysis and develop an LNG Framework that could be used as the foundation for shaping revised qualifications and units of competency in the PMA Chemical, Hydrocarbons and Refining Training Package. In recognition that alignment of training package development work to the LNG Framework would enhance industry outcomes, the project waited until the LNG Framework was established. In late 2018 the LNG Framework was agreed by industry, clearing the way for continuation of the project.

The training package development work is due to be completed and submitted for AISC consideration in 2019.

### Training Product Review – Activities Timeline



## AISC Cross Sector Projects

In 2017, the AISC established nine cross sector projects in the common skill areas of automation, big data, digital skills, consumer engagement through social media, cybersecurity, environmental sustainability, inclusion of people with disability in VET, supply chain, and teamwork and participation. This signalled a new approach to training package development that aims to simplify VET and improve mobility through recognition of qualifications between occupations.

To ensure cross sector units are relevant to multiple occupations and industry sectors, each project includes representation across multiple industries. Cross sector units of competency will be housed in the most relevant training package and marked with a cross sector identifier. Once available on training.gov.au, the units can be adopted across all industry training packages as qualifications and skills are reviewed or developed.

The following cross sector project has been identified as potentially impacting the PMA Chemical, Hydrocarbons and Refining Training Package.

The **Teamwork and Communication** cross sector project aims to develop common 'teamwork' and 'communication' units that can be used across multiple industries. The project includes the development of five new units to be included in the BSB Business Services Training Package.

There are a further three cross sector projects that may also impact the PMA Chemical, Hydrocarbons and Refining Training Package: Automation Skills, Digital Skills and Environmental Sustainability. The next phase of work on these projects is being determined, and the Process Manufacturing, Recreational Vehicle and Laboratory IRC will continue monitoring their progress for consideration in future training package development work.

The Process Manufacturing, Recreational Vehicle and Laboratory IRC will consider recommendations to integrate the new units developed under the above cross sector projects into qualifications in the PMA Chemical, Hydrocarbons and Refining Training Package once components are available.

# Upcoming Activities

## Priorities 2019–2023

Following consideration and analysis of the industry challenges and opportunities, current and emerging skills needs, and the key drivers for change, the Process Manufacturing, Recreational Vehicle and Laboratory IRC have identified a few areas for possible review. These training priorities are outlined in the IRC's [Proposed Schedule of Work 2019–2020 to 2022–2023](#), which lists the priorities for the next four years. The Schedule also provides a rationale for the priorities, proposed scope and timeframes for these activities.

## Priorities Over the Next Three Years

The IRC identified the following training priorities to be considered over the next three years:

Redevelopment of Chemical, Hydrocarbons and Refining Qualifications: Review three Chemical, Hydrocarbons and Refining qualifications to ensure they align to current job role requirements.

# Consultation Undertaken

The 2019 Skills Forecast and Proposed Schedule of Work 2019–2023 builds on the consultations undertaken as part of the 2018 return. Feedback on industry imperatives were also captured as part of training package development projects undertaken throughout 2018.

More specifically, key individual industry and group stakeholders, identified by the Process Manufacturing, Recreational Vehicle and Laboratory IRC, were consulted during the development of the Industry Skills Forecast. See [Appendix E](#) for the consultation list.

Feedback was gathered via the following methods:

- forums, meetings and focus groups – attended in person and via webinar
- one-on-one consultation – attended via phone/teleconference and/or face-to-face.

## Issues and Sensitivities Raised

Industry consultation identified a number of issues and sensitivities, relating to particular areas within the industry, which have been outlined in the table below. The [Upcoming Activities](#) section provides further information on the action to be taken to address these issues/sensitivities.

**Table 10 – Issues and sensitivities raised by stakeholders during consultation**

Area	Issue and/or sensitivity	Action to be taken
Redevelopment of Chemical, Hydrocarbons and Refining Qualifications	An identified gap in the Training Package related to the growth in the use of remote operations in the oil and gas sector and a change in the work of control room operators, with automation and optimisation driving different skills.	Proposed activity 2020–2021
	A disconnect between the Diploma and Advanced Diploma qualification outcomes and industry job roles, resulting in the qualifications not being widely used.	
	The current Diploma and Advanced Diploma identified as generic in nature, with a broad focus on continuous improvement, which is in contrast to actual job roles available in the industry at these occupational levels.	
	Queensland's coal seam gas sector continues to grow and requires additional skills to support this growth.	

# Proposed Schedule of Work 2019–2020 to 2022–2023

Process Manufacturing, Recreational Vehicle and  
Laboratory IRC

PMA Chemical, Hydrocarbons and Refining Training  
Package

**Contact details:** Keith Monaghan

**Date submitted to Department of Education and Training:** April 2019

Year	Items to be Included in the National Schedule
2020–2021	<p><b>Redevelopment of PMA Chemical, Hydrocarbons and Refining Qualifications</b></p> <p>Review three PMA Chemical, Hydrocarbons and Refining qualifications to ensure they align to current job role requirements with specific focus on coal seam gas processing skills.</p> <p>Revision of these qualifications will also incorporate:</p> <ul style="list-style-type: none"> <li>• Development of units of competency to ensure skills are available to meet growing demand of coal seam gas processing, due to growth areas in the oil and gas sector</li> <li>• Identification and removal of redundant and obsolete units of competency from qualification elective banks</li> <li>• Cross sector project impacts.</li> </ul> <p><b>Rationale:</b></p> <p>Following analysis, several issues with the qualifications were identified, including:</p> <ul style="list-style-type: none"> <li>• The growing use of remote operations in the oil and gas sector following the productivity gains in the mining sector and the changing work of control room operators, with automation and optimisation as drivers for different skills, has led to a need to introduce a new Certificate IV qualification.</li> <li>• The Diploma and Advanced Diploma are not widely used by industry as there is a disconnect between the qualification outcome and the job role. Further analysis of these qualifications is required to ensure they remain current and relevant for the sector. Stakeholder feedback identified the need for the development of new units of competency to meet industry needs in coal seam gas, which will likely become a key significant supplier in Australia, especially considering Australia is predicted to become the world's largest gas producer by 2021. Some jurisdictions, such as the Queensland government, are forecasting significant growth in employment, most of whom will be new to the sector. This will lead to increasing demand for skilled process workers and technologists. Qualifications need to ensure they are catering to the needs of this growing industry.</li> </ul> <p>This project provides an opportunity to redesign the qualifications to ensure they are fit-for-purpose to meet industry needs.</p> <p>Further analysis and consultation needs to be undertaken to validate this activity.</p> <p><b>Training products potentially impacted:</b></p> <ul style="list-style-type: none"> <li>• Certificate IV in Process Plant Technology</li> <li>• Diploma of Process Plant Technology</li> <li>• Advanced Diploma of Process Plant Technology</li> <li>• New coal seam gas units developed.</li> </ul>

# Appendix A: Occupation Classifications

For the purposes of analysing employment trends, the following ANZSCO codes have been used.

4-digit code	Unit Group Name	6-digit code	Occupation Title
1335	Production Managers	133512	Production Manager (Manufacturing)
3129	Other Building and Engineering Technicians	312911	Maintenance Planner
		312912	Metallurgical or Materials Technician
		312913	Mine Deputy
		312999	Building and Engineering Technicians nec
3992	Chemical, Gas, Petroleum and Power Generation Plant Operators	399211	Chemical Plant Operator
		399212	Gas or Petroleum Operator
		399213	Power Generation Plant Operator
7123	Engineering Production Workers	712311	Engineering Production Worker
8391	Metal Engineering Process Workers	839111	Metal Engineering Process Worker
8399	Other Factory Process Workers	839911	Cement and Concrete Plant Worker
		839912	Chemical Plant Worker
		839913	Clay Processing Factory Worker
		839914	Fabric and Textile Factory Worker
		839915	Footwear Factory Worker
		839916	Glass Processing Worker
		839917	Hide and Skin Processing Worker
		839918	Recycling Worker
		839999	Factory Process Workers nec

Nec = not elsewhere classified

# Appendix B: Industry Classifications

For the purposes of analysing the business landscape, the following ANZSIC codes have been used.

## 4-digit classification

## 6-digit classification

### Chemical

1800	Basic Chemical and Chemical Product Manufacturing, nfd
1810	Basic Chemical Manufacturing, nfd
1811	Industrial Gas Manufacturing
1812	Basic Organic Chemical Manufacturing
1813	Basic Inorganic Chemical Manufacturing
1830	Fertiliser and Pesticide Manufacturing, nfd
1850	Cleaning Compound and Toiletry Preparation Manufacturing, nfd
1851	Cleaning Compound Manufacturing
1890	Other Basic Chemical Product Manufacturing, nfd
1891	Photographic Chemical Product Manufacturing
1892	Explosive Manufacturing
1899	Other Basic Chemical Product Manufacturing nec

### Hydrocarbons

1700	Petroleum and Coal Product Manufacturing, nfd
1701	Petroleum Refining and Petroleum Fuel Manufacturing
1702	Other Petroleum and Coal Product Manufacturing



## 4-digit classification

## 6-digit classification

**Refining**

2100	Primary Metal and Metal Product Manufacturing, nfd
2110	Iron Smelting and Steel Manufacturing
2121	Iron and Steel Casting
2130	Basic Non-Ferrous Metal Manufacturing, nfd
2131	Alumina Production
2132	Aluminium Smelting
2133	Copper, Silver, Lead and Zinc Smelting and Refining
2139	Other Basic Non-Ferrous Metal Manufacturing
2140	Basic Non-Ferrous Metal Product Manufacturing, nfd
2141	Non-Ferrous Metal Casting

Nfd = not further defined

Nec = not elsewhere classified

**Please note:** For this Skills Forecast, at the recommendation of the IRC, the following two industry classes were included for selected industries in the PMA Chemical, Hydrocarbons and Refining Training Package; previously they had only been included in the PMB Plastics, Rubber and Cablemaking Training Package.

## 4-digit classification

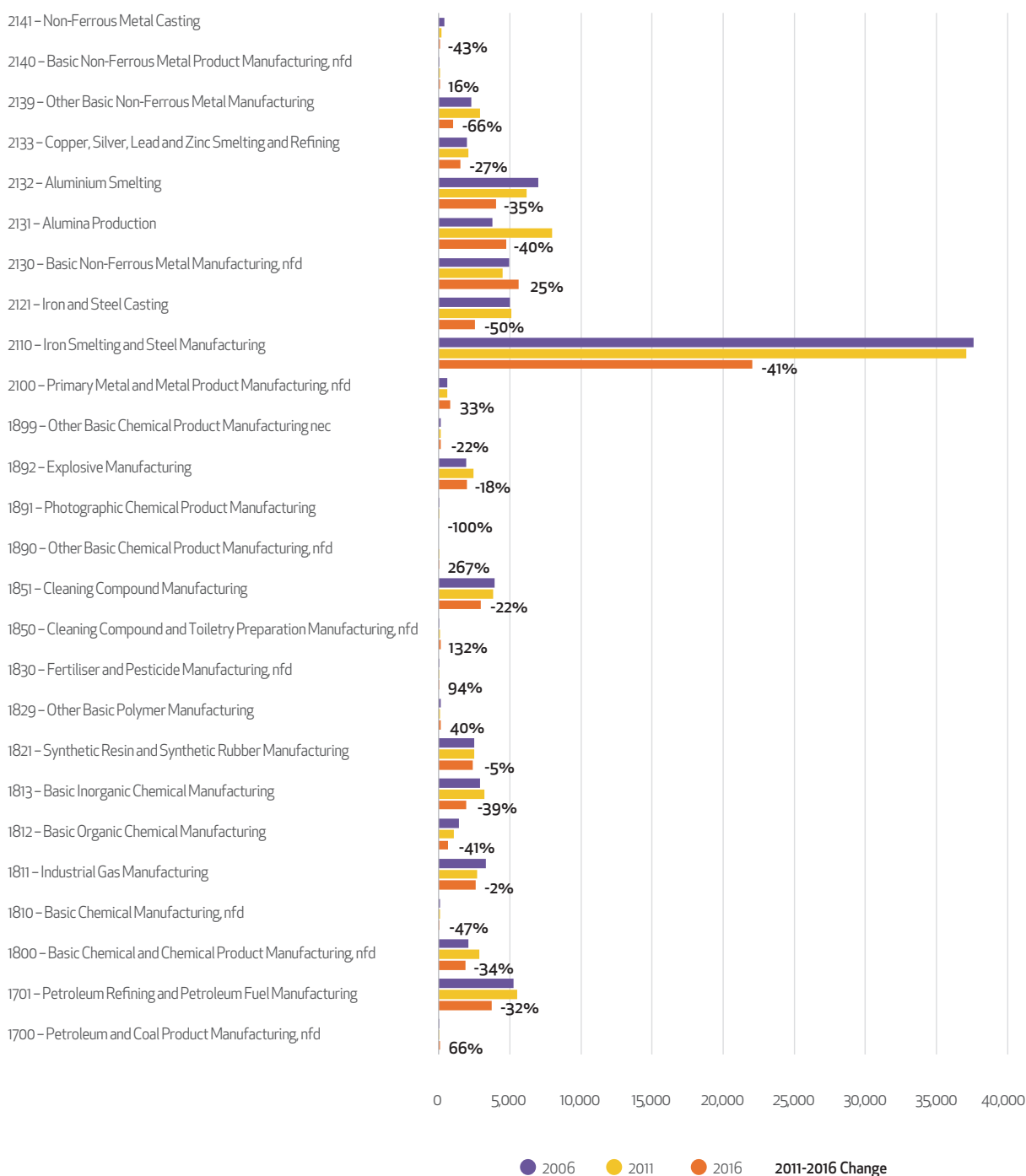
## 6-digit classification

1821	Synthetic Resin and Synthetic Rubber Manufacturing *
1829	Other Basic Polymer Manufacturing *

In terms of estimated employee numbers, the three-digit ANZSIC code 182 had 1,600 estimated employees in 2018. This represents 2% of PMA's total number of employees and 3% of PMB's total (from the selected three-digit ANZSIC codes). However, using 2016 Census data, classification 1821 had 2,385 employees in 2016 and classification 1829 had 125. Together, the 2,510 employees represent 4% of PMA's total number of employees (details from the selected four-digit ANZSIC codes which could be a better representation than the three-digit code ANZSIC code 182).

# Appendix C: Census Snapshot

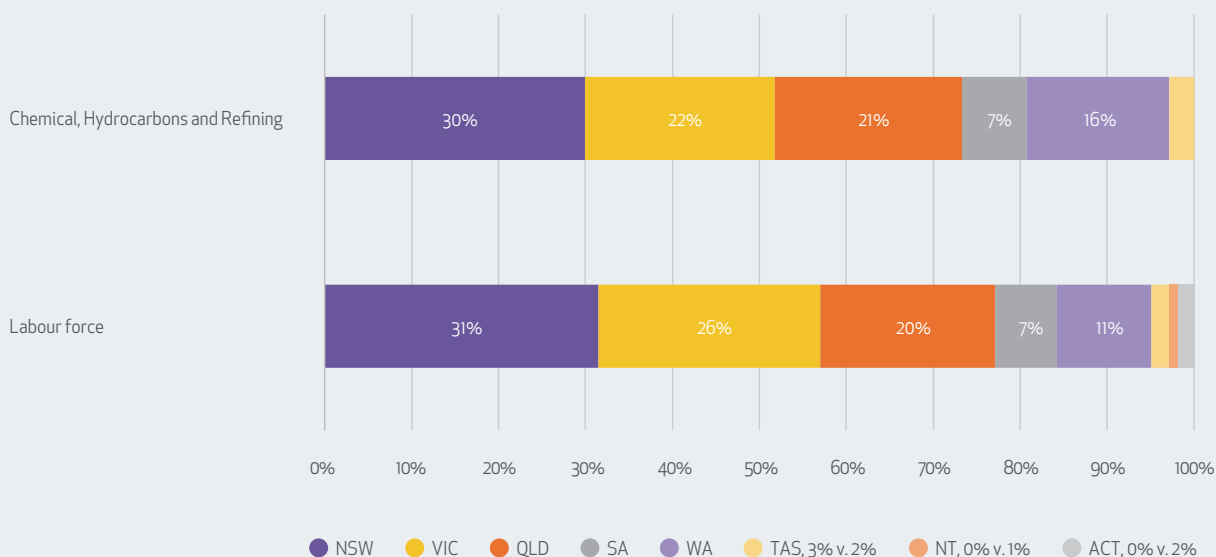
Number of employees in selected industry classes, Census 2006–2016 and five-year change from 2011 to 2016



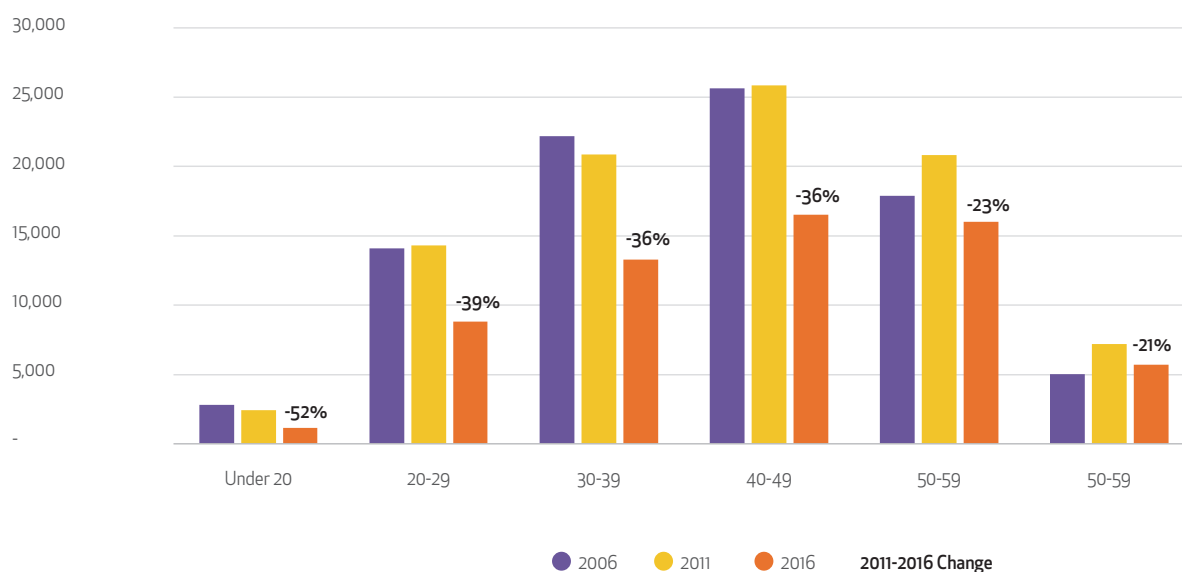
## Total number of employees in selected industry classes by state of usual residence, Census 2006–2016



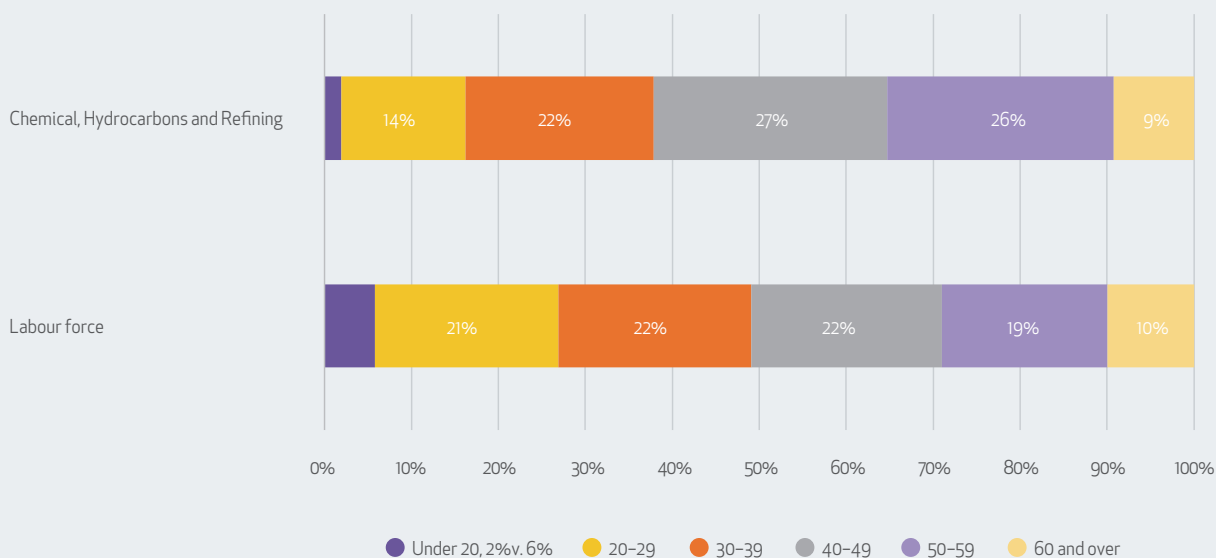
## State of usual residence of employees in selected industry classes versus the general labour force, Census 2016



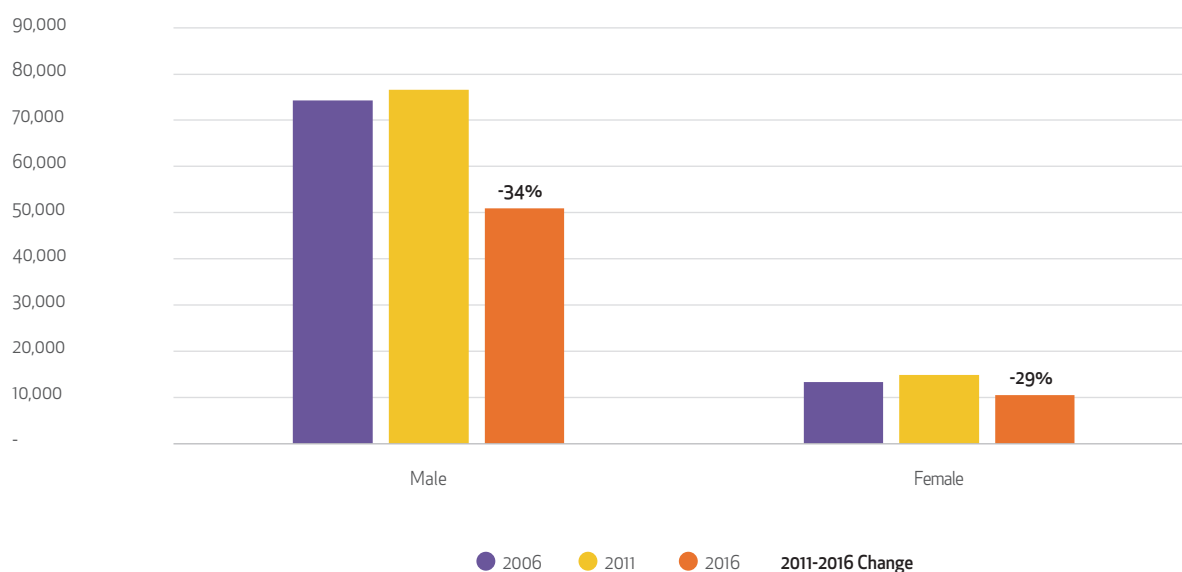
## Total number of employees in selected industry classes by age, Census 2006–2016



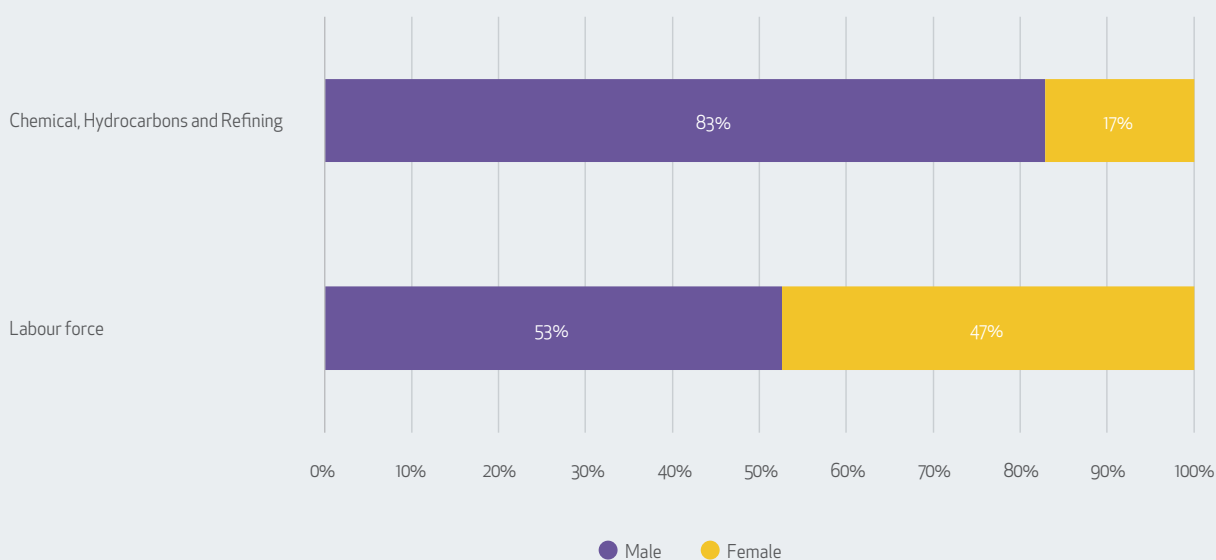
## Age of employees in selected industry classes versus the general labour force, Census 2016



## Total number of employees in selected industry classes by gender, Census 2006–2016

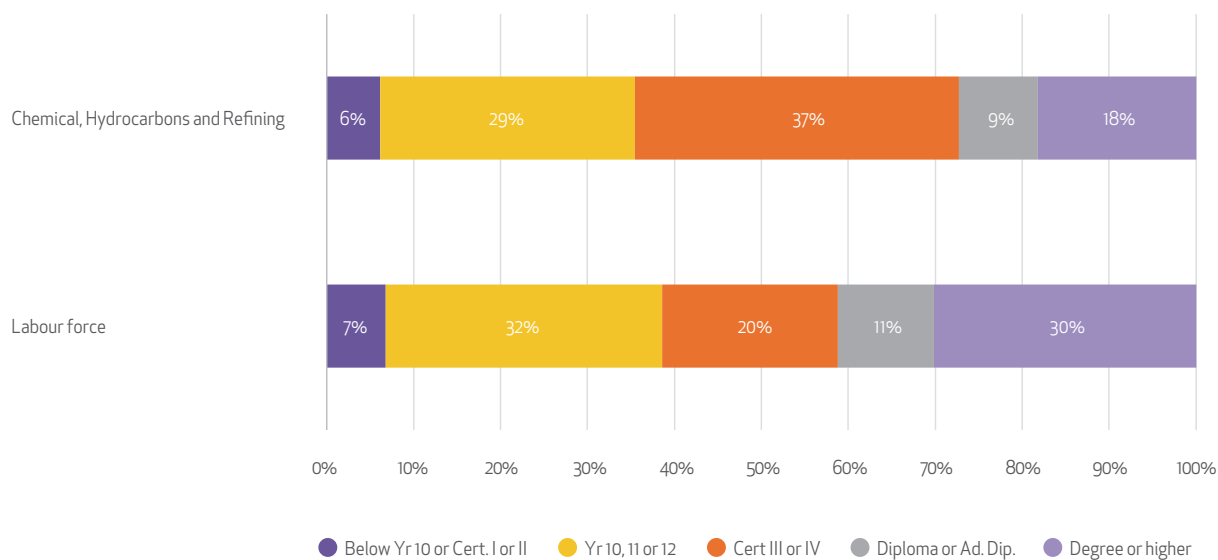


## Gender of employees in selected industry classes versus the general labour force, Census 2016



## Highest educational attainment of employees in selected industry classes versus the general labour force, Census 2016

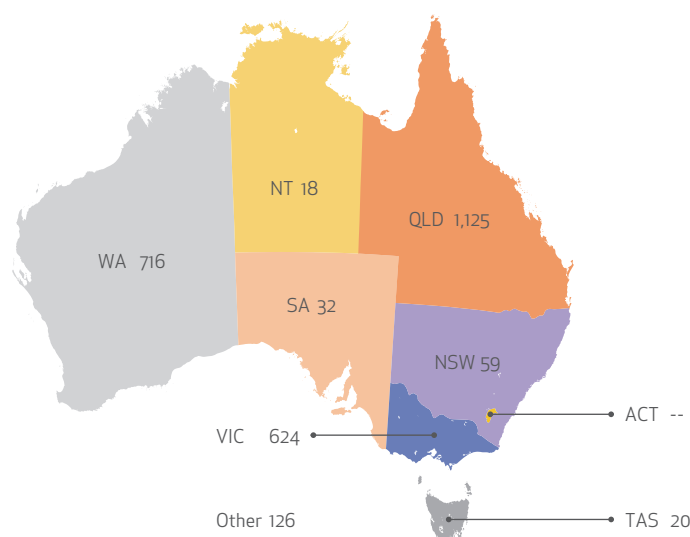
excludes those whose educational attainment was not stated or not applicable



# Appendix D: Enrolment Snapshot

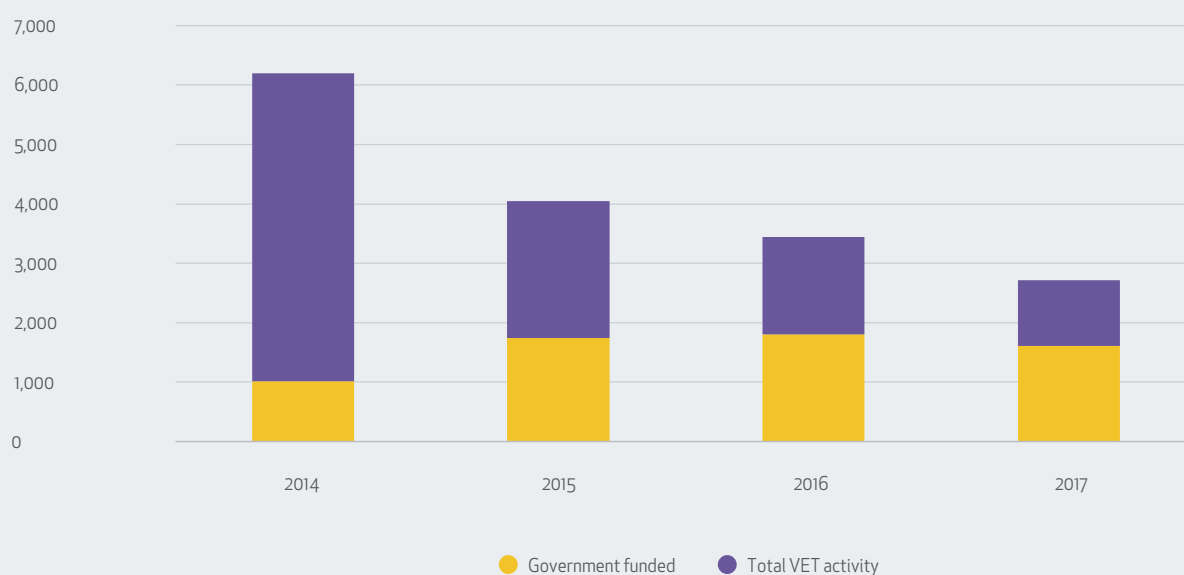
Program enrolments in PMA Chemical, Hydrocarbons and Refining qualifications by state/territory of student residence

2017 Total VET Activity



## Total program enrolments in PMA Chemical, Hydrocarbons and Refining qualifications

2014–2017 Total VET Activity



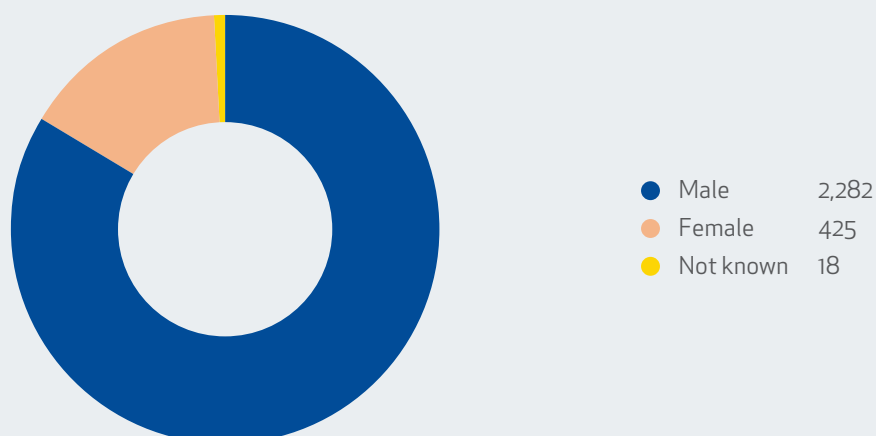
## Proportion of program enrolments in PMA Chemical, Hydrocarbons and Refining qualifications by training provider type

2014–2017 Total VET Activity

	2014	2015	2016	2017
TAFE	63%	50%	56%	51%
Private training provider	31%	46%	36%	45%
University	1%	1%	2%	1%
Enterprise provider	5%	2%	5%	2%
School	0%	0%	0%	0%
Community education provider	0%	0%	0%	0%

## Program enrolments in PMA Chemical, Hydrocarbons and Refining qualifications by gender

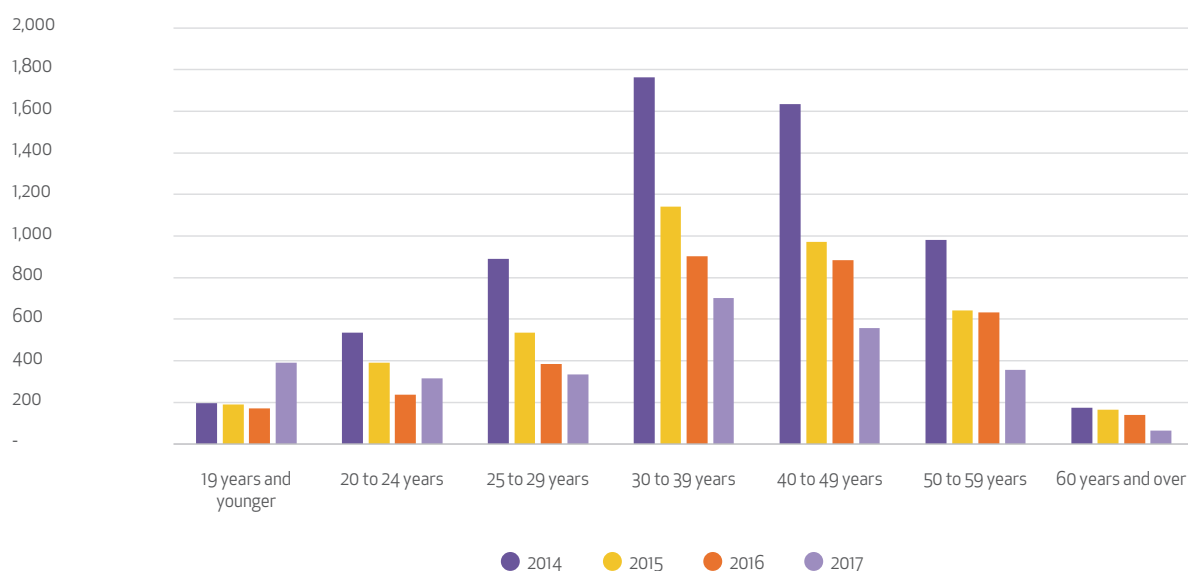
2017 Total VET Activity





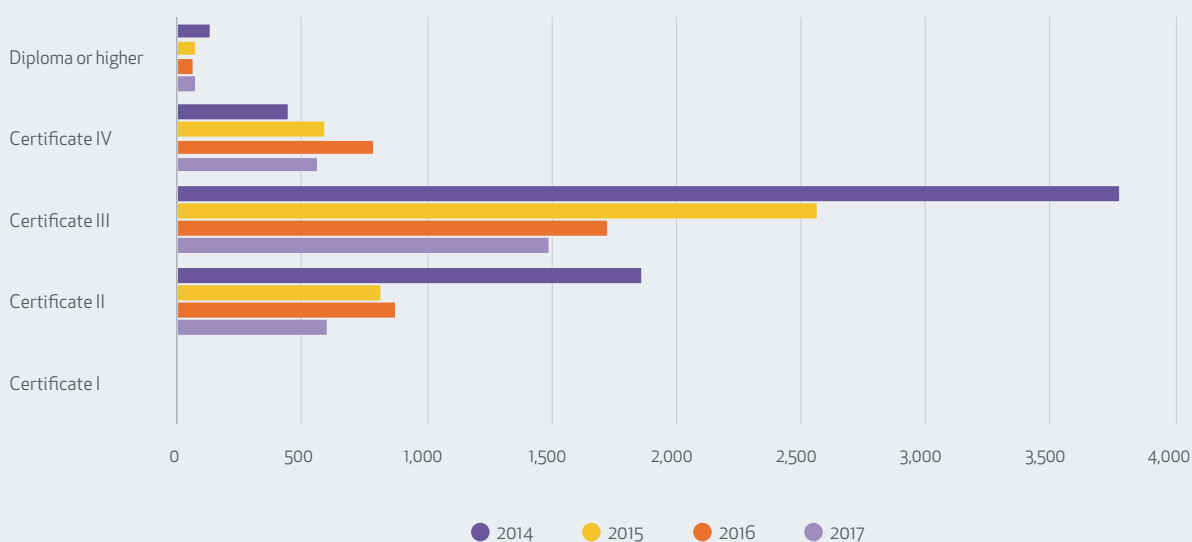
## Program enrolments in PMA Chemical, Hydrocarbons and Refining qualifications by age group

2014-2017 Total VET Activity



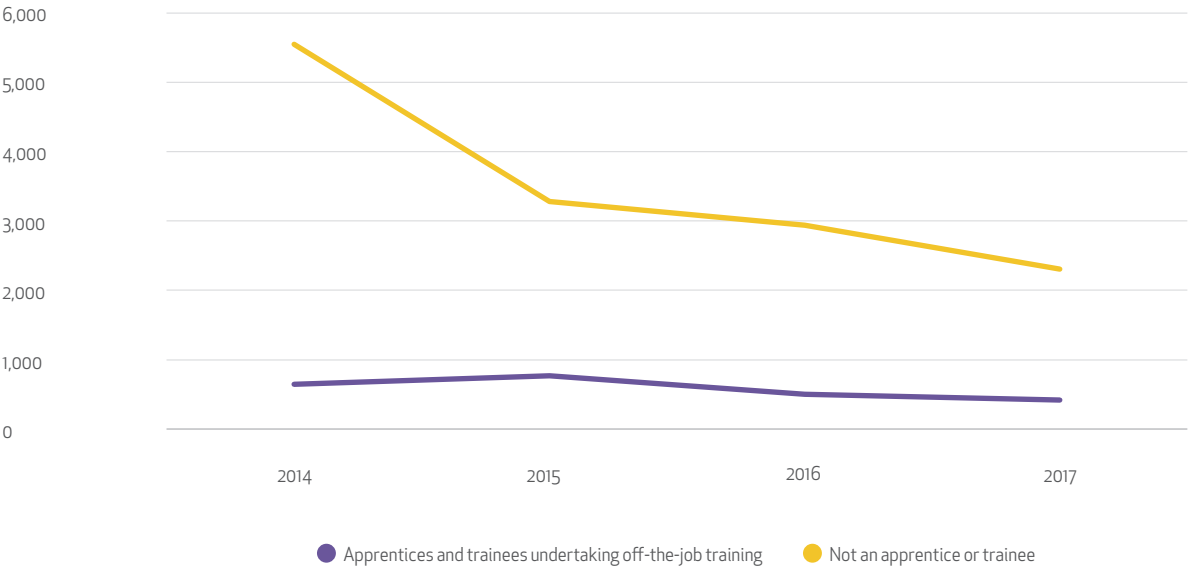
## Program enrolments by qualification level in PMA Chemical, Hydrocarbons and Refining qualifications

2014-2017 Total VET Activity



Program enrolments in PMA Chemical, Hydrocarbons and Refining qualifications by apprentice/trainee undertaking off-the-job training

2014-2017 Total VET Activity



# Appendix E: Consultation List

The 2019 Skills Forecast and Proposed Schedule of Work 2019–2023 builds on the consultations undertaken as part of the 2018 return. Feedback on industry imperatives were also captured as part of training package development projects undertaken throughout 2018.

More specifically, key individual and group stakeholders, identified by the Process Manufacturing, Recreational Vehicle and Laboratory IRC, were consulted during the development of the Industry Skills Forecast. See the consultation list below.

Feedback was gathered via the following methods:

- forums, meetings and focus groups – attended in person and via webinar
- one-on-one consultation – attended via phone/teleconference and/or face-to-face.

## Consultation List

Organisation	Gladstone – Santos
Australia Pacific – Origin Energy and ConocoPhillips	Quadrant Energy
Australian Centre for Energy and Process Training (ACEPT)	Resources Industry Training Council (RITC)
Chevron	Surat Gas Project – Arrow Energy
Curtis Island – Shell	Wesfarmers, Chemicals, Fertilisers and Energy
Dalton and Associates	