Process Manufacturing, Recreational Vehicle and Laboratory Industry Reference Committee

PMA Chemical, Hydrocarbons and Refining Training Package

Four Year Work Plan

September 2016

Prepared by

Manufacturing Skills Australia

Contents

A. Administrative information

Name of Industry Reference Committee (IRC):   **Process Manufacturing, Recreational Vehicles and Laboratory**

Four Year Work Plan prepared by: **Manufacturing Skills Australia**

B. Sector overview

Chemical, hydrocarbons and refining - snapshot of the industry

The chemical, hydrocarbons and refining (CHR) industry sources raw materials from the mineral/hydrocarbon exploration and mineral mining sectors. Its products are distributed to downstream processing plants as well as to the utilities industry, other manufacturing, and food and beverage sectors. Some sectors start with raw materials, such as common salt, sulphur or starch, to produce their products.

The eastern states are the major employers with nearly 85% of all workers located in those states. Major growth has been forecast for Queensland's coal seam gas (CSG) industries, where an estimated 9,000 workers in maintenance and field development operations will be required.[1]

There are five qualifications in the PMA Chemical, Hydrocarbons and Refining Training Package ranging from Certificate II to Advanced Diploma level.

- PMA20116 Certificate II in Process Plant Operations
- PMA30116 Certificate III in Process Plant Operations
- PMA40116 Certificate IV in Process Plant Technology
- PMA50116 Diploma of Process Plant Technology
- PMA60116 Advanced Diploma of Process Plant Technology

The CHR industry in Australia is coded within the Australian and New Zealand Standard Industrial Classification (ANZSIC) in Division C Manufacturing:

- Subdivision 17 Petroleum and Coal Product Manufacturing (hydrocarbons)
- Subdivision 18 Basic Chemical and Chemical Product Manufacturing (chemicals)
- Subdivision 21 Primary Metal and Metal Product Manufacturing[2] (refining)

It does not include:

- Group 182 Basic Polymer Manufacturing
- Group 184 Pharmaceutical and Medicinal Product Manufacturing
- Class 1852 Cosmetic and Toiletry Preparation Manufacturing
- Class 2122 Steel Pipe and Tube Manufacturing
- Class 2142 Aluminium Rolling, Drawing, Extruding
- Class 2149 Other Basic Non-Ferrous Metal Product Manufacturing

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[1] Australian Workplace and Productivity Agency, 2013, *Resources sector skills needs*, https://docs.education.gov.au/system/files/doc/other/resources-sector-skills-needs-2013-final.pdf
[2] Australian Bureau of Statistics, *Australian and New Zealand Standard Industrial Classification 2006*

Business numbers and size

The distribution of businesses reflects Australian demographics with the more populous states having the most number of businesses. The majority of businesses are micro and small businesses (43% and 46% respectively). The alumina production and aluminium smelting sectors are notable exceptions to this, as Western Australia, Queensland and South Australia are the only states to produce alumina while aluminium smelting only occurs in New South Wales, Victoria, Queensland and South Australia. There were no businesses operating in the photographic chemical production sector in June 2015.[3]

**Chemical, hydrocarbons and refining industry
Australia
Business numbers by state and employment size June 2015**

Source: Australian Bureau of Statistics, *Counts of Australian Businesses, June 2015*

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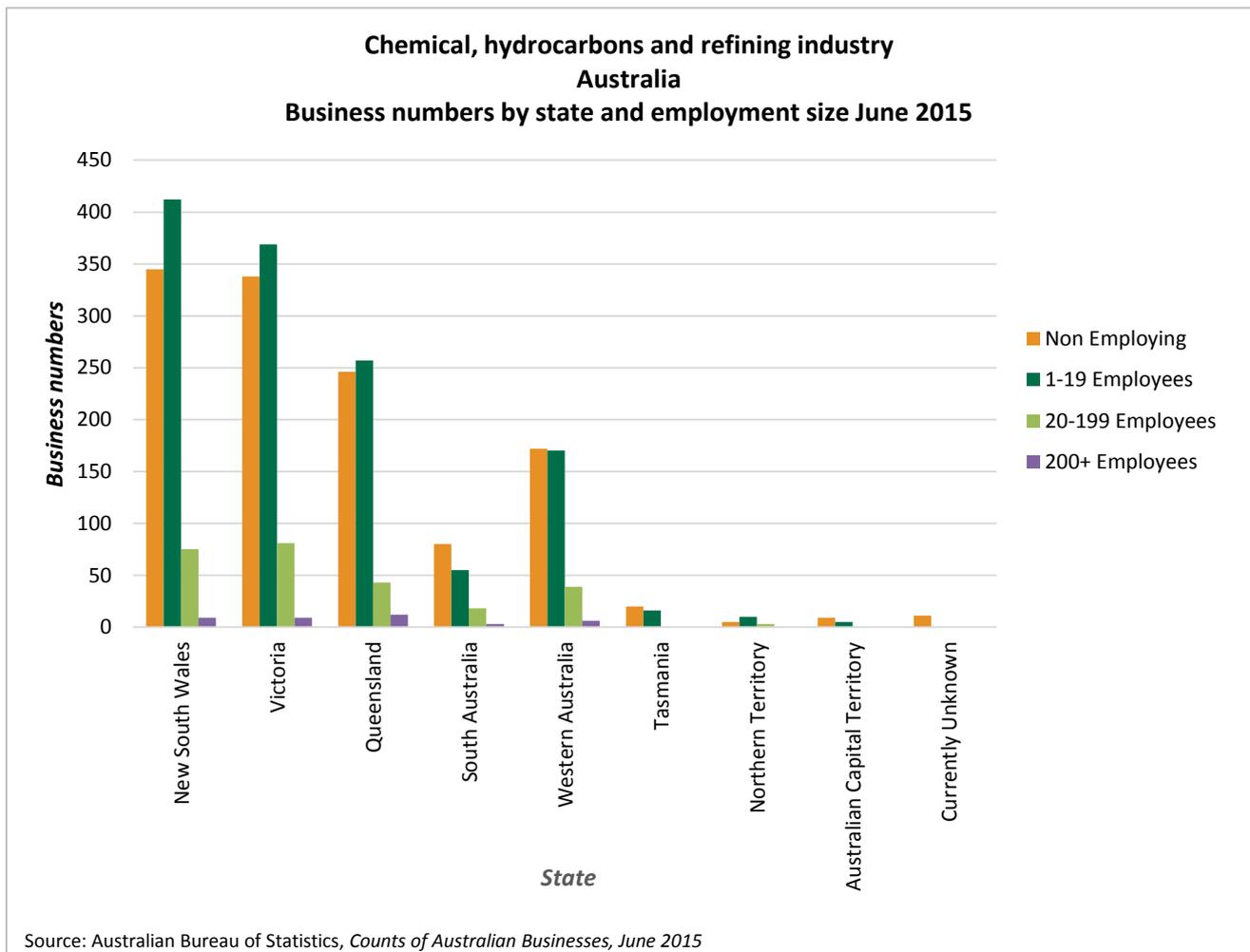
[3] Australian Bureau of Statistics, *Counts of Australian Businesses, 2014-15*

Chemical, hydrocarbons and refining
Australia
Business numbers by state and ANZSIC class, June 2015
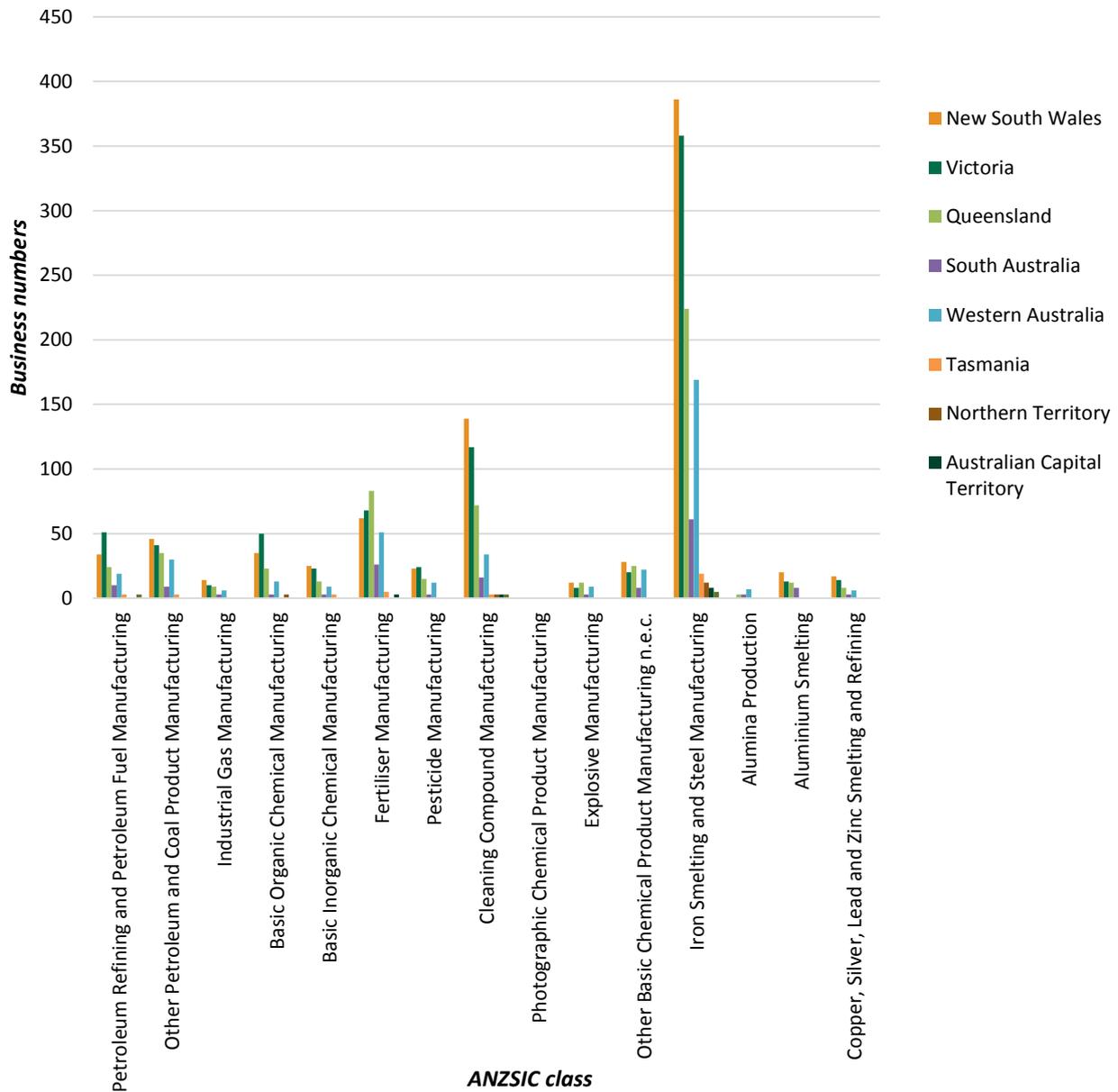
Australian Bureau of Statistics, 2016, *Counts of Australian Businesses, including entries and exits,*

Iron smelting and steel manufacturing dominates this industry group. The two major companies are BlueScope Steel Ltd and Arrium (formerly OneSteel). Both were formed when BHP decided to divest itself of its steel production capabilities. BlueScope focuses on the production of flat steel products and produces a range of finished and semi-finished flat steel products. Arrium is Australia's largest manufacturer and distributor of steel rails, rods, merchant bars, wires, pipes and structural and reinforcing steel products.[4] The smallest sector is the alumina production sector. Alcoa of Australia holds the largest market share in this sector and operates three refineries in Western Australia.[5]Over the last few years, Australia has ceased to operate any major oil refineries. Caltex Australia operates a small refinery in Brisbane and Exxon Mobile a smaller refinery at Altona, Victoria.[6]

Some sectors such as explosive manufacturing are closely linked to the resources sector and are impacted by changes in that industry. Two major companies in the explosive manufacturing sector in Australia are Orica and Incitec Pivot. Between them they have 70% of market share. Both are Australian companies with global reach.

Many of the issues facing the industry in Australia stem from having old technology resulting in companies who are unable to compete in a global market place. Where companies have updated their technology, such as Alcoa, they remain a significant force both domestically and internationally.

Regulation of industry/occupations

All operations to which units in the PMA Training Package apply are subject to stringent health, safety and environment requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Standards relevant to the sector include major hazard facility regulations, Health Safety and Environment (HSE or previously Occupational Health and Safety) legislation and regulation. Procedures discussed in the PMA Training Package also include good operating practice as may be defined by industry codes of practice (e.g. Responsible Care) and government regulations. Workers in sectors such as liquid natural gas/floating liquid natural gas (LNG/FLNG) may require high risk work licenses (HRWL) for activities such as working at heights, entering confined spaces, etc. depending on their job role. Stakeholders are frustrated by the lack of a national licencing system as workers need to be reaccredited each time they move jurisdictions.

Occupational licensing is not generally required in this industry. Licenses may be required in some states for some Units of Competency, check local regulations for details.

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[4] IBISWorld, 2016, *Iron Smelting and Steel Manufacturing in Australia*
[5] IBISWorld, 2015, *Alumina Production in Australia*
[6] IBISWorld, 2015, *Petroleum Refining and Petroleum Fuel Manufacturing in Australia*

Challenges and opportunities in the sector/sub-sector at the international/national/jurisdictional or regional level

The following potential challenges and opportunities facing the industry have been identified by stakeholders:

Challenges
- Downturn/transition of the resources sector
- Trans Pacific Partnership (TPP) and Free Trade Agreements (FTAs)
- The Paris Climate Accord
- The Australian dollar
- Science, technology, engineering and mathematics (STEM) skills
- Lack of a national licensing system, especially for High Risk Work

Opportunities
- National Innovation and Science Agenda (NISA)
- Advanced manufacturing/nanotechnology/advanced materials
- Robotics and automation

The ongoing downturn of the resources sector continues to impact the industry. Margins are tight and Australian businesses are struggling to remain competitive. The oil and gas refining sector is being impacted by the global oil price and the metals refining sector by the decrease in demand from China as well as the increase in low cost Chinese products entering Australia. Stakeholders expect these challenges to increase as the TPP and FTAs come into play.

Compliance with regulations and legislation, both nationally and internationally, was also identified as a major challenge. Both processing and training are dealing with the ramifications of changes in this area. Stakeholders identified that the multitude of regulations and legislation (employee relations, work health and safety, state-based licencing systems, etc.) has major effects on costs making it difficult to compete on price with Australia's Asian neighbours.

Stakeholders within the resources sector have observed that the need to reskill/multi-skill workers to an operator/maintainer model is a workforce development challenge that they are currently facing. It was also noted that there were very few providers who could actually deliver full qualifications for pre-employment and that most of the 'delivery' in the industry was for existing workers via recognition of prior learning (RPL)/recognition of current competency (RCC) procedures. Lack of training providers is also seen as a major challenge for the industry in their drive to obtain employees with the necessary skills.

However, stakeholders agreed that the National Innovation and Science Agenda (NISA) presents a potential opportunity for the industry. Advanced materials and nanotechnology are two opportunities in which stakeholders saw potential to be innovative, especially in the hydrocarbons sector where larger refiners are continuing to invest in downstream manufacturing (lubricants, grease, etc.).

C. Employment

Employment outlook

This industry is undergoing a structural adjustment due to low oil and gas prices, the ceasing of oil refining in Australia and the downturn in the industry as a whole. Many large gas projects are being put on hold due to low oil and gas prices[7] and the volatile Australian dollar. The liquid natural gas/floating liquid natural gas (LNG/FLNG) sector is moving from the construction phase to the production phase which significantly decreases the number of people employed in the sector. As well most large companies in the sector have a policy of 'minimum manning' which also impacts on employment.

Employment in the metal refining sector is also being impacted by the downturn in global prices and demand from our biggest trading partner, China. Because of the volatile Australian dollar and ageing technology, many Australian companies are struggling to compete and this is leading to restructuring and redundancies across the industry.

The global economic forces are also impacting the chemical sector and employment in this sector is also decreasing. Low cost imports and the entry of Chinese manufacturers into the Australian market are squeezing margins for Australian manufacturers.[8] The metals refining sector also continues to downsize with Arrium in Whyalla going into voluntary administration, putting 7,000 jobs at risk.[9] This has a flow on effect to suppliers, especially in South Australia where in Whyalla, Arrium is the largest employer.[10]

Workforce supply-side challenges and opportunities

The industry has identified that one of the challenges as far as workforce supply is concerned is that the various sectors in the industry are diverging and their skill needs are changing to reflect this. As a result, workers are not able to easily transfer between sectors even with qualifications. Furthermore, stakeholders believe that there will be increased competition for experienced process operators as the number of operating LNG trains come on line.

Increased specialisation and competition for jobs may be compounded by delivery constraints. There are very few training providers and a low uptake of the qualifications in the PMA Training Package. In 2014, only 3,907 people were enrolled through a public provider in a PMA qualification and a total of 6,200 across all registered training providers. There are a total of 35 RTOs with PMA qualifications on scope – 14 private RTOs, two universities, two enterprise RTOs and two industry associations. No RTOs currently have PMA70108 Graduate Certificate in Surface Coating Technology on scope.

Another factor which may impact delivery of qualifications in this sector is the restructure and amalgamation

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[7] Farrer, M, 2016, Woodside Petroleum puts huge offshore Browse LNG project on hold, *The Guardian,* 23 March 2016, http://www.theguardian.com/australia-news/2016/mar/23/woodside-petroleum-puts-huge-offshore-browse-lng-project-on-hold

[8] Loussikian, K., 2016, Chinese fertiliser producer Hubei Xinyangfeng buys farm IN NSW, *The Australian*, 5 April 2016, http://www.theaustralian.com.au/business/chinese-fertiliser-producer-hubei-xinyangfeng-buys-farm-in-nsw/news-story/384f466525f744406674ba120674fe96?memtype=anonymous

[9] Chambers, M and Friemann, G., 2016, Arrium teeters as banks push for administration, *The Australian* 7 April 2016, http://www.theaustralian.com.au/business/companies/arrium-teeters-as-banks-push-for-administration/news-story/2f5fd144829400ca5d95f3ea363389b6

[10] Edwards, V., 2016, SA offers loans for Arrium suppliers, *The Australian* 2 May 2016, http://www.theaustralian.com.au/business/sa-offers-loans-for-arrium-suppliers/news-story/06c6fe0d81a1409c91384d4c301e6266

of the TAFE providers in Western Australia[11] and New South Wales[12]. The proposed restructures in these states will see the number of public providers decrease and consolidation and cutting of some course offerings. Regional and rural areas will be the most impacted. As many enterprises in this sector operate in regional areas, this will impact their access to training and a skilled workforce.

Note: Completion data has not been included as initial analysis of the data shows very low completion rates. This may be skewed by the fact that the enrolment in the public system is set up to capture only full qualification enrolments, even if the participant only intends to do a Unit of Competency or a Skill Set. The introduction of the Unique Student Identifier (USI) may provide data that will permit better identification on cohort outcomes and student pathways.

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[11] Department of Training and Workforce Development, 2016, *Changes to TAFE in Western Australia*, http://www.dtwd.wa.gov.au/trainingproviders/training-sector-reform-project/Pages/changes-TAFE-WA.aspx
[12] NSW TAFE Commission, 2016, *A Vision for TAFE NSW*, https://www.tafensw.edu.au/__data/assets/pdf_file/0016/22570/a-vision-for-tafe-nsw.pdf

Additional information

The following graphs have been supplied by the Department of Education and Training. The Department has sourced national occupation-related data from the Department of Employment and the Australian Bureau of Statistics to inform the work of the IRCs.

Key Occupations – Employment Levels (000s)
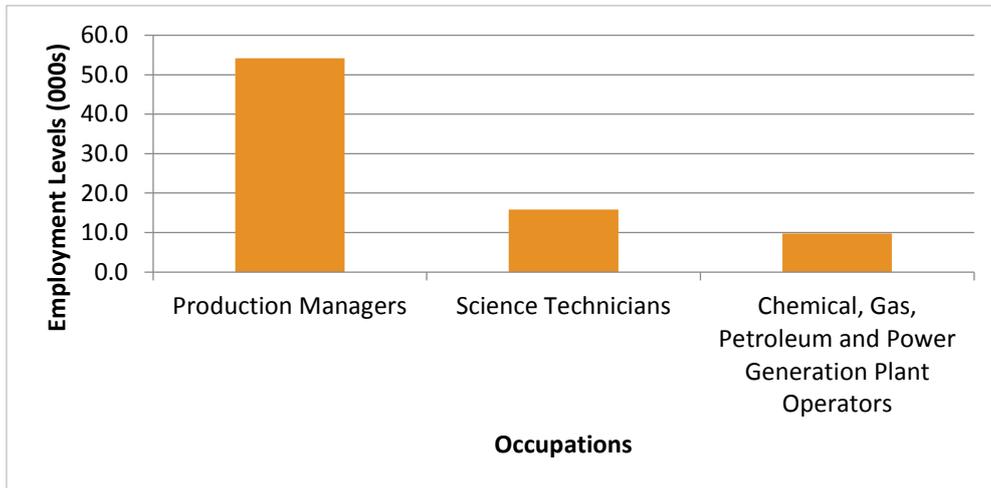
Source: Australian Bureau of Statistics (ABS)[13]

Key Occupations – Historical and Projected Employment Growth (%)[14]
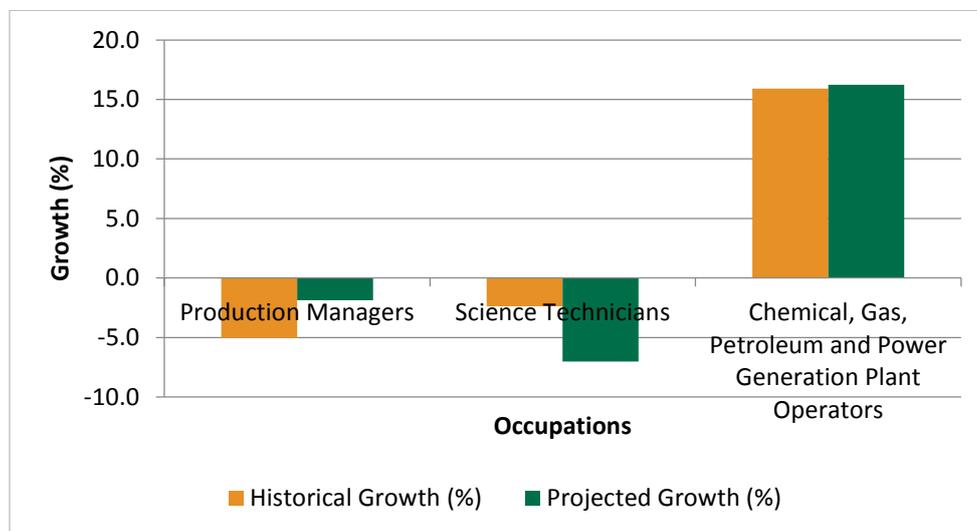
Source: Historical employment growth from the Australian Bureau of Statistics (ABS) and projected employment growth from the Department of Employment.

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[13] Note: Occupations are at the four digit ANZSCO code. Employment levels are the five year annual average to 2015. Figures include all employed in the occupation across the economy, not just the relevant industry.

[14] Note: Occupations are at the four digit ANZSCO code. The historical employment is the five year growth rate to 2015 and the projected employment growth rate is the expected growth rate to 2019. Rates are based on figures that include all employed in the occupation across the economy, not just the relevant industry

IRC analysis

The first graph above, showing a five year annual average, does not give much scope for comment. Without seeing year on year changes, it can be difficult to comment on industry and economic influences that may cause fluctuations in employment.

Data provided in the graphs above represent three Key Occupations as determined by the Department of Employment. These occupations are a small selection of occupational outcomes from the PMA Training Package. The following table provided by MSA to the IRC uses Occupational Projections made by the Department of Employment[15]. It more accurately reflects the Key Occupational outcomes of training identified by stakeholders for qualifications from the PMA Training Package.

Questions have been raised around the accuracy of the projected employment growth of Group 3992 Chemical, Gas, Petroleum and Power Generation Plant Operators. The projections show negative growth for this sector, when the Deloitte Access Economics report predicted robust growth in employment in Oil and Gas Operations, as new gas trains come on line. As mining moves from the construction phase to operations phase, the Oil and Gas Operations sector is expected require an additional 16,932 to 25,948 workers by 2018. [16]. With recent announcements such as Gorgon LNG production on track[17], it is hard to see why employment will decrease in this occupation.

Specific occupations have been targeted as in demand on the Western Australia's State priority occupation list. Those relevant to the PMA Training Package are 399211 Chemical Plant Engineer, 399212 Gas or Petroleum Operator and 233111 Chemical Engineer.[18]

Occupation Code	Occupation	Employment level - November 2015 ('000)	Department of Employment Projections		
			Projected employment level - November 2020 ('000)	Projected employment growth - five years to November 2020	
				('000)	(%)
1335	Production Managers	55.5	56.6	1.1	2.0
2331	Chemical and Materials Engineers	7.2	7.2	0.0	-0.4
2339	Other Engineering Professionals	6.7	7.3	0.6	9.1
3129	Other Building and Engineering Technicians	25.4	26.2	0.8	3.1
3992	Chemical, Gas, Petroleum and Power Generation Plant Operators	10.4	10.1	-0.3	-2.7
7119	Other Machine Operators	9.7	8.3	-1.4	-14.3
7123	Engineering Production Workers	17.3	14.4	-2.9	-16.6
8391	Metal Engineering Process Workers	9.2	6.3	-2.9	-31.5
8399	Other Factory Process Workers	11.5	11.1	-0.3	-3.0

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[15] Department of Employment, 2016 *Employment Projections. Occupation projections*.
http://lmip.gov.au/default.aspx?LMIP/EmploymentProjections Accessed July 2016.
[16] Department of Education and Training, 2015. *Report – Resources sector skills needs, December 2013*.
https://docs.education.gov.au/documents/report-resources-sector-skills-needs-december-2013
[17] Masige, S, 2016. Gorgon LNG production on track. *Australian Mining*. 2 Aug 2016.
https://www.australianmining.com.au/news/gorgon-lng-production-track/
[18] Resources Industry Training Council, 2015. *Industry Workforce Development Plan – Downstream Process Manufacturing*.
http://www.ritcwa.com.au/#!iwdp-new/c1nmi

D. Skills Outlook

International and national trends

The industry is highly exposed to global trends and influences with the majority of its products going offshore.

The LNG market is facing a glut in global production with a prediction of the price falling to around $US3 per million British thermal units by 2020 (down from $US20 in 2014)[19][20]. This will impact employment and job design in Australia as the sector searches for savings to maintain profitability.

One international trend that stakeholders are seriously considering is the use of drones (remote piloted vehicles) in high risk environments and remote areas. A major company in Queensland is exploring the use of drones to monitor remotely located coal seam gas (CSG) wells[21]. Others are exploring their use underground. The FLNG industry is also exploring the use of drones for underwater monitoring activities.

Remote piloted vehicles are already being used in mining activities in northern Western Australia in the form of driverless trucks which are operated and monitored from Perth. There is also a move to introduce driverless trains in the same area.

The industry is seen by consumers are being a major contributor to climate change. This is impacting on community engagement within the regions in which the industry operates both internationally and domestically. Consumers and local and state and territory governments are increasing their environmental monitoring activities and imposing stricter operating conditions as a result. Stakeholders expect that the implementation of the Paris Climate Accord will increase this level of scrutiny. Environmental monitoring skills will be required at all levels of operations.

Much of the technology in the LNG processing plants (LNG trains) is highly automated which allows the operating companies to minimise the number of workers required. Many see the level of automation increasing in the future. Underpinning this increased use of automation is the development of the Internet of Things (IoT) with increasing use of data analytics and real-time remote monitoring to reduce risk and improve productivity. These changes will have a significant impact on both workplace and job design in the next few years. Increasingly the industry will need workers with well-developed skills in data analytics and digital literacy.[22]

As a consequence, job roles in the industry are changing in line with new technology. Employers report that they need multi-skilled workers especially in the area of CSG monitoring. Being able to send one crew that can undertake all the tasks rather than multiple crews travelling long distances is the goal. Currently companies are training internally and not engaging heavily with the Training Package.

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[19] International Energy Agency, 2016, *IEA sees major shifts in global gas trade over next five years* (media release), June 8, http://www.iea.org/newsroomandevents/pressreleases/2016/june/iea-sees-major-shifts-in-global-gas-trade-over-next-five-years.html

[20] McDonald-Smith, A, 2016, Price woes knock heads together in the LNG sector, *Australian Financial Review*, June 10, http://www.afr.com/business/energy/price-woes-knock-heads-together-in-lng-sector-20160609-gpf21y

[21] Aviation Business, 2016, *Queensland Gas contracts RPAS for pipeline inspection*, 25 May 2016, http://www.aviationbusiness.com.au/news/queensland-gas-contracts-rpas-for-pipeline-inspection

[22] Choudhry, H, Mohammad, A, Tan, KT and Ward, R, 2016, *The next frontier for digital technologies in oil and gas*, McKinsey & Company, http://www.mckinsey.com/industries/oil-and-gas/our-insights/the-next-frontier-for-digital-technologies-in-oil-and-gas?cid=other-eml-alt-mip-mck-oth-1608

Sector workforce skills

The five most important skills for the sector's workforce within the next three to five years.

Rank	Skill	How identified
1	Drone operation	Industry consultations
2	Automation	Industry consultations
3	Multi-skilling	Industry consultations
4	Data analytics	Industry consultations
5	Digital literacy	Industry consultations

Generic workforce skills[23]

Ranked from 1 being the most important, to 12 being the least important.

1	Technology
2	Data analysis
3	Environmental and Sustainability
4	Design mindset / Thinking critically / System thinking / Solving problems
5	Learning agility / Information literacy / Intellectual autonomy and self-management
6	STEM
7	Communication / Virtual collaboration / Social intelligence
8	LLN
9	Managerial / Leadership
10	Customer service / Marketing
11	Entrepreneurial
12	Financial

E. Other relevant skills-related insights for this sector

Another trend impacting the industry in Australia is the developing biofuels industry. According to data published by the Queensland government, industrial bioproducts (fuels, chemicals and plastics from agricultural, forestry and greenwaste feedstocks) in Queensland will be worth $1.8 billion to their gross state product (GSP) by 2035. The Plan also states that this industry is projected to provide an additional 6,500 job in Queensland by 2035.[24] The industry is keen to explore the skills needed in this sector to support this growth.

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[23] Pre-populated table supplied by the Department of Education and Training
[24] Department of State Development, 2016, *Queensland Biofutures 10-year Roadmap and Action Plan*, p. 6 Brisbane
http://www.statedevelopment.qld.gov.au/resources/plan/biofutures/biofutures-10yr-roadmap-actionplan.pdf

F. Training Product Review Plan – 2016-17 – 2019-20

Stakeholders identified a range of training product items that need to be considered in the Training Product Review Plan.

Items identified as time critical and included in the priorities for 2016-17:

- A full review of the Training Package and to determine suitability of qualifications across different occupations, for example LNG as well as process safety standalone Unit of Competency or Skill Set

- Units to support skills in drone technology/remote monitoring

Items identified for the 2017-2020 plan:

Industry wide

- process safety

- process systems and operations

- troubleshooting and problem solving skills

- preventative maintenance

- connecting with primary trade skills to standardised basic skills at the Certificate II level

- virtual reality (VR) technology

- data analytics

- electronic control systems support

- a blended Instrument and Electrical Technician qualification

Sector specific - oil and gas

- specific qualifications to meet the needs of the oil and gas industry

- floating liquefied natural gas (FLNG) skills

- skills in relation to ship tie-ups and connections

Sector specific – metal processing

- units to meet the needs of the non-ferrous metals processing sector such as units that address the use of hazardous and complex processing technologies including acid leaching and autoclaves

G. IRC Signoff

This work plan was agreed as the result of a properly constituted IRC decision and was approved by the Chair

Samantha Read on 22 September 2016.

Manufacturing Skills Australia
Manufacturing Industry Skills Council

IRC Training Product Review Plan 2016-17 – 2019-2020

Contact details: Samantha Read, Chair

Date submitted to Department of Education and Training: 22 September 2016

Planned review start (Year)	Training Package code	Training Package name	Qualification code	Qualification name	Unit of Competency code	Unit of Competency name
IRC to recommend the most appropriate financial year in which to review the training product. E.g. 2016-2017	Note: The Department will pre-populate these fields		IRCs to complete only if they propose to review different qualifications or units of competency of a training package at different stages			
2017-2020			*Industry wide* • process safety • process systems and operations • troubleshooting and problem solving skills • preventative maintenance • connecting with primary trade skills to standardised basic skills at the Certificate II level • virtual reality (VR) technology • data analytics • electronic control systems support • a blended Instrument and Electrical Technician qualification			
2017-2020			*Sector specific - oil and gas* • specific qualifications to meet the needs of the oil and gas industry • floating liquefied natural gas (FLNG) skills • skills in relation to ship tie-ups and connections			
2017-2020			*Sector specific – metal processing* • units to meet the needs of the non-ferrous metals processing sector such as units that address the use of hazardous and complex processing technologies including acid leaching and autoclaves			