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## EMPLOYMENT AND SKILLS OUTLOOK

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## PROPOSED SCHEDULE OF WORK

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EXECUTIVE SUMMARY

The Electrotechnology industry of Australia employs almost 340,000 people in a wide range of sectors; mining, manufacturing, communications, construction, renewables, domestic and commercial refrigeration and air-conditioning, and electricians. The industry operates with an annual revenue of $87.11 billion, and a profit of $11.73 billion in 2016-2017.

Research and development in new technology and new processes is changing the Electrotechnology landscape, including the development of highly automated systems that can provide real-time analytics, new solutions for communications and continue to push our technical capacity. Maintenance and equipment servicing will continue to grow in demand as the development of services and new equipment expands.

The Australian Government is actively promoting the development of clean energy. For example, refrigeration systems with new refrigerants with lower global warming potential than current refrigerants are being investigated to explore the feasibility for adoption across the industry. While clean energy remains a focal point of interest into the future, solar and renewable energy markets will offer opportunities for skilled workers who have the skills and knowledge of best practise and installation methods around these systems.

Consumer behaviour will continue to change into the future. With new technology, customers are expecting to be able to monitor and adjust their electricity usage on-demand, informed by diagnostics from Internet of Things devices in the home. These changes will provide new opportunities for electrical services technicians, including customised programmable parameters and payment.

The industry is cognisant of the need to recruit individuals who have the capacity to undertake training and apprenticeship programs, with emphasis being placed on language, literacy and numeracy skills. The IRC recognises that the current Electrician and Air-Conditioning and Refrigeration qualifications need reviewing and updating, to ensure workers are competent and able to work safely with new technologies.

Larry Moore
Electrotechnology IRC Chair
This IRC Skills Forecast was agreed to by the Electrotechnology IRC on 30 April 2018.
IRC SKILLS FORECAST

The Industry Reference Committee (IRC) Skills Forecasts focus on the prioritisation of the skill needs of the industry sectors each IRC has responsibility for. They are developed and reviewed annually and submitted on behalf of the IRC to the Australian Industry and Skills Committee (AISC) for approval.

The document is deliberately brief and it does not seek to identify every issue within every sector. It is a snapshot of a continually evolving story that is intended to alert and inform a wide audience and enhance the industry’s capacity to act.

IRCs are required to consult broadly with stakeholders to ensure a whole-of-industry view about the opportunities and challenges for the workforce and the Training Package review work necessary to meet industry needs. The information is then used to develop the four-year IRC Proposed Schedule of Work.

ELECTROTECHNOLOGY IRC SKILLS FORECAST

This annual IRC Skills Forecast will be submitted by the Electrotechnology IRC to the AISC for approval.

The IRC Skills Forecast identifies the priority skill needs of the Electrotechnology industry following a research and stakeholder consultation process conducted by Australian Industry Standards (AIS) on behalf of the IRC.

Once approved by the AISC, the IRC Skills Forecast informs the development of a four-year rolling National Schedule for review and development work within the UEE/UEE11 Electrotechnology Training Package.

More information on the National Schedule can be found at: www.aisc.net.au/content/national-schedule.

Quick Fact

87.11 BILLION

The amount of revenue generated by the Electrotechnology industry.

*
ELECTROTECHNOLOGY INDUSTRY REFERENCE COMMITTEE

The Electrotechnology IRC has been assigned responsibility for the UEE/UEE11 Electrotechnology Training Package. More information about the Electrotechnology IRC and its work can be found here:


Electrotechnology IRC Members

Carl Copeland
College of Electrical Training

Graeme Murphy
Institute of Instrumentation Control & Automation

Kevin O’Shea
Refrigeration Air-conditioning Contractors Association

Larry Moore (Chair)
National Electrical & Communications Association

Malcolm Richards
Master Electricians Australia

Mark Burgess (Deputy Chair)
Electrical Trades Union

Maurice Graham
Communications Electrical Plumbing Union

Neil Fraser
Energy Safe Victoria

Noel Munkman
Australian Refrigeration Council

Paul Lowe
NSW TAFE

Peter Beveridge
Utilities Engineering Electrical Automotive Training Council

Sandy Atkins
Clean Energy Council

Sarah Loveday
Loveday Electrical

Trevor Moore
Australian Rail Track Corporation

For more information, please contact:

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Electrotechnology Industry Manager
Australian Industry Standards

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Quick Fact

73,759

The amount of businesses in the Electrotechnology industry.
ELECTROTECHNOLOGY INDUSTRY OVERVIEW
The Electrotechnology industry includes the design, maintenance, installation and repair for all electrical and electronic equipment. The technology stretches across many sectors including mining, manufacturing, communications, construction, renewables, domestic and commercial refrigeration and air-conditioning. The Electrical Services industry (a subsector within Electrotechnology) involves electrical wiring or fittings in buildings and other construction projects, and repair and maintenance of existing electrical equipment and fixtures. The Electrotechnology industry is an $87.11 billion revenue industry employing almost 340,000 people.

KEY ELECTROTECHNOLOGY METRICS

- **Revenue**: $87.11B
- **Profit**: $11.73B
- **Average Wage Per Year**: $72,493
- **Employment Growth To 2023**: 5.0%

**ENTERPRISE DENSITY BY STATE/TERRITORY**

**ELECTROTECHNOLOGY BUSINESS COMPOSITION**

EXPLANATORY NOTES

Counts of Australian Businesses
Distinct from the Census and Labour Force data, the Counts of Australian Businesses data uses a top down approach where industries are primarily classified by the single predominant industry class associated with a business’ ABN. A limitation of this approach is that organisations with a presence in several States/Territories will be counted only once. This can lead to enterprise figures appearing low for a given state/territory, but it’s not that there are no enterprises existing in the state/territory, it’s that the headquarters are located elsewhere. A further consideration is that organisations in more than one industry will also be only counted in one industry.

Quick Fact

59% INCREASE
In renewable electricity production between 2009-10 and 2014-15 (solar, wind, hydro, biogas)
KEY ELECTROTECHNOLOGY STAKEHOLDERS

Employers
ActewAGL
Ausgrid
AusNet Services
ElectraNet
Energy Australia
Essential Energy
Loveday Electrical
Powerlink Qld
TasNetworks
TransGrid
Western Power

Employer Representatives
Air-conditioning and Mechanical Contractors Association
Australian Energy Storage Council
Australian Institute of Refrigeration, Air-conditioning and Heating
Australian Refrigeration Council
Australian Rail Track Corporation
Clean Energy Council
Institute of Instrumentation Control & Automation
Master Electricians Australia
National Electrical & Communications Association
National Electrical Switchboard Manufacturers Association
Refrigeration Air-Conditioning Contractors Association

Employee Representatives
Communications Electrical Plumbing Union
Electrical Trades Union

Licensing / Regulatory
ACT Planning and Land Authority (ACTPLA)
Clean Energy Regulator
Electrical Regulatory Authorities Council
Energy Safe Victoria
Energy Safety – WA
Electrical Safety Office -QLD
Industry and Investment -NSW
Office of Consumer and Business Services - SA
Office of Fair Trading – NSW
Office of the Technical Regulator - SA
Safe Work Australia
Worksafe -NSW
Worksafe- NT
Worksafe Tasmania

Government
Federal, State/Territory Departments

Industry Advisory
State Industry Training Advisory Bodies (ITABs)

Training Organisations
TAFEs, Private RTOs, Enterprise RTOs
UEE/UEE11 ELECTROTECHNOLOGY TRAINING PACKAGE

The UEE/UEE11 Electrotechnology Training Package provides the only nationally recognised Vocational Education and Training (VET) qualifications for occupations involved in electronics, electrical, communications, control systems, instrumentation, lifts, refrigeration and air conditioning, renewable/sustainable energy, fire and security, appliances, gaming and rail signalling.

The UEE/UEE11 Electrotechnology Training Package comprises 87 qualifications, 75 Skill Sets, and 614 Units of Competency and associated assessment requirements and covers electrotechnology, electrical, electronics, hazardous areas, instrumentation, rail signalling, refrigeration and air-conditioning, renewable and sustainable energy.

The UEE/UEE11 Electrotechnology Training Package contains the following qualifications:

**Certificates**
- Certificate I in ElectroComms Skills
- Certificate II in Electronic Assembly
- Certificate II in Sustainable Energy (Career Start)
- Certificate II in Fire Alarms Servicing
- Certificate II in Computer Assembly and Repair
- Certificate II in Electronics
- Certificate II in Remote Area Essential Service
- Certificate II in Electrical Wholesaling
- Certificate II in Remote Area Power Supply Maintenance
- Certificate II in Winding and Assembly
- Certificate II in Antennae Equipment
- Certificate II in Security Assembly and Set-up
- Certificate II in Technical Support
- Certificate II in Electrotechnology (Career Start)
- Certificate II in Data and Voice Communications
- Certificate III in Air-conditioning and Refrigeration
- Certificate III in Electrotechnology Electrician
- Certificate III in Switchgear and Controlgear
- Certificate III in Electronics and Communications
- Certificate III in Gaming Electronics
- Certificate III in Business Equipment
- Certificate III in Custom Electronics Installations
- Certificate III in Renewable Energy - ELV
- Certificate III in Electrical Fitting
Certificate III in Rail - Communications and Networks
Certificate III in Data and Voice Communications
Certificate III in Electrical Machine Repair
Certificate III in Appliance Service
Certificate III in Fire Protection Control
Certificate III in Instrumentation and Control
Certificate III in Security Equipment
Certificate III in Computer Systems Equipment
Certificate IV in Refrigeration and Air-conditioning Systems
Certificate IV in Air-conditioning and Refrigeration Servicing
Certificate IV in Air-conditioning Systems Energy Management and Control
Certificate IV in Electrical - Fire Protection Control Systems
Certificate IV in Electrical - Instrumentation
Certificate IV in Electrical Equipment and Systems
Certificate IV in Electrotechnology - Systems Electrician
Certificate IV in Computer Systems
Certificate IV in Energy Management and Control
Certificate IV in Electrotechnology - Electrical Contracting
Certificate IV in Energy Efficiency and Assessment
Certificate IV in Installation Inspection and Audits
Certificate IV in Hazardous areas - Electrical
Certificate IV in Electrical - Data and Voice Communications
Certificate IV in Electrical - Lift Systems
Certificate IV in Renewable Energy
Certificate IV in Industrial Electronics and Control
Certificate IV in Electronics and Communications
Certificate IV in Video and Audio Systems
Certificate IV in Electrical - Photovoltaic Systems
Certificate IV in Electrical - Air-conditioning Split Systems
Certificate IV in Industrial Automation and Control
Certificate IV in Rail - Communications and Network Systems
Certificate IV in Instrumentation and Control
Certificate IV in Electrical - Rail Signalling
Certificate IV in Electrical - Renewable Energy

**Diploma - Advanced Diploma**

Diploma of Air-conditioning and Refrigeration Engineering
Diploma of Engineering Technology - Refrigeration and Air-conditioning
Diploma of Electrical and Instrumentation
Diploma of Electrical Systems Engineering
Diploma of Electrical Engineering
Diploma of Industrial Electronics and Control Engineering
Diploma of Renewable Energy Engineering
Diploma of Research and Development
Diploma of Instrumentation and Control Engineering
Diploma of Computer Systems Engineering
Diploma of Electrical and Refrigeration and Air-conditioning
Diploma of Electronics and Communications Engineering
Advanced Diploma of Engineering Technology - Air-conditioning and Refrigeration
Advanced Diploma of Electrical - Engineering
Advanced Diploma of Air-conditioning and Refrigeration Engineering
Advanced Diploma of Electrical Engineering - Coal Mining
Advanced Diploma of Engineering Technology - Renewable Energy
Advanced Diploma of Engineering Technology - Electrical
Advanced Diploma of Automated Systems Maintenance Engineering
Advanced Diploma of Electrical Systems Engineering
Advanced Diploma of Engineering - Explosion Protection
Advanced Diploma of Instrumentation and Control Engineering
Advanced Diploma of Renewable Energy Engineering
Advanced Diploma of Computer Systems Engineering
Advanced Diploma of Engineering Technology - Computer Systems
Advanced Diploma of Industrial Electronics and Control Engineering
Advanced Diploma of Engineering Technology – Electronics
Advanced Diploma of Electronics and Communications Engineering

The UEE/UEE11 Electrotechnology Training Package is in the Scope of Registration of 162 Registered Training Organisations.
TRAINING DATA
The charts below investigate commencing enrolments by Australian Qualification Framework (AQF) level and funding source by State/Territory, where commencing enrolments of Units of Competency are averaged over three years.

COMMENCING ENROLMENTS BY AQF LEVEL

Entry to the industry continues to remain strong. Overall, two qualifications, Certificate III in Electrotechnology Electrician and Certificate II in Electrotechnology (Career Start), comprise 63 per cent of all UEE11 qualification enrolments. Post-trade qualifications enrolments, which lack government funding, have fallen by 36 per cent since 2014.

UNIT ENROLMENT COUNT BY STATE AND FUNDING TYPE 2014, 2015 AND 2016 AVERAGE

There are nearly the same number of domestic fee for service students in Queensland (95 per cent) as there are in the next top three States combined.
EXPLANATORY NOTES

Training Charts
Total VET Activity (TVA) data is collected by NCVER from all types of training providers and not only those in receipt of Commonwealth or State funding. TVA data collection commenced in 2014.

Exemptions
Where the submission of training data to TVA conflicts with defence or national security legislation or jeopardise the security or safety of personnel working in defence, border protection, customs or Australian police departments, an exemption from reporting training data is available.

Organisations that deliver training for vital services to the community (such as emergency, fire, first aid and rescue organisations) may have received an exemption to submit data to TVA. From 1 January 2016 however, the exemption from reporting applies only in respect of training activity not delivered on a fee for service / commercial basis.
CHALLENGES AND OPPORTUNITIES

TECHNOLOGY AND AUTOMATION
Industries across the world are experiencing rapid changes in their daily operations, accelerated by technological innovation. These changes will transform the way industries manage, supply, and regulate their operations. Technological advances will provide challenges and opportunities to the Electrotechnology industry, with the merging of traditional industry sectors and the emergence of new industry subsectors.

New products and services in process automation for homes are continuously entering the market in Australia. Packaged home automation systems are now being offered that include smart plugs, doors, windows and motion sensors. Furthermore, the development of fully electric vehicles, commercial automation processes, sensor fit-outs, as well as communications and remediation services are continuing to increase in demand.

These new systems allow consumers to conserve energy and automate the use of certain home appliances. From tailored Programmable Logic Controller (PLC) programming to Supervisory Control and Data Acquisition (SCADA) systems, industrial process automation services and devices are now commonplace. New specialist skills will be sought for these new technologies, requiring new and revised training strategies.

MAINTENANCE AND EQUIPMENT SERVICING
As the development of highly autonomous control systems are developed, the industry will face increased demand for skilled equipment and service maintenance workers who are able to conduct repairs on these systems. The ongoing refinement of process control is pivotal to improving the industry’s efficiencies and safety. However, this is further complicated by the technological advances in consumer markets which reduce the ability for devices and equipment to be repaired. These new products will add pressure on maintenance and equipment technicians as these products become more popular in the market.

SOLAR AND RENEWABLE ENERGY
Australia has one of the highest rates of rooftop solar photovoltaic (PV) systems and integration of PV with home battery storage, world-wide. Traditional consumers of power are now able to generate, store and trade their own electricity. Storage solutions for renewable electricity capture, continue to diversify, improve in efficiency, and lower price. This has led to increased growth and adoption of solar panel and battery arrays across Australia. As these technologies develop further, businesses and electrotechnology workers involved in the Electrotechnology industry will be able to provide new services and technological innovations to domestic and commercial customers. Consequently, vocational education and training for Electrotechnology will need to be continually reviewed to ensure it meets the needs of industry.
SUSTAINABLE ENVIRONMENTS
Globally, there is an increasing trend to reduce emissions and pollution, as agreed to in the Paris Climate Agreement. Australia’s commitment to the agreement aims to reduce emissions to below 2005’s levels by 2020⁷. CSIRO and Energy Networks Australia have published a Roadmap which seeks to cease the reliance on Carbon-based fuel for electricity by 2050, aligning to the agreement⁸. Furthermore, there are many energy efficiency initiatives under development⁹. These initiatives, introduced by both the Federal and State Governments, are to encourage the development and uptake of new technologies.

The Australian Government’s announcement of the one billion Clean Energy Innovation Fund aims to facilitate change. It intends to support emerging technologies, with demand for new jobs expected to emerge¹⁰. One such funded initiative has investigated the development of a solar-powered system which uses concentrated solar thermal energy to cool Australian commercial buildings. This enables the building to operate and achieve greater energy efficiency than using current air-conditioning systems¹¹.

The Government also plans to phase down the importation and use of hydrofluorocarbons (HFCs) used as an alternative to chlorofluorocarbons (CFCs) in refrigeration and other processes. Commencing January 2018, the target aims to reduce HFC emissions by 85 per cent by 2036¹². Consequently, alternative synthetic and natural refrigerants will be developed for use in new refrigeration and air conditioning equipment with a lower global warming potential (GWP) than current refrigerants. While these may be more ‘eco-friendly’, they may also be more flammable, more toxic to humans, or operate at higher pressures. These changes in refrigerants will require revised skills for the current and emerging workers in the industry, creating new skills demands and knowledge requirements.

Technological advancements and new energy efficiency targets will create an increased demand for Electrotechnology workers. These workers will also require new skills and knowledge in using these new technologies. Being equipped with the right skills and understanding of new systems will prepare the workforce for the ever-adapting and changing Electrotechnology industry. The design and installation of such products will shape much of the Electrotechnology sectors over the coming years.
CONSUMER BEHAVIOUR

Consumer behaviour is rapidly changing the industry. Customers have increasing options to control systems such as electrical metering, billing, payments, and pricing. Homes and businesses are now using new integrated technologies to control aspects of the physical world, to reduce the ongoing costs of energy consumption through the development of more efficient systems.

Consumer behaviour, driven by new technological change, further increases competition within the market. As companies compete for more efficient and user-friendly devices and management systems, competition and consumer demand will drive the adoption across the industry. The Internet of Things (IoT), for example, is seeing consumers able to use their smart phones to control and integrate their IT systems, security and intercoms, home functions/operation and electrical services from one central system. These new innovations will open new skill needs and demand for Electrotechnology workers.
EMPLOYMENT AND SKILLS OUTLOOK
Quick Fact

The approximate number of people employed by the Electrotechnology industry is 340,000 employees.
EMPLOYMENT DEMOGRAPHICS

The following charts provide an overview of the Electrotechnology workforce at a glance. These include age profiles, major occupations, gender-composition by employment type, workers by State/Territory, and the projected employment for the next five years.

ELECTROTECHNOLOGY WORKFORCE BY STATE/TERRITORY

The Electrotechnology workforce closely follows the general population distribution of Australia, although the less populous States/Territories are slightly underrepresented and the more populous States slightly overrepresented.


ELECTROTECHNOLOGY INDUSTRY AGE PROFILE – 2006 TO 2016

The Electrotechnology industry has grown consistently between 2006-2011 across all age groups. Although the number of workers aged 20-29 and 40-49 has decreased in the last five years (2011-2016), the number of workers aged over 30-39 and over 50 has increased over the same time.

**TOP FIVE ELECTROTECHNOLOGY OCCUPATIONS BY EMPLOYMENT**

The number of Electricians has grown by nearly 35 per cent since 2006, with most of the growth occurring between 2006 and 2011. The remaining top occupations have either declined or experienced small growth in the last five years (2011-2016).


**GENDER BY EMPLOYMENT TYPE**

The proportion of women in the Electrotechnology workforce has fallen since 1984, from 20.8 to 16.9 per cent today. While the percentage of males in the workforce has increased over the same time, the proportion of part-time male employment has increased to 8 per cent (from 2 per cent in 1984).

PROJECTED AND HISTORICAL ELECTROTECHNOLOGY WORKFORCE (2005 – 2023)

The Electrical Services workforce is expected to grow by 10.6 per cent over the next five years. Recent declines in the Telecommunications workforce since 2005 are expected to flatten over the same period. Other relates to: Air Conditioning and Heating Services, Computer and Electronic Equipment Repair, Domestic Appliance Repair and Maintenance, Elevator Installation and Maintenance, Fire and Security Alarm Installation Services.

EXPLANATORY NOTES

Census Data
Each respondent to the Census is asked to provide the industry of their employer at the location of where the person works. This question is designed to address the problem of single organisation operating in several industries, with the assumption being that the individual respondent is typically working in fewer industries than the company they work for. This approach aims to provide better industrial resolution in the data, however it is worth noting that the industry designation is dependent on the individual's interpretation of the question. An example where this could provide misleading data might be a plumber in the Gas Supply industry describing their employer's business (at the location that they are working) as plumbing which would therefore be counted in the Plumbing Services industry.

Labour Force Data
Outside of Census years, the size of an industry's workforce is established by the Australian Bureau of Statistics using the Labour Force survey. This dataset provides a 30-year view of the industry where, like the Census, industry is assigned at the discretion of the individual respondent. Given that the survey is sample-based, it should also be understood that the smaller the industry being measured, the larger the margin of error.

The scope of the Labour Force survey is limited to the civilian population of Australia and therefore members of permanent defence forces are excluded from the survey.

IBISWorld Data
IBISWorld data is comprised from a variety of economic, demographic, government and company data, including the Australian Bureau of Statistics.
ELECTROTECHNOLOGY INDUSTRY SKILL SHORTAGES

On behalf of the Electrotechnology IRC, AIS conducted an online survey for stakeholders, between 4 December and 16 January 2018. The IRC sought feedback on the current skill shortages and the reasons for the shortages, as perceived by industry stakeholders.

ELECTROTECHNOLOGY SKILL AND LABOUR SHORTAGES

71.6 per cent of respondents reported experiencing a skills shortage in the last 12 months. The occupations reported as being in shortage were:

1. Refrigeration / Air Conditioning Technicians
2. Electricians
3. Educators, Trainers and Assessors
4. Engineers (various)
5. Renewables Specialists

REASONS FOR SHORTAGE

Employers identified the following reasons for the shortage with the most frequent response listed first.

1. Ageing workforce / current staff retiring
2. Cost/time to achieve the required qualification
3. Wages/salaries considered too low
4. Unattractive job / poor industry image
5. Competition from other organisations
PRIORITY SKILLS
The priority skills of the Electrotechnology industry are drawn from stakeholder responses to the Electrotechnology IRC Skills Forecast survey conducted between 4 December and 16 January 2018.

SKILL CATEGORY
In order of priority to the industry, the following skills were identified from the survey as the most important for the Electrotechnology workforce within the next three to five years.

1. TESTING/DIAGNOSTICS
2. HEALTH/SAFETY
3. MAINTENANCE/SERVICING
4. ELECTRICAL
5. AIR CONDITIONING / REFRIGERATION

GENERIC SKILLS
The Generic Skills listed are provided to AIS by the Department of Education and Training. Within the survey, the IRC asks stakeholders to rank these skills in order of importance to the industry. Ranking of the 12 generic workforce skills in order of importance to the Electrotechnology industry are as follows.

1. Technology
2. Design mindset / Thinking critically / System thinking / Solving problems
3. Language, Literacy and Numeracy (LLN)
4. Science, Technology, Engineering, Mathematics (STEM)
5. Learning agility / Information literacy / Intellectual autonomy and self-management
6. Managerial/Leadership
7. Environmental and Sustainability
8. Communication / Virtual collaboration / Social intelligence
9. Customer service / Marketing
10. Data analysis
11. Financial
12. Entrepreneurial
WORKFORCE SUPPLY SIDE CHALLENGES AND OPPORTUNITIES

AGEING WORKFORCE
While the average age of workers in the Electrotechnology industry is 39, 24 per cent of the workforce is aged over 50. The ageing workforce presents a considerable challenge to the industry. The loss of key skills and industry knowledge created by retiring workers will put strain on the workforce and further increase competition for employment. The loss of experience and corporate knowledge will further strain the workforce. Mentoring and other knowledge-sharing initiatives could be utilised in training to assist in maintaining corporate and industry knowledge.

With the major disruptions and changes in the use of technology, it is necessary to ensure that workers have the right skills. Upskilling the existing workforce will be necessary for workers to interact and work safely with new products. Companies will be faced with greater demand to upskill, retrain, or recruit appropriately qualified people to undertake jobs in these emerging roles.

ATTRACTION OF NEW STAFF AND RETENTION OF SKILLED WORKERS
Attracting new workers to the various sectors within the Electrotechnology industry is challenging. Competitive salaries from other sectors and difficulty attracting women to the industry, are contributing to the challenges faced by the Electrotechnology industry’s recruitment of new trainees and retention of skilled workers. Employers have reported difficulty attracting applicants with suitable experience using specific technologies, machinery, and equipment.

Strong competition exists for highly-skilled individuals; therefore, companies will need well-designed human resource initiatives and effective recruitment and retention programs. This may include rewards through recognition and incentives, as well as ongoing professional development and mentoring. There is considerable effort within the industry to increase apprenticeship enrolment figures and completion rates via a new training support model.

GENDER DIVERSIFICATION
The participation of females in the Electrotechnology industry has been gradually decreasing over the past 30 years, from approximately 22 per cent in 1987 to approximately 17 per cent in 2017. Diverse workplaces are attributed to having improved financial performance, productivity, corporate knowledge, and lower staff turnover costs. Encouraging a diverse workplace and increasing the cohort of women in the Electrotechnology industry would be beneficial to keep up with demand for skilled workers. This will help ensure the sustainable and economic viability of the industry for the future.
LANGUAGE, LITERACY AND NUMERACY
In 2011, it was estimated 53 per cent of all working age Australians have difficulty with numeracy, while 46 per cent have issues with reading\(^8\). There is strong industry concern and anecdotal evidence that the language, literacy, and numeracy capability of new apprentices entering with school certification are significantly below the recommended standards to complete Electrotechnology qualifications satisfactorily. Ensuring entrants into Electrotechnology apprenticeships have the pre-requisite skills is essential. Pre-vocational training, including in-school programs, is beneficial in addressing this issue.

HIGHER-LEVEL SKILLS AND POST-TRADE TRAINING
To maintain relevance and a competitive edge in the industry, workers should be aware of the new technologies and the requirements of up-skilling. Data from VOCSTAT (the National Centre for Vocational Education Research VET enrolment database) reveals that of the total completions in 2016 of Electrotechnology trade qualifications (Certificate III) and ‘post-trade’ qualifications (Certificate IV and above), only 15 per cent of completion activity was associated to ‘post-trade’ qualifications\(^9\).

The reduction of post-trade training has the potential to further widen the ‘skills gap’ between the highly technical systems being manufactured, and the trade technician’s ability to keep those systems operating. This is further affecting the industry’s knowledge-base. Ensuring the Electrotechnology industry has wide coverage of the subsector skill needs, as well as more highly specialised workers for these sub-sectors, will be a significant challenge in the next few years. Methods of promoting post-trade upskilling and qualifications is necessary to ensure the sustainable longevity of an ever-increasingly technical and specialised industry.

Quick Fact
50% INCREASE

In the efficiency of small split air conditioning systems (compared with 2001)\(^6\)
TRAINING AND APPRENTICESHIPS

There is a strong demand from business for apprentices to be more job ready at the completion of their apprenticeship. This requires increased emphasis on pre-apprenticeships, including preparatory training and education focused on language, literacy and numeracy (see above).

Current training for the design of renewable energy systems is inadequate for commercial/utility scale installations of greater than 100kW systems. Some of the areas that are not adequately covered include: assessing the impact to the network connection point of the system, network protection requirements, building structural requirements, interpreting commercial electricity usage, and power factor impacts.

The capacity for Registered Training Organisations (RTOs) to deliver training on central plant air-conditioning and other sophisticated technologies is further impacted by challenges identifying trainers and assessors who are qualified to deliver the training in these new and emerging technologies. This includes the need for industry-relevant workshop environments to better train and prepare apprentices in new technologies within the industry.

With the rapid advancements in technology, the Electrotechnology industry has reported that the Qualifications UEE30811 Certificate III in Electrotechnology Electrician and UEE3211 Certificate III in Air-Conditioning and Refrigeration are falling behind industry advancements. This is of significant concern to the industry and may have a negative impact on workers ability to adapt to technological advancements.
REFERENCES


§ National Broadband Network (2017) *The nbn™ network take-up rate is right on target.* Available at: https://www.nbnco.com.au/blog/the-nbn-project/the-nbn-network-take-up-rate-is-right-on-target.html.

PROPOSED SCHEDULE OF WORK

DRAFT
KEY DRIVERS

ELECTRICIAN QUALIFICATIONS
Electrical installation and repair is a deemed a high-risk industry. Hence, it is imperative that work being carried out is restricted to competent licensed workers. Licensing systems are in place across all state jurisdictions to ensure only competent workers carry out electrical work.

The UEE30811 Certificate III in Electrotechnology Electrician and UEE22011 II in Electrotechnology (Career Start) qualifications include strict competency standards that cover work practices, equipment and installations. In the electrical industry individuals that breach the regulations can face significant penalties. Consequently, these qualifications are considered top priority for development by the Electrotechnology IRC.

Feedback from industry stakeholders throughout the UEE11 Electrotechnology Training Package Transition project have confirmed that the two qualifications and relevant Units of Competency need to be updated to meet the needs of Industry.

The Electrotechnology IRC submitted a Case for Change to the AISC, to review 43 critical Units of Competency in the two Electrician qualifications. This Case for Change was approved. One of the conditions of approval was that the review needed to be completed by the Transition project end date of 30 June 2018. However, the Technical Advisory Committee responsible for this project recommended to the IRC that given the amount of work involved, this could not be completed by the project end date. Through discussions with the Department Education and Training, the IRC have decided to only transition the 43 Units to comply with the Standards for Training Packages 2012. The IRC will endeavour to maintain all relevant technical content from the currently endorsed Training Package. Once this is completed, the Department of Education and Training will provide support, in principle, to review the two Electrician qualifications in their entirety.

This is a priority work item for the Electrotechnology IRC in 2018-19.

HANDLING OF REFRIGERANTS
The following proposed work item is considered high priority for the Australian government, to enhance protection of the environment to meet immediate regulatory needs. The handling of refrigerants and the carrying out of work using refrigeration and air-conditioning equipment is considered high risk. As such, the Electrotechnology industry is highly regulated and only individuals who have a Refrigerant Handling License can carry out this work.

In addition, there are national regulations that apply to people who acquire, possess, dispose of and handle Ozone Depleting Substances (ODS) or Synthetic Greenhouse Gases (SGGs) in the Refrigeration and Air-Condition (RAC) industry.

Under the Ozone Protection and Synthetic Greenhouse Gas Management regulations 1995, persons who handle these substances in bulk or in equipment, and people who work on equipment containing these gases, are required to hold a Refrigerant Handling License. There is current a gap identified in the industry with regards to the handling of A2 category refrigerants and recovery of refrigerants from decommissioned equipment.
**PROPOSED RESPONSES**

**ELECTRICIAN QUALIFICATIONS**
The Electrotechnology IRC with in principle support from the Department of Education and Training (DET), will begin the review of the UEE30811 Certificate III in Electrotechnology Electrician and UEE22011 II in Electrotechnology (Career Start) qualification, along with relevant Units of Competency, post transition of the UEE11 Electrotechnology Training Package. A Case for Change has already been approved for the review of 43 critical units of this qualification. Dependent on the rationale to be provided by the IRC, AISC will then decide on whether an activity variation request or a full Case for Change will be required.

**HANDLING OF REFRIGERANTS**
The Electrotechnology IRC have agreed in principle to develop two Units of Competency:

1. Handling A2 flammable refrigerants
2. Recovering refrigerant from stationary self-contained end of life decommissioned equipment

A Case for Change was developed for the review of all the Refrigeration and Air-Conditioning qualifications in October 2017 and made available for public consultation. The proposed Units of Competency listed above were included in the Case for Change. However, feedback received from stakeholders indicated a lack of clarity on the scope of the project and the intent/implication on the industry, due to the development of these Units. As a result, the Case for Change did not progress. The IRC have now decided to progress the development of these Units of Competency as a matter of priority. Industry engagement, including an industry round table, will be conducted in May to validate industry support and the Case for Change will be finalised and progressed accordingly.
PROPOSED SCHEDULE OF WORK

2018-19

Electrician Qualifications – Review
The UEE30811 Certificate III in Electrotechnology Electrician qualification has more enrolments than any other qualification in the UEE11 Electrotechnology Training Package. It is considered the single most critical qualification in the industry. During the Transition Project, the AISC approved a Case for Change, developed by the Electrotechnology IRC, to review 43 core and elective Units of Competency in the qualification. However, at an IRC meeting on 14 March 2018, members agreed that the amount of work involved is greater than originally anticipated, and that it could not be achieved by the project end date 30 June 2018.

Consequently, the Electrotechnology IRC has agreed to the transition of these Units as is from the currently endorsed Training Package in the first instance. The IRC has also requested the AISC grant a project variation to approve the Case for Change, post transition. This will allow the Electrotechnology IRC to review the UEE30811 Certificate III in Electrotechnology Electrician and UEE22011 Certificate II in Electrotechnology (Career Start) qualification in their entirety and allow industry sufficient time for consultation. In addition, it will also allow industry to develop some new ‘fit for purpose’ Units of Competency to be packaged in to this qualification.

Handling of Refrigerants – New Units of Competency
The Australian Government Refrigeration and Air Conditioning (RAC) Industry Permit scheme prescribed within the Ozone Protection and Synthetic Greenhouse Gas Management regulations 1995, ensures that refrigerant gases harmful to the environment are handled only by those competent do so. As a result of new practices the development of the following Units is required:

• Handling of A2 Flammable refrigerants
• Recovering refrigerants from stationary self-contained end of life decommissioned equipment

2019-20

Qualifications and Units of Competency – Review
During the Transition Project, stakeholder feedback indicated that the following qualifications need to be reviewed by industry stakeholders. The reasons provided for a review are as follows:

• Technology advances
• Repair and maintenance process improvement and automation
• Increased demands for renewables
• Trend to reduce emissions and pollution
• Crossover between electrical and IT
• Changes in legislation and industry practice

DRAFT
Electrical

UEE330XX – Certificate III in Electrical Fitting

Electrical Engineering

UEENEEI102X Solve problems in pressure measurement components and systems
UEENEEI103X Solve problems in density/level measurement components and systems
UEENEEI104X Solve problems in flow measurement components and systems
UEENEEI105X Solve problems in temperature measurement components and systems
UEENEEI119X Set up industrial field control devices
UEENEEI149X Solve problems in polyphase electronic power control circuits
UEENEEED152X Design embedded controller control systems
UEENEEI116X Assemble, enter and verify operating instructions in microprocessor equipped devices

Industrial Control

UEENEEI150X Develop, enter and verify discrete control programs for programmable controllers
UEENEEI111X Find and rectify faults in process final control elements
UEENEEI113X Setup and configure Human-Machine Interface (HMI) and industrial networks
UEENEEI111X Find and rectify faults in process final control elements
UEE510XX Diploma of Instrumentation and Control Engineering
UEE615XX Advanced Diploma of Instrumentation and Control

Engineering

UEE409XX Certificate IV in Industrial Electronics and Control

Electronics & Computers

UEE604XX Advanced Diploma of Computer Systems Engineering
UEE309XX Certificate III in Electronics and Communications

Refrigeration and Air-conditioning

UEE201XX Certificate II in Split Air-conditioning and Heat Pump Systems
UEE321XX Certificate III in Appliance Service
UEE322XX Certificate III in Air-Conditioning and Refrigeration

Renewables

UEENEEK123X Carry out basic repairs to renewable energy apparatus
UEENEEK128X Solve problems in stand-alone renewable energy systems
UEENEEK134X Install ELV stand-alone photovoltaic power systems
UEENEK125A Solve basic problems in photovoltaic energy apparatus and systems
UEENEK139A Design stand-alone renewable energy (RE) systems
UEENEK135A Design grid connected photovoltaic power supply systems
UEENEK148A Install, configure and commission LV grid connected photovoltaic power systems

2020-21

There are no UEE/UEE11 Electrotechnology Training Package products currently identified for review or development during this forecast period.

Where imported Units of Competency are identified as either deleted or superseded, the IRC may elect to revise the affected qualification(s) through the IRC minor upgrade process.

2021-22

There are no UEE/UEE11 Electrotechnology Training Package products currently identified for review or development during this forecast period.

Where imported Units of Competency are identified as either deleted or superseded, the IRC may elect to revise the affected qualification(s) through the IRC minor upgrade process.
2018-19 PROJECT DETAILS

ELECTRICIAN QUALIFICATIONS – REVIEW

Description
The project is to review and develop the competency skills for Electricians in the Electrotechnology industry

Rationale
The IRC has agreed that the following qualifications need to be reviewed as a matter of priority to ensure:

- That amendments to Critical Aspects of the Essential Performance Capability (EPCs) Requirements for Licensed Electricians, determined by the Electrical Regulatory Authorities Council (ERAC) are included
- Potential new Units of Competency are developed where necessary to ensure the amended EPCs are covered
- Updating Units of Competency to align with new and emerging technologies associated with industry requirements
- Units of Competency that are no longer ‘fit for purpose’, and do not reflect industry requirements are deleted
- Qualification packaging rules are reviewed and aligned with current industry requirements

See pages 16 and 27.

Ministers’ Priorities Addressed

- The project does not propose removal of obsolete and superfluous qualifications from the National Register
- The project will ensure that more information is made available about electricians training delivery to training providers
- The project may support individuals moving from acquired skills and knowledge from one state or territory to another
- The project does not propose creation of Units of Competency that can be owned and used by multiple industry sectors, due to the discrete and targeted nature of the required skills and knowledge
- The project does not propose the development of additional Skill Sets for Electrotechnology
- The project does not propose the incorporation of existing accredited course materials into the UEE/ UEE11 Electrotechnology Training Package

Consultation Plan
The Electrotechnology IRC will undertake consultations within state and territory networks, including key industry stakeholders and communities through the project’s duration. AIS will undertake consultation on the IRCs behalf with State Training Authorities and other key national stakeholders, including seeking public feedback and input into development of training material through the project’s duration.
Scope of Project
The project is planned to be undertaken between July 2018 and June 2019, with a Case for Endorsement planned for submission in July 2019.

Training Package
UEE 11 Electrotechnology Training Package

Qualifications
Two Qualifications:
UEE22011 Certificate II in Electrotechnology (Career Start)
UEE30811 Certificate III in Electrotechnology Electrician

Units of Competency
There are 110 Units of Competency (including the 42 units already approved) In addition, through the review process the Technical Advisory Committee could potentially identify new Units of Competency for development.

Skills sets
Nil
HANDLING OF REFRIGERANTS – NEW UNITS OF COMPETENCY

Description
Competency development for refrigerant handling and refrigerant recovery.

Rationale
This will ensure that technicians licensed under the Refrigeration and Air Conditioning (RAC) scheme gain competencies through a nationally endorsed Unit of Competency to handle Synthetic Greenhouse Gas (SGG), and R32, an A2L Class refrigerant.

There is a need for technicians licensed under the RAC scheme to gain greater competency to safely and correctly recover Ozone depleting substances, including dangerous and flammable refrigerants from stationary systems. See Sustainable Environments, page 17 and Training and Apprentices, page 27.

Ministers’ Priorities Addressed
• The project does not propose removal of obsolete and superfluous qualifications from the National Register
• The project will ensure that more information is made available about Electrotechnology training delivery to training providers
• The project may support individuals moving from acquired skills and knowledge from one state or territory to another
• The project does not propose creation of Units of Competency that can be owned and used by multiple industry sectors, due to the discrete and targeted nature of the required skills and knowledge
• The project does not propose the development of additional Skill Sets for Electrotechnology
• The project does not propose the incorporation of existing accredited course materials into the UEE11 Electrotechnology Training Package

Consultation Plan
The Electrotechnology IRC will undertake consultations within state and territory networks, including key industry stakeholders and communities through the project’s duration. AIS will undertake consultation on the IRCs behalf with State Training Authorities and other key national stakeholders, including seeking public feedback and input into development of training material through the project’s duration.

In addition, AIS will facilitate a special industry roundtable discussion to validate industry support for the development of these two Units of Competency. This industry will also serve as a forum to the discuss the future direction of the relevant Refrigeration and Air-conditioning qualifications within the UEE11 Electrotechnology Training package.
Scope of Project
The project is planned to be undertaken between July 2018 and June 2019, with a case for Endorsement planned for submission in July 2019

Training Package
UEE11 Electrotechnology Training Package

Qualifications
Nil

Units of Competency
Two new Units of Competency:
1. Handling A2 flammable refrigerants
2. Recovering refrigerant from stationary self-contained end of life decommissioned equipment

Skills sets
Nil
2019-20 PROJECT DETAILS

QUALIFICATIONS AND UNITS OF COMPETENCY – REVIEW

Description
Please note - A full Case for Change will be developed later in the year once the members have had the opportunity review and list the listed units and qualifications

Rationale
TBA

Ministers’ Priorities Addressed
TBA

Consultation Plan
TBA

Scope of Project
TBA

Training Package
UEE11 Electrotechnology Training Package

Qualifications
UEE330XX – Certificate III in Electrical fitting
UEE604XX Advanced Diploma of Computer Systems Engineering
UEE309XX Certificate III in Electronics and Communications
UEE201XX Certificate II in Split Air-conditioning and Heat Pump Systems
UEE321XX Certificate III in Appliance Service
UEE322XX Certificate III in Air-conditioning and Refrigeration

Units of Competency
UEENEEI102X Solve problems in pressure measurement components and systems
UEENEEI103X Solve problems in density/level measurement components and systems
UEENEEI104X Solve problems in flow measurement components and systems
UEENEEI105X Solve problems in temperature measurement components and systems
UEENEEI119X Set up industrial field control devices
UEENEEI149X Solve problems in polyphase electronic power control circuits
UEENEED152X Design embedded controller control systems
UEENEEI116X Assemble, enter and verify operating instructions in microprocessor equipped devices
UEENEEI150X Develop, enter and verify discrete control programs for programmable controllers
UEENEEI111X Find and rectify faults in process final control elements
UEENEEI113X Setup and configure Human-Machine Interface (HMI) and industrial networks
UEENEEI111X Find and rectify faults in process final control elements

Skills sets

Nil
AUSTRALIAN INDUSTRY STANDARDS

Australian Industry Standards (AIS) provides high-quality, professional secretariat services to the Electrotechnology IRC in our role as a Skills Service Organisation. AIS provide services to eleven allocated IRCs which cover Aviation, Corrections, Gas, Electricity Supply (Generation and Transmission, Distribution and Rail), Electrotechnology, Maritime, Public Safety (including Police, Fire and Emergency Services, Defence), Rail, Transport and Logistics, and Water industries. AIS supports these important industry sectors using our world class in-house capability and capacity in technical writing, quality assurance, project management and industry engagement in the production of Training Packages.

AIS was established in early 2016, 20 years after its predecessor the Transport and Logistics Industry Skills Council (TLISC) was established in 1996. More information about AIS can be found at http://www.australianindustrystandards.org.au.

- We support industry growth and productivity through our modern innovative approach to establishing skills standards
- We provide high-quality, professional secretariat services to help our allocated industry reference committees develop the skills that industry needs
- We partner with industry to shape the workforce of the future