ESI TRANSMISSION, DISTRIBUTION AND RAIL IRC SKILLS FORECAST KEY FINDINGS DISCUSSION PAPER 2018

The purpose of the paper is to provide industry stakeholders with a summary of the key findings from the recent industry intelligence gathering activities overseen by the ESI Transmission, Distribution and Rail Industry Reference Committee (IRC). The key findings will be used by the IRC in the development of the ESI Transmission, Distribution and Rail IRC Skills Forecast and Proposed Schedule of Work for the UET12 Transmission Distribution & Rail Sector Training Package.

Several targeted strategies were employed to collect industry intelligence about the opportunities and challenges for the ESI Transmission, Distribution and Rail workforce and any UET12 Transmission Distribution & Rail Sector Training Package review work necessary to meet these industry needs. These included:

- A Call for Submissions process inviting stakeholder responses about key issues affecting skills and workforce development;
- An IRC Skills Forecast Survey seeking information on priority skill needs, skill shortages and issues relating to workforce training and;
- A comprehensive review of Data and Research Sources nominated by the ESI Transmission, Distribution and Rail IRC.

Australian Industry Standards has been tasked by the IRC to collect feedback from interested stakeholders about these issues on its behalf.
HOW TO PROVIDE FEEDBACK

Stakeholders are invited to submit their comments on the findings outlined in this paper by close of business on 20 February 2018.

It is acknowledged that the information provided about issues in this paper is deliberately brief. The purpose of this paper is to validate and confirm the findings, which will inform the advice the ESI Transmission, Distribution and Rail Industry Reference Committee (IRC) will provide to the Australian Industry and Research Committee (AISC).

In considering the key issues and themes identified in this paper, we are keen to have any feedback that either confirms your issue has been covered, or else raises an issue you feel should be addressed in the Proposed Schedule of Work (FY18/19–FY21/22) for the UET12 Transmission Distribution & Rail Sector Training Package to be submitted to the AISC on 30 April 2018.

Responses can be emailed to enquiries@australianindustrystandards.org.au.

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ESI TRANSMISSION, DISTRIBUTION AND RAIL
INDUSTRY OVERVIEW
The ESI Transmission, Distribution and Rail (ESI-TDR) industry refers to Australia's infrastructure networks that are used to transport high-voltage electricity from generators to distribution networks; and then directly to domestic and industrial users. The transmission network is inclusive of power lines and substations. The transmission industry accounts for $3.03 billion in revenue and employs almost 4,799 people. The distribution network is significantly bigger generating $16.62 billion in revenue and employing over 33,000 people.

KEY ESI TRANSMISSION, DISTRIBUTION AND RAIL METRICS

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue ($b)</td>
<td>19.65</td>
</tr>
<tr>
<td>Profit ($b)</td>
<td>5</td>
</tr>
<tr>
<td>Average Wage ($)</td>
<td>87,975.0</td>
</tr>
<tr>
<td>No of Businesses</td>
<td>28</td>
</tr>
<tr>
<td>Employment Growth to 2023 (%)</td>
<td>1.6</td>
</tr>
</tbody>
</table>

Scope: Electricity Distribution, Electricity Transmission

KEY ESI TRANSMISSION, DISTRIBUTION AND RAIL FACTS

Over 40 per cent of customers to use onsite power sources by 2027: 29 gigawatts (GW) of solar, 34 GWh of batteries

12 new Large Scale Solar projects in development from 2017, expected to generate 500 megawatts when complete

200 terawatt-hours (TWh) supplied to households and businesses through

Over 40,000 km of transmission lines and cables

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ESI TRANSMISSION, DISTRIBUTION AND RAIL WORKFORCE

ESI TRANSMISSION, DISTRIBUTION AND RAIL WORKFORCE BY STATE/TERRITORY

![Bar chart showing workforce by state/territory](chart.png)

- New South Wales: 9,839
- Queensland: 7,330
- Victoria: 6,316
- Western Australia: 2,468
- South Australia: 1,495
- Tasmania: 682
- Australian Capital Territory: 651
- Northern Territory: 37


ESI TRANSMISSION, DISTRIBUTION AND RAIL INDUSTRY SKILL SHORTAGES

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

1. Educators
2. Health/Safety/Hazard specialists
3. Electrical Engineers
4. Instrumentation Engineers
5. Rail Signalling Engineers

**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. Wages / salaries considered too low
3. Cost/time to achieve the required qualification
4. High staff turnover
5. Competition from other organisations
KEY ESI TRANSMISSION, DISTRIBUTION AND RAIL SKILL ISSUES

INDUSTRY CHALLENGES AND OPPORTUNITIES

Emerging Technology and Automated Systems

Disruptive technologies, autonomous systems development, and digital innovations are rapidly changing the way many industries operate. The Internet of Things (the trend of connecting devices, sensors and data collecting tools to networks, relaying information without a human intermediary) is radically changing the face of electricity supply. Having devices always connected, sending and receiving information, will enable higher resolution (real-time) data collection of electricity use. These tools enable companies to view and analyse electricity demand, while enabling consumers the ability to monitor and adjust their electricity use.

As these devices become more mainstream, the workforce of ESI–TDR will need to be prepared and equipped with the necessary knowledge and skills to fully realise the potential of these opportunities.

The Changing Grid

Consumer behaviour is drastically altering the way the ESI – TDR industry is conducting its day-to-day operations. The next ten years are anticipated to drastically change the way electricity is supplied to consumers. Australian consumers are embracing the future of electricity by actively integrating with distributed energy resources (DER) and engaging with new electricity services and technologies at record levels.

As the national Future Grid Forum notes, Australia’s established electricity systems are facing complex and unprecedented challenges that can affect all points along the electricity supply chain. These new tools will encourage new market structures, disruptive innovations, and business models to emerge.

A trial is currently underway in Adelaide to connect solar PV and battery storage in homes and businesses together through a digital distribution network. The batteries will be able to communicate through a Cloud-based platform using smart controls, forming a connected system that will be able to operate as a virtual 5MW solar power plant. The ‘virtual network’ will monitor and feed electricity into the grid as required. This is anticipated to save each contributor an estimated $500 per annum in electricity charges.

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9 The Australian Gas Light Company (2016) AGL launches world’s largest solar virtual power plant battery demonstration to benefit customers.
It is predicted that up to 50 per cent of all electricity in the grid will be generated by customers in 2050 – furthermore wind, solar, and biogas are expected to be the main suppliers of electricity by this time\textsuperscript{10}. This new model is opposite to the original design of the network and will present significant challenges and opportunities to develop a skilled workforce considering the technical and regulatory challenges in the foreseeable future.

**Environment and the Adoption of Reliable Renewables**

In line with the Paris Climate Agreement of 2016, the Government of Australia has pledged to reduce its CO\textsubscript{2} emissions by 2030 to below 25 per cent of 2005 emission levels\textsuperscript{11}. The energy sector collectively will face significant challenges and opportunities to reduce greenhouse gas emissions to these levels agreed. Government policies plan to promote the adoption of renewable electricity, including sources from wind, solar, hydro, and bioenergy\textsuperscript{12}. As these new forms of generation become cheaper, and adoption is increased, the industry will need to ensure the workforce has the required skills to interact and adapt to new processes being implemented. Developing systems which can monitor electricity demand and draw electricity from different sources in real-time are being developed to provide consistent and reliable electricity to consumers\textsuperscript{13}.

**Solar**

Solar power generation is steadily embedding itself in the national supply of electricity. Plans to add large-scale solar farms to the NEM are increasing, with 1700 MW of large-scale solar PV being proposed in 2017. Rooftop solar is not traded through the NEM but is considered a reduction in demand. Consumers who generate solar electricity input it into the grid for a reduction in power billing. As at December 2016, Australia had over 5.4 gigawatts (GW) of solar power being produced. In the next 20 years, it is expected that solar will contribute 20 GW to the national grid, almost one-third of all electricity forecasted for generation in Australia\textsuperscript{14}.

**Wind**

The cost of wind-generated power is also significantly cheaper than conventional methods. Wind generators accounted for over 7.5 per cent of capacity in 2015 – 2016, while output generated 6.1 per cent of all electricity in the NEM\textsuperscript{15}. However, the reliability of wind power generation and transmission has hampered the adoption on a larger scale until a reliable means to store excess power can be implemented.

\textsuperscript{10} CSIRO and Energy Networks Australia (2016) Electricity network transformation roadmap: Key concepts report.
\textsuperscript{14} Climate Council (2016) State of Solar 2016: Globally and in Australia, Climate Council of Australia Limited.
Although renewable electricity generation is demonstrated to be significantly cheaper to produce than conventional power generation and transmission, the inability to provide 100 per cent up-time requires the addition of large scale electricity storage solutions. The workforce will need to be skilled and experienced in the understanding and deployment of new systems before these technologies can be fully utilised.

**Energy Security**
Ensuring Australia’s domestic energy market can supply continuous and reliable electricity to all consumers will be a significant focus for the future. The Australian network is vital for the economy and the well-being of Australian society. As renewables are added to the grid, ensuring reliable storage of this energy will be critical.

Late 2017 saw a state-wide power blackout in South Australia during increasingly warm weather. In response, the government of Australia approved the deployment of a large battery array developed by Tesla Inc., to store renewable energy and feed this into the grid as required. Experience and knowledge of this, and other solutions for electricity transmission reliability, will be a major part of the ESI-TDR skill needs in the future.

The transformation required to enable the integration of distributed energy resources and enable new system functionality will require new operational responses. This will require the existing workforce to be flexible and agile, to be able to adapt its current skill base to meet and service these new technological requirements.

**Skills for New Services**
The diversification of utility operator’s business models is being developed world-wide. Companies world-wide are seeking to enhance their competitiveness and plan for the emergence of new technologies and innovations entering the market.

Distribution Network Service Providers (DNSPs) can offer services beyond the traditional pricing around kilowatt hours (KWh), such as frequency control, system inertia and back-up systems – in effect, acting as a trading platform for all users. Further, if the Distribution Network Operators take on the role of Distribution System Operator, then their utilisation is likely to both increase and become more complex. Future business model iterations and related revenue opportunities for DNSPs are dependent upon an interconnected, data-rich environment and a highly-skilled workforce that can service those requirements. Australian electricity networks and their workforces will need to respond to their own unique circumstances, taking advantage of reliable electricity in the changing grid.

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16 Energy Networks Association (2016) Transition from distribution network operator to distribution system operator.
WORKFORCE SUPPLY SIDE CHALLENGES AND OPPORTUNITIES

Constrained Funding for Higher Level Skills

There is a pressing need to ensure the ESI – TDR workforce is properly resourced and skilled to meet the demands of new technologies. The speed at which emerging technologies are entering the market will result in a clear skills gap, which will be further impacted should the existing workforce not have access to funding for training. While it is anticipated that the industry and workforce will take on more responsibility for skills and training requirements, it should be acknowledged that any transformation of the workforce will require leadership and involvement from governments.

International/National Workplace Trends

Meeting new skills demands is essential if utilities companies are to accommodate these new technologies. Emerging technologies are rapidly altering the skill requirements in the workforces of Transmission and Distribution Network Service Providers, electrical contractors and workers in other electricity supply sectors. The future grid will require the deployment of new smart technologies such as computer diagnostics of device faults and advanced communications requirements to provide two-way flows of data/energy.

The workforce will need to be prepared to work with intelligent technical support equipment (e.g. smart technologies – inverters, meters and new technologies such as storage at various scales). These tools can provide remote and real-time diagnostics, automated failure finding, interoperability and are centrally controlled by application software.

Recruitment of digitally enabled workforce specialists who also have knowledge of the ESI-TDR industry is already being reported as difficult. This has potential to increase over time as the demand for these occupations inevitably continue to grow to meet demand.

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PRIORITY SKILLS
The priority skills results are drawn from ESI Transmission, Distribution and Rail stakeholder responses to the IRC Skills Forecast survey conducted between 4 December 2017 and 16 January 2018.

SKILL CATEGORY
In order of priority to the industry, the following skills were identified as the most important for the ESI - TDR workforce within the next three to five years.
1. High voltage
2. Health/Safety
3. Risk management
4. Testing/diagnostics
5. Planning

GENERIC SKILLS
Ranking of the 12 generic workforce skills in order of importance to the ESI - TDR.
1. Technology
2. Design mindset / Thinking critically / System thinking / Solving problems
3. Language, Literacy and Numeracy (LLN)
4. Science, Technology, Engineering, Mathematics (STEM)
5. Communication / Virtual collaboration / Social intelligence
6. Learning agility / Information literacy / Intellectual autonomy and self-management
7. Managerial / Leadership
8. Customer service / Marketing
9. Environmental and Sustainability
10. Data analysis
11. Entrepreneurial
12. Financial
BACKGROUND INFORMATION

INDUSTRY REFERENCE COMMITTEES

New arrangements for training product development commenced in January 2016. These arrangements consider the needs of employers of all sizes, across all industry sectors, and ensure the delivery of high quality Training Packages that are nationally endorsed and internationally regarded.

Industry References Committees (IRCs):

- Provide a forum for industry engagement
- Direct the review, development and implementation of Training Package content relevant to the industry sectors they cover
- Act as a conduit for industry feedback to the Australian Industry and Skills Committee (AISC) and governments on industry trends

IRCs are composed of individuals and industry members with the experience, skills and knowledge of their specific industry sector. IRCs are supported by independent and professional Skills Service Organisations (SSO) to develop and review Training Packages, and to inform Training Package development priorities.

IRCs have a direct relationship with the AISC, and are charged with identifying industry’s skills needs, developing Business Cases setting out the Case for Change, and providing the sign off on training products before they go to the AISC for consideration.

Each IRC will perform the following functions:

- Gather intelligence for their industry sectors to inform advice on Training Package development and review
- Direct the work of its SSO in the development of industry proposals, Cases for Change and Cases for Endorsement
- Oversight the development and review of Training Packages in line with the requirements of the AISC
- Provide sign off for industry proposals, Cases for Change, Cases for Endorsement and other submissions for consideration by the AISC
- Direct the work of the SSO in preparing the support materials where funding for additional activities is provided
- Report to the AISC on progress of its work
- Promote the use of Vocational Education and Training (VET) in the sectors they represent
ESI TRANSMISSION, DISTRIBUTION AND RAIL
INDUSTRY REFERENCE COMMITTEE (IRC)

The ESI Transmission, Distribution and Rail Industry Reference Committee (IRC) has been assigned responsibility for the UET12 Transmission Distribution & Rail Sector Training Package.

**Chair:** Stuart Johnson

**Deputy Chair:** Peter Woods


The UET12 Transmission Distribution & Rail Sector Training Package provides the only nationally recognised Vocational Education and Training (VET) qualifications for occupations involved in transmission structure and line assembly, national broadband network cabling, asset inspection, power systems – transmission overhead (erection of towers, poles, structures and associated hardware), power systems – distribution overhead (installation, maintenance and inspection poles, structures and associated hardware), power systems – distribution cable jointing, power systems and power systems operations. The UET12 Transmission Distribution & Rail Sector Training Package comprises 16 qualifications, 18 Skill Sets, and 223 Units of Competency and associated assessment requirements and covers overhead lines (distribution), overhead lines (transmission), overhead traction wiring systems (rail), cable jointing and equipment installation. The UET12 Transmission Distribution & Rail Sector Training Package is in the Scope of Registration of 287 Registered Training Organisations.

IRC SKILLS FORECAST AND PROPOSED SCHEDULE OF WORK

The 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 in consultation with industry stakeholders and submitted on behalf of the IRC to the Australian Industry and Skills Committee (AISC) for approval.

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 IRC Skills Forecast is submitted to the AISC and informs the development of a four-year rolling National Schedule for Training Package development and review work. More information on the National Schedule can be found at www.aisc.net.au/content/national-schedule.
AUSTRALIAN INDUSTRY STANDARDS

Australian Industry Standards (AIS) provides high-quality, professional secretariat services to the ESI Transmission, Distribution and Rail 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.