Environmental Scan

2015

ENERGY SKILLS AUSTRALIA

CONTENTS

CONTEXT, PURPOSE AND AUDIENCE

Rapid advances in technology, seismic shifts in global demography and rise of the conscientious consumers have left economists and policymakers recognising the limited relevance of historical trends and data as a reliable indicator of the future.

Looking to the past is particularly unhelpful when attempting to predict industry's future workforce and skill development needs, particularly as Australia is journeying through a period without precedent, where whole industries are evolving, converging or re-locating and new job roles emerging while others becoming obsolete.

Leading developed nations are now establishing 'early warning systems' to quickly detect the onset of trends and building agile vocational training systems capable of responding once issues are identified. Environmental Scans have been conceived on this basis.

The Scan is produced by E-Oz Energy Skills Australia, the Industry Skills Council for the energy sector industries, which undertakes contemporary, high quality analysis and intelligence on the profile and skills needs of the current and future energy sector workforce.

Based on real-time industry views and evidence from across the Australia, the Environmental Scan gives readers a clear understanding of the key factors currently shaping and impacting on workforce development and how well the national training system, its products and services, and industry itself are responding.

Grass roots insight and immediacy of industry intelligence are what sets the Scan apart from other reports in the national training system. For this reason, the Scan is not focused on already published statistics and economic analyses found elsewhere which, by their very nature, are typically historical. Rather, it draws on a range of topical sources such as the latest industry, enterprise and government research, and international developments. It builds on intelligence gathered from on-going visits and conversations with industry across the country, key stakeholders, regulators and critically, the people doing the jobs across the sectors, and who continue to experience firsthand the issues needing to be written about.

As a template document, restricted in size, the Scan does not seek to capture every issue within every sector. It is a short snapshot of a continually evolving story that is intended to alert and inform a wide audience and enhance their capacity to act.

The Scan's formal audience is the Department of Education and Training but its relevance extends far beyond and continues to be used extensively by state and territory governments, industry bodies, enterprises and the broader skills and workforce development sector.

The 2015 Environmental Scan has been produced with the assistance of funding provided by the Commonwealth Government through the Department of Education and Training.

Sources of information

As always, the content of this year's Environmental Scan has been informed through the ISC's stakeholders via its consultative networks, including;

- E-Oz Board of Directors,
- General Standing Committees of the Board,
- Sector Councils,
- Industry-specific National Training Advisory Groups (NTAGs)
- Sector-specific Technical Advisory Committees (TACs),
- National Project Steering Committees

In jurisdictional matters, this network is supported by the State and Territory Industry Training Advisory Bodies (ITABs) servicing the ElectroComms and EnergyUtilities industries across Australia. Each year, E-Oz Energy Skills Australia formally engages the ITAB network to provide State/Territory-specific industry intelligence. This intelligence and ITAB reports to Government have been utilised to inform this 2015 Environmental Scan.

In addition to these formal structures, E-Oz actively collects 'grass-roots' industry intelligence from a number of key stakeholder consultation forums including: an annual National Workshop Series involving one or more stakeholder consultation workshops in each state and territory, the Annual E-Oz Conference (plus associated industry/sector specific meetings) and project meetings conducted throughout the year.

Grass root intelligence is increasingly collected by targeted electronic surveys, which allow the ISC to reach specific stakeholder groups. Strong industry support for the ISC is demonstrated by the high response rate observed; making these surveys an effective tool for collecting disaggregated data for our industries. Surveys include;

- Stakeholder feedback
- Environmental Scan
- Industry Leader

E-Oz would like to acknowledge and thank all stakeholders who have contributed to these processes, helping to ensure that this report reflects the current state of the industry and how this is expected to evolve in the short to medium term.

LATEST INTELLIGENCE AND IDENTIFIED WORKFORCE DEVELOPMENT NEEDS

The energy sector underpins the operation of the broader economy, providing access to safe, reliable and efficient energy, harnessed to a myriad of productive applications.

The skills base of the energy workforce underpins Australia's capacity to build and maintain energy network infrastructure, service consumer demand, disseminate new technology into the community and respond to emergencies (to protect our communities and secure energy supply and service).

E-Oz Energy Skills Australia's primary role, as the Industry Skills Council for the energy sector, is to work with employers to maintain, develop and disseminate industry performance standards via endorsed national Training Packages in response to;

- Changes in technology
- Changes in industry regulation
- Changes in industry work practices

These standards need to be both ahead of the game, ready to support the rapid implementation of new technologies, and constantly revised, supporting established job roles through innovation processes and procedures to boost productivity.

The need for skills standards to be highly responsive means that some of the ISC's activities may not achieve implementable outcomes, as an emerging technology is replaced by a newer system before it matures.

For training to support and facilitate changes of the nature outlined above it must take account of the time lags inherent in:

- the training system
- the adoption of new technology
- the introduction of regulatory or legislative changes
- changes in policy direction at national or jurisdictional levels
- the acceptance of changed work practices

E-Oz's response is strongly focussed on the role of skills and skills formation as a vital part of economic development and the technical innovation which enhances productivity and outcomes for the community.

The range of activities related to industry innovation or technological change reported below do not represent "picking of winners". The ISC attempts to examine and, where requested/approved by industry, develop appropriate training standards for all technologies/systems which employers feel have a realistic chance of being implemented.

An example of the system working well can be seen in the impact of training in the small scale photovoltaic (PV) generation roll-out across Australia. Driven by consumer demand, government incentives and a steep price reduction due to the maturing of the technology, the installation of PV systems rose steeply from 2009 to over 1 million rooftop installations nationally.

Industry had identified and codified in the nationally endorsed Electrotechnology Training Package the competencies required for the design, installation and maintenance of these

systems, as early as 2004. These standards remained nearly unused for years but their existence allowed industry to respond to the demand, when it came, without having to wait for appropriate training standards to be agreed and endorsed; allowing employers to ramp up their capacity to install PV systems, to take advantage of a commercial opportunity.

Technical skills based on nationally endorsed standards are key elements in the successful deployment of new technologies. It may be argued that the availability of these technical skills is a precursor to acceptance of a new technology in the market, as investors seek assurance that their capital is protected by adequate support services.

Understanding which skills will be required by energy sector employers in the medium term is particularly challenging in the current, highly uncertain, environment. A global revolution is taking place in relation to the way energy is produced, distributed, managed and consumed. Understanding skill demand therefore has a technological, governmental and individual component.

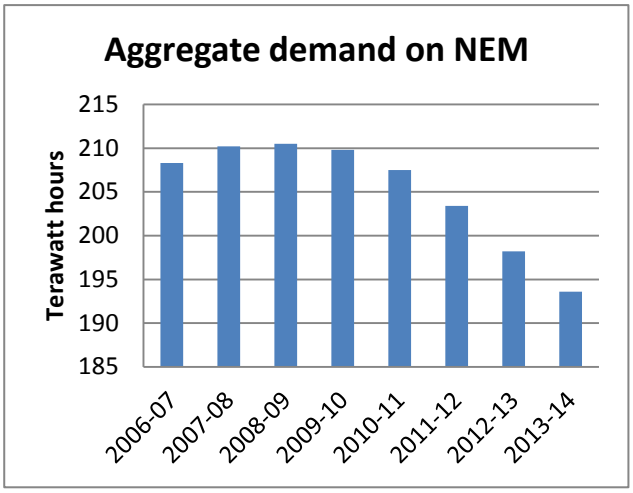
In the photovoltaic example above, a government initiative, a gradual shift in consumer preferences and a technological leap combined to drive an explosion in skill demand. Allowing market forces to operate effectively requires developing skill standards across a range of occupations which currently have minimal demand, in order to remove a potential barrier to their implementation.

What is clear is that establishing a network which will allow for greater data collection and reporting will be vital as consumers seek to actively or passively (through outsourcing) manage their energy usage. Optimising these systems at various scales will require energy auditors and systems developers/designers and installers, and will be facilitated by the 'internet of things', which will see connected devices communicate to regulate their collective usage.

Identifying optimum outcomes will also require further application of user pays principles, supported by access to enabling skill capacity, to prioritise behaviour which allows efficient usage of shared energy networks.

DECOUPLING OF ELECTRICITY DEMAND FROM GDP GROWTH

Electricity demand on the National Electricity Market (running across Queensland, New South Wales, Tasmania, Victoria, South Australia and the ACT) has fallen for an unprecedented fifth straight year and now sits over 8% below its 2009 peak. The most exciting feature of this decline is that it has occurred during a period of sustained economic growth, suggesting a decoupling of the historical connection (entrenched since records began) between electricity consumption and economic growth, entrenched since records began.



The second major wholesale electricity network in the country, the South West Interconnected System (SWIS) which services the major population centres in Western Australia, has also experienced a reduction in aggregate electricity consumption, albeit not so sharp as the much larger NEM and beginning a year later (from 2010).

In the 2014 eScan we identified three factors driving the decline in aggregate electricity consumption which were likely to continue;

1. energy efficiency
2. consumer engagement (initiated by rising prices and measurement/management technology)
3. distributed generation (particularly rooftop photovoltaic panels)

Each of these factors was, and is, expected to have a continuing impact on electricity demand as changing work practices and policy flow through the system. The effect of a final, fourth factor, was identified as having provided windfall reductions in electricity consumption which are unlikely to continue;

4. structural economic shifts (such as the closure of the Point Henry aluminium smelter)

Contrary to this trend, the Australian Energy Market Operator (AEMO) is predicting consumption to increase in 2015 (as it has for the past five years). Despite this, no new generation (or demand side response) is expected to be required to maintain reliability within the NEM. New investment opportunities will rely on renewable generation incentive schemes or localised network demand in response to new intermittent generation sources (such as rapid uptake of photovoltaics (PV) in Qld, SA and Vic).

Skills impact:

Providing households and businesses with the capacity to monitor and manage their consumption requires a fundamental shift in work practices from what was occurring even ten years ago. The embedding of energy efficiency and sustainability units into the core of all energy sector qualifications and energy efficiency considerations into existing standards (now completed) will ensure that new tradespeople, or those who undertake specialised training, will apply energy efficiency practices into all their operations.

While this will provide for the gradual upgrading of the skills base, the cost-benefit of rolling out additional energy efficiency training to existing workers should be examined.

Training Package developers will need to conduct research on technical aspects of energy efficiency and incorporate related knowledge, skills and work performance capabilities into nationally endorsed units of competency, including those for:

- systems operators
- systems integrators
- facility/building managers
- installers and maintenance staff
- system designers

This will involve engagement with systems and equipment manufacturers to ensure that via appropriate nationally endorsed Training Package standards, skills for the installation, maintenance and integration of new technologies associated with smart systems are available to industry, in a timely fashion.

Industry has identified and maintains a suite of technical energy assessment competencies and related qualifications to ensure that industrial, commercial and residential consumers are provided with appropriate technical advice to enable them to maximise energy efficiency.

DISTRIBUTED GENERATION

The installation of distributed generation capacity, particularly solar photovoltaics (PV) and solar hot water heaters, has contributed significantly to of the reduction of aggregate demand on the National Electricity Network (NEM) and South West Interconnected System (SWIS).

Industry representatives report that the price of solar panels has come down by a factor of five in the past six years and that the cost of complete systems (including electronics and wiring) by a factor of three. While fossil fuel prices remain volatile, PV prices continue to decrease (with ultra low ongoing costs).

While the reduction or removal of government financial support for solar installations over the past few years, such as generous feed in tariffs, has corresponded with a reduction in the installation of new systems from a 2011 peak of almost half a million (see Table 1.1 below). Through 2014, PV installation levels appear to have plateaued at around 15,000 per month. Industry however sees the potential for rapid growth if;

1. there is another dramatic price reduction, possibly caused by economies of scale as new factories in China come on stream (renewable power capacity installed in China in 2013 was bigger than its new fossil-fuel and nuclear capacity combined)
2. energy storage technology, which partners well with intermittently generating solar cells, becomes commercially viable (either through price reduction or wide scale adoption of electric cars)
3. prototype high efficiency dual spectrum PV cells (40% higher than existing units) achieve commercial scale

Table 1.1 Solar Installations 2007 - 2014

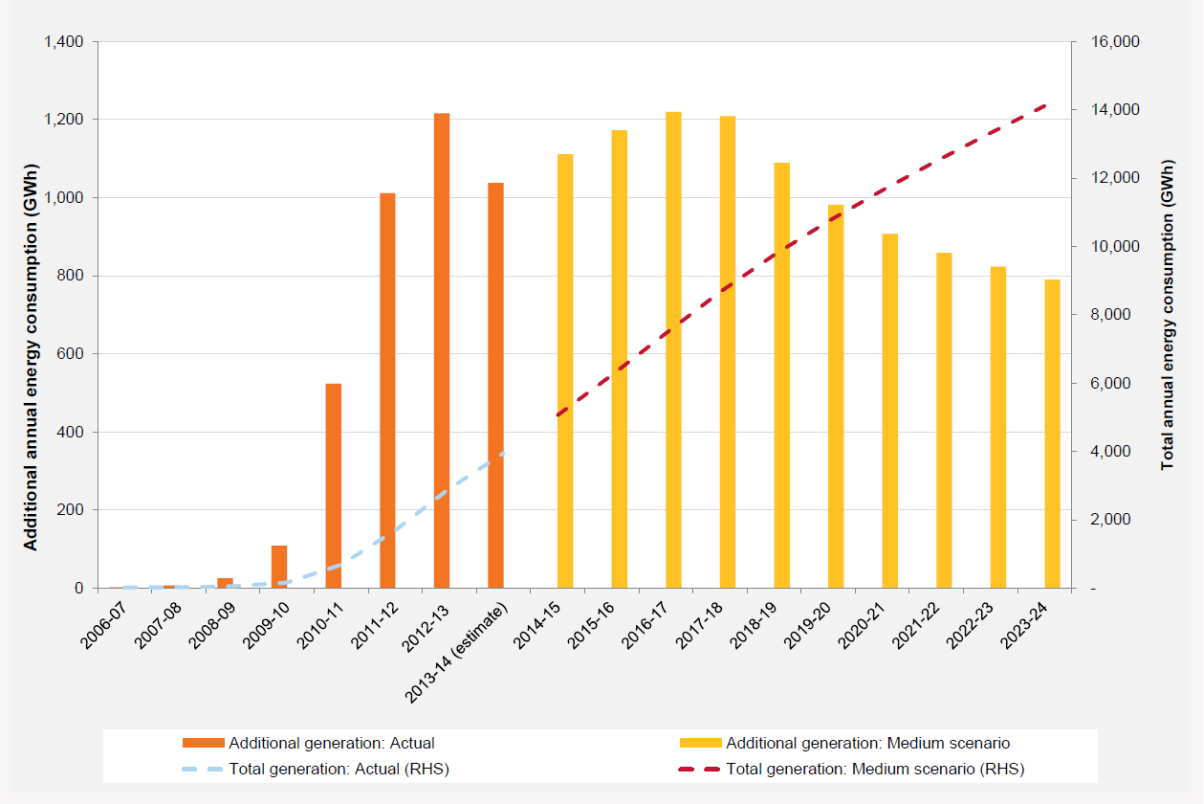
Installation year	Solar PV panel systems (Deemed)	Solar water heaters (including air source heat pumps)	Total
2007	3,480	50,977	54,457
2008	14,064	85,385	99,449
2009	62,916	194,695	257,611
2010	198,208	127,093	325,301
2011	360,745	105,050	465,795
2012	343,320	69,466	412,786
2013	200,407	58,299	258,706
2014	173,805	52,987	226,792
Total	1,356,945	743,952	2,100,897

Source: Clean Energy Regulator

Figure 1.1 below, taken straight from the Australian Energy Market Operator's (AEMO's) 2014 Electricity Statement of Opportunities, shows that despite a reduction in the number of installations, installed capacity is expected to continue growing from 2013-14 levels. This is because the average installation size has increased.

South Australia has the highest penetration rate of solar panels in Australia, with a full quarter of SA homes having PV installed. This has had the effect of pushing peak demand in SA from 5pm to 7pm since 2008.

Figure 1.1



Source: AEMO Electrical Statement of Opportunities 2014

In the supporting text to this figure, AEMO further notes that the appeal of installing PV capacity can be greatly enhanced with a price competitive storage solution, committing to reviewing PV uptake predictions in response to the price of storage.

Skills impact:

While the number of new installations has stabilised, the steadily increasing saturation of homes and businesses with PV on their roofs means that working on or around PV is no longer a niche. It appears inevitable that PV units will need to be included in the core of the electrical qualification in the future to ensure safety and continuity of supply.

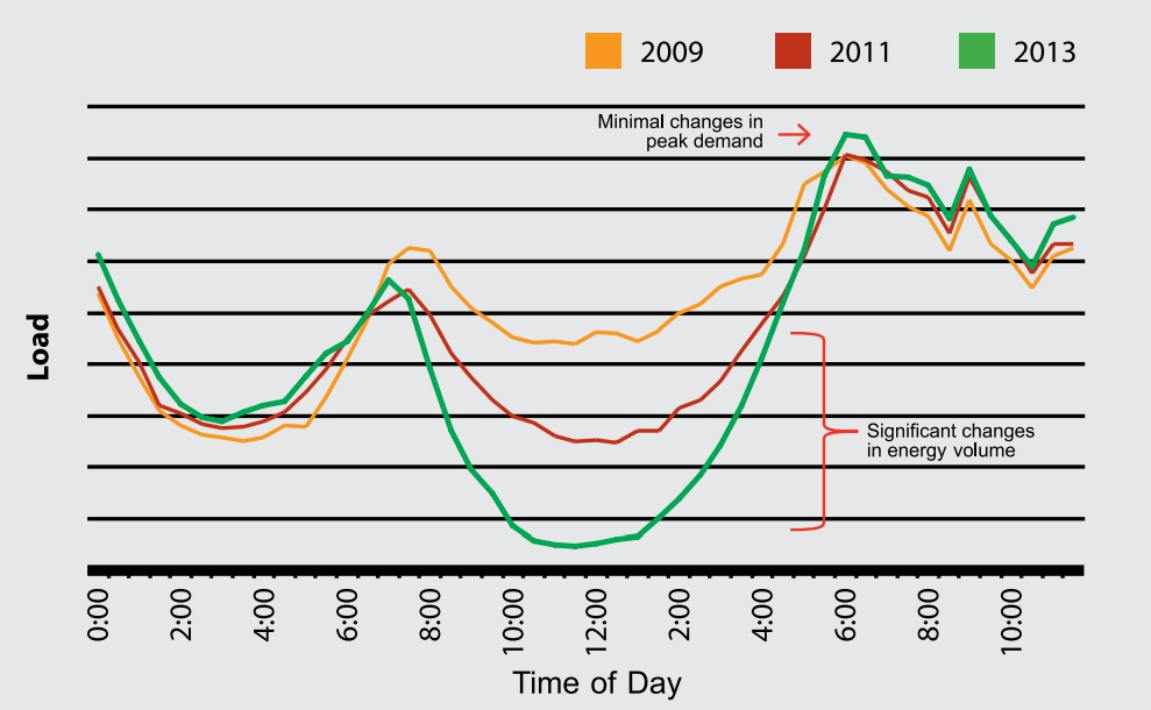
ENERGY STORAGE

At E-Oz Energy Skills Australia's 2014 annual conference, the potential for disruptive change in energy markets from new storage technology was a recurrent theme. A number of technologies were discussed to address differing requirements such as cost, recharge speed or weight. The solution preferred for transport may not be the same as the one chosen for grid level storage.

Storage technology is alluring for a number of reasons. The first is that it partners well with intermittently generating sources of electricity such as wind and solar. The challenge of instantaneously matching output from generators to demand from consumers is amplified by these devices whose output is uncertain. Without the installation of storage capacity, the installation of intermittent capacity must be supported by 'peaking' plants, which can respond rapidly to fluctuations. The capital costs of maintaining 'peaking' plants, which may not be in frequent use, is borne by the network and consumers. This is important because producing too much or too little electricity can seriously destabilise the grid and must be managed.

As well as helping smooth out instantaneous fluctuations in the supply/demand balance, storage can be used to balance out peaks over greater time periods. Figure 1.2 below shows the impact of PV installations without a supporting storage capacity. We can see that the amount of energy drawn from the grid is greatly reduced during daylight hours but peak demand (at approximately 6pm) has barely changed. Since the electricity grid must be built to support these peak periods, solar by itself provides limited benefit to the need for grid augmentation.

Figure 1.2 IMPACTS OF SOLAR PV ON ENERGY CONSUMPTION & PEAK DEMAND



Source: ENA, The Road to Fairer Prices

If storage capacity were installed in this example, generation could be evened out. Electrical energy can be stored when production exceeds demand and released back to the grid when demand exceeds production. This provides far more flexibility. Inflexible base load generators (often cheaper than other forms of generation) can be run at higher levels than would be possible in a system which cannot readily absorb excess capacity, improving efficiency while potentially reducing costs.

The next is that, at least some, storage devices can be, dispersed throughout the community; provide the additional benefit of directly providing electricity to local consumers. During peak periods, where networks are close to their carrying capacity, providing power locally can protect network assets. This has both long and short term benefits in relation to energy security and reducing the need for expensive network augmentation.

Despite these benefits, storage technology is not yet commercially viable except under special circumstances (such as for remote communities or mobile devices).

Several technologies however, such as liquid metal and flow control batteries, are pushing this boundary. As one industry participant noted in the Stakeholder Survey

> '*Batteries today are where solar technology was six or seven years ago. The tech is pretty settled, all we are waiting for is the ramp up in production and prices to fall*'

Bloomberg New Energy Finance predicts that worldwide energy storage will increase sixfold from 2013 to 2020.

There is much excitement in the electrical industry about the impact of car maker Tesla's 'Gigafactory'', a US$5 billion investment in lithium ion battery production. Tesla hopes that the factory, which will produce as much lithium ion storage capacity each year as currently exists worldwide, will drive down prices to a point where electric vehicles are competitive with combustion vehicles.

This could have a significant impact on energy network as electric cars can act as a network asset when not being driven (which research suggests is 95% of the time), absorbing or providing current to the grid. Also, as batteries are displaced by more efficient versions, old batteries can be repurposed to provide domestic storage.

Skills impact:

The design and installation of storage systems, especially those augmenting grid connected PV, is already being addressed by industry through the development of new Training Package components, as a specialisation for electricians holding an electrical license and competencies in PV installation. In a similar manner to PV, it appears inevitable that battery installation/maintenance units will need to be included in the core of the electrical qualification in the future to ensure safety and continuity of supply, although this is likely to be further in the future.

THE INTERNET OF THINGS

Last year's eScan spoke at length about the 'internet of things', predicting a future where;

> *"The internet of things will characterise a second wave in Australia's strategy to move to a lower carbon, energy efficient economy by increasing the availability of information to stakeholders on either side of the meter. Built on intelligent appliances and systems, which as integral components of the energy network connect all other devices producing, distributing, storing or consuming energy…"*[1]

This is certainly progressing. Business Insider Intelligence expects the worldwide market for connected-home devices to be the fastest growing technology market in the world, reaching US$490 billion by 2019. The proliferations of these devices will facilitate remote management and coordination.

The development of applications (or 'apps') which allow users to control their energy usage from a single location (usually a mobile phone or tablet) will be key to realising the benefits of the internet of things. This is because everything that can be connected to the internet can be controlled by an app and mobile phones are already a familiar platform for capturing, recording and acting on data. Different users will naturally seek different levels of control over this process. Some will want to respond to prompts or 'recommendations' while others will want to set their preferences and allow algorithms to manage their usage.

Peak demand

While this will work at an individual level, the further challenge will be coordinating the activity of users to create network wide efficiencies such as those required to manage peak demand[2].

[1] 2014, E-Oz Energy Skills Australia *Environmental Scan*

[2] The electricity network, the 'poles and wires' that transmit electricity around the country, is built to withstand the peak level of demand on the network without failing (causing brownouts or even blackouts). This 'peak demand' traditionally occurs on the hottest days of the year as people move indoors and use air conditioners to control the temperature.
In this way, the cost of network peak demand is reflected in the fact that approximately $11 billion of NEM assets are only used for a hundred hours or so every year. These costs are essentially fixed and are not dependant on the quantity of electricity sold.

This could be as simple as the implementation of time of use pricing, relying on a price signal to coordinate activity, or could involve network operators providing an incentive in return for the right to remotely manage some devices (within pre-set parameters).

For example, users running large cooling, heating or pumping systems may be happy to accept lower electricity prices overall in return for the right of grid operators to turn power to these devices off for small periods at peak times. By managing usage in this way, grid operators could maintain network stability and reduce need for costly network augmentation.

Rise of the prosumer

In this context, the term prosumer refers to a party that is both a producer and consumer of electricity. This reflects a profound change in the way electricity networks operate, as decentralisation turns them into transaction platforms rather than simply a delivery systems.

Network participants are increasingly in a position to be small scale producers and storers of energy. While this can improve the efficiency of systems (by producing energy closer to the point of use) and promote innovation, it also presents challenges of management and coordination.

Prosumer expectations that energy networks will be able to accommodate their specific interactions the grid, whatever these may be, will present a significant challenge to asset owners. Managing the proliferation of devices and coordinating the timing and location of production to demand will require new skills among network owners.

Skills impact:

The internet of things will provide a myriad of opportunities to use electricity efficiently and cheaply through better design, data-processing technology and changes in behaviour.

Therefore it is imperative that energy sector industries identify and endorse appropriate skills standards to ensure that skills are available to support the deployment of these technologies.

New work practices will be embedded across a range of energy sector roles, from retail representatives to energy brokerage, performance auditing and management, network and system design and installation and maintenance.

The deployment of these technologies require that new technical and service skills be available, within applicable regulatory frameworks, to support the installation, calibration, interconnection and synchronisation of intelligent appliances and systems at various scales, both within and between networks.

Significant efficiencies will be facilitated by improving the industrial computing and systems integration skills base of the energy sector workforce, facilitating the automation and interconnection of networks of ‘things’ (which may be devices, appliances, processes, systems or anything else). Importantly this will impact all of the energy sector trades, extending the essential skills set of tradespeople whilst ensuring coverage of existing skill requirements.

The all-encompassing nature of this network will have clear implications for training right across the energy sector, requiring a coordinated response from Registered Training

Organisations, VET regulators and funding bodies. The importance of ensuring quality delivery of 'base trade' skills for energy sector tradespeople whilst developing capacity to provide for the development of skills for the deployment of these technologies will be the main challenge.

The energy sector industries will need to recognise new interdependencies within and between traditional trades and seek ways to ensure that standards and work practices support efficient outcomes. It is imperative that industry identify and endorse appropriate skills standards to ensure that skills are available to support the deployment of these technologies.

The training needs associated with the deployment of technologies in the internet of things will have the following aspects which industry will need to address:

- Skills for the installation, calibration, interconnection and synchronisation of intelligent appliances and systems
- Skills to integrate systems into a networks at various scales
- Skills to communicate with both internal and external customers on the deployment of these technologies

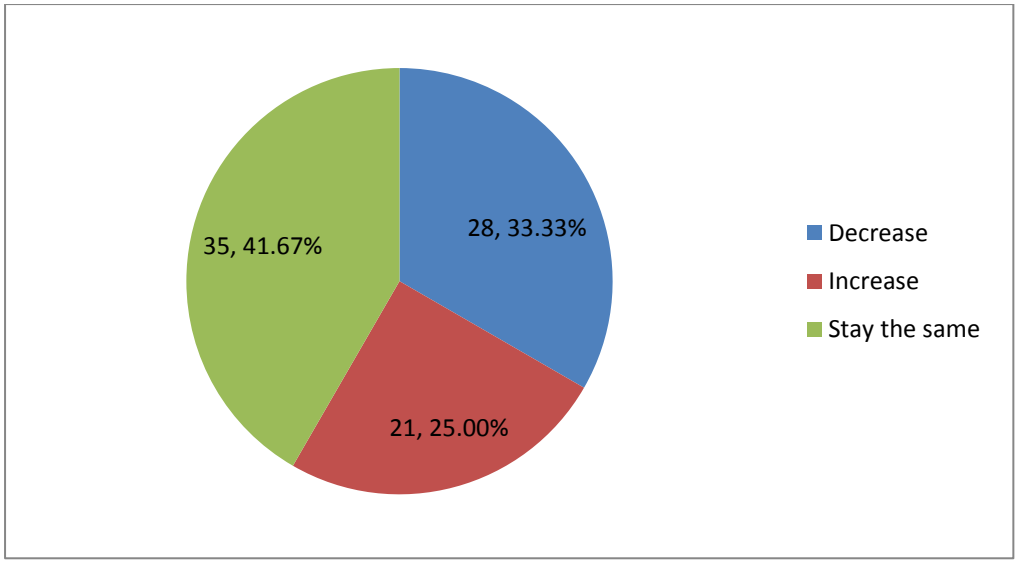
Information on training standards development and implementation for particular emerging technologies which become part of the internet of things is throughout the Environmental Scan.

ERODING ESI SKILLS BASE

Reports from RTOs delivering lineworker training (UET30612) point to a significant decline in the 2015 apprentice intake, particularly in NSW, which is yet to appear in formal statistics. The NSW decline is being driven by supply company's efforts to improve their 'bottom line' ahead of an expected wave of privatisation, rather than in response to changes in underlying demand. Multiple electricity distributers have advised that they will not be putting any lineworker apprentices on in 2015, for the first time in living memory.

The outlook nationwide is quite bleak, with more employers reporting they expect their workforce to shrink than expand in the next twelve months.

Figure 1.3 **ESI Industry: Expected changing in staffing levels (next 12 months)**



Source: E-Oz Stakeholder Survey 2014

Skills impact:

Reducing investment in training lineworkers, while electricity networks continue to expand to accommodate record levels of new housing construction, involves borrowing against future periods.

While training more workers later to make up for under investment today may not sound too bad, the danger is that the current decrease will drive RTOs to close their training facilities, shedding teachers and equipment. Once this happens, it becomes very difficult (and expensive) to start training again.

ENERGY EFFICIENCY

At last year's G20 summit in Brisbane, attending nations agreed to collaborate in improving energy efficiency to drive "economic activity and productivity, strengthen energy security and improve environmental outcomes".[3]

Industry representatives estimate that energy productivity nationwide could be improved by a third through energy efficiency activities in homes, offices, buildings, vehicles and industries. This ranges from simple measures, like using LED lighting and more efficient heating and cooling systems, to the automation of some industrial processes and improving energy data systems.

Heating, ventilation, air-conditioning and refrigeration (HVACR)

Department of Energy statistics indicate that there are over 45 million HVACR installations in Australia, contributing between a fifth and a quarter of aggregate electricity demand. Demand from HVACR installations is proportionally larger at peak periods, making efficiency in this sector particularly beneficial.

The Australian Refrigeration Association estimates that industry can reduce energy consumption by up to two-thirds through energy efficiency measures, particularly improved refrigerant selection and switching to natural refrigerants.

[3] G20 Energy Efficiency Action Plan (2014) Voluntary Collaboration on Energy Efficiency

Opportunities for integrated HVACR energy efficiency solutions include measurement, selection, design, integration, commissioning, operation, maintenance and end of life management. Tables 1.2 and 1.3 outline predictions for these opportunities.

Table (1.2) Vapour Compression Systems

Sector	Indicative volume Per annum/ Total installed	Relevance
Split System HVAC - New - Retrofit	1,000,000/ 12,000,000	Low Rise Commercial & Residential
High Rise HVAC	30,000 / 100,000	Commercial, Industrial
Cold Stores	20,000	Manufacturers, cold chain operators
Cool Rooms	80,000	Retailers, Hospitality
Display Cabinets	1,000,000	Retail
Commercial Refrigeration	10,000	Grocery Stores
Automotive AC	12,000,000	Everyone
Transport Refrigeration	30,000 vehicles	Cold Chain
Hot Water, Heat Pumps	12,000,000	All buildings and facilities
District Energy	Thousands	CBD, Health care, Education, Agricultural Businesses

Source: Australian Refrigeration Association

Table (1.3) Vapour Compression Impact

Sector	Solution	Benefit
Split System HVAC	Hydrocarbon refrigerant	40-60% energy
	12,000,000	Low capital cost
High Rise HVAC	Ammonia	40% energy saving
	100,000	No direct emissions
High Rise HVAC	Hydrocarbons	40% energy saving
	100,000	Low direct emissions
Evaporative Cooling	Air & water refrigerant based HVAC	High efficiency
		No direct emissions
Cold Stores	Ammonia	40% energy saving
	20,000	
Cool Rooms	Hydrocarbons	40% energy saving
	80,000	
Commercial Refrigeration	Transcritical CO_2	High energy savings
	Ammonia / CO_2	
	10,000 grocery stores	
Display Cabinets	Hydrocarbon,	40% energy saving
	CO_2	

Transport	30,000 vehicles +	Fuel efficiency
	Reefers	40% energy savings
Heating	Boiler Controls	10/20% energy saving
District Energy	Decentralised energy, heating, cooling	Major cost and emissions reduction

Source: Australian Refrigeration Association

Skills impact:

There are two parts to the skills impact. First, there is an enormous educational need to make all stakeholders aware of the benefits and requirements of low global warming potential (GWP) refrigerant based technology. This includes not just those in the energy industry but specifiers, contractors, owners and users of this equipment.

Secondly, there is a need to dramatically increase the numbers of the air conditioning/refrigeration mechanic workforce as new refrigerants require new plant and significant retrofit.

Several industry participants noted that HFOs will require new regulatory systems – licensing, training, innovation and validation by industry. As all low GWP refrigerants are flammable there will be significance changes in work practices, which will need to be driven through Training Packages.

REGULATORY ENVIRONMENT FOR GAS EXTRACTION

Australia continues to move toward being the world's largest gas exporter by 2018 due to Liquefied Natural Gas (LNG) export facilities coming online in the north and west of the country. These facilities will leverage Australia's considerable proven reserves of natural gas and established transmission networks to provide benefits including jobs, energy security, royalties and export revenues, which will be felt throughout the economy.

The considerable concern amongst domestic consumers expressed in recent years about the impact of domestic prices converging with international prices (due to this export expansion), have been somewhat mitigated by the dramatic fall in the oil price (which is linked to gas prices).

Despite this welcome short term relief for consumers, longer term security of supply will require regulatory certainty to accelerate gas production. Australia has sufficient proven gas reserves to supply export markets and domestic users (totalling 4.5 million households and 120,000 businesses).

Current barriers to the development of gas supplies in NSW and Victoria are founded on community concerns about how new technologies and extractive processes (such as CSG) may affect water resources. There is an urgent need for research and monitoring of sedimentary rock basins to settle these issues, providing the community with information they can trust.

The Office of the Chief Scientist has recognised the need to have independent information to provide certainty for all stakeholders, recommending the Commonwealth support research 'to understand the structure and dynamics of Australia's sedimentary basins that contain natural gas and oil associated with shale' and 'into the surface and groundwater dynamics

of prospective sedimentary basins to better understand the likely impact on water resources from exploration, production and upstream-industry requirements.'[4]

This should be pursued as a priority, in order to smooth the way for new policy to improve competition in gas supply. Once this occurs there remain significant opportunities to expand gas production and usage in Australia.

Skills impact:

Skill development lead times in the gas industry are short relative to other energy sector occupations. This means that it is comparatively easier to respond to skill demand to meet changing market conditions (noting the potential for growth once impediments mentioned above are addressed).

It will be important that the gas sector's Training Package is constantly reviewed to reflect outcomes of research, to ensure work practices reflect community expectations and effectively communicate to new entrants the skills needed to participate in this exciting sector.

ASBESTOS

The National Strategic Plan for Asbestos Awareness and Management 2013 – 2018 was released on 31 July 2013. The plan is the first of its kind and prescribes a national approach to asbestos eradication, handling and awareness in Australia.

The plan's aim is to prevent exposure to asbestos fibres in order to eliminate asbestos related disease in Australia. It will achieve this by:

- increasing public awareness of the dangers posed by working with or being exposed to asbestos
- moving towards developing a prioritised removal program across Australia
- developing nationally consistent better practice in asbestos handling and management
- coordinating national research to minimise the risk of exposure to asbestos for the Australian community
- playing a leadership role in a global campaign for a worldwide asbestos ban.

The Plan was developed in consultation with Commonwealth, state and territory and local governments and a range of non-governmental stakeholders. It is a high level document that establishes a framework within which jurisdictions work both cooperatively and independently to achieve set objectives.

In developing the Plan, the findings and recommendations of the Asbestos Management Review were considered.

The Plan will be supported by annual operational plans which will be approved by the federal Minister with responsibility for workplace relations. The Plan, Agency operational plans and Agency annual reports will published on this website.

The Plan will mark an historic step in Australia becoming the first nation to progress towards the ultimate elimination of ARDs.

[4] http://www.chiefscientist.gov.au/wp-content/uploads/shalegas-recommendationsFINAL.pdf

Skills impact:

Implementing a nationally consistent best practice approach to asbestos handling represents a significant challenge in altering existing work practice, involving coordination across industries (beyond just the energy or construction sectors).

Training Package developers will need to determine an appropriate manner to include coverage of relevant work practices into industry qualifications which may bring workers into contact with asbestos. This is likely to impact almost all energy sector qualifications.

VOCATIONAL EDUCATION AND TRAINING REFORM

The Australian Government has declared its intention to overhaul the skills and training system, with a package of reforms that elevate trades and vocational education to the centre of Australia's economy and puts the focus squarely on ensuring Australian workers are highly skilled and job-ready.

On 31 October 2014, the Minister for Industry, the Hon Ian Macfarlane MP released two discussion papers for public consultation on the issue of Training Packages.

The first of those papers 'Industry Engagement in Training Package Development – Towards a Contestable Model' sought views and suggestions about contestable approaches to the development of Training Packages. The second paper 'Review of Training Packages and Accredited Courses' was designed to start a conversation with industry, employers, training providers and students about whether Training Packages and accredited courses are meeting their needs and the needs of the economy more broadly.

These papers, along with national consultations, will inform the VET Reform Taskforce in developing and progressing reforms.

Through the ISC and independently, E-Oz's stakeholders have been involved in this process to ensure that the skill development system meets their needs. Three points in particular have been consistently presented;

1. **Standards are separate from their application**

Ensuring that performance standards (codified in Training Packages) meet the needs of stakeholders, through maximising workplace productivity and participation rates, is important in ensuring that 'the best possible outcomes at the best possible price and quality' are achieved.

There is of course a step between the skill standard and the end user, which is the development and assessment of skills against the standard by the RTO.

In analysing the effectiveness of the broader system, it is essential to recognise that end user experiences reflect both the appropriateness of the standard and the appropriateness of its application by the RTO.

The Government's discussion paper, *Review of Training Packages and Accredited Courses*, correctly identifies national qualifications as a strength of the VET system, noting;

'National qualifications mean that their [a learner's] skills are recognised by industry Australia wide'

The corollary of this strength however is that qualifications are not distinguished between providers. This makes it critical that standards are being applied consistently nationwide. If one provider starts cutting corners, it can undermine public confidence in our industry qualifications amongst all stakeholders much more broadly.

To ensure Australia's VET system works, employers, regulators and the community at large need to be assured that when workers come to them with qualifications, they are competent, having skills, knowledge and work experience to perform safely and productively in the workplace.

If this confidence breaks down, it will have severe implications for every VET graduate holding a qualification and every employer looking to hire skilled workers; in high risk, licensed trades, it will pose serious threats to community public safety and asset protection.

The key to maintaining public confidence in our industry qualifications lies in ensuring that the rigor of evidence of competence and assessment is consistent between training providers and that, consequently, students have successfully obtained the required skills.

If effective measures are not in place to ensure the consistency of training outcomes, unprincipled providers could do untold damage to the integrity of qualifications and the national training system. Industry Skills Councils, as the custodians of industry Training Packages, continue playing an important role in this regard by providing consistent industry validated tools for collecting evidence.

The same confusion between these elements arises in discussion of flexibility. Training Packages overall provide a significant amount of flexibility through packaging rules and allowing contextualisation to jurisdictional or workplace standards. Whether this flexibility is reflected in the product offering to end users (businesses and individuals) will depend on an RTO's capacity to vary their product offering.

It is important to continually review skills standards to ensure they are fit for purpose. It is also important to recognise the other elements of end user experiences with the system.

2. Ahead of the game

In the energy sector industries, associated with rapid technological change, it is important that standards are in place to support a variety of nascent technologies and work practices – some of which may never be widely adopted.

The alternative is for the training system to 'pick winners', making a determination of which technologies and work practices are likely to be adopted or to be reactive, compromising industry's capacity to rapidly respond to changing conditions. As directed by industry, the training system needs to develop appropriate training standards for all technologies/systems which employers feel have a realistic chance of being implemented.

For training to support and facilitate changes of the nature outlined above it must take account of the time lags inherent in:

- the training system
- the adoption of new technology
- the introduction of regulatory or legislative changes
- changes in policy direction at national or jurisdictional levels
- the acceptance of changed work practices

An example of the system working well can be seen in the impact of training in the small scale photovoltaic (PV) generation roll-out across Australia. Driven by consumer demand, government incentives and a steep price reduction due to the maturing of the technology, the installation of PV systems rose steeply from 2009 to over 1 million rooftop installations nationally to 2012.

Industry had identified and codified in the nationally endorsed Electrotechnology Training Package the competencies required for the design, installation and maintenance of these systems, as early as 2004. These standards remained nearly unused for years but their existence allowed industry to respond to the demand, when it came, without having to wait

for appropriate training standards to be agreed and endorsed; allowing employers to ramp up their capacity to install PV systems, to take advantage of a commercial opportunity.

Technical skills based on nationally endorsed standards are key elements in the successful deployment of new technologies. It may be argued that the availability of these technical skills is a precursor to acceptance of a new technology in the market, as investors seek assurance that their capital is protected by adequate support services.

Understanding which skills will be required by energy sector employers in the medium term is particularly challenging in the current, highly uncertain, environment. A global revolution is taking place in relation to the way energy is produced, distributed, managed and consumed. Understanding skill demand therefore has a technological, governmental and individual component.

In the photovoltaic example above a government initiative, a gradual shift in consumer preferences and a technological leap combined to drive an explosion in skill demand. Allowing market forces to operate effectively requires developing skill standards across a range of occupations which currently have minimal demand, in order to remove a potential barrier to their implementation.

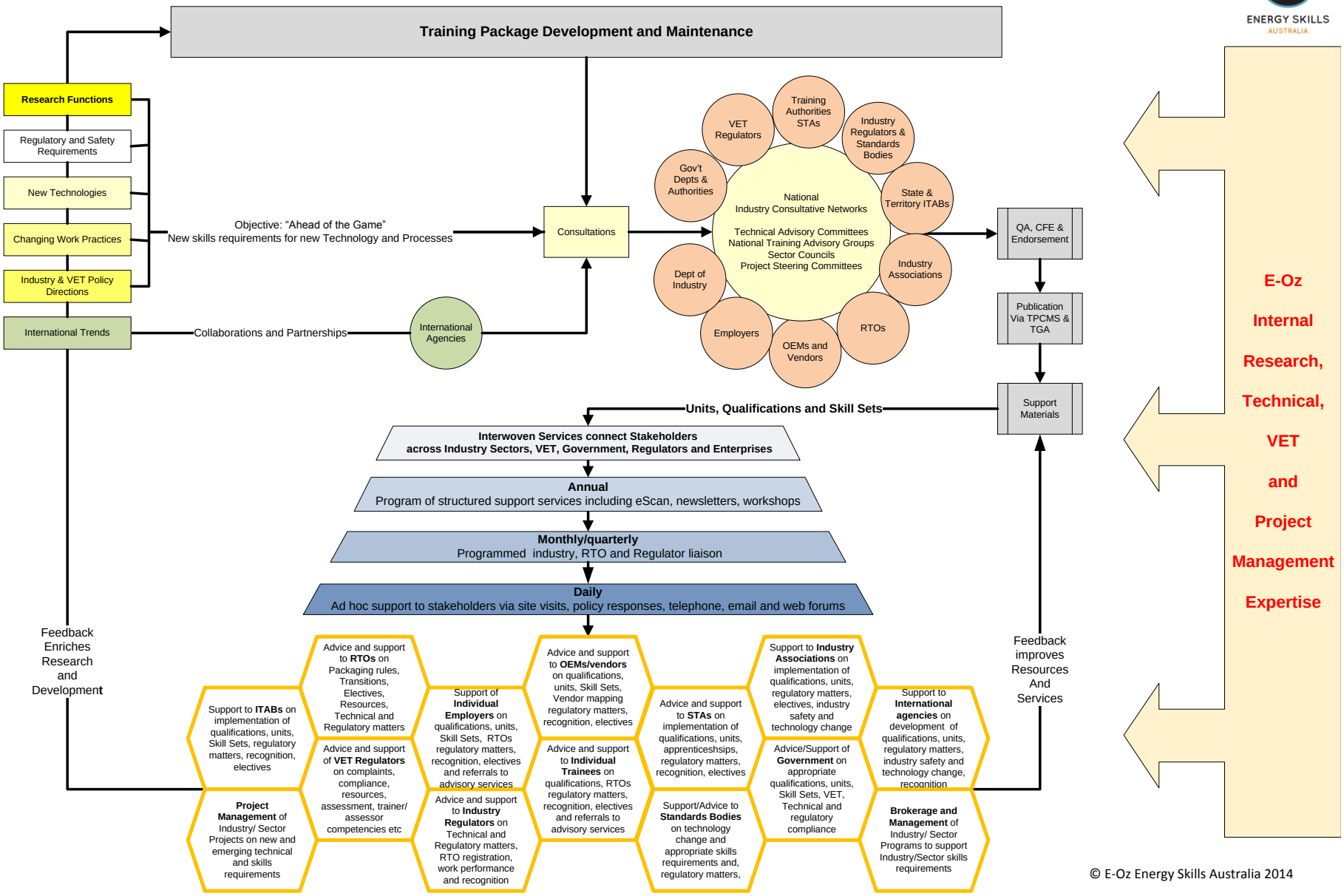
3. Training Packages can't exist in isolation

A Training Package should not be considered as an endpoint but as part of an interlaced "web of services" which adds high value to the Training Package materials for a wide variety of individuals, industry, training providers government agencies and VET and Industry regulators.

This reflects the fact that Training Package standards have a variety of applications beyond training including business safety cases, permits to work and industrial roles. The diagram on the next page, titled *E-Oz Energy Skills Australia – Services Value Chain,* attempts to illustrate the existing Training Package support services provided by this ISC to the energy sector. The productivity flows detailed in the diagram come from the ISC's internal capability and capacity to:

- Carry-out targeted research across the spectrum of change drivers including:
    - Regulatory and safety requirements
    - New and emerging technologies
    - Changing work practices, including VET delivery practices
    - Industry and VET policy directions
- Develop, codify and communicate technical training standards
- Understand and operate in VET environment at national, regional and international levels
- Partner and collaborate with international agencies
- Provide targeted and timely support and advisory services

E-Oz Energy Skills Australia – Services Value Chain



The complex nature of this value chain, which is recognised and respected by stakeholders, includes interlinked services and systems with variety of feedback mechanisms as detailed in the Service Value Chain diagram attached to this briefing.

Australian Industry Benefits

The broad sweep of the Australian energy industry covered by the Council can access and benefit from these services, on a no cost basis, including:

- Registered Training Organisations
- Individual Employers and large and small Enterprises
- Industry Associations
- Industry Regulators
- VET regulators
- Original Equipment Manufacturers (OEMs), vendors and wholesalers
- Individual trainees and apprentices
- State and Territory Training Authorities
- National and International Standards Bodies
- Commonwealth, State and Territory government departments and agencies

These services which support all aspects of training and Training Package standards are provided via structured and programmed activities designed to ensure stakeholders are engaged, connected and informed, supported by highly responsive ad hoc services which provide advice and connections with other system participants via:

- Enterprise, RTO or OEM/Vendor Site visits
- Responses to national, international, industry and jurisdictional policy directions
- Telephone and email communications
- Corporate Websites, discipline specific web forums
- Social media channels

Whichever of the proposed models for Training Package development and maintenance is adopted, industry is eager to ensure that these services continue to be provided seamlessly. Failure to do so could have significant impact on business operations in a number of areas.

CURRENT IMPACT OF TRAINING PACKAGES

IMPACT OF WORKFORCE DEVELOPMENT PROGRAMS

E-Oz Energy Skills Australia provided a brokerage service to industry for training places allocated via the National Workforce Development Fund in response to employer demand driven training and service enterprises which have identified training as an appropriate workforce development strategy.

With the passing of the 31 December deadline for enrolments against the last cohort of approved projects, E-Oz is now focussing on administering its suite of Projects to closure.

Table 2.1: E-Oz NWDF SUMMARY REPORTING by Feb 2015

	Sector	Number of Employers	Number of Learners
Industry Sector (add lines as required)	Electrotechnology Industry	1132	3635
	Gas Industry	1	38
	ESI Generation Industry	1	72
	ESI TDR Industry	10	340
	TOTAL	**1144**	**4085**

As shown in Table 2.1, the majority of NWDF funding brokered by E-Oz has been allocated on training for the electrotechnology industry. Training for ESI TDR Industry has received the second most fiscal support from NWDF.

ELECTROTECHNOLOGY

The tables below reflects the impact of endorsed Electrotechnology Training Packages, including RTOs with current scope by jurisdiction (Table 2.1), UTE99 Qualification - Training contract status July 2012- June 2014 (Table 2.2), UEE06 Qualification - Training contract status July 2012- June 2014 (Table 2.3), UEE07 Qualification - Training contract status July 2012- June 2014 (Table 2.4), UEE11 Qualification - Training contract status July 2012- June 2014 (Table 2.5).

REGISTERED TRAINING ORGANISATIONS SERVING THE ELECTROTECHNOLOGY SECTOR

The electrotechnology sector is well serviced by RTOs across the nation. Table 2.1 shows the statistics for RTOs with current scope to deliver components from the Electrotechnology Training Package by State or Territory. With the number of RTOs delivering the recent Training Packages (UEE07 and UEE11) growing, RTOs are effectively responding to the updates of Electrotechnology Training Packages.

Table 2.1: RTOs with current scope by state

Training Package	Accessed time	ACT	NSW	NT	QLD	SA	TAS	VIC	WA
UTE99 (status: superseded)	February 2013	0	12	2	0	5	2	6	5
	January 2014	6	17	7	5	9	7	9	8

	February 2015	**4**	**15**	**5**	**3**	**5**	**5**	**6**	**5**
UEE06 (status: superseded)	February 2013	0	13	0	1	0	0	0	0
	January 2014	0	10	0	0	0	0	0	0
	February 2015	**0**	**10**	**0**	**0**	**0**	**0**	**0**	**1**
UEE07 (status: superseded)	February 2013	2	33	4	44	9	5	41	21
	January 2014	51	88	55	77	64	51	88	67
	February 2015	**59**	**92**	**59**	**78**	**67**	**57**	**89**	**68**
UEE11 (status: current)	February 2013	1	18	4	32	6	3	25	16
	January 2014	45	74	45	62	53	44	66	60
	February 2015	**69**	**95**	**67**	**84**	**71**	**65**	**85**	**83**

Source: Training.gov.au - RTO report (accessed January 2015)

TAKE-UP OF UEE ELECTROTECHNOLOGY QUALIFICATIONS

Table 2.2: UTE99 Qualification - Training contract status

UTE99 Electrotechnology Training Package	**Training contract status**			
Apprentices and trainees				
Qualification	**Commencements July 2012 - June 2013**	**Commencements July 2013 - June 2014**	**In - Training June 2013**	**In - Training June 2014**
UTE30402 - Certificate III in Electrotechnology Communications	0	**0**	1	**0**
UTE30699 - Certificate III in Electrotechnology Data Communications	0	**0**	1	**0**
UTE30702 - Certificate III in Electrotechnology Entertainment and Servic	0	**0**	1	**0**
UTE30899 - Certificate III in Electrotechnology Instrumentation	0	**0**	1	**0**
UTE30999 - Certificate III in Electrotechnology Refrigeration and Air Co	0	**0**	17	**5**

UTE31199 - Certificate III in Electrotechnology Systems Electrician	5	**4**	115	**38**
Totals	**5**	**4**	**136**	**43**

Source: NCVER, VOCSTATS (accessed January 2015)

Table 2.3: UEE06 Electrotechnology Training Package

UEE06 - Electrotechnology Training Package	**Training contract status**			
Apprentices and trainees				
Qualification	**Commencements July 2012 - June 2013**	**Commencements July 2013 - June 2014**	**In -Training June 2013**	**In -Training June 2014**
UEE30806 - Certificate III in Electrotechnology Electrician	0	**0**	10	**4**
UEE31306 - Certificate III in Refrigeration and Air-Conditioning	0	**0**	1	**0**
Total	**0**	**0**	**11**	**4**

Source: NCVER, VOCSTATS (accessed January 2015)

Table 2.4: UEE07 Electrotechnology Training Package

UEE07 - Electrotechnology Training Package	**Training contract status**			
Apprentices and trainees				
Qualification	**Commencements July 2012 - June 2013**	**Commencements July 2013 - June 2014**	**In -Training June 2013**	**In -Training June 2014**
UEE20207 - Certificate II in Business Equipment Servicing	5	**0**	6	**0**
UEE20507 - Certificate II in Computer Assembly and Repair	0	**0**	1	**0**
UEE21310 - Certificate II in Remote Area Essential Service	1	**0**	9	**1**
UEE21610 - Certificate II in Security Assembly and Setup	2	**0**	2	**0**
UEE21707 - Certificate II in Technical Support	0	**0**	5	**0**
UEE22007 - Certificate II in Electrotechnology (Career Start)	1	**0**	5	**0**
UEE30107 - Certificate III in Business Equipment	0	**0**	4	**0**

UEE30207 - Certificate III in Computer Systems Equipment	0	**0**	6	**2**
UEE30210 - Certificate III in Computer Systems Equipment	1	**0**	2	**1**
UEE30407 - Certificate III in Data and Voice Communications	8	**0**	83	**49**
UEE30507 - Certificate III in Appliance Servicing	2	**0**	38	**19**
UEE30510 - Certificate III in Appliance Servicing	5	**0**	26	**17**
UEE30607 - Certificate III in Electrical Machine Repair	5	**0**	84	**54**
UEE30707 - Certificate III in Switchgear and Control Gear	6	**0**	45	**28**
UEE30807 - Certificate III in Electrotechnology Electrician	1698	**114**	19300	**11,937**
UEE30907 - Certificate III in Electronics and Communications	35	**0**	399	**199**
UEE30910 - Certificate III in Electronics and Communications	70	**0**	531	**286**
UEE31007 - Certificate III in Fire Protection Control	5	**0**	23	**20**
UEE31207 - Certificate III in Instrumentation and Control	20	**0**	167	**64**
UEE31210 - Certificate III in Instrumentation and Control	30	**0**	78	**33**
UEE31307 - Certificate III in Refrigeration and Air-Conditioning	104	**7**	1855	**946**
UEE31407 - Certificate III in Security Equipment	1	**0**	31	**12**
UEE31410 - Certificate III in Security Equipment	31	**0**	68	**56**
UEE40407 - Certificate IV in Electrical – Instrumentation	0	**0**	17	**4**
UEE40410 - Certificate IV in Electrical – Instrumentation	10	**0**	36	**11**
UEE40707 - Certificate IV in Electronics and Communications	0	**0**	1	**0**
UEE40710 - Certificate IV in Electronics and Communications	1	**0**	0	**0**
UEE42210 - Certificate IV in Instrumentation and Control	0	**0**	1	**1**
UEE50507 - Diploma of	0	**0**	2	**1**

Electronics and Communications Engineering				
UEE60107 - Advanced Diploma of Electrical Engineering	0	**0**	10	**7**
UEE60110 - Advanced Diploma of Electrical Engineering	0	**0**	14	**0**
UEE60207 - Advanced Diploma of Electronics and Communications Engineering	0	**0**	2	**1**
UEE60210 - Advanced Diploma of Electronics and Communications Engineering	0	**0**	1	**1**
UEE60707 - Advanced Diploma of Refrigeration and Air-Conditioning Engine	0	**0**	2	**2**
UEE61307 - Advanced Diploma of Electrical – Technology	0	**0**	14	**14**
UEE62110 - Advanced Diploma of Engineering Technology – Electrical	0	**0**	1	**1**
Total	**2041**	**121**	**22869**	**13767**

Source: NCVER, VOCSTATS (accessed January 2015)

Table 2.5: UEE11 Electrotechnology Training Package

UEE11 - Electrotechnology Training Package	**Training contract status**			
Apprentices and trainees				
Qualification	**Commencements July 2012 - June 2013**	**Commencements July 2013 - June 2014**	**In -Training June 2013**	**In -Training June 2014**
UEE20111 - Certificate II in Split Air-conditioning and Heat Pump System	3	**0**	3	**0**
UEE20511 - Certificate II in Computer Assembly and Repair	1	**3**	1	**3**
UEE21611 - Certificate II in Security Assembly and Set-up	5	**6**	4	**4**
UEE21711 - Certificate II in Technical Support	2	**0**	2	**2**
UEE21911 - Certificate II in Electronics	15	**5**	15	**6**
UEE22011 - Certificate II in	11	**15**	11	**18**

Electrotechnology (Career Start)				
UEE22111 - Certificate II in Sustainable Energy (Career Start)	1	**0**	1	**0**
UEE30211 - Certificate III in Computer Systems Equipment	1	**3**	1	**3**
UEE30411 - Certificate III in Data and Voice Communications	23	**23**	21	**43**
UEE30611 - Certificate III in Electrical Machine Repair	15	**12**	13	**20**
UEE30711 - Certificate III in Switchgear and Controlgear	5	**2**	6	**7**
UEE30811 - Certificate III in Electrotechnology Electrician	6024	**7315**	6884	**13656**
UEE30911 - Certificate III in Electronics and Communications	261	**395**	241	**569**
UEE31011 - Certificate III in Fire Protection Control	3	**14**	3	**16**
UEE31211 - Certificate III in Instrumentation and Control	115	**156**	104	**260**
UEE31411 - Certificate III in Security Equipment	41	**66**	35	**76**
UEE32111 - Certificate III in Appliance Service	26	**38**	28	**54**
UEE32211 - Certificate III in Air-conditioning and Refrigeration	961	**1106**	1045	**1939**
UEE33011 - Certificate III in Electrical Fitting	31	**50**	54	**122**
UEE40411 - Certificate IV in Electrical – Instrumentation	26	**28**	28	**41**
UEE40711 - Certificate IV in Electronics and Communications	3	**6**	3	**9**
UEE40911 - Certificate IV in Industrial Electronics and Control	1	**26**	1	**23**
UEE41211 - Certificate IV in Electrical - Rail Signalling	5	**4**	42	**48**
UEE42211 - Certificate IV in Instrumentation and Control	0	**31**	1	**26**
UEE42711 - Certificate IV in Air-conditioning and Refrigeration Servicin	8	**0**	8	**8**
UEE50411 - Diploma of Electrical Engineering	1	**0**	1	**1**
UEE50511 - Diploma of	1	**0**	3	**2**

Electronics and Communications Engineering				
Total	**7,590**	**9304**	**8,558**	**16954**

Source: NCVER, VOCSTATS (accessed January 2015)

The preponderance of enrolments remains in Electrotechnology Electrician (UEE30807 and UEE30811), Air-conditioning and Refrigeration (UEE31307 and UEE32211) and Electronics and Communications (UEE30910 and UEE30911).

These statistics do not report much of the post-trade training which the Industry undertakes through the completion of higher level qualifications and Skill Sets which are not under contracts of training.

For example the key qualification for photovoltaic renewable energy design and installations UEE42011 - Certificate IV in Electrical - Photovoltaic systems is not listed in these statistics. This qualification or the related post-trade Skill Sets are required to carry out the design and installation of photovoltaic systems as small generation units.

RECENT RELEASE OF UEE11

The most recent release (Release 1.5) of UEE11 was published in December 2014. Amendments to Release 1.5 of UEE11 include 2 new Skill Sets, amendments to 3 Qualifications and editorial amendments to 132 Units.

Table 2.6 UEE11 - Electrotechnology Training Package Amendments (Release Date 16/Dec/2014)

Training package	Skill Sets	Qualifications	Units
UEE11 - Electrotechnology Training Package			
Release 1.5	2 new Skill Sets	3 amended Qualifications	132 Units with editorial amendments

ELECTRICITY SUPPLY INDUSTRY

The tables below reflect the impact of endorsed Transmission Distribution and Rail Sector Training Packages and endorsed ESI Generation Sector Training Packages.

Tables 2.7 and 2.8 shows the statistics for RTOs with scope to deliver components from the two ESI Training Packages by jurisdiction.

Table 2.7 ESI Generation RTOs with Scope

ESI - Generation Training Package	Accessed time	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Total
UTP98 (status: superseded)	February 2013	0	0	0	0	0	0	2	1	3
	January 2014	0	0	0	0	0	1	1	0	2
	February 2015	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**2**
UEP06 (status: superseded)	February 2013	0	2	1	9	0	2	6	26	46
	January 2014	8	15	14	18	12	11	16	25	119

	February 2015	**7**	**14**	**12**	**17**	**11**	**10**	**14**	**17**	**102**
UEP12 (status: Current)	February 2013	0	1	1	4	0	0	1	0	7
	January 2014	21	25	25	27	23	25	26	28	200
	February 2015	**23**	**31**	**26**	**32**	**26**	**28**	**29**	**30**	**225**

Source: Training.gov.au – RTO Report (accessed January 2015)

Table 2.8 ESI TDR RTOs with Scope

ESI - TDR Training Package	Accessed time	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Total
UTT98 (status: superseded)	February 2013	0	4	0	0	1	1	2	2	10
	January 2014	1	5	1	3	2	2	2	1	17
	February 2015	**1**	**5**	**1**	**3**	**1**	**2**	**2**	**1**	**16**
UET06 (status: superseded)	February 2013	0	16	0	2	3	2	7	3	33
	January 2014	2	2	3	3	2	2	2	2	18
	February 2015	**1**	**1**	**2**	**2**	**1**	**1**	**1**	**1**	**10**
UET09 (status: superseded)	February 2013	3	26	2	18	7	2	22	5	85
	January 2014	26	37	27	35	31	27	34	27	244
	February 2015	**13**	**25**	**14**	**20**	**15**	**15**	**12**	**13**	**127**
UET12 (status: current)	February 2013	1	13	2	12	4	0	13	4	49
	January 2014	97	111	98	128	101	95	105	99	834
	February 2015	**144**	**163**	**144**	**184**	**148**	**142**	**151**	**149**	**1225**

Source: Training.gov.au – RTO Report (accessed February 2015)

TAKE-UP OF UEP QUALIFICATIONS AND ESI TDR QUALIFICATIONS SERVING THE ELECTRICITY SUPPLY SECTOR

Table 2.9 UEP Generation Sector Qualifications

UEP – Generation Sector Training Package	**Training contract status**			
Apprentices and trainees				
Qualification	**Commencements July 2012 - June 2013**	**Commencements July 2013 - June 2014**	**In -Training June 2013**	**In -Training June 2014**
UEP20106 - Certificate II in ESI Generation (Operations Support)	0	0	0	0
UEP30206 - Certificate III in ESI Generation (Operations)	4	0	6	18
UEP40206 - Certificate IV in ESI Generation (Operations)	1	0	3	6
UEP40306 - Certificate IV in	0	0	0	0

ESI Generation Maintenance (Mechanical)				
UEP40506 - Certificate IV in ESI Generation Maintenance (Electrical/Electronic)	0	0	0	0
UEP50206 - Diploma of ESI Generation (Operations)	0	0	3	8
Total	**5**	**0**	**12**	**32**

Source: NCVER VOCSTATS (accessed January 2015)

Table 2.10 UTT ESI TDR Qualifications

UTT Training Package	**Training contract status**			
Apprentices and trainees				
Qualification	**Commencements July 2012 - June 2013**	**Commencements July 2013 - June 2014**	**In -Training June 2013**	**In -Training June 2014**
UTT20198 - Certificate II in ESI - Distribution (Powerline)	0	0	0	0
UTT30101 - Certificate III in ESI - Distribution (Powerline)	0	0	0	0
UTT30198 - Certificate III in ESI - Distribution (Powerline)	0	0	0	0
UTT30298 - Certificate III in ESI - Transmission (Powerline)	0	0	0	0
UTT30301 - Certificate III in ESI - Cable Jointing (Powerline)	0	0	0	0
UTT30402 - Certificate III in ESI - Rail Traction (Powerline)	0	0	0	0
Total	0	0	0	0

Source: NCVER VOCSTATS (accessed January 2015)

Table 2.11 UET ESI TDR Qualifications

UET - Transmission, Distribution and Rail	**Training contract status**			
Apprentices and trainees				
Qualification	**Commencements July 2012 - June 2013**	**Commencements July 2013 - June 2014**	**In -Training June 2013**	**In -Training June 2014**
UET30106 - Certificate III in ESI - Transmission	0	0	8	0

UET30109 - Certificate III in ESI - Transmission	5	0	36	21
UET30206 - Certificate III in ESI - Distribution	0	0	219	5
UET30209 - Certificate III in ESI - Distribution	107	0	1126	782
UET30306 - Certificate III in ESI - Rail Traction	0	0	2	1
UET30309 - Certificate III in ESI - Rail Traction	3	0	76	50
UET30406 - Certificate III in ESI - Cable Jointing	0	0	54	5
UET30409 - Certificate III in ESI - Cable Jointing	2	0	63	50
UET30512 - Certificate III in ESI - Power Systems - Transmission Overhead	6	7	6	7
UET30612 - Certificate III in ESI - Power Systems - Distribution Overhead	371	406	415	820
UET30712 - Certificate III in ESI - Power Systems - Rail Traction	25	11	20	26
UET30812 - Certificate III in ESI - Power Systems - Distribution Cable Jointing	16	12	15	30
UET40109 - Certificate IV in ESI - Power Systems	0	0	2	0
UET40512 - Certificate IV in ESI - Power Systems Substations	0	0	18	17
UET50109 - Diploma of ESI - Power Systems	5	0	31	18
UET60109 - Advanced Diploma of ESI - Power Systems	5	0	36	26
UET60212 - Advanced Diploma of ESI - Power Systems	1	11	0	11
Total	**546**	**453**	**2126**	**1868**

Source: NCVER VOCSTATS (accessed January 2015)

RECENT RELEASE OF UEP12 AND UET12

The most recent release (Release 2.1) of UEP12 was published in September 2013. The most recent release (Release 2.1) of UET12 was published in November 2014. Amendments made to Release 2.1 of UEP12 and Release 2.1 of UET12 are listed as below.

Table 2.12 UEP12 - Electricity Supply Industry - Generation Sector Training Package Amendments (Release 07/Sep/2013)

Training package	Skill Sets	Qualifications	Units
UEP12 ESI Generation Sector Training Package			
Release 2.1	2 added Skill Sets	• 2 Qualifications with metadata updated • 11 edited/updated Qualifications	5 edited/amended Units

Table 2.13 UET12 - Transmission, Distribution and Rail Sector Training Package Amendments (Release 05/Nov/2014)

Training package	Skill Sets	Qualifications	Units
UET12 ESI TDR Sector Training Package			
Release 2.1	14 updated Skill Sets	9 updated Qualifications	12 updated Units

GAS SUPPLY INDUSTRY

Tables below reflect the impact of endorsed Gas Industry Training Packages, including RTOs with qualifications on scope (Table 2.14) and current number of enrolments (Table 2.15).

The GSI is serviced by a small number of RTOs. Table 2.14 shows the statistics for RTOs with current scope to deliver components from the Gas Industry Training Package by State.

Table 2.14 RTOs with Current Scope for UEG Qualifications by State of Head Office Location

TP	Accessed time	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Total
UEG06 (status: superseded)	January 2013	0	3	0	0	0	1	5	1	10
	January 2014	3	4	3	4	3	4	5	3	29
	February 2015	**3**	**4**	**3**	**4**	**3**	**4**	**5**	**3**	**29**
UEG11 (status: current)	January 2013	0	1	0	1	0	0	2	0	4
	January 2014	4	5	3	7	3	4	6	3	35
	February 2015	**8**	**11**	**8**	**11**	**8**	**8**	**11**	**7**	**72**

Source: Training.gov.au - RTO report (accessed January 2015)

TAKE-UP OF UEG QUALIFICATIONS SERVING GAS SECTOR

Table 2.15 Enrolment by qualification in UEG Gas Industry Training Package

UEG Gas Industry Training Package Apprentices and trainees	Training contract status			
Qualification	**Commencements July 2012 - June 2013**	**Commencements July 2013 - June 2014**	**In -Training June 2013**	**In -Training June 2014**
UEG20211 - Certificate II in Gas	10	0	8	1

Industry Pipeline Operations				
UEG30106 - Certificate III in Gas Industry Operations	0	0	19	0
UEG30110 - Certificate III in Gas Industry Operations	0	0	2	2
UEG30211 - Certificate III in Gas Supply Industry Operations	12	12	11	22
UEG40106 - Certificate IV in Gas Industry Operations	2	0	32	3
Total	24	12	73	27

Source: NCVER, VOCSTATS (accessed February 2015)

RECENT RELEASE OF UEG12

The most recent release (Release 2.0) of UEG11 was published in March 2014. Amendments made to Release 2.0 of UEG11 are listed as below.

Table 2.16 UEG11 - Gas Industry Training Package Amendments (Release 13/Mar/2014)

Training package	Qualifications	Units	Imported Units
UEG11 Gas Industry Training Package			
Release 2.0	• 5 new Qualifications • 8 removed Qualifications	• 78 new Units • 58 removed Units	• 6 updated Imported Units • 2 removed Imported Units • 100 additional Imported Units

FUTURE DIRECTION FOR ENDORSED COMPONENTS OF TRAINING PACKAGES

At the time of writing, Training Package design and development are under review by the VET Reform Taskforce. The outcomes of these reviews may have significant impact on the future direction of Training Packages and the capacity of industry to access the skills required to boost productivity.

The stated principle for reform is to ensure that industry decides the direction of training to ensure graduates of the sector, including apprentices and trainees, are job ready.

The energy sector industries strongly support this principle, emphasising the two related yet independent aspects;

- The standards which underpin qualifications must be industry defined
- Industry must have confidence that standards are being achieved (i.e. qualifications must a reliable signal for employees and employers)

Achieving this aim requires that some elements of the system remain, while a focus on quality is strengthened.

Unit of competence, for example, should remain a specification from industry to the training sector, clearly articulating an agreed standard of skills, knowledge and work performance which provide the employer confidence to employ. Training Packages are utilised in licensing, regulation and certification, are embedded in industrial awards and enterprise agreements, integrated into enterprise workforce development strategies and provide a structured framework for recruitment, work organisation and skills audits, up-skilling and performance management in the workplace.

Allowing industry to define performance standards nationally delivers four key benefits;

- Enterprises are able to skill their workforce to the nationally agreed level, regardless of their geographic location or business scale;
- Individual learners hold skills that are recognised by industry in all jurisdictions which underpins skilled labour mobility between employers;
- VET system funding is sharply focussed on industry's nationally agreed outcomes which build workforce productivity and lift workforce participation;
- Allow governments to give effect to specific policy imperatives or skill needs in the economy such as reskilling workers affected by structural adjustment and to drive economic and social reform.

In relation to quality, the temptation to focus on inputs over outputs should be resisted. Mandating delivery measures is a 'second best' approach to controlling quality in VET outcomes because it does not consider the variability of inputs such as learner backgrounds and it discourages innovation. A more effective approach to ensuring quality is to standardise output measures through standardised assessments, particularly around key deliverables for a qualification (such as capstone testing mandated by electrical regulators for the issuance of an electrical license).

APPENDIX A – SOURCES OF INTELLIGENCE

INTERNAL

E-Oz (2014), *Stakeholder Survey*

The survey was distributed at training package consultations around the country and available online. Respondent breakdown by sector;

141 from the Electrotechnology sector

89 from the Electricity Supply Industry sector

10 from the Gas Supply Industry sector

E-Oz (2014), *Industry Leader Survey*

15 responses

E-Oz (2014), *Training Package consultation meetings*

Approximately 500 attendees around the country, predominantly RTO teacher/trainers

E-Oz (2014), *Technical Advisory Committee meetings*

Approximately 140 attendees per round. 2 rounds per year (some overlap in attendance)

E-Oz (2014), *National Training Advisory Group meetings*

27 Electrotechnology attendees

12 ESI Generation attendees

15 ESI Transmission, distribution and rail attendees

21 Gas attendees

E-Oz (2014), *Annual Conference*

182 industry attendees

EXTERNAL DOCUMENTS

Australian Energy Market Operator (2014), *Electrical Statement of Opportunities*

CSIRO (2014), *Change and Choice: FutureGrid Forum Report*

Energy Networks Association (2014), *The Value of a Grid Connection to a Distributed Generation Customer*

Energy Networks Association (2014), *The Road to Fairer Prices*

G20 Energy Efficiency Action Plan (2014) *Voluntary Collaboration on Energy Efficiency*

Office of the Chief Scientist (2013), *Engineering Energy: Unconventional Gas Production*

APPENDIX B- LATEST INTELLIGENCE ALIGNMENT WITH SKILLS SHORTAGES

ASCO / ANZCO Code (indicate the closest code – please highlight if this is not in line with the approach of your industry)	**Occupation**	**Training Package Qualification**	**Justification/evidence** **(qualitative and/or quantitative)**
3411-11	ELECTRICIAN (GENERAL)	UEE30811 Electrotechnology electrician	Backfilling to replace workers moving into specialised areas See *Decoupling of electricity demand from GDP growth* See *Distributed Generation* See *Energy Storage* See *The Internet of Things* See *Energy Efficiency*
3411-12	ELECTRICIAN (SPECIAL CLASS)	UEE40411 Electrical - Instrumentation UEE40611 Electrical - Systems electrician UEE41011 Energy management and control UEE42011 Electrical - Photovoltaic systems UEE43111 Energy efficiency and assessment	See *Decoupling of electricity demand from GDP growth* See *Distributed Generation* See *Energy Storage* See *The Internet of Things* See *Energy Efficiency*
3421-11	AIRCONDITIONING AND REFRIGERATION MECHANIC	UEE32211 Air-conditioning and refrigeration UEE42711 Air-conditioning and	See *Energy Efficiency - HCVAR*

		refrigeration servicing UEE42811 Certificate IV in Air-conditioning Systems Energy Management and Control UEE42911 Certificate IV in Refrigeration and Air-conditioning Systems	
3422-11	ELECTRICAL LINESWORKER (AUS) / ELECTRICAL LINE MECHANIC (NZ)	UET30612 Distribution lineworker overhead	See *Eroding ESI skills Base*
3992-12	GAS OR PETROLEUM OPERATOR	UEG30114 Gas supply industry operations	See *Regulatory Environment for Gas Extraction*
8999-99	LABOURERS NEC	UEG20114 Gas supply industry operations	See *Regulatory Environment for Gas Extraction*
All energy sector qualifications across all four Training Packages			See *Asbestos*