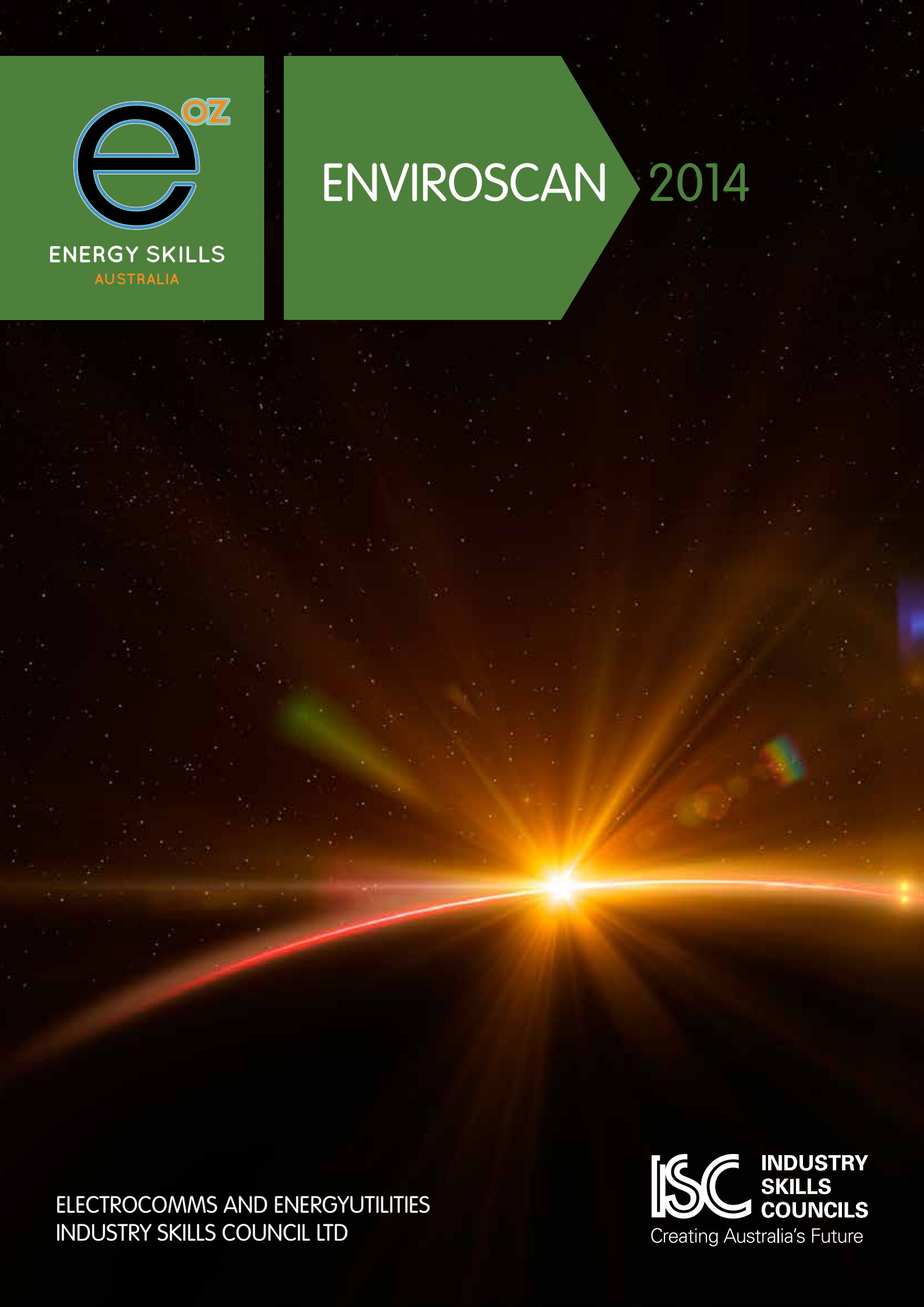
ENERGY SKILLS AUSTRALIA

ENVIROSCAN 2014



ELECTROCOMMS AND ENERGYUTILITIES
INDUSTRY SKILLS COUNCIL LTD

INDUSTRY SKILLS COUNCILS
Creating Australia's Future

ENVIROSCAN 2014

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PO Box 1202 Dickson ACT 2602
Unit 2, 48 Mort Street, Braddon ACT 2612
office@e-oz.com.au
www.e-oz.com.au
02 6262 7055
02 6257 4222

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E-Oz Energy Skills Australia is the Australian Government declared Industry Skills Council for the Australian ElectroComms and EnergyUtilities industries. This publication has been produced with the assistance of Australian Government funding.

CEO's Introduction

Welcome to E-Oz Energy Skills Australia's 2014 edition of the Environmental Scan (eScan).

In the past eScans, we have talked at length about changes in community attitudes toward energy generation, use and monitoring of energy reported by our stakeholders which, coupled with opportunities provided through technological innovation, have been changing the energy landscape in Australia. The implications of these have begun to flow through to national data sets.

Breaking a century long trend of climbing energy consumption, including through two world wars, a depression and the global recession of 2009, energy consumption has fallen over recent years. At the forefront of this change have been residential consumers, who have realised double digit reductions. The question now for the energy industry is whether or not this fall can be sustained.

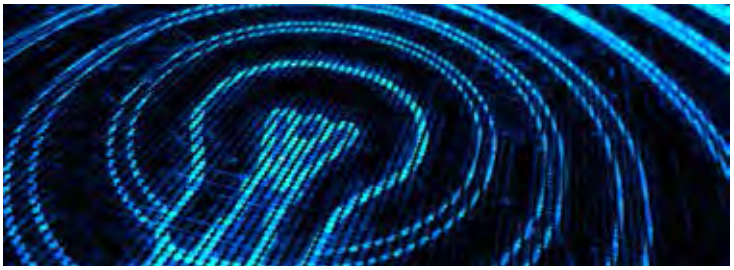
It is an exciting time for the energy industry. Whilst some of the factors which have allowed consumption to fall have been fully realised, opportunities exist for further efficiencies. As always, to realise these opportunities will require a skilled workforce to identify, design, implement and monitor appropriate solutions.

Technologies supporting grid/network management and remote operation will occur on both sides of the meter. Implementation of advanced technologies will also challenge existing jobs requiring skill development with increasing emphasis on regulatory and monitoring roles in operating across multiple interconnected systems.

This edition

The format of this edition has again been revised to focus on 'grass roots' intelligence over the sectoral implication of trends in national data sets. Much of the *Latest Intelligence* section of this eScan is dedicated to an analysis of the changing skills, technologies, work practices and attitudes which will allow reduction in energy consumption to become entrenched, accelerating the efficiency of energy usage and driving productivity growth throughout our economy.

The other change of this volume has been the amalgamation of the *Latest Intelligence* for each of the industries into a single chapter. This reflects that continuing integration of the energy is rendering it increasingly difficult to talk about technological impacts for one industry in isolation.



The challenge for the VET sector

I would also like to highlight the primary challenge for the VET sector as a whole in the short to medium term – the challenge of building the standard of skills output against a constrained funding backdrop.

It should come as no surprise to our readers that the national training system at the RTO level across the country is facing increasing budgetary constraints, particularly in regard to government funding. This is likely to continue for the foreseeable future.

Responding to these constraints has driven training organisations to trial various strategies in order to reduce their costs including increase in tuition fee, alternative delivery methods, reduction in 'face-to-face' teaching hours, more stringent student selection (removal of repeat classes) or decrease in teacher support. For example, an institution delivering the high risk electrician qualification has reduced their nominal teaching hours by 20% between 2013 and 2014.

The implications of each of these strategies need to be accurately measured to mitigate the impact of funding reductions and inform future policy decisions. It is important to recognise that each of these strategies carries a risk that stakeholder (including student, employer and community) outcomes will be impaired, some directly in the short term (like reducing teaching hours) or indirectly over the longer term (like reducing professional development which can severely impair overall capacity to deliver skills in the longer term).

The fundamental risk to the industry training overall, however, is that institutions will try to cover reduced outcomes by 'lowering their standards' and issuing qualifications to students who have not yet developed required competencies. This is an inherent risk to our training system which relies on the same institution to develop and assess competence – particularly with the funding system shifting to paying upon successful completions!

Australia's national training system is built on national consistency requiring all training providers around the country to deliver VET training against the endorsed national standard and requiring apprentices to demonstrate competence against a regular set of workplace tasks to a predefined standard. Because a qualification means compliance with the same training standards from Hobart to Darwin, it provides a form of currency allowing a worker to quickly communicate their skills to an employer.

Qualifications are not distinguished between providers; therefore, it is particularly 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 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.

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 Industry, the Australian Workforce and Productivity Agency and the National Skills Standards Council 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 2014 Environmental Scan has been produced with the assistance of funding provided by the Commonwealth Government through the Department of Industry.

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 2014 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.

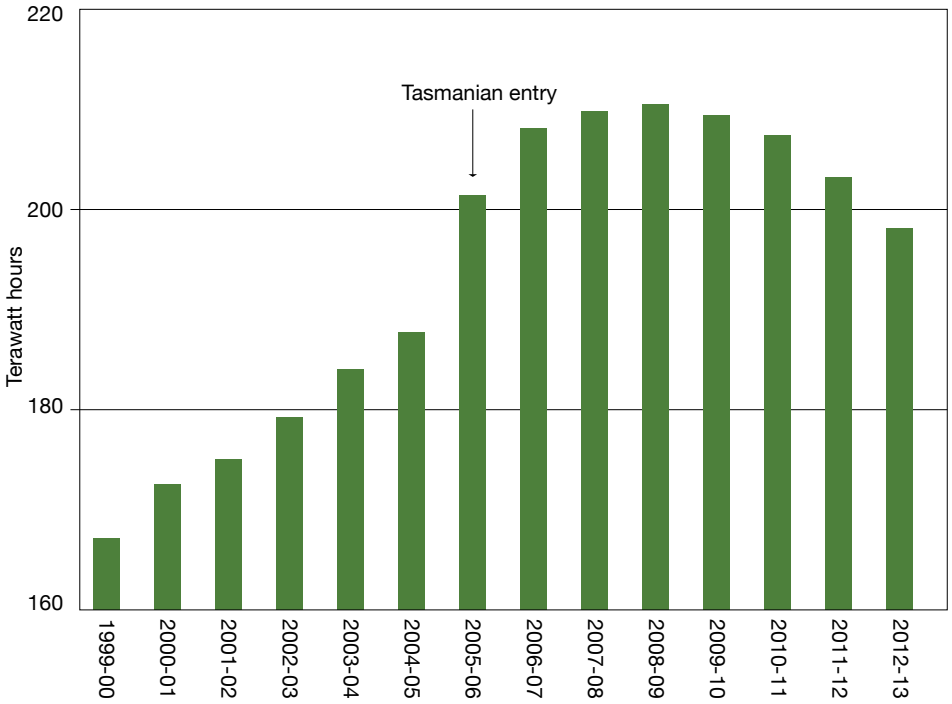
Changes in consumption

In 2013 for the fourth year in a row electricity consumption fell in Australia. This is certainly without precedent in Australian history (although accurate statistics on aggregate electricity usage are difficult to compile given the fragmented history data collection across various regional energy markets) and challenges traditional assumptions about electricity demand in modern society. Against a backdrop of rising GDP this represents a significant improvement in energy productivity.

This national decline is reflected in aggregate consumption data from the National Electricity Market (NEM), which measures wholesale electricity generation provided to electrical distributors across of Queensland, New South Wales (inc. ACT), Tasmania, Victoria and South Australia (this is the longest interconnected power system in the world) which shows a 5.85% decrease in aggregate consumption in 2012/13 from the 2008/09 peak.

Although some Electricity Supply Industry representatives had raised the possibility of falling demand to Energy Skills Australia (reported in 2011, 2012 and 2013 Environmental Scans), it is no exaggeration to say that the extent of this fall took everyone by surprise. Indeed the Australian Energy Market Operator's predictions from early 2010 were for an average annual increase in demand of 2.1% across the NEM for the next decade[1]. In actuality, since that prediction, energy demand has fallen by an average of 1.5% per annum. Compounded this amounts to over 30 Terawatt Hours of non-realised demand (over 16% less electricity required in just four years!).

National Electricity Market electricity consumption



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).

It is particularly encouraging that this reduction has occurred through a period of continued economic growth (requiring network expansion) maintained throughout the period. Indeed, as the number of dwellings has increased, the average consumption per household has fallen even further than the aggregate.

Understanding whether this reduction is a windfall or represents a change in the trajectory of electricity demand is essential in planning Australia's energy future. It can also provide guidance on whether these factors can and should (to the extent that the reduction represents improved energy productivity) be maintained, and the nature of policy/industry/consumer input required to extend their influence.

1 Electricity Statement of Opportunities 2010, Australian Energy Market Operator

Industry intelligence, particularly from representatives in the Electricity Supply Industry, suggests that four main factors have been involved in the reduction;

1. **Energy Efficiency:** The largest single portion of the reduction in electricity demand is linked to the implementation of energy efficiency measures, particularly regulated standards for buildings and appliances.

   The inclusion of energy efficiency measures for all building classifications in the National Construction Code since 2010 has significantly reduced the energy required to heat and cool premises, the largest factor in a building's energy consumption. Technological improvements, again supported by regulated minimum standards, have brought significant efficiencies in lighting premises, the next major factor in a building's consumption. Although these classifications only apply to new builds or extensive refurbishments, they are having a flow through effect which will continue to be felt for decades as older building are replaced or refurbished.

   In the residential sector, National Construction Code classifications have helped to reverse the trend of increasing household energy usage due to increasing house sizes and more appliances. The Government's recent Energy White Paper Issues Paper highlighted that modern houses are 30% more efficient to heat and cool than a house built just a decade ago.

   In addition to facilitating a reduction in aggregate electricity consumption, standards for appliances (particularly refrigerators, air-conditioners and televisions) are having an impact on peak demand; which traditionally occurs when people return home from work and switch on their appliances. Efficiency standards for appliances have a much faster flow through period than premises standards, with the vast majority of gains to be realised within a decade.

   Extending this influence: The good news is that regulatory standards will continue to have flow through effects on electricity consumption, as old appliances and buildings are replaced with new compliant units.

   Despite this, the effects of current standards are clearly finite and ensuring a continuation of improvements in energy productivity will require the regular revision of energy efficiency standards. These standards should be maintained through a dialogue with industry and consumers, to ensure that they are set at an appropriate level to deliver cost-effective efficiency gains across the economy.

   Skill implications: From the training side, 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.

   E-Oz will continue 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.

2. **Consumer response to rising prices:** For most of the past century in Australia electricity prices have been falling in real terms. In the past decade however this trend has reversed and prices have begun to increase, accelerating over the past five years to over 10% per annum.

   This has led to residential energy customers seeking ways of reducing their consumption, which they have done very effectively; household energy consumption has fallen by about 13% in the past four years.

   Over the same period business demand has been flat, which is still a significant achievement given that consumption has risen consistently for the previous century, and the economy has produced more goods and services year on year.

   Extending this influence: The keys to incentivising energy efficiency are to increase the benefits consumers can realise through their investment and communicating that message effectively.

   Consumer awareness about electricity usage has increased markedly in the past few years, paving the way for the reduction in consumption. Some of this will happen naturally, as new, more efficient technologies become available. Some of it will be regulated, as increasingly stringent energy efficiency standards are required for new domestic and commercial appliances and applications. Some of it will be behavioural, as consumers change their consumption patterns in response to price.

   Measurement is the first step. Allowing customers to more accurately understand their usage (whether directly or indirectly through a representative third party) provides a framework for assessing efficiency opportunities and designing tailored responses. This will be facilitated through access to the 'internet of things' by which all manner of objects will report on their performance (including energy usage) and may be managed intelligently.

   Skills impact: E-Oz will continue to review existing competencies in systems integration, control, instrumentation and communications technologies in response to evolving work practices and technological possibilities.

   Similarly, the 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.

3. **Distributed generation:** Increased adoption of distributed generation systems acts as a substitute for centralised, wholesale generation, removing demand from the wholesale energy markets (although not reducing the true amount of electricity used). The proliferation of these systems (more than a million rooftop solar photovoltaic systems have been installed) is responsible for a portion of the reduction in electricity consumption from the NEM and SWIS and, because electricity is generated close to the source of consumption, transmission losses may be substantially reduced adding to energy productivity.

   Importantly, distributed generation is not limited to photovoltaic and includes a wide variety of sources such as micro hydro plants, micro wind farms, landfill gas plants, biomass cogeneration plants and gas fuelled Co/Tri-generation plants at small industrial sites or commercial buildings. Co/tri-generation systems provide an additional dimension of efficiency by employing waste heat from electricity generation to heat and/or cool a building.

   It is somewhat difficult to quantify the impact of these systems as generation occurs 'behind the meter' with production difficult to differentiate from energy efficiency measures which reduce consumption.

   It is also worth noting that distributed generation may place an increased strain on the electricity network which needs to accommodate these, often intermittently generating, sources of electricity into a network wide supply/demand balance. Also, although aggregate electricity demand from premises may be negative (i.e. it develops more electricity than it uses), there is still a cost associated with maintaining the network it uses to distribute this energy and provide a backup to domestic production.

   Ensuring the true costs and benefits of distributed generation, accounting for price fluctuations in the wholesale market, are reflected will guarantee the largest benefits are realised by all participants.

Extending this influence: Because distributed generation must necessarily be connected to the grid, installation and maintenance of these systems requires an electrical license which is contributing to the rapid growth of demand for electricians (E-Oz's 2013 Environmental Scan noted that between the 2006 and 2011 Censuses employment of electricians grew at three times the rate of the national workforce and that the growth rate appears to be accelerating further). Developing skills to design and install distributed generation systems often requires 'post trade' training.

As generation technologies are often substitutes, their uptakes are also highly technology and price sensitive and hence volatile. In this environment, the key focus is on ensuring appropriate technical standards are available for all viable technologies to allow electrical services firms to develop capacity rapidly in the face of changing market conditions.

Workforce development programs like the National Workforce Development Fund (NWDF), which allow employers to identify their own skills needs, are essential in this environment. They provide flexibility for employers to adapt as conditions change on the ground. As mentioned earlier, the effective combination of early standard identification and demand driven training was demonstrated by the uptake of post trade photovoltaic training, including under the NWDF, which saw thousands of electricians up skill over a couple of year period facilitating the installation of one million roof top distributed generation systems.

Extending consumer or network control to these devices will be important in ensuring they are managed effectively, contributing to overall network stability and efficiency as an integral part of the 'internet of things'.

Skill implications: Technologies currently being investigated for development of standards for biomass, heat exchange and tidal.

At larger scale, new units have been developed (and are awaiting endorsement) in the ESI Generation Operations and ESI Generation Maintenance disciplines which incorporate energy efficiency outcomes related to the installation, operation and maintenance of generation systems deployed as distributed co/tri-generation systems. These include:

- Distributed Generation
- Identify opportunities to apply co/tri-generation to enhance energy efficiency
- Coordinate services to install and maintain energy efficient tri-generation systems
- Operate tri-generation plant and equipment for energy efficiency
- Maintain tri-generation plant and equipment for energy efficiency
- Utilise data collection and analysis for energy efficient tri-generation operations
- Coordinate tri-generation to meet local energy service demand
- Manage tri-generation systems for energy efficiency

Further work has been flagged to:

- Up skill and cross skilling of electrical workers to install, operate and maintain off-grid ESI systems in the resources sector including HV and LV Switching.
- Amendment and further development of skills in electrical, transmission and distribution, gas and air-conditioning disciplines associated to co-generation or tri-generation technologies (combined heat and power).
- Further development and review of existing renewable competencies especially where these are, as technologies are disseminated, moving from specialist to generalist skills.
- Engagement of stakeholders investing in biomass based renewables to determine the extent of specific skills needs related to installation, operation, compliance and maintenance

4. **Structural economic shift:** It is necessary to mention, although of limited relevance in this context, that a portion of the reduction in electricity usage relates to a structural shift in manufacturing away from energy intensive industries. A reliable supply of low cost electricity, along with good access to natural resources led to the establishment to steel, aluminium and oil refining industries in Australia over the past twenty years, which have been closed since 2009 due to various factors (including the high Australian dollar and rising electricity prices).

   Although these closures have reduced electricity demand in the NEM, there is no net energy productivity benefit if these industries are simply moving reporting jurisdictions, rather than being made more efficient.

   This change accounts for no more than 10% of the reduction in electricity demand on the NEM since 2009.

An Internet of things

In addition to this sudden decrease in consumption, a more gradual change has been occurring in the production and consumption of energy since at least the turn of the century. This has been most obvious in the electricity generation sector where, in 2000, electricity was produced predominantly via coal fired generation and hydro-electricity. Now, less than 15 years on, there have been a number of coal fired generation plants closed and the current mix of generation sources includes:

- Large scale gas fired peaking and base load
- Large scale wind
- Large scale solar photovoltaic or thermal
- Small scale wind
- Small scale solar photovoltaic
- Micro - hydro
- Co/Tri-generation – Waste heat and Combined Heat and Power
- Biomass

Additionally there are pilot programs in technologies such as:

- Tidal generation
- Ocean wave/current generation
- Geothermal technology

Similarly gas as an energy source has also been marked by increased diversity of sources including:

- Liquified Petroleum Gas
- Liquified Natural Gas
- Coal Seam Gas
- Shale Gas

This burgeoning of alternate sources and technologies for energy production means that consumers now have more choice. As detailed below, consumers are becoming increasingly aware of the economic impacts of energy consumption and translating this awareness into the adoption strategies for efficiency.

These shifts have had notable impacts on skills formation and demand, particularly in areas such as photovoltaics and large scale wind which have given rise to the identification and endorsement of new qualifications in response to the demand for specialised skills.

This proliferation of generation sources may be characterised as part of a ‘first wave’ in Australia’s strategy to move to a lower carbon, energy efficient economy. It has been accompanied by other less visible technologies which have enormous potential to change the way energy is produced, distributed, managed and consumed. These include:

- The roll-out of smart meter technology
- The uptake of smart consumer appliances e.g. air-conditioners
- Replacement of high energy use equipment with more efficient systems e.g.
  - Lighting
  - Water heaters
  - Televisions
- Introduction of integrated management and control systems at various scales
- Burgeoning communications technology

What Internet?

The term “network” is readily applied to energy generation, transmission and distribution and is easily understood when used at various scales e.g. local distribution or the national grid, as a way of understanding and managing energy supply and usage. Energy grids are, due ownership, jurisdictional boundaries, voltages etc, essentially networks of networks which have a degree of built in redundancy. Such a network of networks is called an internet.

Each consumer also has in their installation, a local network which comprises the system and appliances within the home, building or factory. Each consumer has a point of attachment which connects their local system to the energy network. This local network is broadly considered “behind the meter” and separate from the grid.

What Things?

Each of the technologies listed above can become parts of an internet of things which together provide new ways for the various players in the energy market to interact. Such technologies will connect local networks (homes, buildings, factories) with the energy grid in new ways, extending the network of networks to form an internet of things.

For example; the combination of smart metering with intelligent consumer appliances and systems will extend the networks or networks to another layer, bringing the local "intranet of things" from behind the meter, into the internet of things. Interconnection of appliances locally and as part of the internet of things can also increase efficiency by identifying synergies or resolving conflicts.

The installation, calibration, synchronisation and interconnection of intelligent systems and redundant sources of supply into an "internet of things" which, like the computer internet, makes each node in the system both a point of use (output) and a source of information (input) will contribute to energy efficiency and security whilst providing intelligence on network usage to inform the decision making of consumers, intermediaries and suppliers.

This 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, the internet of things can in real time communicate meaningful information about:

- energy sources
- actual and predicted energy availability
- actual and predicted price
- historical, actual and predicted appliance usage
- aggregate consumer usage (all appliances) at various scales
- aggregate network demand at various scales

Importantly, at all scales, the internet of things will impact the linear relationships between individual appliances and consumption. Via the internet of things consumers will seek optimisation and maximise benefits by being able to (either automatically or by human intervention) take into account how all elements of the consumer's local "intranet of things" e.g. a home, business or factory, work together. This will be facilitated by the consideration of historical, actual and predicted costs and usage data to inform consumer choice.

Appropriate combinations of local and distributed generation and storage will also be an essential part of the internet of things ensuring high reliability and lowest cost through redundancy of service.

As capital costs and risks associated with technology choice are always high for early adopters, this re-conceptualisation of the energy network as an internet of things has at best only partially been understood and operationalised. Once both the concept of the internet of things and the technologies which empower its existence and expansion are established in industry and consumer thinking, opportunities for the accommodation of individual preferences via various interfaces are nearly limitless.

As with other interactive, data intensive systems, the mining of available data will serve the needs of both consumers and providers. Better data can in turn be leveraged into more efficient solutions and, potentially, smarter integrated systems for energy management and efficiency operating via common backbones provided by high speed communications technologies.

Benefits to both consumer and suppliers may accrue from other non-energy related services delivered via the internet of things e.g. appliance firmware updates, consumable ordering etc.

Skills impact: These technologies will facilitate coordination between generators, network operators, service providers and consumers to holistically impact energy usage, network stability, consumer and suppliers costs, energy productivity and optimum investment levels. 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 to 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.

Peak energy usage

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.

Under current pricing regimes however, cost recovery for electricity usage occurs primarily through aggregate consumption (with some limited price differentiation based on time of day). This creates little incentive for consumers to alter their behaviour other than to reduce overall usage, which they have done.

As noted above, aggregate electricity consumption has fallen for the past four years and, subject to the capacity of the system to sustain the underlying factors, may continue to fall in the next few years. The problem is that peak demand hasn't really fallen. During the extreme heat at the beginning of 2014, peak demand was close to the all-time peak experienced on Black Saturday in 2009.

Because these network charges are locked in, but the total has reduced, those same network charges are now spread over fewer kilowatt hours (kWh). Perversely, reducing daily electricity consumption does little to reduce the cost of the energy network and can actually drive the price per unit up.

Because peak demand is the primary investment driver, getting prices under control requires managing peak demand. The 'internet of things', including the drivers of peak demand, will provide a framework for intelligently managing usage to shift non-essential consumption to other periods.

Skills impact: Further incentives to encourage consumers to manage their consumption in peak periods are necessary to reduce network augmentation costs. Some distributors are calling for tariff reform which moves to time of use pricing, with a greater focus on connection charges, to more closely reflect user pay principles.

Regardless of the method chosen to incentivise the management of peak demand, methods to measure usage at time of use (smart meters) are a prerequisite.

E-Oz will continue to research and develop Training Package components associated with peak demand management, including competencies related to the development, installation, integration and management of smart appliances, which allow a consumer to shift load from peak periods.

The CSIRO has trialled automated control technologies for heating, lighting and air-conditioning which indicate a 13% reduction in aggregate electricity usage and a massive 30% off peak demand.

The strong industry demand for automation skills is demonstrated through the uptake of the Certificate IV in Instrumentation under the National Workforce Development Fund (NWDF – see relevant section of report), which has held up over the term of the program, implying continued unmet demand from industry and consumers.

Electricity storage and electric cars

Predicting electricity demand at a given moment is extremely difficult and involves a multitude of variables, however producing too much or too little electricity can seriously destabilise the grid and must be managed.

Grid operators maintain the current on the grid by managing generation, using sophisticated forecasting tools to predict demand ahead of time and then buying electricity from generators to meet that demand.

The challenge of instantaneously matching output from generators to demand from consumers is amplified by intermittent generation sources such as wind and solar, 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.

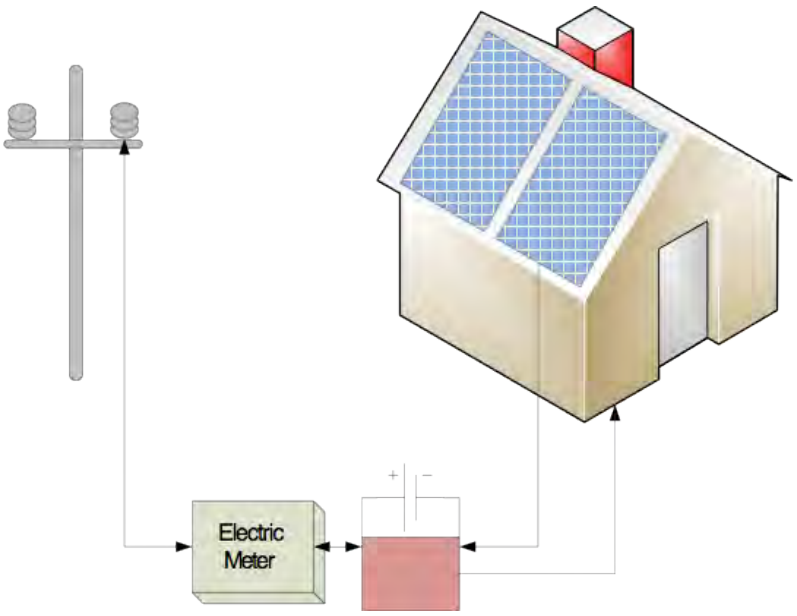
An electrical storage device can help in this regard by adding or removing current as needed. At a grid level, electrical energy can be stored when production exceeds demand and released back to the grid when demand exceeds production, absorbing fluctuations which could damage or destablise the grid.

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. Additionally, electricity generated by intermittent power sources like wind or solar can be flexibly managed, reducing their impact on the grid and improving energy security.

Distributed storage solutions, 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.

While energy storage is not cheap, proven technology is already available and emerging technologies suggest that significant improvements in performance and price are likely to occur in the short to medium term. An incentive regime which allows commercial and residential storage owners to capture the benefits of their investment, realising arbitrage profits by taking advantage of variable electricity prices, would encourage investment whilst stabilising the grid and reducing the impacts of peak demand.

Diagram 1.1 – Battery on Grid, Distributed Storage Model



For all of these reasons, electricity storage systems are predicted to become an increasingly important element of electrical infrastructure.

Electric cars: Most discussion of electrical vehicles focuses on their consumer benefits, such as the comparative simplicity and efficiency of electric motors over combustion ones and cheap running costs, or disadvantages, such as long recharge times and limited range.

The benefits they can provide to the electrical grid are less often considered but, capturing these, could inspire more wide scale adoption, while providing significant benefits to all electrical consumers.

The Energy Supply Association of Australia (ESAA) recently released a report highlighting the benefits of large scale electrical vehicle adoption on network stability and utilisation. The report noted that improved monitoring and control infrastructure (effectively the 'internet of things') could allow network owners to directly manage the charging of cars, essentially using them as network assets to realise the benefits highlighted above, absorbing fluctuations in generation and mitigating the impacts (and costs) of peak demand.

Agreements to use electrical cars in this manner would naturally require the consent of owners, who would expect to be duly compensated for the use of their assets.

Additionally, as vehicles would primarily be charged in off peak periods, they would increase network utilisation without requiring additional network augmentation. This would allow essentially fixed network costs (described in the Peak Demand section of the Environmental Scan) to be spread over a larger number of kilowatt hours, lowering costs per unit.

The report estimates that approximately 500,000 electric vehicles could be added to the grid without requiring new network infrastructure.

Developing these sort of collaborative arrangements, with significant benefits to all electricity network participants including those without electrical vehicles, rely on automation systems which allow for coordination between appliances/devices across extensive networks.

Skills impacts of electricity storage: Implementation of on and off grid storage solutions will have impacts across the entire Energy Supply Industry – Transmission, Distribution and Rail Training Package, particularly in qualifications focused on system design, control and management.

Smaller scale residential systems will likely require post trade training for electricians, particularly for design of systems including photovoltaic and allow for remote monitoring/management.

There are various competing technologies in this space and, as always, the challenge will be to ensure appropriate standards are in place to remove barriers

Switch from engineering to residential construction

More immediately, short term demand for energy sector workers is primarily driven by the level of construction activity. This has both direct and indirect causes, as the construction sector is the largest direct employer of energy sector workers and has an indirect link to the level of aggregate energy demand, as well as driving the need for upgrades and extensions of energy utilities.

Nationally, a rebalancing is occurring as a significant period of engineering construction (primarily in the mining sector) winds down and residential construction picks up; driven by historically low interest rates and pent up demand from income and population growth. The net effect of this switch is likely to be positive construction employment, the corollary of which is an increase in energy sector employment.

Only Victoria, Tasmania and the ACT are expected to experience flat demand in residential construction across 2014 before growth kicks off from 2015. All other jurisdictions can expect strong growth in residential construction, especially the Sydney region.

As expected, engineering construction will weaken furthest in Queensland and Western Australia; the States which experienced the strongest growth through the mining boom. Demand for energy sector training in Western Australia will be hit particularly hard, as displaced mining sector workers flood the residential construction industry.

Engineering construction will actually strengthen in Tasmania and the Northern Territory over the next year, as existing projects ramp up.

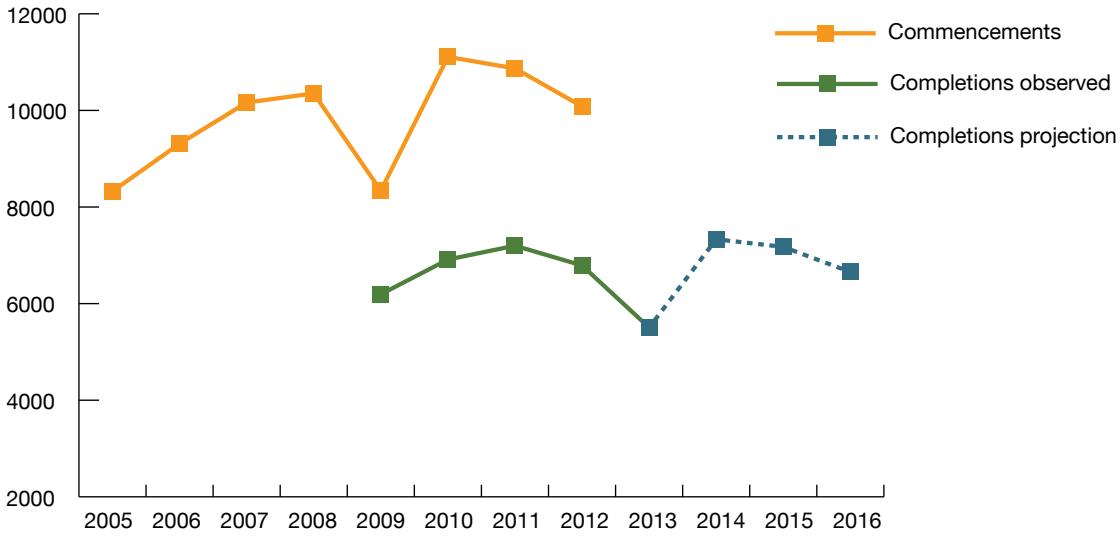
Over the medium term engineering construction nationally will be driven by infrastructure upgrades, particularly in the large population centres of Victoria and NSW.

The overall outlook is the weakest in the ACT, which seems set for an extended period of weak construction demand across all sectors.

Skills impact: Industry intelligence is that the Electrotechnology sector, particularly apprenticeships for licensed electricians, will weaken in the short term due to the combination of this shift in industry focus and changed industrial arrangements for industry apprentices. This is already evident in reported apprentice commencements in 2013-14.

Completion projections for 2014-June, 2017 are derived from **NCVER commencement and completion data** 2010 to June 2013, using average completion modifier rate of the past four and half years.

Figure 1.1: NCVER commencement and completion data projections for Electrotechnology apprentices (ANZSCO – 341, 342), 2005-2017



Despite continued reporting of skills shortages by industry participants, commencement data demonstrates that electrical apprentice completions (Figure 1.1) will peak in 2014 and then fall away, driving medium term deterioration in skills supply.

Reductions in resource allocations to trade programs by RTOs (due to their own funding pressures) are likely to further impact completion rates, suggesting that projections in Figure 1.1 may be optimistic (relying on historic trends).

Compounded by concern about an ageing workforce and the time lags between vocational training commencements and completion, this situation again places the industry facing shortages in the medium term.

Unfortunately, for the industry to respond to the challenges of the deployment of intelligent systems and smart appliances, investment in skills is required. In the short term, it appears that these skills will need to be developed post-trade in existing workers, signalling a greater need for industry workforce development strategies.

In the medium term the completion of the transition from engineering to construction, a return to growth and adjustment to new industrial arrangements should see apprentice numbers rebound.

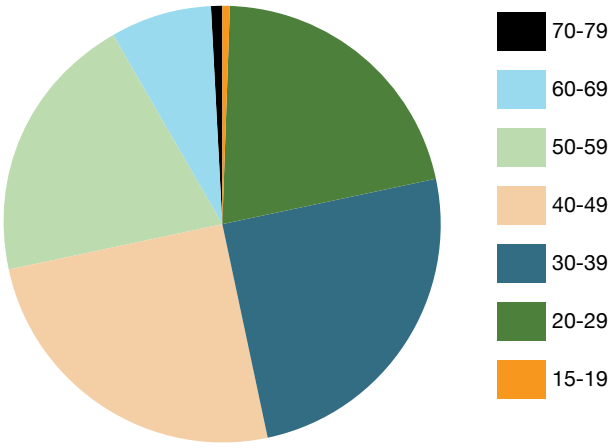
The drop in apprenticeship numbers will have an impact over the medium term and industry led programs for up-skilling existing workers, improving apprenticeship quality and completions and skilled migration, must be continued to meet the irrevocable proliferation of advanced electrical appliances and systems. Electrical contractors already looking to expand their services offerings to remain competitive (against local and internationally based competitors) are creating multifaceted roles within their organisations to consolidate costs and increase productivity.

With the expected increase in demand for post trade training to meet the above needs of industry, RTO's will need to be flexible and offer modes of training to suit employees who are unable to attend training in a traditional manner.

Not all RTO's are able to meet the needs of industry in their region as they are rigid in their delivery of specific competencies rather than providing flexibility in meeting industry needs. It is clear that cost and capability are the drivers in these situations. RTOs improving industry engagement and investing in the capacity and currency of trainers and teachers must occur for skills needs to be met.

Industry reported figures for transmission and distribution show that across all networks apprentices comprise 6% of the electrical workforce. Recent intelligence indicates that the 2014 apprentice intake represents a significant reduction below this level.

Figure 1.2 ESI - TDR Workforce Age Range



Only minor shifts in the age profile of the total ESI transmission and distribution workforce (Figure 1.2) have occurred in 2013 and the ageing of the workforce is still expected to have an impact on skills supply.

As systems integrate and new technologies are deployed of across distribution networks it is anticipated that skills demand will remain high. Whilst the ESI sector is highly successful in graduating apprentices, in the face of falling apprenticeship numbers, at least in the short term, the up-skilling of existing workers to respond to these factors will be necessary. This deepening of skills needs as systems integrate will need to be a key feature of industry's response.

The ESI Generation sector continues to undergo technological change and changes network ownership. These factors are impacting the workforce and skills demand.

New owners are less reliant on in-house training and are seeking to ensure national standards apply in the workplace. This has been highlighted by the new owners of base-load power stations initiating workforce development strategies to recognise existing workforce capabilities and provide up-skill training to meet endorsed national competency standards from the UEP ESI Generation Training Package.

The large renewable generation sector has responded with new qualifications and proposed skill sets to ensure the availability of appropriate skills for ongoing asset maintenance.

The impact for generation workers of the deployment of new consumer and distribution network technologies will be mainly at the systems operator level. Operators are already engaged in the management of energy production and these roles may have to respond to a greater range of variables and be required to more flexibly respond to these. A deepening of skills rather than new skills will be the major impact for this sector.

The Gas Supply Industry is also calling for new skills which will be an important part of the development of the internet of things.

Particularly the industry has put forward the following areas for development:

- advanced scheduling
- terminal management
- higher levels of workforce computer literacy

These skills are required by existing workers and appropriate standards and workforce development strategies need to be put in place.

The role of gas in Australia's energy mix

Domestically, gas provides approximately a quarter of the country's primary energy needs. It provides highly efficient fuel for transport and heating/cooling, as well as a low emission intensity source of electricity generation. The Gas Supply Industry (GSI), particularly the pipeline network, is a highly efficient system for distributing energy with low transmission losses. Each of these factors ensures that gas will continue to expand its role in Australia's (and the world's) energy mix.

Structural change in the gas industry is being driven by Liquified Natural Gas (LNG) export facilities being built in the north and west, which will propel Australia into the being the world's largest gas exporter within the next few years. These facilities will leverage Australia's considerable proven reserves of natural gas, stable regulatory environment and established transmission network to provide benefits including jobs, energy security, royalties and export revenues, which will be felt throughout the economy.

While there is some justified consternation amongst domestic consumers about the impact of increased export capacity on domestic prices, it is clear that Australia's proven gas reserves are sufficient to meet both domestic and export markets. The challenge will be to provide an investment environment which encourages an expansion, both in extraction and distribution, to meet predicted demand.

The many benefits of gas as an energy source, along with improved extraction technologies, are expected to drive continued growth in global demand. Over the medium to longer term, this will require innovation (both technological and skills based) to access further reserves at an appropriate price.

Skills impact: The primary challenge will be in augmenting existing supply networks to provide opportunities for the expansion of gas usage, with all the associated benefits. Target skills areas in the GSI include system operators for gas supply and the workers/builders responsible for the installation and maintenance of gas transmission, distribution and generation infrastructure, plant and equipment associated with new capital investment.

The secondary challenge will be in ensuring peak network efficiency is achieved. As with electricity networks this will involve accurate measurement and process automation, supported by the 'internet of things'. E-Oz will continue to work closely industry to ensure that GSI workers have the skills required to optimise their productivity.

VET policy environment

In recent years, the rate of policy change in the VET sector has been hectic.

Efficiency and quality improvements are recognised as being beneficial and a positive for the system overall. However, the multilevel nature of systemic change often leads to poor change management characterised by:

- Competing agendas and priorities for change
- Contradictory initiatives
- Uncoordinated and/or inconsistent implementation
- Diffused responsibility for planning and implementation
- Frequent, reactive change
- Ineffective communication of change
- Arbitrary deadlines for change
- Inadequate impact assessment and evaluation of outcomes

Currently there are a number of reforms being undertaken at a number of policy, regulatory standards and operational levels, including:

- Progressive shifts in RTO funding to an entitlement model funding of training
- Redevelopment of all units of competency to comply with the Standards for Training Packages including:
  - Assessment requirements
  - Foundation Skills
  - Recoding of units
- The development of companion volumes Training Packages
- Ongoing implementation and refinement of the National Standards for VET regulation

And further change foreshadowed and not yet implemented.

- Change from Registered Training Organisations to Licenced Training Organisation including:
  - Providers to incorporated companies or associations
  - Requirement for an accountable education officer
- Incorporation of VET Quality Project outcomes
- Systems for interfacing VET with Higher Education

These represent significant change which has to be effected within our system and; whilst these developments are likely valuable, it will be difficult to ascertain their true impact occurring, as they do, on top a previous wave of VET reform which may not have been fully operationalised and evaluated.

It is important to note that whilst this level of change is being implemented in the VET Sector continuous improvement processes for nationally endorsed Training Packages (the ISCs core business and industry's priority) must be maintained in response to:

- New technology and work practice changes
- Industry regulatory changes
- WHS/OHS regulatory changes
- Energy efficiency and sustainability policy

Further, employers are also, as key end user of the national training system, required to bear the administrative costs and burdens of ongoing changes to the system(s) of implementation of VET including revision of:

- Quality assurance systems
- Human resources systems
- Reporting systems e.g. apprentice management
- Training and assessment materials

Employers' perceptions of the value of change are diminished by inadequate change management and communication processes associated with change. Most notable is the use of "industry requested systemic change" as a selling point to industry when stakeholders have neither requested or had input into the process of deciding change is needed .Industry enterprises who contribute high level technical and training expertise to the development and maintenance of national Training Package standards are concerned that poorly managed change at various levels devalues this effort.

A pause to offer a period of stability and allow for the establishment of new benchmarks for quality and efficiency, based on the outcome of current reforms, is imperative. Most major initiatives currently in train will deliver outcomes in 2015-16.

Quality of training and support for VET trainers and assessors

This issue of the quality and effectiveness of the development of VET trainer/assessor was highlighted both in the April 2011 Productivity Commission report into the Vocational Education and Training Workforce and the February 2011 Expert Panel's report A shared-responsibility-Apprenticeships for the 21st-century.

Action research conducted as part of the EnergiseOz Apprentice Progression Management pilot, indicates that the retirement of experienced teachers with higher level teaching qualifications is hampering RTO's capacity to design and deliver training programs. Newer trainer/assessors, who have begun teaching since the introduction of the Certificate IV TAE as a minimum standard (and consequently are much less likely to tertiary level teaching qualifications) often lack essential and in some cases, basic structured training delivery skills including lesson planning and the use of blended learning techniques, using basic IT systems to access electronic learning materials and engaging with the learning styles and needs of young people in the Facebook/Myspace era.

Industry is deeply concerned also at the loss of corporate knowledge within training providers seeking to remain in the market place in the face of continued efficiency cuts. This often means that the best training expertise is lost to providers and the system more broadly. Increasingly, the staffs of training providers are part-time or sessional. Strong evidence is emerging that this is impacting not just frontline trainer/assessors but the lack of career progression opportunities is directly impacting the management of training provision by skilled and experienced leading trainers or section/department managers.

In trade areas, such as the trades which underpin the safe delivery of energy services to our community, the quality and skills of trainers/assessors are paramount to the ongoing safety and productivity of the sector. Investment in re-establishing trade training as a viable career pathway is essential to meeting the longer term needs of industry.

Skills impact: Recent entrants into the VET workforce identify a huge learning curve from full time technical work to full time teaching and many refer to a lack of support at this time from their RTOs as a cause of discomfort and anecdotally advise this causes some trainers to return to technical roles. Given the difficulty in recruiting new entrants and the demonstrable advantages in terms of training outcomes of establishing higher level teaching skills, this is a problem that must be addressed. E-Oz supports the adoption of a Diploma of Technical Teaching qualification which incorporates industry specific units for currency verification with educational delivery and management competencies.

The intention of promoting this Diploma level qualification is not to replace the Cert IV TAE qualification but to encourage new entrants into the sector to undertake a higher level teaching qualification part time in their first year (with a part time teaching load). In this manner it is not envisioned that the Diploma will act as a barrier for new entrants but that it will encourage them by helping them to develop effective teaching and apprentice management skills.

Current Impact Of Training Packages

Impact of workforce development programs

E-Oz Energy Skills Australia continues to provide 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.

Places allocated June 2012 - Feb 2013 as Reported in 2013 E-Scan this included 585 places for E-Oz qualifications, 160 places for identified E-Oz Skill Sets and 26 places for other qualifications (771 places combined).

Qualification/Skill Set Title	Number of Places
Cert IV Business	3
Cert IV Project Management	6
Certificate II Air Conditioning Split Systems	80
Certificate IV Business Administration	1
Certificate IV Frontline Management	5
Certificate IV Hazardous Areas - Electrical	225
Certificate IV in Electrical - Instrumentation	201
Certificate IV in Electrical - Rail Signalling	29
Certificate IV in Electrical Energy Efficiency and Assessment	50
Certificate IV Training and Assessment	7
Diploma Building and Construction	1
Diploma Of Business Administration	1
Diploma Project Management	2
ACMA ‘Open’ Cabling Provider – Skill set	60
PV - Designer/Installer of Grid Connect – Skill set	100
Total	**771**

An additional 1470 training places (including adjustments) were allocated in the period Feb 2013 - June 2013. This comprised 525 places for identified E-Oz Skill sets and 945 places for qualifications in 691 E-Oz qualifications and 254 places for qualifications from other Training Packages. Skill sets places accounted for 525 places.

Qualification/Skill Set Title	Number of Places
Advanced Diploma of ESI	7
Advanced Diploma of Project Management	1
Certificate II in ESI Powerline Vegetation Control	160
Certificate III in ESI Generation	40
Certificate III in Occupational Health and Safety	99
Certificate III in Telecommunications DRT	90
Certificate IV in Air Conditioning & Refrigeration Servicing	29
Certificate IV in Electrical - Photovoltaic systems	60
Certificate IV in ESI Generation	40
Certificate IV in Hazardous Areas - Electrical	146
Certificate IV in Electrical - Instrumentation	228
Certificate IV in Electrical - Rail Signalling	-19
Certificate IV in Frontline Management	37
Certificate IV in Training and Assessment	1
Certificate IV in Work Health and Safety	15
Diploma of Management	2
Diploma of Project Management	9
ACMA Open Cabling Skill set	144
Service & Repair Carbon Dioxide Ref Systems Skill Set	88
Service and Repair of Hydrocarbon Refrigeration and Air Conditioning Skill Set	293
Total	**1470**

There was a total of 2241 NWDF places allocated by E-Oz in the 2012-13 Financial Year (including NWDF Places reported in the 2013 E-Scan).

To date, E-Oz has brokered a further 854 NWDF places in the 2013-2014 Financial year. These have mostly comprised qualifications (466) for the E-Oz suite of Training Packages. 150 places have been allocated for E-Oz identified Skill Sets and the remaining 238 places for qualifications from Training Packages including a significant allocation of 198 places to Certificate III Occupational Health and Safety. The withdrawal of 19 places for Rail Signaling training is accounted for by changes in enterprise ownership and structure leading reduced skills demand and willingness to co-invest.

Qualification/Skill Set Title	Total Places
Certificate II ESI- Powerline Vegetation Control	27
Certificate II in ESI - Asset Inspection	65
Certificate III Occupational Health and Safety	198
Certificate III Telecommunications DRT	20
Certificate IV Hazardous Areas - Electrical	90
Certificate IV in Electrical Instrumentation	284
Certificate IV Work Health and Safety	20
Service and Repair Hydrocarbon Refrigeration and Air Conditioning skill set	150
Total	**854**

As noted in 2013, the demand for post trade training (AQF 4) in Hazardous Areas - Electrical and Electrical Instrumentation has remained high over the period of this program. Over the three periods reported above Hazardous Areas Electrical training has accounted for 15% of total places allocated and 26% of demand for qualifications from the E-Oz suite of Training Packages.

In the same period the demand for Electrical Instrumentation training has been approximately 41% of qualifications from the E-Oz suite of Training Packages and 23% of all places allocated.

Whilst there has been some variation in allocations over these periods, which may be accounted for by factors such as requirements for RTOs to re-scope for new Training Package versions and delays associated with the caretaker period for the recent election there seems to be consistent demand training as a workforce development strategy. This is clearly signalled by industry enterprises continued willingness to co-invest with government in these technical skills to meet their business needs.

Electrotechnology

The tables below reflects the impact of the currently endorsed UEE11 Electrotechnology Training Package, including RTOs with current scope by jurisdiction (Table 2.1), UTE99 Qualification - Training contract status 2011-2012 (Table 2.2), UEE06 Qualification - Training contract status 2011-2012 (Table 2.3), UEE07 Qualification - Training contract status 2011-2012 (Table 2.4), UEE11 Qualification - Training contract status 2011-2012 (Table 2.5) and registered number of Photovoltaic System Installers (Table 2.6).

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.

Table 2.1: RTOs with current scope by state

Training Package	Accessed time	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Total
UTE99 (status: superseded)	February 2013	0	12	2	0	5	2	6	5	32
	January 2014	6	17	7	5	9	7	9	8	68
UEE06 (status: superseded)	February 2013	0	13	0	1	0	0	0	0	14
	January 2014	0	10	0	0	0	0	0	0	10
UEE07 (status: superseded)	February 2013	2	33	4	44	9	5	41	21	159
	January 2014	51	88	55	77	64	51	88	67	541
UEE11 (status: current)	February 2013	1	18	4	32	6	3	25	16	105
	January 2014	45	74	45	62	53	44	66	60	449

Source: Training.gov.au - RTO report (accessed January 2014)

Table 2.2: UTE99 Qualification - Training contract status

UTE99 Electrotechnology Training Package	Training contract status	
Apprentices and trainees		
Qualification	Commencements July 2012 - June 2013	In -Training June 2013
UTE30402 Certificate III in Electrotechnology Communications	0	1
UTE30699 Certificate III in Electrotechnology Data Communications	0	1
UTE30702 Certificate III in Electrotechnology Entertainment and Service	0	1
UTE30899 Certificate III in Electrotechnology Instrumentation	0	1
UTE30999 Certificate III in Electrotechnology Refrigeration and Air Co	0	17
UTE31199 Certificate III in Electrotechnology Systems Electrician	5	115
Totals	5	136

Source: NCVER, VOCSTATS (accessed January 2014)

Take-up of UEE Electrotechnology Qualifications

Table 2.3: UEE06 Electrotechnology Training Package

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

Source: NCVER, VOCSTATS (accessed January 2014)

Table 2.4: UEE07 Electrotechnology Training Package

UEE07 - Electrotechnology Training Package	Training contract status	
Apprentices and trainees		
Qualification	Commencements July 2012 - June 2013	In -Training June 2013
UEE20207 Certificate II in Business Equipment Servicing	5	6
UEE20507 Certificate II in Computer Assembly and Repair	0	1
UEE21310 Certificate II in Remote Area Essential Service	1	9
UEE21610 Certificate II in Security Assembly and Setup	2	2
UEE21707 Certificate II in Technical Support	0	5
UEE22007 Certificate II in Electrotechnology (Career Start)	1	5
UEE30107 Certificate III in Business Equipment	0	4
UEE30207 Certificate III in Computer Systems Equipment	0	6
UEE30210 Certificate III in Computer Systems Equipment	1	2
UEE30407 Certificate III in Data and Voice Communications	8	83
UEE30507 Certificate III in Appliance Servicing	2	38
UEE30510 Certificate III in Appliance Servicing	5	26
UEE30607 Certificate III in Electrical Machine Repair	5	84
UEE30707 Certificate III in Switchgear and Control Gear	6	45
UEE30807 Certificate III in Electrotechnology Electrician	1698	19300
UEE30907 Certificate III in Electronics and Communications	35	399
UEE30910 - Certificate III in Electronics and Communications	70	531
UEE31007 - Certificate III in Fire Protection Control	5	23
UEE31207 Certificate III in Instrumentation and Control	20	167
UEE31210 Certificate III in Instrumentation and Control	30	78
UEE31307 Certificate III in Refrigeration and Air-Conditioning	104	1855
UEE31407 Certificate III in Security Equipment	1	31
UEE31410 Certificate III in Security Equipment	31	68
UEE40407 Certificate IV in Electrical - Instrumentation	0	17
UEE40410 Certificate IV in Electrical - Instrumentation	10	36

UEE40707 Certificate IV in Electronics and Communications	0	1
UEE40710 Certificate IV in Electronics and Communications	1	0
UEE42210 Certificate IV in Instrumentation and Control	0	1
UEE50507 Diploma of Electronics and Communications Engineering	0	2
UEE60107 Advanced Diploma of Electrical Engineering	0	10
UEE60110 Advanced Diploma of Electrical Engineering	0	14
UEE60207 Advanced Diploma of Electronics and Communications Engineerin	0	2
UEE60210 Advanced Diploma of Electronics and Communications Engineerin	0	1
UEE60707 Advanced Diploma of Refrigeration and Air-Conditioning Engine	0	2
UEE61307 Advanced Diploma of Electrical - Technology	0	14
UEE62110 Advanced Diploma of Engineering Technology - Electrical	0	1
Total	2041	22869

Source: NCVER, VOCSTATS (accessed January 2014)

Table 2.5: UEE11 Electrotechnology Training Package

UEE11 - Electrotechnology Training Package	Training contract status	
Apprentices and trainees		
Qualification	Commencements July 2012 - June 2013	In -Training June 2013
UEE20111 Certificate II in Split Air-conditioning and Heat Pump System	3	3
UEE20511 Certificate II in Computer Assembly and Repair	1	1
UEE21611 Certificate II in Security Assembly and Set-up	5	4
UEE21711 Certificate II in Technical Support	2	2
UEE21911 Certificate II in Electronics	15	15
UEE22011 Certificate II in Electrotechnology (Career Start)	11	11
UEE22111 Certificate II in Sustainable Energy (Career Start)	1	1
UEE30211 Certificate III in Computer Systems Equipment	1	1
UEE30411 Certificate III in Data and Voice Communications	23	21
UEE30611 Certificate III in Electrical Machine Repair	15	13
UEE30711 Certificate III in Switchgear and Controlgear	5	6
UEE30811 Certificate III in Electrotechnology Electrician	6024	6884
UEE30911 Certificate III in Electronics and Communications	261	241
UEE31011 Certificate III in Fire Protection Control	3	3
UEE31211 Certificate III in Instrumentation and Control	115	104
UEE31411 Certificate III in Security Equipment	41	35
UEE32111 Certificate III in Appliance Service	26	28
UEE32211 Certificate III in Air-conditioning and Refrigeration	961	1045
UEE33011 Certificate III in Electrical Fitting	31	54
UEE40411 Certificate IV in Electrical - Instrumentation	26	28
UEE40711 Certificate IV in Electronics and Communications	3	3
UEE40911 Certificate IV in Industrial Electronics and Control	1	1
UEE41211 Certificate IV in Electrical - Rail Signalling	5	42
UEE42211 Certificate IV in Instrumentation and Control	0	1

UEE42711 Certificate IV in Air-conditioning and Refrigeration Servicing	8	8
UEE50411 Diploma of Electrical Engineering	1	1
UEE50511 Diploma of Electronics and Communications Engineering	1	3
Total	7,590	8,558

Source: NCVER, VOCSTATS (accessed January 2014)

Whilst the preponderance of enrolments remains in the electrician and refrigeration and air-conditioning trades, these statistics indicate the growth in post-trade training especially in the areas of instrumentation and control.

Significantly 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.

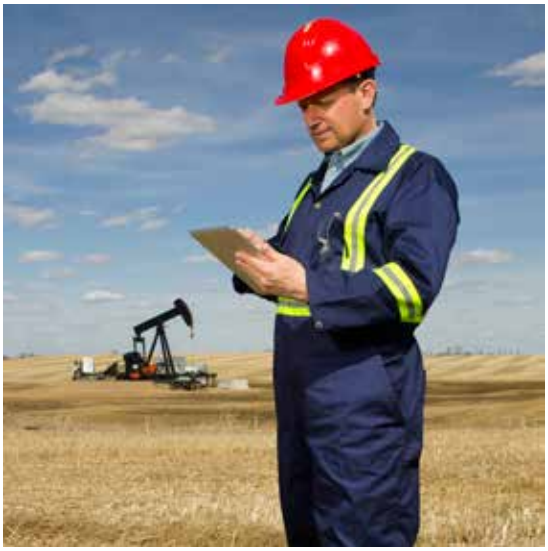
For example the key qualification for photovoltaic renewable energy design and installations UEE42011 - Certificate IV in Electrical - Photovoltaic systems is not listed in these statistics. This qualification or the related post-trade Skill Sets are required to carry out the design and installation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

The Clean Energy Council which maintains the national database of accredited designers and installers reports that there are a significant number of trained and registered electricians able to carry out this work (Table 2.6 below).

Table 2.6: Registered number of Photovoltaic System Installer, Photovoltaic System Designer and Photovoltaic System Designer/Installer

Clean Energy Council Accreditation	Number Registered
Photovoltaic System Installer	639
Photovoltaic System Designer	166
Photovoltaic System Designer/Installer	3771
Total	4576

Source: Clean Energy Council http://www.solaraccreditation.com.au (accessed January 2014)



Electricity Supply Industry

The tables below reflect the impact of the currently endorsed UET12 ESI Transmission Distribution and Rail Sector Training Package and the UEP12 ESI Generation Sector Training Package.

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 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
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
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
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

Source: Training.gov.au – RTO Report (accessed January 2014)

Table 2.8 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
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
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

Source: Training.gov.au – RTO Report (accessed January 2014)

Both the ESI sectors are characterised by being serviced by specialised RTOs, including Enterprise RTOs which either have both the technical training expertise and can access the highly expensive capital equipment necessary to provide industry training or can enter into strong industry partnerships with energy network and generation enterprises to enable them to have sufficient resources to deliver training.

Many of the latter deliver training on the basis of long standing relationships; however, there remains an issue when such relations cease to exist and the RTOs retain scope for qualifications gained on the basis of such relationships.

Table 2.9 UTT ESI TDR Qualifications

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

Source: NCVER VOCSTATS (accessed January 2014)

Table 2.10 UET ESI TDR Qualifications

UET - Transmission, Distribution and Rail	Training contract status	
Apprentices and trainees		
Qualification	Commencements July 2012 - June 2013	In -Training June 2013
UET30106 Certificate III in ESI - Transmission	0	8
UET30109 Certificate III in ESI - Transmission	5	36
UET30206 Certificate III in ESI - Distribution	0	219
UET30209 Certificate III in ESI - Distribution	107	1126
UET30306 Certificate III in ESI - Rail Traction	0	2
UET30309 Certificate III in ESI - Rail Traction	3	76
UET30406 Certificate III in ESI - Cable Jointing	0	54
UET30409 Certificate III in ESI - Cable Jointing	2	63
UET30512 Certificate III in ESI - Power Systems - Transmission Overhead	6	6
UET30612 Certificate III in ESI - Power Systems - Distribution Overhead	371	415
UET30712 Certificate III in ESI - Power Systems - Rail Traction	25	20
UET30812 Certificate III in ESI - Power Systems - Distribution Cable Jointing	16	15
UET40109 Certificate IV in ESI - Power Systems	0	2
UET40512 Certificate IV in ESI - Power Systems Substations	0	18
UET50109 Diploma of ESI - Power Systems	5	31
UET60109 Advanced Diploma of ESI - Power Systems	5	36
UET60212 Advanced Diploma of ESI - Power Systems	1	0
Total	546	2126

Source: NCVER VOCSTATS (accessed January 2014)

Table 2.11 UEP Generation Sector Qualifications

UEP – Generation Sector Training Package	Training contract status	
Apprentices and trainees		
Qualification	Commencements July 2012 - June 2013	In -Training June 2013
UEP20106 Certificate II in ESI Generation (Operations Support)	0	0
UEP30206 Certificate III in ESI Generation (Operations)	4	6
UEP40206 Certificate IV in ESI Generation (Operations)	1	3
UEP40306 Certificate IV in ESI Generation Maintenance (Mechanical)	0	0
UEP40506 Certificate IV in ESI Generation Maintenance (Electrical/Electronic)	0	0
UEP50206 Diploma of ESI Generation (Operations)	0	3
Total	5	12

Source: NCVER VOCSTATS (accessed January 2014)

Newly endorsed version of UET12 and UEP12

Version 1 of UET12 and UEP12 were endorsed in early 2012. Late in 2012 both the ESI-TDR sector and the Generation proposed amendments to the respective Training Packages. These were endorsed as UET12 Version 2 and UEP12 Version 2.

Table 2.12 UET12 ESI –TDR Sector 2012 amendments

Training package	Qualifications	Competency Standards	Imported Units
UET12 ESI TDR Sector Training Package			
Release 1	13 new qualifications	205 new units	103 new imported units
	11 replaced qualifications	190 replacement units	
Release 2	1 amended qualification	2 new qualifications	

Table 2.13 UEP12 ESI –Generation Sector 2012 amendments

UEP12 ESI – Generation Sector Training Package	Qualifications	Competency Standards	Imported Units
Release 1	12 new qualifications	43 new units	104 new imported units
	11 deleted qualifications	182 Amended units	16 imported units removed
	79 units removed	25 units imported updated	
Release 2	1 new qualification	14 new units	
Release 3	13 updated qualifications	5 amended units	2 added skill sets

Gas Supply Industry

The tables below reflect the impact of the currently endorsed UEG11 Gas Industry Training Package, 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 2.3 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
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

Source: Training.gov.au - RTO report (accessed January 2014)

Table 2.15 Enrolment by qualification in UEG Gas Industry Training Package

UEG Gas Industry Training Package	Training contract status	
Apprentices and trainees		
Qualification	Commencements July 2012 - June 2013	In -Training June 2013
UEG20211 Certificate II in Gas Industry Pipeline Operations	10	8
UEG30106 Certificate III in Gas Industry Operations	0	19
UEG30110 Certificate III in Gas Industry Operations	0	2
UEG30211 Certificate III in Gas Supply Industry Operations	12	11
UEG40106 Certificate IV in Gas Industry Operations	2	32
Total	24	73

Source: VOCSTATS (accessed January 2014)

Future Directions For Endorsed Components Of Training Packages

Migration to Standards for Training Packages

In 2014-15 E-Oz will transition of all Training Package components so that they comply with the Standards for Training Packages endorsed by the NSSC in November 2012.

This will incorporate the restructuring of all existing units to meet the requirements of the policy including the mandated templates for the new Unit of Competency and Assessment Requirements for each currently endorsed to include:

- Redevelopment of the current Unit Descriptor, Application and Licencing/Regulatory requirements statements into a single application statement
- Inclusion of Foundation Skills
- Specification of the range of conditions
- Specification of knowledge evidence and mapping to performance criteria
- Specification of performance evidence and mapping to performance criteria
- Specification of assessment conditions including assessor competencies and experience requirements

Additional to these requirements is the need to develop a least one Training Package Companion Volume per Training Package.

The increased specificity required by this template and the need to ensure technical/regulatory requirements are explicit has meant the E-Oz has undertaken the development and appropriate language based strategy for the migration. This work has required some analysis of the new relationships between the two parts (Unit of Competency and Assessment Requirements) of the template as well as the internal relationships between sections of each template.

The task will involve considerable effort on behalf of the ISC and its industry stakeholders who contribute their expertise to the development and endorsement of Training Package components. A total of 1186 native units and 511 imported units currently included in the E-Oz suite of Training Packages will need to be migrated comprising:

- UEE 612 Units plus 89 Imported
- UET 224 Units plus 105 Imported
- UEP 241 Units plus 157 Imported
- UEG 109 Units plus 160 Imported

It will be important for industry that equivalence of outcomes is maintained where possible. To minimise disruption to training programs this must be facilitated at least at the qualification and preferably at the unit level.

However, E-Oz recognises that under the migration process, the requirements of the new policy combined with review and development work to be undertaken by industry will mean that some existing competencies may be replaced, amended, split or combined to better describe industry competency requirements.

Migration Strategy

Within the E-Oz Suite of Training Packages the primacy of AQF 3 qualifications which are delivered via Trade Apprenticeship and lead to regulated outcomes is recognised by stakeholders. These qualifications typically have significant training effort (nominal 48 months) and the highest levels of usage, which means that disruption must be minimised for users.

These also provide essential skills which underpin the higher level skills at AQF 4-6. These are also essential to the appropriate identification of AQF 1-2 qualifications as pathways to higher qualifications.

Accordingly, the overall strategy for migration will be based on the re-development of components associated with the AQF 3 qualifications as a platform for the re-development other components which comprise other AQF levels.

This will ensure that key industry qualifications are migrated first so that industry can move forward with these as the basis for further migration.

E-Oz is also aware that there will be over 500 units imported from other Training Packages which will need to be incorporated into Energy Skills Australia's suite of qualifications. Managing the migration process to minimise re-work and associated re-versioning of Training Package qualifications will require monitoring and coordination with other developers.

Parallel with the migration processes E-Oz needs to continue to support industry enterprises with the development and endorsement of new and revised components as indicated in the current impacts and future directions of Training Packages sections of this document which inform the E-Oz Training Package continuous improvement plan.

UEE Electrotechnology Training Package

The UEE Electrotechnology Training Package covers the broad scope of design, specification, installation and maintenance of commercial, industrial and residential electrical, electronic, data communications and refrigeration and air conditioning systems across the economy.

Accordingly, the future directions of this area are diverse. Within this diversity however there is the common theme of achieving energy efficiency via smarter integrated technologies.

To better align with industry needs and provide suitable career pathways, research and development activities at the qualification level will include:

- In recognition of the increased complexity of energy efficiency roles requirements, investigation of developing a dual level trade structure in the Refrigeration and Air Conditioning trade to incorporate:
  - AQF 3 level trade
  - AQF 4 level advanced
- Investigation of alternate pathways in AQF 3 appliance servicing qualifications to provide for enterprises which service a variety of appliances including
  - Service refrigeration and air conditioning equipment
  - Servicing of smart appliances
  - Servicing of fixed and plug in restaurant beverage machines
  - Maintenance of evaporative coolers
-

- Investigation of the intended job role outcomes of a proposed Diploma of Engineering Technology - Renewable Energy, incorporating
  - Industry demand for non-licenced design and technical support staff
  - Identification of appropriate skills and associated units
  - Assessment of outcomes against existing qualifications
- Research of an AQF 3 level qualification to provide skills for Electronics and Computer systems installers and first line support to determine:
  - Industry demand for these job roles
  - Assessment of outcomes against existing qualifications and units
  - Identification of appropriate skills and associated existing units
  - Identification of required new or amended units
- Energy Storage via battery technology is predicted to contribute significantly to energy efficiency and network peak demand management. E-Oz will conduct research across the related, electrical, renewable energy and electronics/control disciplines to identify the need for new post-trade qualifications in the design, specification, installation and maintenance of battery technology in premises, local areas or district/regional scales, incorporating
  - Technical requirements of current systems and technologies
  - Technical attributes of systems and technologies under development
  - Skills requirements for deployment of these technologies and appropriate AQF levels of these
  - The need for and design of new or amended qualifications within the UEE Training Package
- Industry stakeholders from systems integration enterprises have highlighted the need for a significant review and extension of UEE Electrotechnology Training Package qualifications and units relevant to systems integration, especially in relation to the deployment of various multiple services and technologies which connect to common data communications services for the purposes of control, monitoring and reporting. Accordingly, E-Oz will engage with industry enterprises and stakeholders to confirm these requirements and identify appropriate training responses. This research and development may impact a number of qualifications at AQF level 3 and higher.
- The requirements of WHS regulations and the use of flammable natural and synthetic gases as refrigerants means that industry must establish appropriate training requirements for operatives working with these gases and related equipment. Investigation of these requirements will determine the extent of new or existing competencies required to be included in electrical, refrigeration and air conditioning qualifications related to electrical work in hazardous areas.
- In 2014 the Australian Communications and Media Authority (ACMA) will review its cabling provider rules and related training requirements. E-Oz will need to engage with ACMA and registering bodies to ensure that qualification and competencies are amended or developed to align with these requirements including endorsement to registrations for Fibre-Optic work.
- E-Oz will undertake further engagement with Engineers Australia on the inclusion of requirements for alignment to the Dublin Accord in the Advanced Diploma qualifications in the Electronics and Computer Systems Engineering. Outcome may include the development or amendment of new and existing qualifications.
- Six new units are programmed to be developed for High Voltage Maritime Propulsion systems which will be incorporated into the revised Certificate IV in Electrical Equipment and Systems, Diploma and Advanced Diploma of Electrical Systems Engineering.
- Units addressing Energy efficiency outcomes in Vapour Compression Systems and assessing HVACR energy loads will be developed an incorporated into relevant refrigeration and air conditioning qualifications along with components for end of life recovery of refrigerants.
- Industry has also indicated the need to research the development of AQF 8 Graduate Certificate and Graduate Diploma qualifications to provide vocational skills to engineering staff in the following disciplines:
  - Instrumentation & Industrial Control
  - Refrigeration and Air Conditioning
  - Electronics and Computer Systems
  - Electrical and Data Communications

UET Transmission Distribution and Rail Sector Training Package

Development work in the UET Training Package will be mainly at the unit of competency level and focus on the following areas:

- Identification of relevant existing units or the creation of new competency standards for fatigue management to be included in the systems discipline and related qualifications at AQF 4-6.
- The review of existing units and the development of new power system switching units in the new template
- Research and development of new introductory systems operations units to improve pathways
- In the vegetation control discipline within UET improvements will include:
  - New units required covering trimming vegetation within the Exclusion Zone using insulated equipment/tools
  - Research and development of an appropriate vegetation control refresher training competencies to improve safety and workforce mobility.
- Research of the skills impacts of on-grid energy storage using battery technology for the ESI Transmission, Distribution and Rail Sectors including, identifying and developing any new competency standards for:
  - ESI systems operators
  - Trade level lineworkers
  - ESI asset inspectors
  - Network design and infrastructure technicians
  - Testing and protection technicians
- To improve the pathways for skill development for ESI engineering staff the sector will investigate the need for graduate diplomas and graduate certificates and their applicability to disciplines to the systems operations, testing and protection, electrical engineering and power systems disciplines with UET.
- Incorporating newly drafted design discipline units into a new AQF 4 qualification in UET Training Package.

UEP Electricity Supply Industry – Generation Sector Training Package

The generation sector needs to continue to maintain its existing skills base whilst creating pathways to new skills as new technologies are adopted. The following activities target these goals:

- In consultation with Safe Work Australia and jurisdictional WHS/OHS regulators work to migrate the existing high risk units for pressure equipment and the specification of mandated assessment instruments to the new units template, including:
  - Any revisions or amendments of the existing standards required
  - New Skills Sets for the High Risk Work Licensing on Steam Turbines and the Advanced Boiler competency managed by Manufacturing Skills Australia
- In the renewable energy discipline industry will extend the pathways available for accessing competencies developed for large scale wind generation by:
  - Developing Skills Sets for wind turbine generation units with appropriate electrical fitter or electrical licence entry requirement.
  - Providing for wind turbine generation units to be included as electives in appropriate post-trade AQF 4-5 qualifications.
- Developing Skills Sets that address pathways to the streams offered by the higher-level electives in the existing qualifications including for:
  - Generalist, mechanical, electrical, and control systems operatives.
  - High Voltage Operation – HV Switching
  - High Voltage Operation - Development and coordination of HV switching programs
- Research and develop a new Certificate III in ESI Small Islanded Power Generation - Operations and Maintenance qualification using existing and specifically identified units of competency to ensure appropriate skills are incorporated.
- Investigate career progression pathways from existing AQF 2 Remote Areas qualifications:
  - Pathways to existing qualifications
  - The development of a Certificate III in Remote Area Supply to provide for career progression
- Engage with enterprises on the identification and development of new units of competency at appropriate AQF levels to address operational and maintenance skills for the deployment of waste to gas - biomass micro-turbine generation systems
- Research and identify an appropriate structure for a Generation Skills Passport which builds on the model adopted in the Transmission, Distribution and Rail sector.
- Investigate and identify generation sector skills needs emerging from the adoption of battery technology energy storage at various scales to enable generation enterprises access skills to deploy these systems at a level which suits the business model.

UEG Gas Industry Training Package

The UEG11 Gas Industry Training Package has undergone an extensive, industry led review resulting in UEG11 Gas Industry Training Package Version 2. UEG11 Version 2 provides the Gas Industry with strengthened qualifications from which it will migrate to the NSSC endorsed Standards for Training Packages. Currently scoped development effort which will contribute to the future direction of the UEG Training Package comprises:

- Conducting ongoing research on industry job roles and their alignment with qualifications within the UEG Training Package. This work will focus on:
  - Determining if new qualifications should be developed
  - Identifying elective pathways for job roles within existing qualifications
  - Further work on qualification based career pathways within the industry
- Preliminary research conducted as part of the development of UEG11 Version 2 suggested that there may be a need for AQF 8 Graduate Certificate and Graduate Diploma qualifications to provide vocational skills to engineering staff. Further research will be conducted to determine:
  - The requisite skills for engineering staff
  - The type qualifications – Graduate Certificate or Graduate Diploma
  - The appropriate of units required to address these skills
- The Gas industry has not yet engaged with the application of the Australian Core Skills Framework (ACSF) to identification and communication the Foundations Skills requirements for units of competency within the Training Package. This work will need to be carried out to inform the redevelopment of the Training Package, including:
  - Application of the methodologies developed to identify and incorporate ACSF levels into the Electrotechnology and Electricity Supply Industry Training Packages
  - Validation of identified ACSF levels
  - Development of appropriate support information
  - Identification of suitable units to be imported from the FSK Foundation Skills Training Package to support Gas Industry skills development

Unmanned Aerial Vehicle (UAV or Drone) Technology

The proliferation of UAV technology at various scales has been widely noted in the media. These systems can clearly add value when applied to various activities in the energy sector industries which are currently rely on either manned aircraft and/or ground based activities to carry out a range of tasks. These are principally related to asset surveillance, asset inspections and emergency responses. UAVs offer advantages in terms of:

- the level/detail of inspection or surveillance
- access to remote, damaged or dangerous sites
- reduced risk to personnel and equipment
- data collection including GPS tracking, data logging and real time imaging in various spectra
- lower costs of inspection and surveillance
- increased regularity of inspection and surveillance
- faster and better coordinated emergency responses

E-Oz will examine the application of this technology to energy sector activities and develop appropriate training standards for its application to relevant work activities including but not limited to:

- Gas pipeline surveillance
- Electricity distribution and transmission line surveillance
- Electricity supply asset inspection
- Generation asset inspection
- Electrical inspections
- Emergency response planning and management
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Notes

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