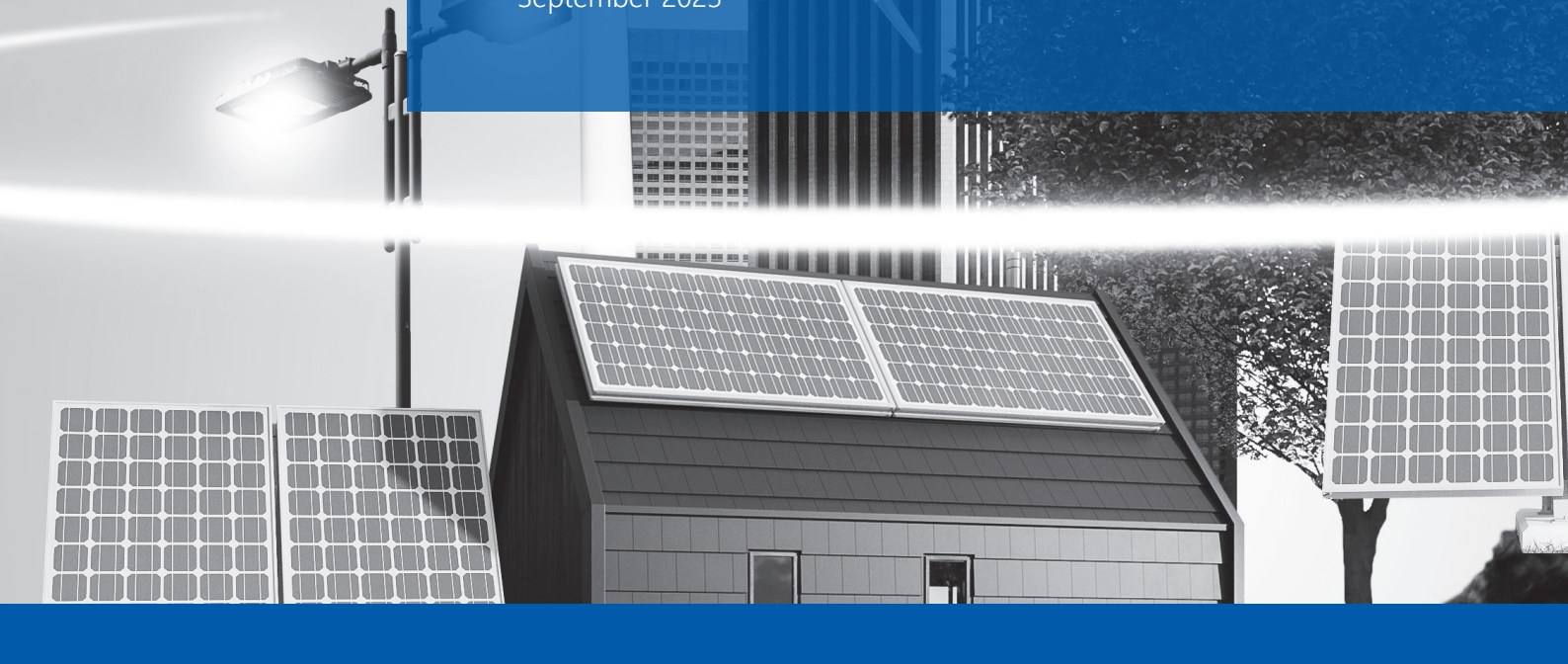
national electrical and communications association

Submission to the Senate Inquiry into Residential Electrification

By the National Electrical and Communications Association for the Senate Economics References Committee

September 2023



Overview

The National Electrical and Communications Association (NECA) provides this submission in response to the Senate Inquiry into Residential Electrification.

NECA and its members are highly engaged in this space, particularly in the energy and electrotechnology sector and the design, installation and maintenance of the relevant infrastructure and systems required to achieve electrification.

NECA is the peak body for Australia's electrical and communications industry, which employs 344,370 people and turns over more than $82bn annually. NECA represents over 6,500 businesses performing works including the design, installation, and maintenance of electrical and electronic equipment in the construction, mining, air conditioning, refrigeration, manufacturing, communications, security, automation, and renewable energy sectors.

344,370

Workers in the sector

$82B

Annual Turnover

6,500

NECA member businesses nationally

NECA has advocated on behalf of the electrotechnology industry for over 100 years and helps its members and industry operate in an efficient, safe, and regulatorily compliant manner.

NECA represents the interests of electrical and communication businesses to all levels of government and in regulatory, legislative and industry development forums. It is also a foundation member of the Australian Chamber of Commerce and Industry (ACCI).

NECA members make an essential economic contribution – connecting businesses, homes, and infrastructure – encouraging investment, improving reliability and energy security, and delivering affordable, environmentally sustainable outcomes. The safety and reputation of the electrical industry is critical to tradespeople, consumers, and the community.

NECA also plays an integral role in the development of the next generation of Australia's electrical and communications tradespeople and contractors.

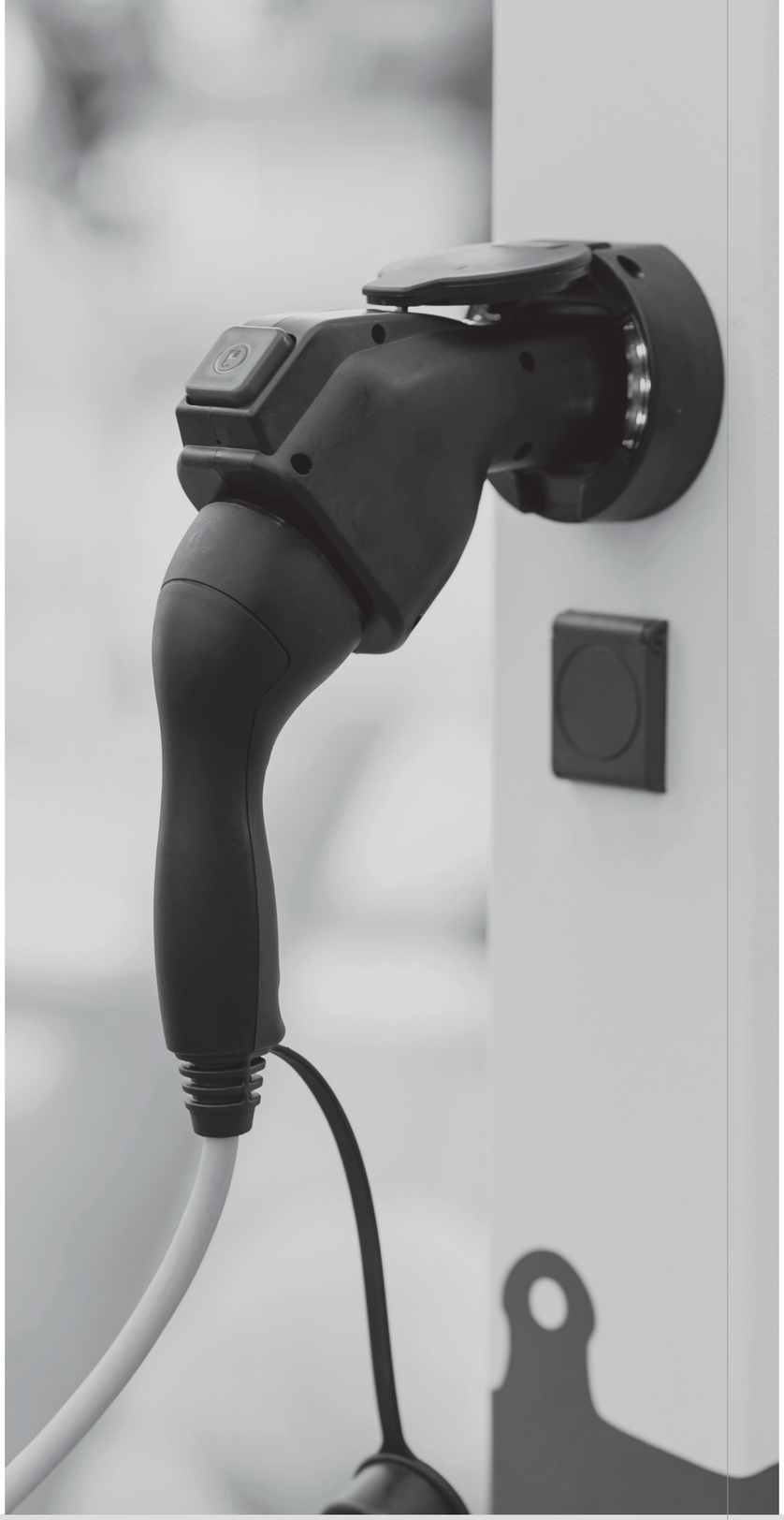
Through its associated Group Training Organisations (GTOs) and Registered Training Organisations (RTOs), NECA offers employment and trade training to some 4,800 apprentices nationally.

Its success is clear: NECA GTO's and RTO's boasts a consistent minimum 90% apprenticeship completion rate, compared to the national average of just 55%. Our female participation in apprenticeships sits above 15% against an industry average of less than 5%.

NECA delivers high-quality holistic, industry-relevant programs, including pre-apprenticeship, apprenticeship, and post-trade accredited and industry-specific training to the electrical and communications industry.

It proactively strives to build diverse workforces, supporting First Nations and mature aged apprentices and promotes career paths to school students and school leavers, in consultation with schools and community.

Introduction



NECA commends the Senate Economics References Committee for undertaking this important inquiry into residential electrification.

This submission aims to provide a summary analysis of the opportunities, barriers, costs, benefits, and other relevant aspects associated with household electrification.

In embarking on this analysis, NECA would like to identify some broad concepts of residential building electrification that will help inform the analysis. Those being:

1. **Basic electrification** – whereby existing buildings that do consume energy directly from fossil fuel combustion undertake conversions to receive and/or consume energy only via electrical energy.
2. **Enhanced electrification** – whereby buildings are also modified/converted to include additional electrical functions such as generation, battery energy storage, EV charging components, and demand management systems.
3. **Community based residential electrification** – whereby local infrastructure/facilities are established to service multiple buildings or community.

Economic Opportunities of Residential Electrification

The economics of energy production, transmission/distribution, and consumption are complex and evolving.

However, the electrification of residential buildings presents opportunities to complement and substantially reduce the size of the grid scale efforts required to de-carbonise and maintain system stability and reliability at the same time.

Those opportunities will be maximised in the case where household generation, storage, and bi-directional energy management (Consumer Energy Resources – or CER) technologies are encouraged and integrated into the electrification and network planning models.

The potential benefits of getting these aspects right are:

- Reducing/leveling the peak demand on network infrastructure and thereby deferring the need for additional network capital investment and high cost 'peaking plant' generation facilities.
- Enabling broad scale participation in energy production, storage and/or other energy services.
- Offsetting the increase in required electrical energy due to:
    - o The household replacement of gas appliances and plant, and;
    - o EV charging.

Alternatively, failure to utilise the potential of wide scale enhanced residential electrification could lead to an inefficient mix of:

- High operating costs associated with the traditional network planning, AER regulation and National Electricity Market (NEM) operation.
- CER implementation that does not contribute to demand levelling or system reliability/stability and a need for the market operator to shed (waste) installed capacity to maintain minimum operational demand.[1]
- Benefits accruing only to participants with the means to make significant capital investments to reduce their own exposure to rising retail energy costs.

With respect to long term employment opportunities, the shift to full residential electrification will stimulate employment opportunities in multi-disciplinary engineering and electrical construction and services sectors, as the demand for workers with the skills to design, construct, maintain, and integrate elements of residential electrification solutions will be considerable, fostering job creation and overall economic growth.

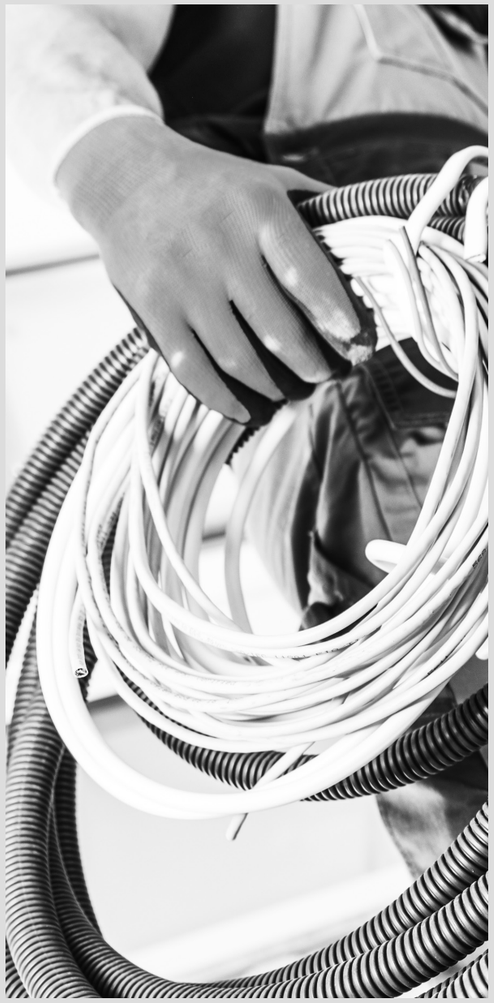
To elaborate further, any residential electrification project that goes beyond basic electrification, and many that don't, will require considered designs and skilled workers to install and maintain.

[1] https://www.aemo.com.au/-/media/files/learn/fact-sheets/minimum-operational-demand-factsheet.pdf?la=en

Macro-barriers to Residential Electrification

NECA submits that the following items are substantial barriers to the large-scale uptake of residential electrification:

- Consumer awareness / apprehension with respect to the benefits of electrifying their property versus the upfront expense of doing so.
- Consumer uncertainty / difficulty with respect to obtaining trustworthy advice on the most appropriate and cost-effective electrification solution for their property.
- Variations in network planning and connection policies between the geographic footprints of Distribution Network Service Providers (DNSPs), even those within the same state, provide for differing experiences, opportunities and barriers for consumers/planners when initiating electrification projects and local generation/storage capability.



- Regulatory reform is required in this respect to:
  - » Standardise/normalise the technical requirements for DNSPs to manage Distributed Energy Resources (DER) and bi-directional power flow.
  - » The operation of the National Electricity Market (NEM) to foster participation and a ROI for those that do install CER technologies.
- Limited penetration of smart meter technologies to enable real-time network demand monitoring and advanced planning activities.
- Lack of co-operative planning frameworks between DNSPs and local government authorities to secure appropriate locations and connections for community batteries.
- Inconsistent strata and planning regulation/policies across each jurisdiction, specifically around the implementation of EV charging stations on residential blocks and surrounding community infrastructure.
- Resistance from local government to allow state and federal policy to be implemented at a macro level, threatening local government's scope and role.
- Inadequate skilled workforce numbers required to competently design, implement and maintain the volume of building systems and hardware to manage electrification.
- Lack of incentive(s) for landlords to participate in/spend the capital to provided for enhanced electrification or improve the energy efficiency of their property.

Upfront Costs to Consumers

For new builds, the cost of mandating electrification is relatively minor, as those buildings are engineered, specified and built to be electrified and potentially include advanced functions to limit / manage demand.

For existing dwellings/buildings the costs may be considerable, including:

- Replacement of non-electrical appliances and plant (typically gas fuelled water / space heating / cooking appliances) along with associated new wiring.
- Design and installation of additional building wiring to cater for other equipment to enhance electrification capabilities (e.g. EV charging, BESS, solar installations etc) and/or manage demand.
- Switchboard modifications and/or upgrades to meet increased demand, additional functions, smart metering and/or general safe installation requirements.
- Augmentation of existing network service connections/facilities, particularly to existing multi-occupancy installations.
- Engineering designs and/or building modification to accommodate equipment requirements and/or meet construction standards.

These costs will vary considerably between individual buildings however, any that:

- Require conversion to electrify; or
- Wish to participate in enhanced electrification will require assessment/ planning by competent professionals, and will incur electrical wiring costs including many that will require switchboard replacements.

1. HOUSE, DWELLING WITH INDIVIDUALLY METERED SWITCHBOARD

Basic Electrification	Replacement of gas appliances	Water $3,000 - $5,000 Cooking $2,000 - $4,000 Space heating $7,000 - $20,000
	New appliance wiring	$1,000 - $3,000
	Possible switchboard replacement / upgrade	$2,000 – $6,000
	Range	**$3,000 - $38,000**
Enhanced Electrification	Solar system installation	$6,500 - $25,000 ($1,300 / kW with STCs)
	EV charger	$3,000
	BESS	$6,000 - $15,000; @ $1,200K / kWh
	Range	**$3,000 - $43,000 (additional)**

2. HOUSING DEVELOPMENTS WITH CENTRALISED METERING (NOT UNITS)

Basic Electrification	Replacement of gas appliances (individual)	Water $3,000 - $5,000 Cooking $2,000 - $4,000 Space heating $7,000 - $20,000
	New appliance wiring	$1,000 - $3,000 per dwelling
	Possible switchboard replacement / upgrade	$2,000 – $6,000 per dwelling
	Submain replacements	$1,000 – $3,000 per dwelling
	Range	**$3,000 - $36,000 per dwelling**
	Possible shared switchboard replacement / up-grade.	$5,000 - $15,000
	Possible increase in network connection capacity	$5,000 - $20,000 (assumes local network capacity available)
	Range shared (body corporate)	**$10,000 - $35,000**
Enhanced Electrification	Solar system installation	$6,500 - $25,000 ($1,300 / kW with STCs) per dwelling
	EV charger	$3,000 per unit
	BESS	$6,000 - $15,000 per dwelling; @ $1,200K / kWh
	Range	**$3,000 - $43,000 (additional per dwelling)**

3. UNIT BLOCKS

Basic Electrification

Replacement of gas appliances (individual)	Per dwelling Cost of electrical appliance(s) Water $0 - $4,000 Cooking $2,000 - $4,000 Space heating $1,000 - $7,000
New appliance wiring	$1,000 - $3,000 per dwelling
Unit distribution board replacement	$1,000 - $2,000 per dwelling
Shared switchboard replacement / upgrade	$20,000 - $50,000 (Shared – body corporate)
Submain replacements (MSB to distribution points)	$2,000 - $10,000 (Shared – body corporate)
Range	**$3,000 - $18,000** **(per dwelling and share of body corporate)**

Enhanced Electrification

Solar system installation	$6,500 - $25,000 + ($1,300 / kW with STCs) per dwelling
Commercial EV chargers	$5,000 per charger
BESS	$15,000 - $100,000
New wiring / plumbing / building works and control panels	Subject to engineering design and installation costs
Possible augmentation of network connection	$20,000 - $150,000 + (dependent on increase and local capacity)
Range	**$20,000 - $100,000 +** **(shared - body corporate)**

Upfront Costs to Distributed Network Service Providers (DNSPs)

Upfront costs to DNSPs will be incurred in upgrading / modifying network hardware to:

- Accommodate increased localised demand.
- Manage local demand.
- Accommodate community-based battery installations, micro-grids, bi-directional power flow.
- Manage power quality, reliability, distributed energy sources.

The quantum of these upfront costs is probably best commented on by the DNSPs.

Key Recommendations

1. The marginal cost of abatement for household electrification compared to alternative sectors and options to decarbonise the economy.

The inclusion of household and local community BESS in residential electrification policy is critical to securing the viability of renewable energy sources (local or large scale) to offset reduction of fossil fuel energy and provide other energy services (network reliability/ stability).

NECA would recommend to the committee the contents and analysis of:

- The 2019 report prepared by AECOM titled *'Grid vs Garage - A comparison of battery deployment models in providing low voltage network support and other services'* [2] which provides a detailed analysis of the economic viability of BESS versus traditional network economics, and;
- The 2022 paper titled *'The unexpected disruption: distributed generation'*[3] which looks at the potential for distributed generation and the opportunities to reduce traditional infrastructure expenditure.

2. The optimal timeline for household electrification accounting for the likely timing of decarbonising electricity.

NECA would suggest that the optimum timeframe for complete household electrification would be within the decade prior to the global net zero target of 2050.

NECA considers this a reasonable timeframe to:

- Enable government and regulators to communicate and implement policy and legislation.
- Enable the training and development an electrical workforce capable of performing the electrical installation work and integrating the enhancing technologies into those installations, and then maintaining that equipment as needed.
- Address the considerable volume of existing installations that will require conversions of some kind.

It is anticipated that the conversion of the population of existing multi-occupancy installations will present additional engineering and administrative challenges.

[2] https://arena.gov.au/assets/2020/04/arena-grid-vs-garage.pdf
[3] https://download.schneider-electric.com/files?p_Doc_Ref=DistributedGeneration

3. The impacts and opportunities of household electrification for domestic energy security, household energy independence and for balance of international trade.

With respect to household energy independence, NECA would suggest that genuine energy 'independence' is effectively unachievable for the majority of households.

A more realistic concept would be the ability of households to offset their own energy consumption and/or export surplus energy and/or provide other energy services via the technologies available for electrification (e.g. BESS and VPP).

4. The impacts of household electrification on reducing household energy spending and energy inflation as a component of the consumer price index.

As previously indicated, if residential electrification is introduced and implemented in a way that maximises the contribution and efficiency of CER technologies and their interaction with DNSP networks then the exposure of all consumers to escalating energy (particularly peak tariffs) and transmission costs will reduce.

5. Solutions to the economic barriers to electrification for low-income households.

The introduction of storage capacity into the grid through CER would undoubtably have the effect on lowering electricity pricing for all.

Whilst those consumers with CER assets will most likely gain access to TOU and generation tariffs that provide for a return on their investment there will still be need for many consumers access a default flat, general light, and power tariff where they are less able to engage in CER.

If retailers embrace the offering of innovative products such as VPPs (Virtual Power Plant) [4,5] , there could be energy plans available to those in rental accommodation, or low-income cohorts, or dwellings that are unsuitable / impractical for CER installations, that could still offer reductions on current electricity pricing, without having to invest directly in CER infrastructure.

With respect to rented dwellings, where tenants obviously have a limited capacity engage with electrification or improve the buildings energy performance, policies such as those adopted in the ACT[6] or France[7], requiring minimum standards

[4] https://en.wikipedia.org/wiki/Virtual_power_plant
[5] https://www.solar.vic.gov.au/virtual-power-plant-pilot
[6] https://www.justice.act.gov.au/renting-and-occupancy-laws/energy-efficiency-standards-for-rental-homes
[7] https://build-up.ec.europa.eu/en/news-and-events/news/understanding-energy-performance-certificates-france

of efficiency are likely to be effective in incentivising landlords and body corporates to invest in suitable building improvements.

Governments should also convert social housing and government building infrastructure to the CER network and offer incentives for landlords to invest in the installation of CER infrastructure on investment properties.

6. The effectiveness of existing federal, state and local government initiatives to promote and provide market incentives for household electrification.

Government incentives for solar installations have created a significant demand and market for rooftop solar PV with some local innovation taking place.

Regrettably, the incentives have also attracted poor quality providers and evidence of fraudulent conduct, resulting in numerous examples of non-compliant installations, ineffective installations and poor work practices.

NECA would recommend the provision of incentives similar to the STC's for the provision of residential BESS subject to the government resolving the disparate approaches by DNSP's to installations with BESS.

NECA would also caution that additional controls be implemented to prevent fraudulent claims, non-compliant equipment and unsafe installations.

7. Australia's current standing against international standards, particularly with respect to the uptake of rooftop solar, batteries and electric household appliances.

The per capita rates of uptake for household solar generation and batteries are well documented and indicate that the Australian population are participating in those technologies at a high rate compared to other countries.

Whilst this is positive news, NECA understands that Australia's residential energy transition is largely being deployed using locally developed standards such as,

- AS/NZS 4777.1 Grid connection of energy systems via inverters Installation requirements;
- AS/NZS 4777.2 Grid connection of energy systems via inverters Inverter requirements;
- AS/NZS 5033:2021 Installation and safety requirements for photovoltaic (PV) arrays;
- AS/NZS 4755.x Series on demand response capabilities and supporting technologies;
- AS/NZS 5139 Electrical installations - Safety of battery systems for use with power conversion equipment.

This reduces our ability to capitalise on the latest international developments. Australia needs to participate and align globally with Global OT cybersecurity standards, Home Energy Management System (HEMS standards) and ISO 60364 learnings.

State based regulators and grid operators are also creating divergent approaches across the country, thus exacerbating the situation. We need national policy and technical leadership that brings all stakeholders to the table.

Importantly that leadership should promote optimum technical solutions over competing economic and market considerations.

8. Additional matters identified

NECA would like to identify the further challenges with respect to the training and upskilling of a workforce capable of designing, installing and maintaining the CER systems required to deliver the benefits of an effective transition to universal residential electrification.

Specifically, the current structural deficiencies in vocational training for the electrotechnology trades which are contributing to:

1. Poor quality tuition and/or dangerously inadequate assessments of competence by RTOs that are either marginal with respect to industry involvement and engagement or with respect to profitability in delivering the qualification thoroughly.
2. Chronically low completion rates and difficulty in attracting/retaining trainees from diverse backgrounds, in particular female participation.

The structural deficiencies include:

- Inadequate regulation by ASQA with respect to investigating complaints about non-compliant/aberrant RTO activity.
- Inadequate government funding (state/federal) to RTO's for the base qualification.
- Inadequate efforts to monitor and support the progress, development and well-being of apprentices in the workplace during the term of the apprenticeship.

Industry Priorities

NECA is well placed to offer strategic advice on the problems identified above given its success in exceeding industry standards regarding retention, completion, migration assistance and apprentice and post trade training in our sector.

To address our workforce needs, a dedicated plan is necessary.

This plan should include the following components:

1. **Increased mentoring for apprentices:**

   This plan should secure active mentoring and assistance to apprentices, aiming to increase the number of apprentices who successfully complete their training and remain in the sector.

2. **Funding for industry led not-for profit Registered Training Organisations:**

   This involves providing dedicated funding for institutions that offer training in the energy sector.

   Specialised industry-led centres should be established and equipped with the latest technology to train apprentices and post-trade students using modern methods.

3. **Attracting and retaining apprentices:**

   This includes making improvements to attract and retain apprentices and trainees, especially those from underrepresented groups like women, First Nations, mature age and culturally and linguistically diverse (CALD) workers.

4. **Mobility and transition:**

   Ensuring that training and licensing are consistent across the nation, enabling workers to move freely between different areas.

   Alternative pathways should be available for those who want to switch careers or industries, especially in regions or sectors facing changes.

5. **Migration:**

   Supporting overseas tradespeople to attain the same level of expertise and dedication as those in the sector.

   This not only enhances the sector's reputation but also promotes Australia as a welcoming and diverse society.

   Reputable industry led organisations must ensure the quality of not only training, but the experience and training obtained internationally while ensuring the safety and quality of Australia's system is not compromised.

   The pathway for these workers to obtain a licence is through the state and territory systems of licence recognition, which in turn, relies on the integrity of Registered Training Organisations (RTO) who may not ensure that critical competencies are achieved and recorded to support a robust licensing system.

   Previous experience has shown that candidates will have non-trade qualifications 'reverse engineered' to achieve a Certificate III Electrotechnology, apply for a licence in a less regulated jurisdiction, and then claim mutual recognition in another jurisdiction.

   This weakens the entire licensing system.

   It will be critical to provide a more robust industry led system or program and ensure the process is adequately resourced to deliver expedient, high-quality skills verification and gap training of overseas trained electrical workers.

6. **Powering Australia skills cluster:**

   Recently funded by the Federal Government, this initiative will need to respond directly to the rapidly changing skill requirements of the energy sector.

Risks of Electrification

While residential electrification presents numerous benefits, it is essential to acknowledge and address the associated safety risks.

Poorly installed electrical systems or faulty equipment can pose risks such as electrical shocks, fires, or other hazardous incidents.

- Strict product and installation standards are required to mitigate the risk to the occupants of buildings with CER elements.
- Comprehensive regulations, and regular inspections are crucial to ensure the safe implementation and maintenance of electrification projects.
- Persons working on/with the elements of electrified buildings need to be fully trained and competent to deal with the potential hazards of that equipment.

Businesses engaged in such work must ensure that their workers are equipped with the appropriate information, training, instruction and supervision[8] to protect them from harm.

To this end, additional specific requirements may be needed for businesses working on or near installations with generation / storage elements need to have thorough information and systems to ensure hazards are controlled.

[8] Model WHS legislation s19 Primary Duty of Care

Summary

In conclusion, residential electrification presents immense economic, environmental, and social opportunities for Australia.

By addressing the technical and macro-barriers, including inadequate infrastructure and risks associated with substandard equipment, we can pave the way for a successful and sustainable transition to electrified households.

The training and upskilling of a new generation of modern electrical workers will provide rewarding, secure and well-paid vocations.

Investment in training will be required by industry and government alike.

We appreciate the opportunity to contribute to this inquiry and look forward to the positive outcomes it will bring.

NECA seeks to work constructively with the Department, and the Federal Government, on this important task.

To discuss details outlined in this submission, please contact NECA's Head of Government Relations and Regulatory Affairs, Mr Kent Johns via email: kent.johns@neca.asn.au or phone 0467 660 110.

Yours sincerely

Oliver Judd

Chief Executive Officer
National Electrical and Communications Association (NECA)