Training and skills study

New England Regional Major Infrastructure Studies

NSW GOVERNMENT

December 2025

Acknowledgement of Country

The Energy Corporation of New South Wales acknowledges that it stands on Aboriginal land. We acknowledge the Traditional Custodians of the land and we show our respect for Elders past and present through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places in which Aboriginal people are included socially, culturally and economically.

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Introduction

Renewable energy zones (REZs) are a critical part of our plan to provide affordable, clean and reliable energy for NSW.

Existing transmission lines near Tamworth

A secure energy future for everyone in NSW

Five REZs have been identified so far which will help keep the lights on as coal-fired power stations retire.

Regional communities play a vital role in hosting the power lines and renewables we need. We are committed to working with communities to minimise impacts and maximise the benefits of this investment in our regions. REZs will contribute to the growth, prosperity of regional communities through jobs, training, investment and funding for local projects.

Investigating priority areas for the New England REZ

EnergyCo is leading the delivery of the REZs to ensure long-term energy security for NSW. We are working closely with a range of stakeholders to coordinate investment and provide long-term benefits to communities who are hosting new energy projects.

EnergyCo has been investigating how potential impacts will be managed in the New England REZ. This work includes a program of engagement with local councils, government agencies and other key stakeholders to understand local issues.

In 2024, we commissioned a series of studies to understand the potential constraints and challenges caused by concurrent development in the region, as well opportunities that could be used to support renewable energy development. The studies aim to provide a point-in-time analysis of the potential impacts of REZ development along with other major infrastructure projects in the region.

We will use this information, along with local feedback, to develop the REZ in a way that supports growth and sustainable demand for skills, services and infrastructure across the region in the years to come.

Community, council and key stakeholder input will help us to focus efforts where they are needed.

Purpose of this document

This document provides the training and skills study developed by the Institute of Sustainable Futures (ISF) at the University of Technology Sydney, SGS Economics and Planning and DeltaPearl Partners. The study aims to understand employment demand, existing capacity of training facilities, labour supply and opportunities to prepare locals for the development in the region. It also identifies potential opportunities to support REZ delivery in a proportionate and appropriate way which also meets the needs of local councils and communities.

Study development and limitations

Information contained in the study is based on knowledge and understanding at the time of its development. For this reason, it may not accurately represent local conditions at the time of reading.

The study provides a point-in-time analysis based on available data, proposed developments and the delivery timeframes for the New England REZ as of November 2024. The study does not predict future developments or changes in policy and should not be interpreted as a predictive or exhaustive assessment of all cumulative impacts over time.

Information has been sourced from EnergyCo, councils, government agencies, industry stakeholders, related third parties and/or as available in the public domain at the time of writing, coupled with research and industry knowledge of the study consultants. The passage of time, manifestation of latent conditions or impacts of future events may require further examination and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed within the study. The study should not be interpreted as specific advice or relied upon in lieu of appropriate professional advice.

Project lists

Inclusion of projects or infrastructure in the study does not imply endorsement, approval or funding commitment by any government agency or private entity. Decisions about development approvals and infrastructure investments will be subject to separate statutory and policy processes.

Scenarios outlined in the study include renewable energy projects and non-renewable energy projects at various stages of the project development lifecycle (pre-planning, planning, construction and operation). Major projects, state significant development, state significant infrastructure and critical state significant infrastructure have been considered.

The modelling undertaken for this study is based on the proposed projects identified at the time of writing and may exceed what can feasibly be realised due to factors such as generation availability and transmission capacity within the REZ network infrastructure.

The scenarios used are sufficient to support the study's key findings, addressing the challenges and opportunities associated with the REZ. Subsequent studies (if undertaken) may build on this as more information becomes available. This methodology was used so that the full extent of potential impacts was presented in the study, allowing NSW Government to plan for a higher impact to communities. Some sections of the study are redacted due to confidential information provided by renewable energy developers or other key stakeholders. While this data was used in modelling, its removal does not affect the overall findings.

Opportunities

The study has identified opportunities to address potential cumulative impacts. The study does not represent a list of commitments or set of guaranteed actions to be implemented.

EnergyCo will share the studies with community, councils and key stakeholders for feedback to help us identify and prioritise a list of potential opportunities to investigate further. We will then work with councils, renewable energy developers, other government agencies and key stakeholders to develop the opportunities into initiatives which provide legacy benefits for the region.

New England REZ network infrastructure corridor changes

In October 2025, EnergyCo announced that the corridor of the New England network infrastructure project is to be changed between Bayswater Power Station near Muswellbrook and the energy hub near Walcha. More information on this change is available at: energyco.nsw.gov.au/nerez

What the corridor updates mean for the studies

The studies provide a baseline understanding of the region and consider a point-in-time analysis of the potential challenges and opportunities from major infrastructure development in the region. These insights, together with community feedback, will help develop the REZ as a whole to best support growth, meet the future demand for skills, services, and infrastructure across the region, and provide legacy outcomes. As no new council areas are impacted by the revised corridor and due to the regional nature of the studies, the baseline information provided by the studies is largely unaffected. There may be changes in the timing of peak construction periods which will be determined by changes to the New England REZ network infrastructure project, and any changes renewable energy projects make to their programs.

A key part of the next phase will be for EnergyCo to monitor the status of projects as they continue to develop and refine the understanding of the potential cumulative impacts from development in the region. Further investigations will be carried out as part of the development of the REZ to capture these changes and respond to the identified impacts.

We will continue to work closely with community and stakeholders, including councils, to understand the areas that matter most to local communities. We are also continuing to work closely with renewable energy developers to identify opportunities and strategies to manage potential impacts from development in the region over time.

What the corridor updates mean for the training and skills study

The training and skills study uses modelling to understand employment demand from development, capacity of existing training facilities, and labour supply availability. The demand modelling does not rely on the specific corridor alignment and so the demand assessment is largely unaffected by the corridor change. The opportunities identified in the study are still applicable and will be considered by EnergyCo and its stakeholders.

Acknowledgements

The study has been developed with assistance from a range of key stakeholders providing their input, expertise and local insights. EnergyCo thanks all those individuals and organisations who have participated in the development of this training and skills study.

For more information

If you have any questions about the contents of this document, please get in touch with our team on 1800 061 114 (toll free) or by emailing nerez@energyco.nsw.gov.au.

For more information about the New England REZ visit our website at energyco.nsw.gov.au/nerez.


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New England REZ Training and Skills Study

Prepared for The Energy Corporation of NSW (EnergyCo)

Institute for Sustainable Futures, University of Technology Sydney, SGS Economics and Planning & DeltaPearl Partners

October 2025

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isf.uts.edu.au

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Acknowledgement of Traditional Owners

We acknowledge the Traditional owners and Custodians of the land within the study area, including the Jukembal, Bundjalung, Kamilaroi, Ngoorabul, Anaiwan, Dunghutti, and Wonnarua Peoples. We acknowledge their continuing connection to the land through culture and community and we pay our respects to Elders past, present and future.

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Acronyms

Abbreviation	Meaning
ABS	Australian Bureau of Statistics
AEMO	Australian Energy Market Operator
ANZSCO	Australian and New Zealand Standard Classification of Occupations
BAU	Business-as-usual
CWO	Central West Orana
DET	Department of Education
DPHI	Department of Planning, Housing and Infrastructure
EnergyCo	Energy Corporation of NSW
GRP	Gross Regional Product
GTO	Group Training Organisation
ISF	Institute for Sustainable Futures
ISP	Integrated System Plan
LTESA	Long-Term Energy Service Agreements
NE	New England
NENW	New England Northwest
NE REZ	New England Renewable Energy Zone
NRNIP	New England REZ network infrastructure project
O&M	Operations and Maintenance
OEM	Original Equipment Manufacturer
REZ	Renewable Energy Zone
RTO	Registered Training Organisation
VET	Vocational Education and Training

Key findings

Employment demand profile

The employment profile for the New England REZ and transmission corridor has large upward and downward swings based on construction activity.

The local construction workforce peak in the New England REZ ranges from 175 to 1,400 jobs and the non-local workforce from 850 to 3,900 jobs.

The New England REZ will require a significant on-going operations and maintenance workforce.

The largest grouping in the New England REZ is trades and technicians and in the Transmission Corridor labourers.

Training facilities and capacity

Provision of new training facilities within the REZ is not recommended, instead the focus should be in unlocking additional capacity of existing training facilities.

There are a range of inter-related options to unlock training capacity such as upgrading training facilities, mobile training units, new courses, increasing the trainer workforce and private RTOs.

Measures to increase the local supply into employment or training will be required alongside measures to increase training capacity.

Labour supply

Labour supply for renewable energy projects within the New England REZ is relatively constrained.

New England REZ demand exceeds labour supply for the maximum scenario, but supply exceeds demand for most occupations in the minimum scenario.

Regional opportunities

Industry partnerships brokered by government can enable training and employment opportunities.

The major opportunities for local employment are for students, First Nations, unemployed and migrant populations.

Executive Summary

Maximising the local workforce is one of the key priorities for enabling development of the New England Renewable Energy Zone (NE REZ) and creating benefits for the local community. The Energy Corporation of NSW (EnergyCo) has an important role in enabling workforce and skills development for the New England REZ through the administration of access funds for employment purposes and coordination with government agencies. The purpose of this study is to support the planning and strategy for employment, training, and skills development by creating an evidence base for policy and program development.

The study assesses training and employment across the New England REZ (which includes the Local Government Areas (LGAs) of Armidale Regional, Glen Innes Severn, Inverell Shire, Tamworth Regional, Tenterfield Shire, Uralla Shire and Walcha Shire) and in addition the LGAs traversed by the New England REZ network infrastructure project (NRNIP) Corridor (including Liverpool Plains, Muswellbrook Shire, and the Upper Hunter Shire LGAs). Using a combination of desktop analysis, modelling, surveys, interviews and stakeholder workshops, this study provides a holistic assessment of the challenges, opportunities and options for creating training and employment opportunities in the New England REZ and NRNIP Corridor.

Key objectives of the study include to:

- Provide a holistic assessment of the employment demand and labour availability across the key phases of development for the New England REZ and the NRNIP Corridor;
- Analyse the cumulative impacts and risk factors in the context of labour demand from other sectors;
- Identify the current education and training system's capacities, resources and facilities; and
- Uncover the opportunities for local employment and training initiatives for the New England REZ and NRNIP Corridor so that regional benefits can be realised.

Eleven key findings have emerged from this study in four key thematic areas:

1. Employment Demand Profile;
2. Corridor Labour Supply;
3. Training Facilities and Capacity; and
4. Regional Opportunities.

Employment demand profile

Employment requirements and fluctuations for the New England REZ and NRNIP Corridor vary significantly depending on the development scenario

- Employment demand for renewable energy, storage and transmission (collectively referred to as 'renewable energy employment' in this study) for the New England REZ and the NRNIP Corridor has been projected based on two scenarios using project list data provided by EnergyCo: the 'minimum' scenario (projects classified as 'high' probability) and the 'maximum' scenario (projects classified as 'medium' and 'high' probability).

- In the maximum scenario, the model assumes around 19.5GW built in the New England REZ and around 6GW in the NRNIP Corridor. In the minimum scenario, the model assumes there is around 4.5GW built in New England REZ and around 800MW built in the NRNIP Corridor. These scenarios aim to provide insight into the size of the potential challenge to inform the study outcomes, and are not intended to reflect the final makeup of the power generated in the New England REZ.

- Under the maximum scenario, total renewable energy employment (construction and operations and maintenance) in the New England REZ is modelled to increase from just over 5,500 full-time equivalent (FTE) jobs by 2027 to a peak of around 8,500 FTE jobs by 2031[1]. Employment then reduces with flucuations above and below 5,000 before plateauing at under 2,500 FTE jobs by 2034.

- Renewable energy in the NRNIP Corridor is even more volatile in the maximum scenario, increasing from around 2,500 FTE jobs in 2027 to around 4,500 FTE jobs by 2029 and then falling to around 500 FTE jobs in 2032.

- Under the minimum scenario, there is much lower levels of construction activity and therefore employment and volatility. Employment peaks just under 1,800 FTE jobs in the New England REZ and at just over 200 FTE jobs in the NRNIP Corridor. Both the lower scale and employment fluctuations would be much easier to manage in the minimum scenario, than under the maximum scenario.

- The location of the modelled employment is concentrated in a handful of LGAs. In the maximum scenario, annual employment averages over 1,000 FTE in four of the LGAs in the study area (i.e. Uralla Shire, Tamworth Regional, Upper Hunter Shire, Armidale Regional) and between 100 to 200 FTE in four other LGAs in the study area (i.e. Walcha Shire, Muswellbrook Shire, Inverell Shire, Glen Innes Severn).

The local construction workforce peak in the New England REZ ranges from 175 to 1,400 jobs and the non-local workforce peak ranges from 850 to 3,900 jobs

- To estimate the total numbers of workers (i.e. headcount), the estimates of full-time equivlent (FTE) were converted into numbers of workers. Survey data collected from developers was used to estimate the volume of local and non-local workers during construction. The median response on the proportion of local workers expected for the construction phase is 28% and an average working week of 50 hours. This split between the local and non-local workforce was applied to the total FTE estimate and the FTE estimate was converted to a headcount of workers using the average working hours (i.e. 35 hours).

- The local workforce in the maximum scenario is generally between 500 to 1,000 people across the build-out in the New England REZ with a peak of 1,400 workers. The non-local construction workforce peaks at around 3,900 and is generally between 2,000 to 3,000 workers. In the minimum scenario, the local construction workforce peaks at 175 and is generally 50 to 100 workers and the non-local construction workforce peaks over 850 and is generally 500 to 700 workers.

The New England REZ will require an on-going operations and maintenance workforce

- Whilst construction dominates the employment profile until 2034, there is also a significant operations and maintenance employment requirement after the construction phase. In the maximum scenario, operations and maintenance employment in the New England REZ grows from 400 FTE to over 2,000 FTE jobs from 2034 onwards. In the minimum scenario, operations and maintenance employment in the New England REZ grows from around 250 FTE to 400 FTE from 2034 onwards.

- It is noted that some of these operations and maintenance employment jobs are not local (e.g. on-going finance, legal work etc is likely to be undertaken outside the region), but there will be on-going jobs in electrical and mechanical maintenance of wind farms, on-site maintenance of battery storage and solar farms etc.

There are variations in occupational demand: the largest grouping in the New England REZ is trades and technicians and in the New England REZ network infrastructure project corridor it is labourers

- In the New England REZ, wind farms are the dominant driver of demand for trades and technicians followed by solar farms. Whilst professionals are the second largest grouping, most of these jobs would be carried out outside the New England REZ – in practice the next largest source of local employment demand would be labourers. The largest occupations are projected to be electricians, construction labourers, mechanical technicians and concreters. In the New England REZ network infrastructure project corridor, the largest source of employment demand is for various categories of construction labourers reflecting the occupational profile of pumped hydro storage.

- The key driver underpinning these variations in occupational mix is the project technologies. In the New England REZ, wind farms are the largest overall source of employment in the maximum scenario with generally at least 1,500 FTE (peaking at over 4,000 FTE in 2030). Pumped hydro storage employment outstrips wind farms through most of 2027-2029 with between 1,500 to 2,000 FTE before wind farm construction scales up. Solar farm FTE jobs are generally 500-plus with a couple of construction peaks of 2,000 FTE jobs (2030-31) and 1,500 FTE jobs (2032-33). Transmission employment averages 575 FTE across the building of the line from 2027 – 2033. In the New England REZ network infrastructure project corridor, pumped hydro storage is by far the largest source of activity.

Labour supply

Labour supply for renewable energy projects within the New England REZ is relatively constrained

- There are a number of factors which together constrain labour supply for renewable energy projects in the New England REZ:

    1. **The labour market is tight:** All LGAs have lower unemployment than the NSW average – ranging from 1.8% (Walcha Shire) to 3.6% (Inverell Shire) - which means there is limited spare capacity to allocate workers to new REZ projects.
    2. **There is a hollowing-out of the prime working age population:** one-quarter of the population is under the age of 19 and the proportion of older residents is higher than the middle-age groups which is the source of most labour supply.
    3. **There is uneven population growth forecast by Transport for NSW:** half of the LGAs in the study area are projected to experience population growth and, while the other half are projected to experience populational decline.
    4. **Less than 10 per cent of all current employment is in the key occupations for renewable energy** and there is low enrollments and completions in courses aligned to occupations for renewable energy. There is low female completions reflecting a wider issue for renewable energy that is limiting the sector's ability to increase labour supply.

- Workforce growth in the majority of the key occupations is limited, although there is 5-6% growth projected in some occupations (e.g. truck drivers, electricians). Even using a sensitivity that assumes full-employment, the size of the workforce in occupations used by renewable energy only grows from 11,000 to 13,500 FTE by 2040. Growth is inherently limited by the size of the population.

Labour supply-demand balance is heavily influenced by the development pathway: under the maximum scenario, New England REZ demand exceeds local supply, but local supply exceeds demand for most occupations under the minimum scenario

Estimating the labour supply-demand gap is tricky in the context of the New England REZ. Using the largest occupation (electricians) as an example, the current and future electrician workforce can be projected as can the demand for electricians, but many of these electricians will work in other sectors so the actual local supply is uncertain. The unemployed can be taken as a measure of spare capacity but whilst the unemployed may work in some roles (e.g. construction labourers) it is unlikely many will train to become an electrician in the timeframe of the New England REZ development.

Consequently, this study uses a range of measures to evaluate the supply-demand balance:

- Under the maximum scenario, peak workforce demand is equivalent to the total New England REZ renewable energy workforce in 2030. Many of these workers will already be working in other sectors and would be unable to meet the demand of the New England REZ without causing labour shortfalls across other industries. Consequently, this indicates that demand for workers is likely to significantly exceed regional supply under the maximum scenario. At an occupational level, there are shortages in local labour supply relative to demand across all the key occuptions.
- By contrast, under the minimum scenario, the employment demand from renewable energy is only around one-quarter of total labour supply in the relevant occupations. There are some occupations where the supply-demand balance is tight, especially construction labourers and trades and technicians, but overall there is a much greater likelihood the local labour market can meet demand.
- The 15-19 year old population exceeds or is equivalent to a large share of the projected demand across the period. Whilst many of the jobs require specialised skills or experience and students will enter a wide range of vocations, it does highlight the potential for students to make a material difference to labour supply with the right programs.

Training facilities and capacity

Provision of new training facilities within the New England REZ is not recommended, instead the focus should be in unlocking additional capacity within existing training facilities

- To evaluate how best to increase training capacity to realise the local employment opportunities and whether there should be new training facilities, our team completed an initial assessment of 49 TAFE NSW campus sites, 12 private and council organisations/facilities, and UNE facilities in the region.
- Generally, the private training providers have small offices or classrooms for short courses in town centres. UNE have vast campus facilities all over the region, which are operated in association with Country Universities Centre and other organisations. TAFE NSW is one of the leading providers of vocational education and training (VET) in Australia. TAFE NSW has 154 campuses across the state (as at 10 June 2025) including in Armidale, Tamworth and Muswellbrook. TAFE NSW also offers microcredentials and microskills, which are largely delivered online.
- Armidale and Tamworth are the main hubs that provide training to all the surrounding regions. Armidale TAFE is the hub for construction and carpentry. Tamworth TAFE has a very large campus and is the regional hub for electrical trades.

- Whilst there can be benefits with building new facilities (e.g. signal to community, modern facilities etc), new facilities may not be completed in a timely fashion to address renewable energy employment requirements and are expensive. There are many uncertainties impacting on cost but as a preliminary indication, our capital cost estimate is $28.2m - $59m for Tamworth and $8.8m - $18.3m for Armidale.
- There is scope to improve the existing training facilities with targeted upgrades and renovations to provide additional capacity. Upgrades would need to be considered on a case-by-case basis in consideration of many factors, such as availability and timing of funding, and assessment of long-term demand following the REZ development peak.
- Our assessment is that the provision of new training facilities in the New England REZ is not preferred: instead, the focus should be on unlocking additional capacity within existing training facilities.

There are a range of interrelated options to increase training capacity including upgrading facilities, mobile training units, new courses, increasing the trainer workforce and private RTOs

- There are a range of other ways to increase training capacity without constructing new training facilities. These include upgrading facilities, increasing the trainer workforce, and introducing new courses or innovative delivery methods such as mobile units and digital learning. A combination of measures could be required to work effectively.

- This study has identified opportunities for upgrading or renovating current TAFE NSW and UNE training facilities to enable a higher throughput capacity. TAFE NSW buildings in Tamworth and Armidale are comparatively old, with aging equipment and lower levels of student comfort and flexibility than offered by more modern buildings. The UNE buildings contain a mix of modern and heritage buildings of different ages and qualities, but there may be value in improving teaching spaces for engineering, architecture, and town planning students.

- Relative to building new facilities, upgrading facilities has shorter timeframes, but the cost could still be significant and is subject to many uncertainties (e.g. older buildings can often have large hidden costs). As a preliminary indication, our indicative capital cost estimate is in the range of $26.5m - $41.5m (Tamworth) and $8.2m - $12.9m (Armidale).

- Another alternative is the development of new courses. UNE leadership estimated the cost of re-establishing an engineering course would be about $600,000 to $1 million per year, depending on the facility start up cost. Several renewable energy generators interviewed for this study noted an interest in partnering with UNE to develop new or modified courses, including engineering. Council stakeholders identified revitalising student attendance via partnerships with renewable energy generators as an interesting opportunity. Re-establishing the UNE engineering program is considered likely the highest net value option in this study given the estimated low ongoing costs and the ability to leverage UNE's existing capabilities to deliver critical skills needed for REZ development.

- Expanding courses in the current TAFE NSW hubs, such as to include 'electrotechnology' in Armidale and 'construction' in Tamworth would also reduce the barriers to entry for students. TAFE Armidale is not currently able to offer electrotechnology courses on-site due to a lack of specially built facilities. Part courses might be run using a combination of digital training and mobile training, but that system would need to be staffed and designed to meet TAFE NSW standards.

- A barrier to increasing training capacity is the difficulty to attract qualified trainers due to industry typically offering more competitive salaries.
- Private training providers should also be considered in any possible investments for education and training in the region. An example of where a private RTO might be better suited to meet REZ training demands is in providing Global Wind Organisation training that is required before personnel can work on wind turbines. A combination of private and institutional providers is likely to offer the lowest cost and highest payoff solutions.

Measures to increase the local supply into employment or training will be required alongside measures to increase training capacity

- Measures to increase the capacity of training systems will be more effective and equitable if they are complemented by other initiatives to increase the supply of locals into training and employers that can host apprentices. These measures are generally lower cost and will increase utilisation of existing capacity as well as being required to create the supply of students to underpin new training capacity. Complementary measures will also be required to improve equity and increase employment participation amongst underrepresented and diversity groups.
- Offering financial support across the board for new apprenticeships could be the catalyst for increased supply of apprentices and demand from host employers. However, this option is relatively expensive. An illustrative scenario developed for this study estimates a cost of $43.6m over nine years.
- Other opportunities to increase the supply of local people for training or employment include:
  - **Increasing the pool of people with skills and qualifications for entry-level jobs**: short-term training measures can position school leavers and the unemployed for entry-level jobs such as 'job-readiness programs' to address employability barriers (e.g. literacy, numeracy) or drives to get students, the unemployed and those not in the labour force the right tickets and licences (e.g. 'white card' for construction sites, truck and forklift licences, safety). Pre-employment programs focussed on First Nations people for solar farms have demonstrated jobs can be created which lead to further employment after construction with high socio-economic benefits for the unemployed and communities;
  - **Increase local supply of apprentices and university students**: There is a range of options to complement initiatives to increase training capacity by increasing candidates for training:
    - **Pre-apprenticeship programs**: programs to provide basic skills and a pathway to apprenticeships;
    - **Awareness campaigns for school students**: programs to increase awareness and interest in renewable energy jobs;
    - **School-based programs**: e.g. 'taste tester' courses, VET in schools etc; and
    - **Non-training cost relief for students**: e.g. transport support to get to training, accommodation.
  - **Increasing the supply of training candidates and workers from underrepresented and diversity groups**: tailored measures can increase the supply and participation of groups where there is low representation in the sector including women, First Nations, refugees and migrants.
  - **Increasing the pool of organisations that host apprentices**: an apprenticeship requires a host employer and so initiatives to increase the pool of organisations able and willing to host an apprentice are also part of the solution. This could include:
    - **Funding for councils and other employers to engage apprentices in trades that can be employed on renewable energy projects**: supporting other organisations to host apprentices in trades that will be in demand by renewable energy projects (e.g. electricians, mechanical trades, construction trades) which could then work on renewable energy projects as they come online and otherwise add to the local skill base.
    - **Programs for housing energy retrofits which can host apprentices**: A similar approach could be deployed through government programs for housing retrofits to improve their energy performance, such as energy upgrades for social housing and First Nations housing. Commitments to apprentices in relevant trades (e.g. electricians) could be part of competitive tenders with support to identify and recruit apprentices.
    - **Collaborations with electricity networks to host apprentices**: Electricity networks are another organisation that could be a host for increased supply of apprentices in specialised electrical roles and lineworkers.

- **New England REZ-wide tender for Group Training Organisations**: Some businesses are reluctant to take on apprentices due to short project lengths and the risks that they may not have sufficient work or that the apprentice may leave the project. Group Training Organisations can provide a solution by engaging the apprentices and moving them between different renewable energy projects as the need arises.

Regional opportunities

Industry partnerships brokered by government can enable training and employment opportunities

- Industry partnerships between other stakeholders including community/not-for-profits, training providers and governments are another mechanism for increasing training and employment opportunities. There are some examples of such initiatives already established in the region, and opportunities to grow these partnerships further.
- **The New England REZ Workforce and Skills Group:** an existing group run by the Department of Primary Industries and Regional Development (DPIRD) which seeks to coordinate across industry and between industry, government, training and community stakeholders to improve local employment and skills outcomes.
- **Collaboration between wind firms, employment and training providers on an apprenticeship program:** long-term maintenance jobs could be created through a coordinated program with wind farm operators. Past research has specifically highlighted this as an opportunity for First Nations youth as well if combined with other elements such as 'wrap-around' services.[2]
- **Support industry to achieve training and employment targets through a network of industry support officers:** The NSW Infrastructure Skills Legacy Program has demonstrated a model of engaging industry support officers to procure training services and undertake other activities to assist industry achieve employment and training targets. A similar program could be applied to the renewable energy sector.
- **Industry partnerships to increase First Nations employment:** there are partnership opportunities to create training and employment opportunities for First Nations people such as cultural heritage assessors and business service providers.

The major opportunities for local employment are for students, First Nations, unemployed and migrant populations

- Whilst there is likely to be some movement from the existing workforce in the New England REZ to renewable energy employment, the primary sources for increasing local labour supply and employment and training opportunities are likely to be students, the unemployed, First Nations and migrant populations.
- **The major opportunity is to use renewable energy development as a base to create opportunities for apprenticeships and traineeships**, and retain more school leavers and younger residents in the region (which would increase the local labour capacity for other employers beyond renewable energy). Armidale Regional, Tamworth Regional, Muswellbrook Shire and Inverell Shire in particular have large populations shares for 15-19 year olds. There has also been a notable increase in VET completions in relevant occupations for renewable energy in Armidale and Tamwoth in recent years, which might have experienced some gains from the School-based Apprenticeships and Traineeships (SBATS).

- **Renewable energy could be an opportunity to close the gap in employment participation for First Nations people.** There is a relatively high First Nations population in the New England REZ (10%), and in the New England REZ network infrastructure project corridor especially in Liverpool Plains (16.6%), Tamworth Regional (13.6%) and Muswellbrook Shire (13.2%). All LGAs in this region have higher First Nations population shares than the NSW share. The median age in the First Nations population is very young, ranging from 21 to 27 years across LGAs compared to 37 to 50 years for the wider population. There is also higher unemployment ranging from 6.2% (Armidale Regional) to 10.7% (Inverell).
- **There are underrepresented and diversity groups in the renewable energy workforce where employment participation rates could be increased**. These include women, the local Ezidi community and those who are not in the workforce. Employment participation rates are lower than NSW average illustrating there may be opportunities for increasing participation amongst those who are not in the labour force
- Amongst local stakeholders, there was a strong awareness about the challenges and uncertainty about whether the New England REZ will create local employment but also palpable optimism about the opportunity to create training and employment opportunities for students, First Nations, the unemployed and migrant and refugee communities.

Evaluating Options: Increasing Training Capacity, Local Labour Supply and Industry Partnerships

Table 1 presents a summary of options to facilitate comparison. Indicative funding estimates have been produced for some options, where reasonably possible, but these should be regarded as no more than indicative before more detailed scoping can be undertaken.

Each option is considered against the following criteria used to evaluate options in this study:

- What contribution can the measure make to reducing skills shortages by meeting employment demand within the region?
- What is the level of local socio-economic benefit?
- What is the indicative funding requirement?
- What is the level of stakeholder support?

These should not be considered as recommendations but are provided as an input to policy development by EnergyCo and other government stakeholders. A 'high', 'medium' and 'low' rating is applied based on our evaluation of the impact of the measure (reducing skill shortages and local socio-economic benefit), the funding required (noting indicative estimates are provided where there is adequate information) and the level of stakeholder support based on research undertaken for this project. There is no quantification of the ratings specific value.

Table 1: Consolidated list of Options

Option	Reducing skill shortages /meeting employment demand	Local socio-economic benefit	Indicative funding	Stakeholder support
Objective: Increasing training capacity				
New training facilities	**Low** New training facilities were not found necessary in this specific context and therefore the opportunity cost from diverting funding from other uses is high.	**Medium** A new training facility adds to the stock of infrastructure (and generates jobs during construction), but its benefit depends on developing uses for existing facilities in addition to the new facility.	**High** Our preliminary capital cost estimate is: Tamworth: $28.8m (low) to $59.9 (high) Armidale: $8.8m (low) to $18.3m (high)	**Low** Council stakeholders engaged through this project agreed with the evaluation that new training facilities were not required.
Upgrading existing training facilities	**Medium-High** There is scope and benefit from upgrading existing training facilities to offer modernised, expanded offerings for skills in demand for the New England REZ.	**Medium-High** Upgraded training facilities would leave a legacy of improved training capacity for the region beyond the New England REZ.	**High** Upgrading training facilities is only marginally cheaper than building new facilities and subject to a significant level of budget uncertainty (e.g. detailed assessments may find additional work is required). Our preliminary estimate is: Tamworth: $26.5m (low) to $41.5 (high); Armidale: $8.2m (low) to $12.9m (high)	**Medium** Council stakeholders engaged through this project agreed there was scope for targeted upgrades of current facilities.

Option	Reducing skill shortages /meeting employment demand	Local socio-economic benefit	Indicative funding	Stakeholder support
New courses	**High** Good option to use current facility excess capacity and reduce barriers to participation.	**High** Offers opportunities to local people to attend courses and will attract new teachers/lecturers to the region	**Low-Medium** UNE say less than $1 million per year to produce a full engineering degree course for locals. No costings have been undertaken for new courses at TAFE. Micro-credentials can be a low-cost way to target specific skill gaps. TAFE may require new staff and upgraded facility	**High** UNE and TAFE are enthusiastic about re-establishing the courses, but lack funding/ students. Industry stakeholders also referred to the opportunity to collaborate with UNE.
Mobile and digital training delivery	**Low-Medium** Mobile training delivery is one option to increase student enrolments and completions across the New England REZ. Depending on the actual approach the number of additional students can be significant. Digital training good where suitable.	**High** Very helpful solution for lower socioeconomic and long-term unemployed people due to lowering the barriers to attendance. Mobile training could be used to increase apprenticeship enrolments and completions but should be considered in conjunction with providing transport support to students.	**Low-Medium** A significant amount of funding is required to make a mobile solution work well, vehicles, drivers, coordination staff, and course materials. Digital training is already well funded and has low marginal costs.	**Low-Medium** Given the low level of funding historically, the results from past mobile training were not significant. Digital training has experienced success where appropriate, however, is limited in the trades.
Increasing the trainer workforce	**Low-Medium** The size of the trainer workforce is a barrier to unlocking existing training capacity.	**High** Local RTOs offer jobs to trainers and better training opportunities for locals.	**Medium** Costs will depend on the approach taken to increase the trainer workforce.	**Medium** TAFE management would appreciate new trainers.
Apprentice subsidies	**Medium-High** Impact depends on the size of the subsidy, difficulty in securing the approvals, and willingness of local organisations to participate. However, if subsidies work, they could play a key role in stimulating the student demand required to underpin increased training capacity.	**High** Very good targeting of local students.	**High** A scenario used to illustrate cost in this report totalled $43.7m. The cost would depend on the volume of the subsidy, uptake and length of program. Notwithstanding, there is a high level of spending needed to make the system effective.	**High** Organisations, students, and community are supportive of these types of programs as clear financial benefit to locals.

Option	Reducing skill shortages /meeting employment demand	Local socio-economic benefit	Indicative funding	Stakeholder support
Objective: Increasing local supply for training and employment				
Pre-employment programs for construction	**Medium** Construction labourers are less subject to skill shortages than more specialised jobs but there are concerns that shortages could emerge during peak demand.	**High** Pre-employment programs can have a high socio-economic impact by assisting people to escape or avoid unemployment. One job often leads to another job, especially within tight labour markets. Increasing the labour force has a longer-term benefit to the economy of the New England REZ. These programs can also be a bridge into an apprenticeship.	**Low-Medium** Whilst the program would need to be costed, our expectation is that the cost would be modest and funded through grants to expand the capacity of existing providers. The programs could be one-off initiatives (e.g. drives to increase locals with 'white card') or periodically undertaken across New England REZ build-out (e.g. annually). If the programs are to succeed in increasing employment amongst disadvantaged groups and long-term unemployed, additional wrap-around services are likely to be required to assist people with other social issues (e.g. health, housing) maintain employment.	**High** Local stakeholders have expressed high support for programs that can leverage renewable energy to reduce unemployment and address social disadvantage.
Fund pre-apprenticeship programs	**Medium** Pre-apprenticeship programs could be used to increase apprenticeship entry levels for key trades in shortages such as electricians.	**High** If they are successful, pre-apprenticeship programs could increase the skill base and employment amongst students and recent school leavers. Pre-apprenticeship programs can reduce the level of unemployment and associated impacts for groups that may not have moved smoothly in transition from school to training or work.	**Low-Medium** Whilst the cost would depend on the scope of programs, these are discrete courses that could be funded through grants to TAFE or private RTOs. If the programs are successful, they may be run on an on-going basis drawing on either New England REZ or alternative funding sources.	**High** Whilst this option was not specifically tested, there is high stakeholder support for measures that increase apprenticeships. Pre-apprenticeship programs and other initiatives were raised as an option for young people who have not finished school at the First Nations workshops.

Option	Reducing skill shortages /meeting employment demand	Local socio-economic benefit	Indicative funding	Stakeholder support
School programs	**High** Given the high population of young people in the region and the lead time for workforce peaks, students are an ideal cohort to invest in upskilling. Making renewable energy appropriate VET in-school training available across the region could increase the labour supply. Currently there are 2,000 students in the NENW region in the VET in school program.	**High** Arguably, the largest opportunity for increasing local employment is from creating pathways for students. If young people are educated and trained early, in their region, and are then able to go into a trade or career, then this could increase the volume of young people staying in the region, creating ongoing socio-economic benefit and stability.	**Low-Medium** VET in schools already exists, what is required in tailoring the offerings to ensure they line up with the required skills and job types needed across the New England REZ. Investment would need to go into building training capacity, and access to the facilities.	**High** Stakeholders widely expressed strong support for anything that targets and supports school aged/young people. Integrating schooling with gaining qualifications is also highly supported.
Awareness campaign focussed on school students	**High** High school students are well poised to pursue study, then employment in the renewables sector. However, there is very low understanding or awareness of the opportunities, and what kinds of pathways they need to take in order to get there. Building awareness is the first step to encouraging greater uptake of renewable professions. An awareness raising campaign could be run along with efforts to support easy access and pathways into training).	**Medium-High** As above, with more students aware of the opportunities and pursuing qualifications and employment in the renewables sector, then local employment can be maximised.	**Low** There are existing networks, organisations and initiatives to leverage off in the case of running an awareness campaign.	**High** Stakeholders were very supportive of encouraging young people into careers in the renewables sector. Some people, however, did express concern over the short-term nature of renewable construction jobs and how there is a risk that young people might be ‘set up to fail’.
Funding for councils and other employers to engage apprentices in trades that can be employed in renewables projects	**Medium** Impact depends on the size of the subsidy, willingness of local organisations to participate, and attract participants.	**High** Very good targeting of local people and increases both the local skill base and capacity within Councils as well as for the renewable energy industry.	**Medium-High** High level of spending needed to make the system effective.	**High** Organisations, students, and community are supportive of these types of programs as clear financial benefit to locals. LALCs suggested in workshops that they could be the host for apprentices and trainees with funding.

Option	Reducing skill shortages /meeting employment demand	Local socio-economic benefit	Indicative funding	Stakeholder support
Program for housing retrofits that hosts apprentices that can be employed in renewables projects	**Low-Medium** The impact would depend on the size of the pool of apprenticeships generated through the initiative. Some of the trades for housing retrofits do not feature in large-scale renewables projects (e.g. air-conditioning technicians) but a pool of electricians could be created that could be transferred across to large-scale projects.	**Medium-High** Housing retrofits could create a pool of apprenticeships across occupations for renewable energy projects but also the housing sector where there are constraints.	**Low** The primary mechanism for delivering this initiative would be procurement targets for housing retrofit providers. Additional support would be required for successful implementation with costs to be determined (e.g. pre-apprenticeship programs, facilitation by training providers etc.).	**Medium** This option was not specifically tested with stakeholders but there is high support for initiatives to leverage opportunities for new apprenticeships.
Collaboration with electricity networks to host apprentices	**Medium** The impact would depend on the size of the pool of apprenticeships generated through the initiative. However, the electricity networks are natural hosts for energy apprentices that could contribute to the pool of workers in the region.	**Medium** The pool of energy workers with high-voltage and other specialisations is relatively low in the region. Adding to the pool of specialised energy workers would increase the local benefit share.	**Low-Medium** Electricity networks have existing systems to engage apprenticeships. Additional funding would be required for hosting and initiatives to attract more apprentices.	**Medium** This option was not specifically tested with stakeholders but there is high support for initiatives to leverage opportunities for new apprenticeships
New England REZ-wide tender for Group Training Organisations	**Medium** The expansion of GTO is considered by industry and training organisations to be one of the ways apprentice numbers can be increased in the context of renewable energy characteristics. Funding support to increase GTO could unlock higher apprenticeships in sector.	**Medium** One of the strengths of GTOs is that the apprentices could work on renewable energy projects and other employers in the region. It is therefore a way of increasing productive capacity and increasing opportunities for young people in the region	**Medium** This option has not been costed. It is likely to be comparable to other initiatives to increase hosts for apprentices.	**Low-Medium** Other options ranked higher in the survey of council workshop attendees, although it was raised by some stakeholders.

Option	Reducing skill shortages /meeting employment demand	Local socio-economic benefit	Indicative funding	Stakeholder support
Diversity programs	**Medium** Diversity programs include pre-employment training, scholarships and financial support, wrap-around services, such as a workplace support officer, childcare and transport access, mentoring and awareness raising and cultural awareness training and capacity building of employers so that they provide safe work environments. These programs can be targeted to different underrepresented and diversity groups, such as women, First Nations or people with disability. The impact of diversity programs hinges on the willingness of industry to participate, the number of participants (or the pool from which the program targets) and the efficacy of the program itself.	**High** Programs targeted at disadvantaged and marginalised groups, who are often left out of the labour force, can have a huge benefit to the community, by moving people out of disadvantage and unemployment. Obtaining employment can disrupt a cycle of inter-generational disadvantage.	**Low- Medium** For diversity programs to be successful at scale, they will require multiple stakeholders and investment in social supports and services. Smaller scale initiatives, like a solar farm working directly with an organisation such as Backtrack, to contract staff, can have a big impact for little outlay.	**High** Stakeholders expressed strong support for initiatives that deliver legacy benefits and social impact. First Nations stakeholders advocated strongly for a range of diversity initiatives at workshops in New England and Scone.
Objective: Industry partnerships				
New England REZ Working Group	**Medium** Coordination across renewable energy companies and between the industry and training providers is consistently identified as a major barrier to increasing local training and employment opportunities. It is difficult to quantify, but if a successful coordination mechanism could be developed which enabled redeployment of workers and better linkages with the training system the impact could be significant.	**Medium** It is also difficult to quantify the impact on local socio-economic benefits, but a well-functioning coordination mechanism can be an enabler for other initiatives.	**Low** Administration of a working group is relatively low-cost compared to other initiatives.	**Medium** Improving coordination and community with the renewable energy sector is a key theme in stakeholder views. However, there is also consultation fatigue with industry and community stakeholders, so the challenge is designing a mechanism which is effective in getting active participation of people who make decisions on employment and training to make the time-commitment worthwhile. Participants in the First Nations workshop in Armidale advocated strongly in favour of a working group that could assist in uniting their community and higher engagement.

Option	Reducing skill shortages /meeting employment demand	Local socio-economic benefit	Indicative funding	Stakeholder support
Wind maintenance technician program	**High** Wind OEMs have identified wind technicians as a current, worsening skill shortage in recent work undertaken by the research team.	**High** The opportunity is the creation of long-term, well-paid jobs in the region for the duration of the wind farms. Apprenticeships and jobs could be created for students, including First Nations students where an opportunity was identified in the Powering First Nations Jobs Strategy.	**Low-medium** Costs need to be scoped but would primarily be in government coordination, initiatives to attract and place applicants and wrap-around services for First Nations or disadvantaged students. Funding for coordination may be able to be leveraged from the Indigenous Employment Skills Program.	**High** This option was not specifically tested with stakeholders but there is high support for initiatives to leverage opportunities for new apprenticeships.
Industry support officers	**High** The NSW Infrastructure Skills Legacy Program has a demonstrated record in delivering higher rates of learning workers and the employment of underrepresented and diversity groups, and reviews have identified industry support officers as a key component of the program.	**High** If the success of the Infrastructure Skills Legacy Program can be replicated, increasing participation of underrepresented and diversity groups can deliver socio-economic benefits and increase the productive capacity of regional labour markets.	**Low-medium** Administrators of the Infrastructure Skills Legacy Program can provide insights into costs. Costs would occur from administration and the employment of industry support officers.	**Medium** Stakeholders stated that industry support officers were their second-highest preference, as an industry partnership initiative that should be prioritised. Further consultation would be required with industry to gauge wider support.
First Nations Business Participation	**Low-Medium** There are a range of opportunities for First Nations businesses to contract to renewable energy which contributes to meeting employment demand, with past cases including traffic control, catering, fencing, ongoing vegetation management on solar farms. In a tight labour market, this contributes to labour supply but for the most part the contracts that have been operational to date are also not in areas of major skill shortage or constraint.	**High** If local First Nations' businesses can be supported to grow, develop, and contract for business in the New England REZ, this can mean ongoing jobs and wealth generation for the wider community. First Nations business also employ more First Nations workers than non-First Nations businesses. With a pipeline of projects that are coordinated and staggered, First Nations businesses can provide steady employment to their community.	**Low-Medium** Initiatives such as Indigenous Business Australia and Reach Out by the ATO already exist and could be of benefit. However, some additional renewable energy specific and place-based in-person support (e.g. pre-tender meetings to support applications) could be hugely beneficial and relatively low-cost.	**High** In conversation with two developers the idea of supporting the capacity of local First Nations businesses to participate in the New England REZ roll out came up. Both developers were supportive and wanted to see more First Nations involvement in the sector. At both the New England and Scone workshops, First Nations stakeholders placed a high priority on First Nations business participation.

Option	Reducing skill shortages /meeting employment demand	Local socio-economic benefit	Indicative funding	Stakeholder support
First Nations cultural heritage assessment and cultural competency training for industry	**Low-Medium** Meeting employment demand locally to ensure maximum regional benefit, specifically for First Nations people, requires engaging First Nations consultants where possible. Cultural heritage assessment and cultural competency training for industry is best undertaken by local knowledge holders and traditional owners.	**High** Prioritising First Nations businesses and consultancies can deliver ripple benefits throughout the community. There is a social benefit for First Nations communities from being able to participate in cultural heritage assessment and cultural competence training.	**Low** Government funding to enable these activities should be low. Developers are required to undertake and fund cultural heritage assessment as a part of their EIS's. Cultural competency training could be a requirement for industry and/or considered as part of First Nations economic participation expenditure by industry.	**High** At both the New England and Scone workshops, First Nations stakeholders identified these services as key opportunities.

Note: the ratings of high, medium and low primarily reflect our assessment of the impact, cost or support. In the case of funding, initiatives or programs that would cost >$10 million were classified as high, >$1m as medium and <$1m as low. These are however indicative cost estimates and, in some cases, based on assessments without firm costs. In relation to skill shortages, the rating reflects an assessment of which types of jobs would be impacted and the significance of the measure in our view. In the case of socio-economic benefit, no modelling has been undertaken but the rating reflects our view based on past experience. The rating of stakeholder support is based on engagement undertaken for this project. It should be noted that consultation with industry was often with developers at early stages of their project and not all had strong experience with employment, skills and training.

1. Introduction

Australia is transitioning its energy system from a coal-based energy system to one based on renewable energy and storage. Underpinning this transition is the Federal Government's target of 82% renewable electricity by 2030. The build-out of renewable energy, storage and transmission in NSW is occurring primarily through the Renewable Energy Zones (REZ). The largest of these REZs in NSW is the New England REZ (NE REZ). Facilitating the connection of the generation and storage projects in the New England REZ to the existing electricity grid is the New England REZ network infrastructure project (NRNIP) which includes transmission infrastructure and associated ancillary infrastructure.

One of the challenges for the REZs is increasing the supply of skilled labour to avoid skill shortages and maximise local and regional benefits. Previous research and analysis undertaken for the NSW Renewable Energy Sector Board have highlighted local workforce supply is likely to be especially challenging in the New England REZ due to the scale of development and the modest size of the local workforce in key occupations for renewable energy, reflecting the dominance of the agricultural sector.[3] Pro-active employment, training and skills development and the development of training infrastructure (either hard or soft) is a key step to lower the risk of skill shortages and create a legacy that improves socio-economic outcomes for the NE REZ.

EnergyCo, as the Infrastructure Planner, has a lead role in coordinating benefits and strategies to manage impacts for local communities and stakeholders in the REZs.

1.1. Purpose and objectives

The purpose of this Training and Skills Study is to support the planning and strategy for employment, training and skills development in the study area, which includes:

a) the New England REZ (Armidale Shire, Glen Innes Severn, Inverell Shire, Tamworth Regional, Tenterfield Shire, Uralla Shire and Walcha Shire LGAs); and

b) the NRNIP Corridor (Liverpool Plains, Muswellbrook Shire, and the Upper Hunter Shire LGAs).

Key objectives of the study include to:

- Provide a holistic assessment of the employment demand and labour availability across the key phases of development for the New England REZ and the NRNIP Corridor.
- Analyse the cumulative impacts and risk factors in the context of labour demand from other sectors.
- Identify the current education and training systems capacities, resources and facilities.
- Uncover the opportunities for local employment and training initiatives for the New England REZ and NRNIP Corridor so that regional benefits can be realised.

1.2. Background

EnergyCo is the NSW Government statutory authority, appointed under the *Electricity Infrastructure Investment Act 2020* (NSW) (EII Act) as the 'Infrastructure Planner' responsible for delivering the New England REZ. EnergyCo is responsible for coordinating transmission, generation, firming and storage projects to deliver efficient, timely and coordinated investment in the New England REZ. As the Infrastructure Planner, EnergyCo's role includes coordinating benefits and strategies to manage impacts for local communities and stakeholders in the REZs.

The New England REZ was formally declared under the EII Act on 17 December 2021. It has been identified for the development of 6GW capacity of renewable energy, and transmission infrastructure to connect this new capacity to the grid over two stages – with Stage 1 delivering 2.4 GW of transfer capacity by 2032 and Stage 2 delivering 3.6 GW by 2034. The NRNIP Corridor is the transmission route and related infrastructure that will transmit the new generation in New England REZ to the National Energy Market (NEM), running from west of Armidale down to Bayswater.

1.3. Legislative and Policy Context

Employment and training targets for the REZs

Under the Electricity Infrastructure Roadmap, competitive tenders are administered for access rights to transmission infrastructure within the REZs and Long-Term Energy Supply Agreements (LTESAs) for renewable energy and storage projects. The LTESAs are an options contract under which a renewable energy project can access a minimum fixed price for their output, providing sufficient revenue certainty for the project to secure finance for construction. LTESAs are awarded to projects in competitive tenders based on criteria including price, local content, grid impact and employment and training requirements. Within the tender guidelines, there are 'baseline' criteria which are mandatory and 'stretch goal' criteria, with the advice that 'high scoring' projects are expected to demonstrate their contribution to these targets (AEMO Services 2022).

Table 2: Employment and Training Targets, Long-Term Energy Supply Agreements

Aspect	Baseline requirement (%)	Stretch Goal (%)
Learning workers (% of total Project workforce)	20	40
Apprentices (% of all trade positions on a Project)	20	30
First Nations Participation (%)	1.5	10 (or goal in the region-specific protocol under the First Nations Guidelines)
Employment of underrepresented and diversity groups, e.g. women, young people (%)	15	25

Source: New South Wales Renewable Energy Sector Board Plan.

REZ Access Scheme

An Access Scheme refers to a scheme that authorises or prohibits access to, and use of, specified network infrastructure in a REZ by Network Operators and operators of generation and storage infrastructure.

Section 26 of the EII Act sets out that access fees are to be determined by the Consumer Trustee (AusEnergy Services Ltd) and must include a component for community purposes – section 26(2) - and for employment purposes – section 26(4). The fee values are set in accordance sections 56(2) and 57(2) of the EII Regulations.

An example of this under the South West REZ Access Scheme Declaration includes obligations for an access right holder to pay the Scheme Financial Vehicle the access fees determined by the consumer trustee in accordance with section 26 of the EII Act to meet the terms of its access right agreement. Funds are administered by EnergyCo as the Infrastructure Planner. For the New England REZ, a REZ Access Scheme is yet to be declared at the time of writing this study.

Skills and Workforce Programs

There are a range of skills and workforce programs which will have relevance for the New England REZ. Some of these programs are renewable energy skills programs whilst others are broader programs which have applicability for renewable energy. It is also important to note that the NSW Government is currently developing a Renewable Energy Skills Strategy.

The key skills and workforce policies and programs with relevance to the New England REZ are outlined in Table 3.

Table 3: Skills and Workforce Programs relevant to the New England REZ

Program	Key Elements
New Energy Apprenticeship Program (Federal)	New energy apprentices undertaking a Certificate III or IV, Diploma or Advanced Diploma qualification for an occupation on the priority list can be eligible to receive up to $10,000 in payments, access to tailored support services and an income contingent loan.[4]
Future Made in Australia (Federal)	The Future Made in Australia plan invests $22.7 billion into key areas including skills and training to build local renewable energy manufacturing, supporting investment in Australia, utilising natural resources, and industrial innovation and technology.[5]
Skilling the Clean Energy Workforce (Federal)	The 2024- 2025 budget committed $91 million over five years to help skill Australia's clean energy workforce. This includes a new capital and equipment investment fund for facility upgrades to expand clean energy training capacity, investment in VET teachers for clean energy, support for small and medium businesses employing priority apprentices in clean energy, construction and manufacturing, and investment to promote careers in the clean energy sector.[6]
National Skills Agreement (Federal)	Federal government is investing in skills and training, primarily through the National Skills Agreement. This is a five-year agreement between the commonwealth and state governments to strengthen the national VET system.[7]
Indigenous Skills and Employment Program	A competitive grant program which funds placed-based initiatives to connect First Nations people to jobs, training and career opportunities.[8]
Regional Industry Education Partnerships (NSW)	The program designs and deliver networks and connections between employers and secondary schools to educate students about employment pathways and opportunities.[9]
School Based Apprenticeships and Traineeships (NSW)	TAFE NSW has introduced a range of courses to upskill renewable energy workers. Examples of courses include Grid-Connected Solar PV Systems Design Accreditation, Foundation Studies in Renewable Energy and Sustainability, and Renewable Energy Engineering.[10]
Smart and Skilled Program (NSW)	The NSW Government is investing in VET education by subsidising training for apprentices and trainees, including those in the construction and renewable energy sector.[11]
Renewable Energy Skills Strategy	Following a roundtable which included a range of stakeholders (industry bodies, unions, educators and government agencies) the Renewable Energy Skills Strategy is currently under development.[12]

1.4. Methodology

To achieve the study's purpose and objectives, a multi-pronged methodology was employed, covering:

- **Desktop review and analysis**: the policy and legislative context of the energy transition and workforce coordination in NSW and federally, a demographic and labour market profile of the New England and surrounds using mixed quantitative datasets and analysis of existing studies on the challenges and opportunities to grow the local workforce. This desktop review and analysis facilitated an in-depth understsanding of the local workforce dynamics and the wider context within which the New England REZ and NRNIP Corridor will be delivered.
- **Modelling**: workforce projections for the labour demand associated with the projects slated for the New England REZ; modelling and projections of the labour supply, and a supply and demand gap analysis. The modelling supports the study's objective of providing a holistic understanding of projected employment demand, alongside a labour supply analysis. This information enables a fine grained

assessment of the kinds of jobs that will be available in the region, so that local employment outcomes can be supported and impacts mitigated.

- **Asset mapping**: an investigation into the training system, infrastructure and facilities in the region was conducted. This mapping of the local training system, including courses, facilities and resources, recognises that employment outcomes do not happen in a vacuum, but are enabled by the provision of training opportunities. This information provides the essential context for coordinating increased local training throughput.
- **Fieldwork and stakeholder engagement**: a survey and interviews with generators, interviews with a range of local stakeholders and workshops with councils and First Nations stakeholders. The fieldwork and stakeholder engagement provided a range of critical insights for the study. Survey and interview data with developers formed data inputs and assumptions into modelling, resulting in workforce projections that are targeted and regional. Workshops with key regional stakeholders from Councils and First Nations communities served to provide rich nuance and insight into the current labour market and training landscape locally, and to also sense check data, assumptions and progress to date.

For more details on the stakeholder engagement and the related methodology, refer to the New England Skills and Training Study Stakeholder Engagement Summary Report.

1.5. Renewable Energy Occupations and Skillsets

Throughout this study reference is made to 'renewable energy occupations'. Most occupations in renewable energy are well-established in other sectors with some sector and site-specific skills for renewable energy – they are often not specific to the renewable energy sector. The term 'renewable energy occupations' is used as a short-hand for the key group of occupations employed in renewable energy, storage and transmission.

In general, there is low understanding within the community about what type of job opportunities there are in renewable energy and the training pathways to enter these jobs. For the labour supply and employment demand projections, our focus is on the core occupations required by the renewable energy sector which are listed in Table 4 with key qualifications and licences.

A detailed list of jobs, qualifications/licences and the training and workforce pathways is outlined for solar, wind, battery storage, transmission and hydro in Appendix 1.

Table 4: Key Renewable Energy Occupations: Qualifications and Training Pathways

Occupation	Minimum Qualifications
Civil Engineering Professionals	Bachelor of Civil Engineering (4-years).
Telecommunications Technicians	Certificate III in Electronics and Communications Trade (3-years).
Clerical and Administrative Workers	School qualifications may be sufficient but a vocational qualification such as Certificate III in business administration (BSB 30120) (6-12 months) is advantageous.
Concreters	Certificate III in Concreting (CPC30320) (2 years).
Crane, Hoist and Lift Operators	TLI30121 - Certificate III in Mobile Crane Operations (2 years) and/or TLI40721 - Certificate IV in Mobile Crane Operations.
Earthmoving Plant Operators	Certificate III in Civil Construction Plant Operations (1.5 - 2 years).

Occupation	Minimum Qualifications
Electrical Distribution Trades Workers	Transmission Line Workers - UET30521 Certificate 3 in ESI – Transmission Overhead (4 years).
Electricians	The minimum qualification for a licenced electrician is UEE 30820 – Electrotechnology – Electrician Apprenticeship. There are a range of specialisations with other qualifications such as substations (e.g. UET40521 Certificate 4 in ESI – Power Systems Sub-stations) and battery systems (e.g. UEERE4001 Install, Maintain and Fault Find Battery Storage Systems for Grid Connected Photovoltaic Systems).
Mechanical Engineering Trades Workers	MEM30219 - Certificate III in Engineering - Mechanical Trade. UEP40622 - Certificate IV in Wind Power Generation.
Occupational and Environmental Health Professionals	BSB41419 - Certificate IV in Work Health and Safety.
Environmental Scientists	Bachelor Degree in Environmental Science (3-years).
Structural Steel Construction Workers (Riggers and Dogmen)	CPCCLRG3001, CPCCLRG3002, CPCCLRG4001 Licence to Perform Rigging Basic (5-days), Intermediate and Advanced respectively.
Structural Steel Construction Workers (Steel Fixers)	Certificate III – Steel Fixing (course can be completed as quickly as 6 months but may be undertaken over several years as part of traineeship).
Truck Drivers	Drivers Licence for relevant vehicle, Certificate III in Driving Operations (TLI31216).
Construction Labourers	There are different pathways into construction labouring jobs depending on the skill level. Some roles do not require formal training whilst other roles require trade qualifications (e.g. see concreter and crane operator descriptions).
Electrical Engineers	Electrical engineering degree plus apply for a professional engineer's licence to work as a contractor.
Construction Managers	There are formal qualifications for construction and project management but typically construction managers have various types of construction qualifications and proceed into management based on experience and additional training.
Supply, Distribution and Procurement Managers	Logistics managers may have a qualification such as Diplomat of Logistics (TL150415) but often progress into roles based on experience.

2. The New England REZ: Labour Market and Demographic Profile

2.1. Overview and approach

This section of the study profiles labour market and demographic trends in the New England REZ to establish a baseline for identifying potential gaps in workforce skills and capacity, to better target the design and sequencing of training programs to specific population groups and regions, and to provide evidence to justify future investment in strategic training and planning interventions.

For the purposes of the labour market and demographic profile, a study area was defined to include the seven LGAs within the New England REZ region, the three LGAs within the NRNIP Corridor, and immediately surrounding LGAs (Figure 1). Immediately surrounding LGAs were included in this analysis as a project of the New England REZ's scale has the potential to shape the structure of the economy and flows of residents and workers across the region over time. Therefore, understanding potential workforce capacity and anticipated population growth, may inform better alignment between labour supply and demand and skills and training investments to meet industry need.

In this section, references to the 'NE REZ population' and 'NE REZ workforce' refer to data for the LGAs intersecting with the New England REZ boundary and NRNIP Corridor.

Also to note, in this section the study refers to First Nations peoples as Aboriginal and Torres Strait Islanders to keep in harmony with the wording of the key data set used in analysis, ABS Census data.

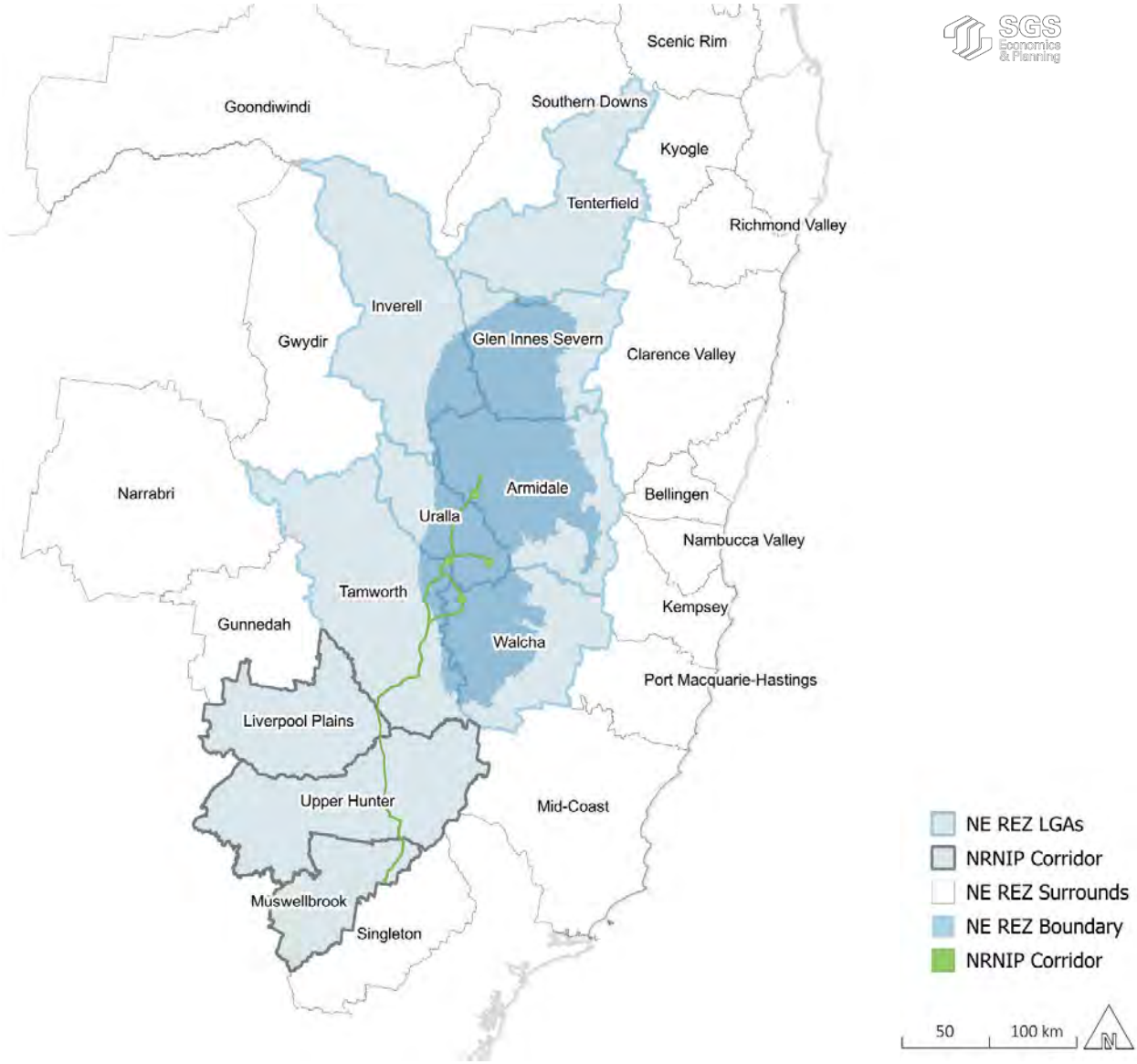
The labour market and demographic profile was developed from quantitative analysis of:

1. Australian Bureau of Statistics (ABS) Census of Population and Housing data, 2016 and 2021. The profile characterises current and recent trends in population change, population age profile, population by First Nations status, workforce participation, and educational attainment.
2. Transport for New South Wales's Travel Zone Projections 2022 (TZP22). TZP22 represents the most likely future for base housing, population, and workforce by balancing current trends with existing and continued policy and structural changes. Note that population and workforce forecasts for the years 2027, 2030, 2032, and 2034 are interpolated from the 5-yearly TZP22 forecasts. Forecasts are not included for Goondiwindi, Scenic Rim, and Southern Downs in the Queensland portion of the 'REZ Surrounds', as the TZP forecasts are NSW based.
3. National Centre for Vocational Education Research (NCVER) VET completions, 2018 to 2023. VET completions offer insight into the potential pipeline of graduates by occupations, help to identify locations with relatively higher and lower rates of VET enrolment and completion, and support place-based actions to improve equity in VET access and outcomes.

While these datasets provide an overview of population and workforce trends, supplementary insight from stakeholder engagement is needed to inform the challenges and opportunities identified by this study. For example, stakeholder engagement suggests that population growth in some locations of the New England REZ and NRNIP Corridor could be higher than is represented in forecasts developed by NSW government.

There are patterns of intra and inter-regional migration occurring, particularly for young people who travel to Armidale, Tamworth or Newcastle for education. Across the region, low unemployment and a tight labour market has led local businesses to innovate with workforce attraction measures, such as supplying housing, meals and switching to a four-day week. Section 6 combines the following analysis and stakeholder insights to identify challenges and opportunities for increasing local employment and training in New England REZ.

Figure 1: Labour market and demographic profiling study area



Source: Author analysis, 2024

Table 5: Summary New England REZ population and labour market trends

LGA	Population 2021	Employment rate 2021	Population Trend (2016-21)	Projected Trend (2021-34)	Educational Centres/Notes
Armidale Regional	29,124	53.5%	Minor decline	Growth	UNE
Tamworth Regional	63,070	56.9%	Growth	Continued growth	TAFE hub
Inverell Shire	17,853	48.9%	Growth	Continued growth	TAFE facility
Glen Innes Severn	8,931	44.2%	Minor growth	Continued growth	TAFE facility
Tenterfield Shire	6,810	41.5%	Minor growth	Minor decline	TAFE facility
Uralla Shire	5,971	54.7%	Minor decline	Minor decline	-
Walcha Shire	3,016	54.9%	Minor decline	Minor decline	-

Source: Author analysis, 2024; ABS, 2021; TZP, 2022

2.2. Population

This section reports recent and forecast population trends and demographic attributes for the study area (Figure 1). Key indicators are reported at the LGA and regional level to highlight the distribution of skills and workforce across the study area. Note that while the ABS has released population data in 2023 and 2024, employment and education indicators at a finer spatial scale were not yet available for those years when this analysis was carried out. Therefore ABS 2021 data is used throughout this section for consistency across the study analysis.

Resident population

As shown in Table 6, population growth in the New England REZ region is generally concentrated in the regional centres and large rural areas of Tamworth and Inverell. Over the next decade, these areas are also forecast to experience net population growth of several thousand residents, while surrounding smaller townships are set to decline in population:

- Inverell Shire (+1,368 residents; 1.6% average annual growth rate) and Tamworth Regional (+3,408; 1.1% average annual growth rate [AAGR]) experienced the largest real and proportionate population growth between 2016 and 2021. Tamworth Regional was also the most populated LGA in the study area in 2021.
- Tenterfield Shire and Glen Innes Severn's populations remained stable over the same period.
- Armidale Regional, Uralla Shire, and Walcha Shire experienced minor population declines.

Along the NRNIP Corridor, Muswellbrook Shire's population was the fastest growing between 2016 and 2021, recording an additional 271 residents representing an AAGR of 0.3%.

Table 6: Total resident population, 2016-2021

	LGA	2016 population	2021 population	2016-21 Growth	2016-21 AAGR
NE REZ Region	Armidale Regional	29,451	29,124	-327	-0.2%
	Glen Innes Severn	8,832	8,931	99	0.2%
	Inverell Shire	16,485	17,853	1,368	1.6%
	Tamworth Regional	59,662	63,070	3,408	1.1%
	Tenterfield Shire	6,624	6,810	186	0.6%
	Uralla Shire	6,049	5,971	-78	-0.3%
	Walcha Shire	3,090	3,016	-74	-0.5%
NE REZ Region sub-total		**130,193**	**134,775**	**4,582**	**0.7%**
NRNIP Corridor	Liverpool Plains	7,689	7,551	-138	-0.4%
	Muswellbrook Shire	16,086	16,357	271	0.3%
	Upper Hunter Shire	14,112	14,229	117	0.2%
NRNIP Corridor sub-total		**37,887**	**38,137**	**250**	**0.1%**
NE REZ Surrounds	Bellingen	12,670	13,253	583	0.9%
	Clarence Valley	50,670	54,115	3,445	1.3%
	Gunnedah	12,214	12,929	715	1.1%
	Gwydir	5,255	4,910	-345	-1.3%

	LGA	2016 population	2021 population	2016-21 Growth	2016-21 AAGR
	Kempsey	28,886	30,688	1,802	1.2%
	Kyogle	8,939	9,359	420	0.9%
	Mid-Coast	90,302	96,579	6,277	1.4%
	Nambucca Valley	19,210	20,407	1,197	1.2%
	Narrabri	13,083	12,703	-380	-0.6%
	Port Macquarie-Hastings	78,541	86,762	8,221	2.0%
	Richmond Valley	22,805	23,565	760	0.7%
	Singleton	22,990	24,577	1,587	1.3%
	Goondiwindi (QLD)	10,628	10,310	-318	-0.6%
	Scenic Rim (QLD)	40,078	42,984	2,906	1.4%
	Southern Downs (QLD)	35,115	36,290	1,175	0.7%
NE REZ Surrounds sub-total		**451,386**	**479,431**	**28,045**	**1.2%**

Source: ABS 2016, 2021; SGS Economics and Planning, 2024

More populous regions attract residents for their existing amenity and presence of population-serving industries. These include healthcare, education, and social infrastructure. Job availability and economic diversification in regional centres also plays a role, as do the infrastructure investments that improve physical and digital connectivity with other parts of NSW.

Spatial trends in population growth and distribution have implications for a range of training and skills-related matters. For example, they shape the ease of businesses and industries' access to a local workforce, ease of local procurement, and the proximity of training providers to places of practical work, should the integration of industry to education partnerships evolve as a feature of the clean energy training and skills landscape.

Forecast population

LGAs intersecting with the New England REZ region are forecast to experience net population growth of over 4,600 residents over the next decade, in contrast with a forecasted net population decline (-178 residents) across the LGAs intersecting with the NRNIP Corridor (Table 7). These population forecasts do not include specific inputs related to New England REZ developments.

Population forecasts estimate that the population of Tamworth Regional LGA, located in the southern region of the New England REZ, will be the fastest growing between 2024 and 2034. Over 4,800 additional residents are expected to call the LGA home, representing an average annual growth rate of 0.7%. In 2024, Tamworth Regional is already the most populated LGA within the New England REZ, followed by Armidale Regional and Inverell Shire.

In contrast, Tenterfield Shire and Uralla Shire are forecast to experience population declines of 783 and 651 residents respectively by 2034.

Regions immediately to the east of the New England REZ region, namely Port-Macquarie Hastings (+7,735 residents) and Mid-Coast (+7,310) are also expected to experience high population growth.

The map in Figure 2 highlights relative population change forecasted between 2021 and 2034. The majority of the New England REZ region is expected to experience a population decline, with the exception of parts of Tamworth Regional, Armidale Regional and Glen Innes Severn LGAs.

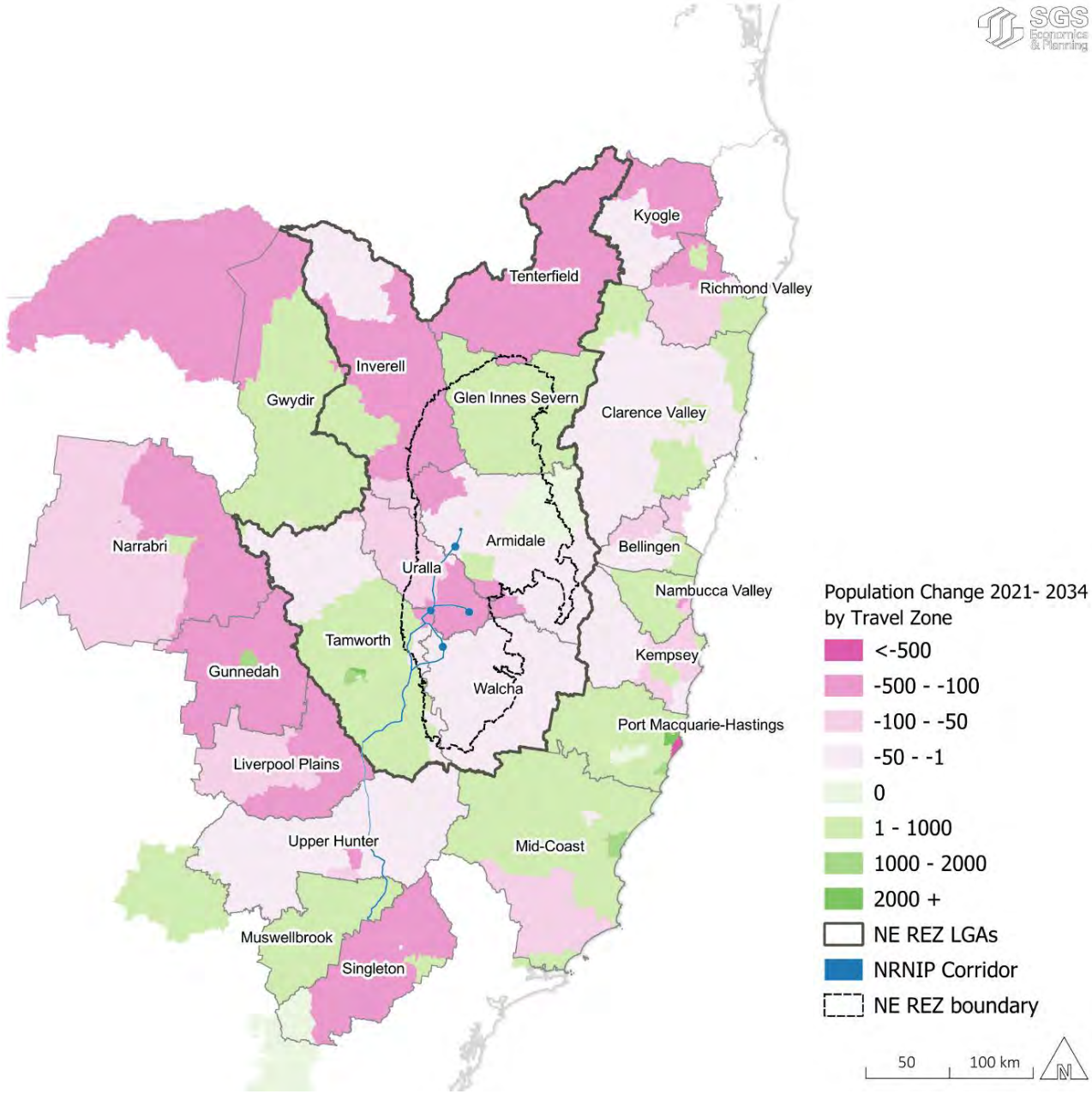
Table 7: Population forecast, 2024-2046

	LGA	2024 population	2027 population	2030 population	2032 population	2034 population	2046 population	2024-34 Change	2024-2027 Change	2027-2032 Change (Stage 1)	2030-2034 Change (Stage 2)
NE REZ Region	Armidale Regional	30,255	30,536	30,843	31,062	31,296	32,741	1,041	282	526	454
	Glen Innes Severn	8,920	8,967	8,998	9,009	9,009	8,885	89	47	42	11
	Inverell Shire	16,042	16,118	16,156	16,170	16,172	16,035	130	76	52	16
	Tamworth Regional	63,664	65,228	66,670	67,613	68,538	73,903	4,874	1,564	2,385	1,869
	Tenterfield Shire	6,189	5,968	5,731	5,570	5,406	4,433	-783	-221	-398	-325
	Uralla Shire	6,421	6,253	6,060	5,920	5,770	4,785	-651	-168	-332	-290
	Walcha Shire	3,143	3,120	3,096	3,081	3,068	3,001	-75	-23	-39	-28
NE REZ Region sub-total		**134,633**	**136,190**	**137,553**	**138,425**	**139,260**	**143,782**	**4,627**	**1,557**	**2,235**	**1,707**
NRNIP Corridor	Liverpool Plains	7,748	7,657	7,542	7,457	7,364	6,747	-384	-90	-200	-178
	Muswellbrook Shire	16,607	16,837	17,010	17,107	17,187	17,460	580	230	271	177
	Upper Hunter Shire	13,997	13,912	13,797	13,713	13,623	12,993	-375	-85	-199	-174
NRNIP Corridor sub-total		**38,352**	**38,406**	**38,349**	**38,278**	**38,174**	**37,200**	**-178**	**54**	**-128**	**-175**
NE REZ Surrounds	Bellingen	13,799	13,900	13,974	14,017	14,053	14,193	254	101	118	79
	Clarence Valley	52,227	52,737	53,194	53,466	53,707	54,636	1,480	510	729	513
	Gunnedah	12,680	12,826	12,950	13,030	13,108	13,565	428	146	204	158
	Gwydir	6,305	6,340	6,366	6,379	6,387	6,377	82	35	39	21
	Kempsey	30,323	30,701	31,030	31,223	31,391	32,070	1,069	379	522	361

	LGA	2024 population	2027 population	2030 population	2032 population	2034 population	2046 population	2024-34 Change	2024-2027 Change	2027-2032 Change (Stage 1)	2030-2034 Change (Stage 2)
	Kyogle	8,470	8,198	7,894	7,681	7,458	6,048	-1,012	-273	-516	-436
	Mid-Coast	96,930	99,312	101,544	102,938	104,240	110,773	7,310	2,382	3,627	2,696
	Nambucca Valley	19,926	20,061	20,170	20,227	20,267	20,263	341	134	167	96
	Narrabri	13,049	12,954	12,821	12,722	12,612	11,877	-437	-96	-232	-209
	Port Macquarie-Hastings	88,693	91,213	93,578	95,054	96,428	103,279	7,735	2,520	3,841	2,850
	Richmond Valley	23,865	24,175	24,421	24,568	24,697	25,265	832	310	393	276
	Singleton	23,131	22,908	22,623	22,411	22,179	20,670	-952	-223	-496	-444
NE REZ Surrounds sub-total		**389,398**	**395,323**	**400,566**	**403,718**	**406,526**	**419,014**	**17,128**	**5,925**	**8,395**	**5,960**

Source: SGS Economics and Planning, 2024 based on Travel Zone Projections (TZP) 2022. Notes: The 2027, 2030, 2032, and 2034 figures are interpolated from the 5-yearly TZP22 forecasts. Population forecasts are not included for Goondiwindi, Scenic Rim, and Southern Downs in the Queensland portion of the 'REZ Surrounds', as the TZP forecasts are NSW based. TZP24 projections were released in January 2025, following the completion of the Training and Skills Study regional profiling.

Figure 2: Forecast population change by Travel Zone, 2021- 2034

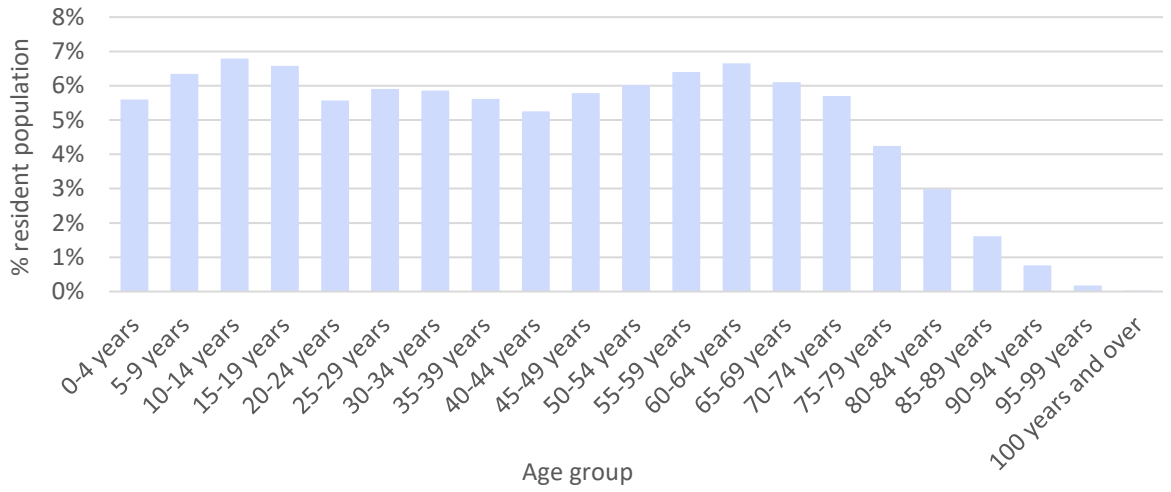


Source: SGS Economics & Planning, 2024. Notes: The 2034 figures are interpolated from the 5-yearly TZP22 forecasts. Growth from 2021 (actual population) is shown rather than 2024. 2024 figures in TZP22 were being updated at the time of this report. TZP24 projections were released in January 2025, following the completion of the Training and Skills Study regional profiling.

Population age profile

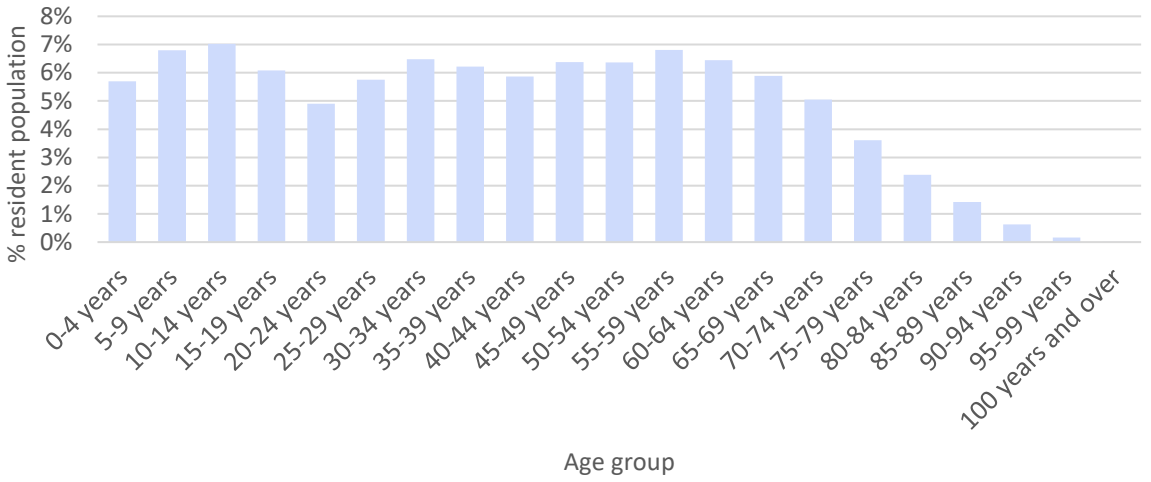
Over a quarter of residents in New England REZ region are under the age of 19 (Figure 3). At the same time, there is a higher proportion of older residents compared to middle-aged residents. The combination of younger residents seeking out education and employment in larger cities and an ageing population puts pressure on existing workforce shortages, particularly among the mid-career workforce who are an important cohort for passing industry expertise and mentoring the next generation. This suggests the need for a focus on training and skills and on designing options school to work transitions, which would leverage the workforce potential of the school-aged population to offset a reduction in labour supply from the retiring workforce. Figure 4 shows that like the New England REZ region, a large portion of the resident population along the NRNIP Corridor are young or middle aged. The 10–14-year age group has the highest representation (7%), followed by 5–9-year-olds and 55-59 year olds (both 6.8%).

Figure 3: Age profile, LGAs in the New England REZ Region, 2021



Source: ABS, 2021; SGS Economics and Planning, 2024.

Figure 4: Age profile, LGAs in the NRNIP Corridor, 2021



Source: ABS, 2021; SGS Economics and Planning, 2024.

Analysis of the 15–19-year age group indicates the potential for new workforce entrants (Table 8). The 15–19-year-old population coincides with the later years of secondary schooling and/or transition into VET for some individuals.

It has been identified that:

- Within the New England REZ, Armidale Regional is home to the highest proportion of 15–19-year-olds, who represent 8% of the total resident population, followed by Tamworth Regional and Inverell; and
- Along the NRNIP Corridor, Muswellbrook Shire has the highest proportion and number of 15–19-year-old population.

These are areas where student outreach and raising awareness of career, study, and relevant post-school destinations could have considerable impact for the future regional workforce and connecting career pathways in the clean energy sector. This would serve a dual objective of providing early and connected career development opportunities for regional school-aged students and helping to offset labour supply reductions from retirement and/or projected depopulation.

Table 8: 15–19-year age group as proportion of resident population, 2021

	LGA	Number of residents in 15-19 years age group	Proportion of population in 15–19 years age group
REZ Region	Armidale Regional	2,335	8.0%
	Glen Innes Severn	493	5.5%
	Inverell Shire	1,116	6.3%
	Tamworth Regional	4,102	6.5%
	Tenterfield Shire	312	4.6%
	Uralla Shire	360	6.0%
	Walcha Shire	147	4.9%
REZ Region sub-total		**8,865**	**6.6%**
NRNIP Corridor	Liverpool Plains	446	5.9%
	Muswellbrook Shire	1,053	6.4%
	Upper Hunter Shire	822	5.8%
NRNIP Corridor sub-total		**2,321**	**6.1%**
REZ Surrounds	Bellingen	708	5.3%
	Clarence Valley	2,731	5.0%
	Gunnedah	681	5.3%
	Gwydir	211	4.3%
	Kempsey	1,694	5.5%
	Kyogle	480	5.1%
	Mid-Coast	4,668	4.8%
	Nambucca Valley	1071	5.3%
	Narrabri	690	5.4%
	Port Macquarie-Hastings	4,938	5.7%
	Richmond Valley	1,363	5.8%
	Singleton	1,746	7.1%
	Goondiwindi (QLD)	551	5.3%
	Scenic Rim (QLD)	2617	6.1%
	Southern Downs (QLD)	2,051	5.7%
REZ Surrounds sub-total		**26,200**	**5.5%**

Source: ABS, 2021; SGS Economics and Planning, 2024.Aboriginal and Torres Strait Islander population

Population of Aboriginal and Torres Strait Islanders

There are significant opportunities to ensure that Aboriginal and Torres Strait Islander Australians benefit from the renewable energy transition and can access equitable opportunities to participate in employment, education, and training. The New England REZ region is home to a much higher proportion of Aboriginal and Torres Strait Islander populations compared to the NSW average. Across the New England REZ region, Aboriginal and Torres Strait Islander residents represent over 10% of the total population, compared to 3.4% across NSW. Within the New England REZ and NRNIP Corridor, the proportionate share of Aboriginal and Torres Strait Islander residents varies from 7.3% in Walcha Shire to 16.6% in Liverpool Plains.

The median age of Aboriginal and Torres Strait Islander residents is also significantly younger than the non-Aboriginal and Torres Strait Islander population, due to gaps in life expectancy and the socio-economic determinants of health.

Table 9: Aboriginal and Torres Strait Islander population by LGA, 2021

	LGA	Aboriginal and Torres Strait Islander population	Proportion of population
NE REZ Region	Armidale Regional	2,210	8.4%
	Glen Innes Severn	680	8.4%
	Inverell Shire	1,978	12.2%
	Tamworth Regional	8,035	13.6%
	Tenterfield	515	8.3%
	Uralla Shire	563	10.1%
	Walcha Shire	201	7.3%
NE REZ Region sub-total		**14,182**	**11.4%**
NRNIP Corridor	Liverpool Plains	1,122	16.6%
	Muswellbrook Shire	1,897	12.3%
	Upper Hunter Shire	983	7.3%
NRNIP Corridor sub- total		**4,002**	**11.3%**
NE REZ Surrounds	Bellingen	564	4.6%
	Clarence Valley	4,392	8.7%
	Gunnedah	2,022	17.1%
	Gwydir	342	7.6%
	Kempsey	3,960	13.9%
	Kyogle	528	6.2%
	Mid-Coast	7,014	7.7%
	Nambucca Valley	1,634	8.6%
	Narrabri	1,879	16.5%
	Port Macquarie-Hastings	4,723	5.7%

	LGA	Aboriginal and Torres Strait Islander population	Proportion of population
	Richmond Valley	1,853	8.6%
	Singleton	2,034	8.8%
	Goondiwindi (QLD)	801	8.5%
	Scenic Rim (QLD)	1,575	3.9%
	Southern Downs (QLD)	1,966	5.9%
NE REZ Surrounds sub- total		**35,287**	**7.9%**

Source: ABS, 2021; SGS Economics and Planning, 2024.

Note: the number of residents who did not respond range from 200 to 6,000 in some LGAs. Therefore, the Indigenous population is calculated as Indigenous residents divided by the population who responded to this question.

The Aboriginal and Torres Strait Islander population in the New England REZ region is younger than the general population. In New England REZ region LGAs, the median age of Aboriginal and Torres Strait Islanders ranges from 21 (Armidale Regional and Tamworth Regional) to 27 years (Glen Innes Severn), compared to 40 to 57 years of age in the non-Aboriginal and Torres Strait Islander population (Table 10). The stark contrast in median age is an indicator of the life expectancy gap between Aboriginal and Torres Strait Islanders and non-Aboriginal and Torres Strait Islanders, which in turn is shaped by health outcomes and the social determinants of health such as income, employment, housing, and education.

Table 10: Median age, population by Aboriginal and Torres Strait Islander status, 2021

	LGA	Aboriginal and Torres Strait Islander median age	Non-Aboriginal and Torres Strait Islander population median age
NE REZ Region	Armidale Regional	21	40
	Glen Innes Severn	27	52
	Inverell Shire	24	46
	Tamworth Regional	21	42
	Tenterfield Shire	23	57
	Uralla Shire	23	49
	Walcha Shire	26	52
NE REZ Region average		**24**	**48**
NRNIP Corridor	Liverpool Plains	27	50
	Muswellbrook Shire	21	39
	Upper Hunter Shire	23	44
NRNIP Corridor average		**24**	**44**
NE REZ Surrounds	Bellingen	24	51
	Clarence Valley	25	51
	Gunnedah	22	41
	Gwydir	24	51

	LGA	Aboriginal and Torres Strait Islander median age	Non-Aboriginal and Torres Strait Islander population median age
	Kempsey	25	52
	Kyogle	24	53
	Mid-Coast	23	56
	Nambucca Valley	26	55
	Narrabri	23	44
	Port Macquarie-Hastings	22	50
	Singleton	21	38
	Richmond Valley	23	48
	Goondiwindi (QLD)	22	42
	Scenic Rim (QLD)	22	47
	Southern Downs (QLD)	21	49
NE REZ Surrounds average		**23**	**49**

Source: ABS, 2021; SGS Economics and Planning, 2024.

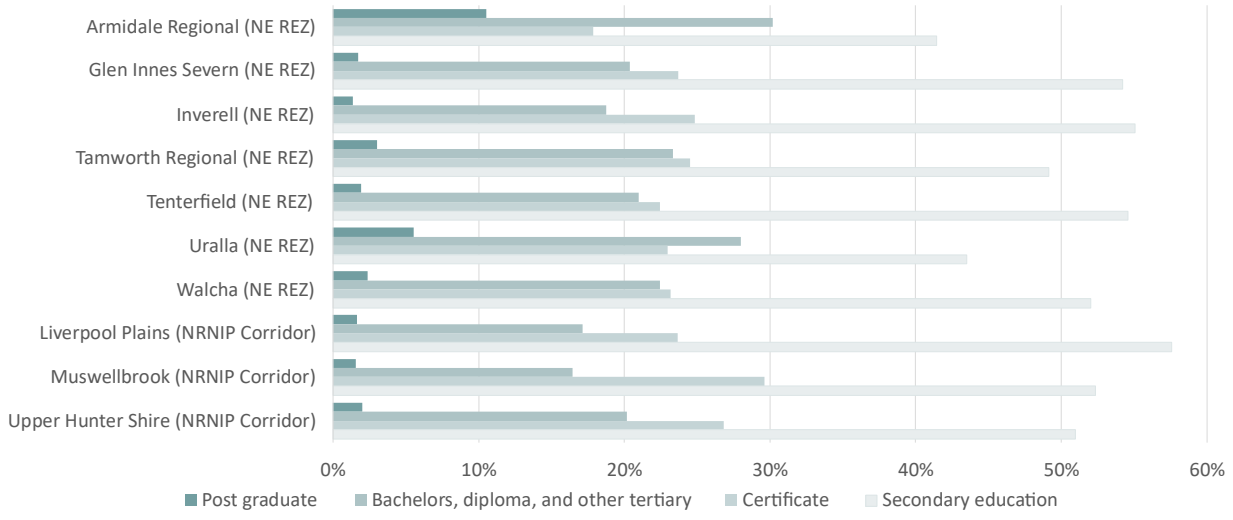
2.3. Education and employment

This section reports key employment indicators and trends in educational attainment for the study area. This analysis highlights the distribution of skills, qualification level, and access to workforce across the New England REZ region and along the NRNIP Corridor.

Educational attainment

Higher educational attainment is a predictive factor of higher incomes, more diverse sources of income, healthier behaviour, and reduced reliance on the aged pension.[13] In the study area, Armidale Regional LGA (10.5%) and Uralla Shire LGA (5.6%) had the highest proportion of residents with post-graduate degree qualifications in 2021 (Figure 5). This is likely due to the presence of the University of New England in Armidale. Armidale Regional, Uralla Shire, and Tamworth Regional also had a significant proportion of residents who had attained a Bachelor, Diploma, or Other Tertiary qualification.

Figure 5: Highest level of educational attainment, 2021



Source: Author analysis, ABS, 2021.

VET completions in clean energy aligned occupations

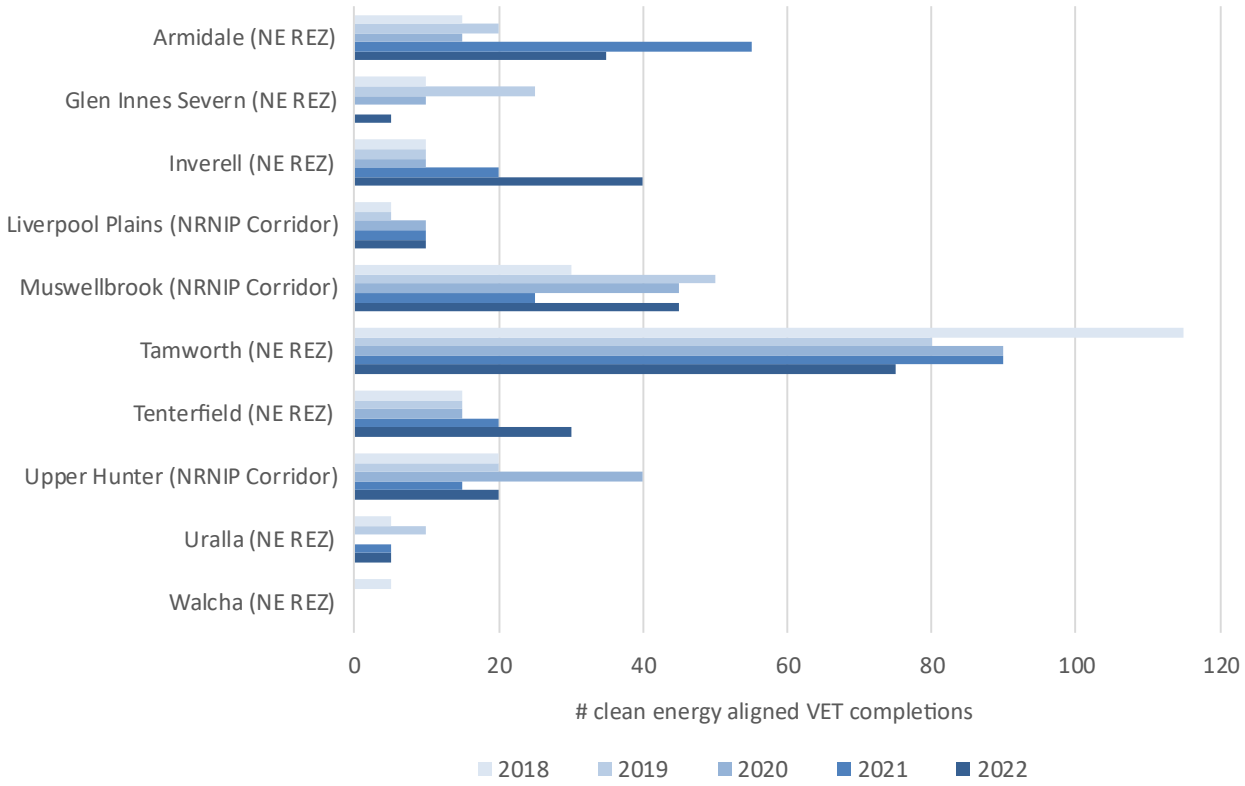
VET completions in the sector in the New England REZ region offer insight into the potential pipeline of graduates. However, as the analysis in Figure 6 illustrates, overall completion volumes are low. The low numbers are also reflected in the volatility in the analysis of clean energy VET completions as a proportion of total VET completions by region. Therefore, this study does not incorporate VET-related assumptions into workforce supply modelling as the historical trend is too uncertain. Nonetheless, workforce forecasts include materiality analysis to illustrate the potential impacts if unemployment or participation rates were to shift.

Between 2018 to 2022, VET program completions in clean energy occupations varied in most LGAs. The highest number of completions overall was in Tamworth Regional LGA in the New England REZ region (450 between 2018 and 2022), followed by Muswellbrook Shire (195 completions). VET completions are available at the statistical area 2 (SA2) level and subsequently concorded to the LGA scale.

An analysis of VET completions in clean energy occupations by gender shows a skew towards male students (Table 11). The largest difference was in Tamworth Regional LGA (155 male and 35 female completions) and Muswellbrook Shire along the NRNIP Corridor (90 male and 15 female completions).

As shown in Table 12, around a fifth to a quarter of all VET completions in Tamworth are in clean energy aligned occupations. Clean energy aligned VET completions in Armidale also appear to have increased from around 5% between 2018-20 to 10 to 20% in the last two years.

Figure 6: VET completions in clean energy occupations by LGA, 2018-22



Source: National Centre for Vocational Education Research (NCVER), 2022; SGS Economics and Planning, 2024. Clean energy aligned occupations included in this analysis were: Business Administration Managers, Electricians, Contract Program and Project Administrators, Other Miscellaneous Clerical and Administrative Workers, Earthmoving Plant Operators, Truck Drivers, Electrical Distribution Trades Workers, Mechanical Engineering Trades Workers, Mechanical Engineering Draftspersons and technicians, Structural Steel Construction Workers, Other Mobile Plant Operators, and Safety Inspectors.

Table 11: VET completions in clean energy occupations by gender, 2021-2023

LGA	Gender	2021	2022	2023	Total
Armidale Regional (NE REZ)	Male	40	20	10	70
	Female	5	-	-	5
Inverell Shire (NE REZ)	Male	5	15	5	25
	Female	5	-		5
Tamworth Regional (NE REZ)	Male	45	55	55	155
	Female	20	10	5	35
Tenterfield Shire (NE REZ)	Male	10	10	5	25
	Female	-	10	-	10
Uralla Shire (NE REZ)	Male	5	5	-	10
	Female	-	-	-	0
Liverpool Plains (NRNIP Corridor)	Male	10	10	10	30
	Female	-	-	-	0
Muswellbrook Shire (NRNIP Corridor)	Male	25	30	35	90
	Female	-	5	10	15
Upper Hunter (NRNIP Corridor)	Male	15	15	15	45
	Female	-	-	-	0

Source: National Centre for Vocational Education Research (NCVER), 2023; SGS Economics and Planning, 2024. Note: VET completions data by gender is available for 2021-23 only. Clean energy aligned occupations included in this analysis were: Business Administration Managers, Electricians, Contract Program and Project Administrators, Other Miscellaneous Clerical and Administrative Workers, Earthmoving Plant Operators, Truck Drivers, Electrical Distribution Trades Workers, Mechanical Engineering Trades Workers, Mechanical Engineering Draftspersons and technicians, Structural Steel Construction Workers, Other Mobile Plant Operators, and Safety Inspectors. Note: There were some 'unknown' categories in the data

Table 12: VET completions in clean energy aligned occupations as proportion of total VET completions by LGA, 2018-22

LGA	2018	2019	2020	2021	2022	Proportionate share 2018-22
Armidale Regional (NE REZ)	5.6%	5.4%	4.2%	20.4%	11.9%	**8.95%**
Glen Innes Severn (NE REZ)	1.5%	3.6%	1.3%	0.0%	0.8%	**1.43%**
Inverell Shire (NE REZ)	2.2%	1.9%	2.7%	4.4%	6.4%	**3.71%**
Liverpool Plains (NRNIP Corridor)	0.1%	0.1%	0.4%	0.4%	0.3%	**0.25%**
Muswellbrook Shire (NRNIP Corridor)	1.9%	3.2%	3.5%	2.2%	3.2%	**2.81%**
Tamworth Regional (NE REZ)	24.2%	16.2%	20.7%	24.7%	24.2%	**21.63%**
Tenterfield Shire (NE REZ)	1.4%	0.9%	1.1%	1.2%	2.0%	**1.28%**
Upper Hunter Shire (NRNIP Corridor)	7.0%	4.7%	13.3%	3.7%	7.5%	**6.82%**
Uralla Shire (NE REZ)	1.1%	1.7%	0.0%	1.1%	1.1%	**1.04%**
Walcha Shire (NE REZ)	0.3%	0.0%	0.0%	0.0%	0.0%	**0.06%**

Source: NCVER (2018-22), SGS Economics and Planning (2024). Note: Proportionate shares 2018-22 are distinct from the average of the five years. Rather, they track the 'running' total share of all clean energy aligned VET completions against total VET completions by LGA. Note that overall volumes of VET completions are low and therefore these are indicative proportions only.

Employment and workforce participation

Across the New England REZ region, both unemployment (ranging from 1.8% to 3.2%) and workforce participation (ranging from 44% to 60%) were generally lower than the NSW average. All LGAs in the New England REZ region had a lower unemployment rate compared to the NSW unemployment rate of 4.6% in November 2021,[14] ranging from 1.8% in Walcha to 3.2% in Inverell. Low unemployment suggests a tight labour market, which is further exacerbated by the reduced participation of the local working age population. Existing agricultural strengths and high proportionate employment in the Health Care and Social Assistance industry[15] may also be driving these figures, helping to buoy the region from the impacts of the COVID-19 pandemic. With both unemployment and labour market participation being lower than the NSW average,[16] this suggests that there is a higher proportion of the population who is not in the labour force.

There is an opportunity to better engage those not in the labour force as a key cohort for growing the renewable energy workforce. However, designing the right incentives to promote workforce re-entry will require close understanding of the underlying factors of low workforce participation. An ageing population, population health, household composition and potential misalignment between job requirements and having the flexibility to attend to caregiving or other responsibilities are just some of the factors that bear on labour market participation.

Between 2016 and 2021, the unemployment rate declined across the New England REZ region (Figure 7). The largest percentage point decline in the unemployment rate was experienced in Muswellbrook Shire (from 4.8% to 3.1% unemployment), followed by Armidale Regional (4.3% to 3%).

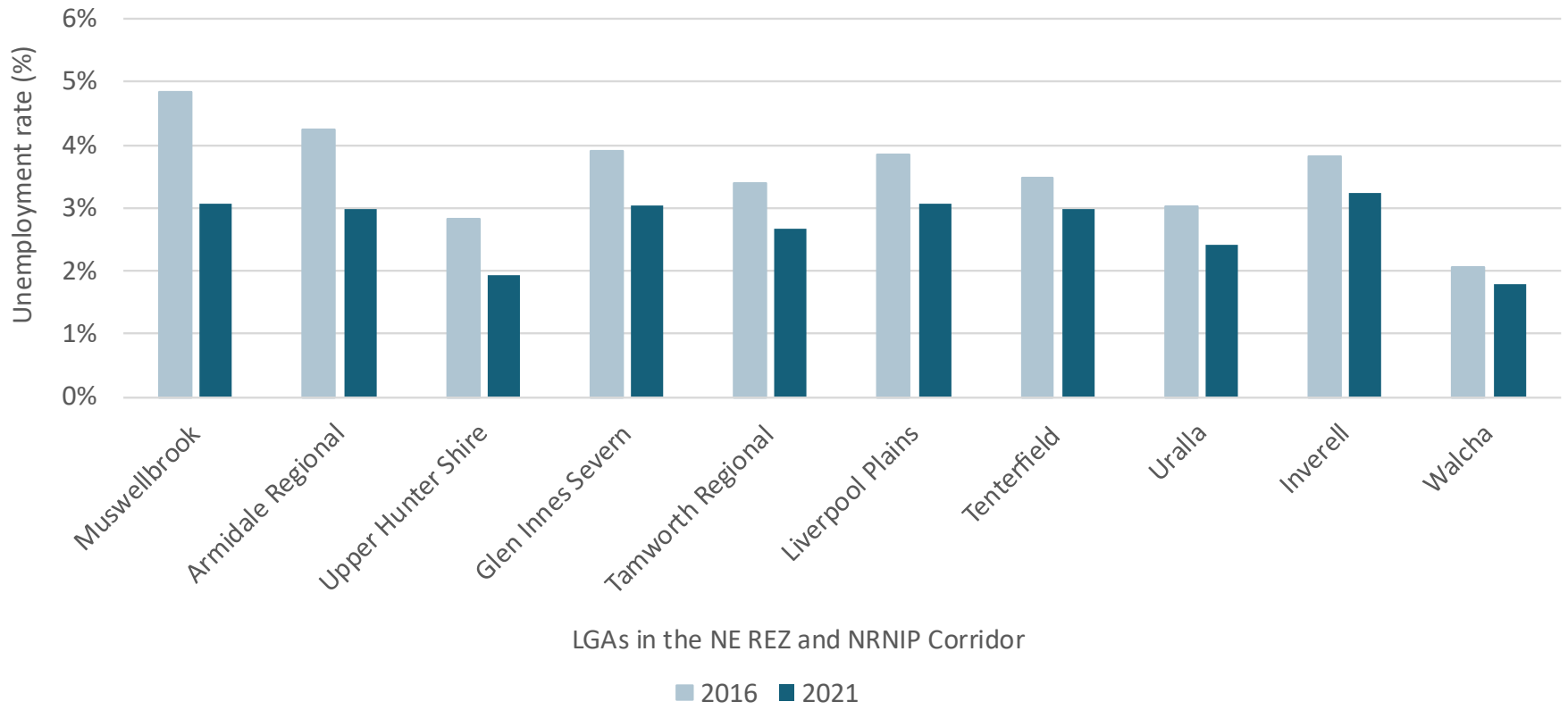
Table 13: Key employment indicators, 2021

	LGA	Employment rate	Unemployment rate	Employment	Unemployed	Not in the labour force
NE REZ Region	Armidale Regional	53.5%	3.0%	12,763	715	7,993
	Glen Innes Severn	44.2%	3.0%	3,342	230	3,228
	Inverell Shire	48.9%	3.2%	7,061	467	5,524
	Tamworth Regional	56.9%	2.7%	28,640	1,340	16,743
	Tenterfield Shire	41.5%	3.0%	2,429	174	2,684
	Uralla Shire	54.7%	2.4%	2,690	119	1,771
	Walcha Shire	54.9%	1.8%	1,376	45	830
NE REZ Region sub-total		**53.2%**	**2.8%**	**58,301**	**3,090**	**38,773**
NRNIP Corridor	Liverpool Plains	49.0%	3.1%	3,045	190	2,234
	Muswellbrook Shire	57.1%	3.1%	7,354	394	4,276
	Upper Hunter Shire	58.6%	1.9%	6,783	225	3,808
NRNIP Corridor sub-total		**56.0%**	**2.6%**	**17,182**	**809**	**10,318**
REZ Surrounds	Bellingen	48.6%	2.7%	5,363	299	4,530
	Clarence Valley	43.5%	2.9%	19,775	1,306	21,170
	Gunnedah	58.5%	2.6%	5,874	261	2,988
	Gwydir	48.3%	2.0%	1,950	82	1,632
	Kempsey	41.7%	3.2%	10,671	827	12,151
	Kyogle	44.7%	2.8%	3,520	218	3,364

	LGA	Employment rate	Unemployment rate	Employment	Unemployed	Not in the labour force
	Mid-Coast	41.2%	2.7%	34,023	2,228	40,128
	Nambucca Valley	41.3%	3.0%	7,090	512	8,244
	Narrabri	56.9%	2.4%	5,780	245	3,015
	Port Macquarie-Hastings	48.8%	2.5%	35,595	1,789	31,821
	Richmond Valley	47.4%	2.3%	9,126	451	7,810
	Singleton	62.1%	2.4%	12,101	469	5,655
	Goondiwindi (QLD)	59.2%	2.2%	4,830	177	2,381
	Scenic Rim (QLD)	53.0%	2.4%	18,767	849	13,269
	Southern Downs (QLD)	49.8%	2.4%	14,976	728	11,928
REZ Surrounds sub-total		**47.5%**	**2.6%**	**189,441**	**10,441**	**170,086**

Source: Author analysis, ABS, 2021. Note: Working age population by LGA included residents in the 'Not Stated' category.

Figure 7: Unemployment rate, 2016-21



Source: Author analysis, ABS, 2021.

The population of Tamworth Regional and Walcha Shire had the highest proportion (53%) of employed persons (full-time and part-time combined), followed by Armidale Regional (50%). Inverell Shire had the highest proportion of those who were unemployed and looking for full-time or part-time work (3.3%).

Almost half of Tenterfield Shire's population (46%) was not in the labour force in 2021, defined as persons aged 15 years and over who are neither employed nor unemployed and looking for work. This group includes retirees, those in unpaid work (e.g. performing home duties or caring for children), those unable to work due to health conditions, and/or those permanently unable to work.

Table 14: Population by employment category and LGA, 2021

	LGA	Employed, worked full-time	Employed, worked part-time	Employed, away from work	Unemployed, looking for full-time work	Unemployed, looking for part-time work	Not in the labour force
NE REZ Region	Armidale Regional	30.9%	19.2%	3.4%	1.5%	1.5%	33.5%
	Glen Innes Severn	25.0%	16.0%	3.1%	1.9%	1.1%	42.7%
	Inverell Shire	29.5%	16.2%	3.3%	2.1%	1.2%	38.3%
	Tamworth Regional	35.8%	17.7%	3.4%	1.5%	1.2%	33.2%
	Tenterfield Shire	22.6%	16.0%	3.0%	1.7%	1.2%	45.9%
	Uralla Shire	31.9%	19.1%	3.7%	1.3%	1.2%	36.0%
	Walcha Shire	34.8%	17.0%	3.1%	1.0%	0.8%	33.1%
NE REZ Region sub-total		**32.2%**	**17.7%**	**3.3%**	**1.6%**	**1.2%**	**35.4%**
NRNIP Corridor	Liverpool Plains	30.3%	15.2%	3.4%	1.9%	1.1%	35.9%
	Muswellbrook Shire	36.3%	16.8%	4.0%	1.8%	1.2%	33.2%
	Upper Hunter Shire	37.9%	16.9%	3.8%	1.2%	0.8%	32.9%
NRNIP Corridor sub-total		**35.7%**	**16.5%**	**3.8%**	**1.6%**	**1.0%**	**33.6%**
NE REZ Surrounds	Bellingen	23.0%	22.4%	3.3%	1.4%	1.3%	41.1%
	Clarence Valley	23.3%	17.0%	3.2%	1.7%	1.2%	46.6%
	Gunnedah	38.1%	16.7%	3.8%	1.7%	0.9%	29.8%
	Gwydir	30.6%	15.0%	2.7%	1.2%	0.9%	40.4%
	Kempsey	21.4%	16.8%	3.4%	1.9%	1.3%	47.4%
	Kyogle	23.4%	18.1%	3.2%	1.5%	1.2%	42.7%

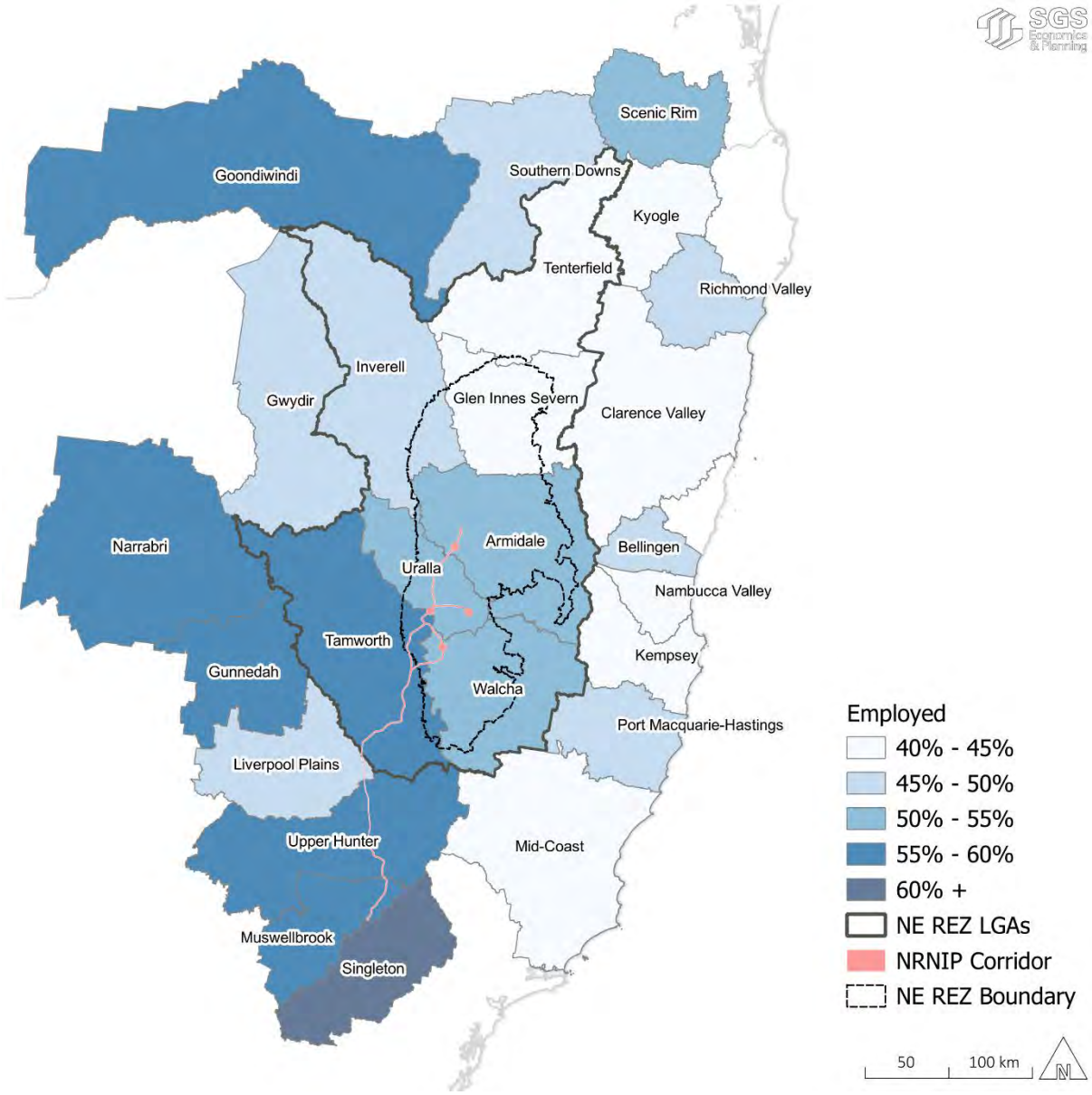
	LGA	Employed, worked full-time	Employed, worked part-time	Employed, away from work	Unemployed, looking for full-time work	Unemployed, looking for part-time work	Not in the labour force
	Mid-Coast	21.1%	16.8%	3.3%	1.6%	1.1%	48.6%
	Nambucca Valley	20.0%	18.1%	3.2%	1.7%	1.3%	48.0%
	Narrabri	37.6%	15.7%	3.6%	1.5%	0.9%	29.7%
	Port Macquarie-Hastings	26.4%	19.3%	3.1%	1.2%	1.2%	43.6%
	Richmond Valley	26.0%	17.8%	3.6%	1.3%	1.0%	40.6%
	Singleton	38.7%	18.4%	5.0%	1.3%	1.1%	29.0%
	Goondiwindi (QLD)	38.7%	17.1%	3.4%	1.3%	0.9%	29.2%
	Scenic Rim (QLD)	29.6%	17.5%	5.9%	1.4%	1.0%	37.5%
	Southern Downs (QLD)	27.9%	18.4%	3.6%	1.3%	1.1%	39.7%
NE REZ Surrounds sub-total		**26.0%**	**17.8%**	**3.6%**	**1.5%**	**1.1%**	**42.6%**

Source: Author analysis, ABS, 2021. Note: Working age population by LGA included residents in the 'Not Stated' category.

The maps in Figure 8, Figure 9 and Figure 10 are based on the data provided in Table 14 and highlight spatial trends in employment, unemployment, and those not in the labour force by LGA.

Current employment (full-time, part-time, and employed but away from work) is more heavily concentrated in the south of the New England REZ region in the Tamworth Regional, Uralla Shire, Armidale Regional and Walcha Shire LGAs. Population employment is least concentrated in the north of the New England REZ, in Tenterfield and Glen Innes Severn.

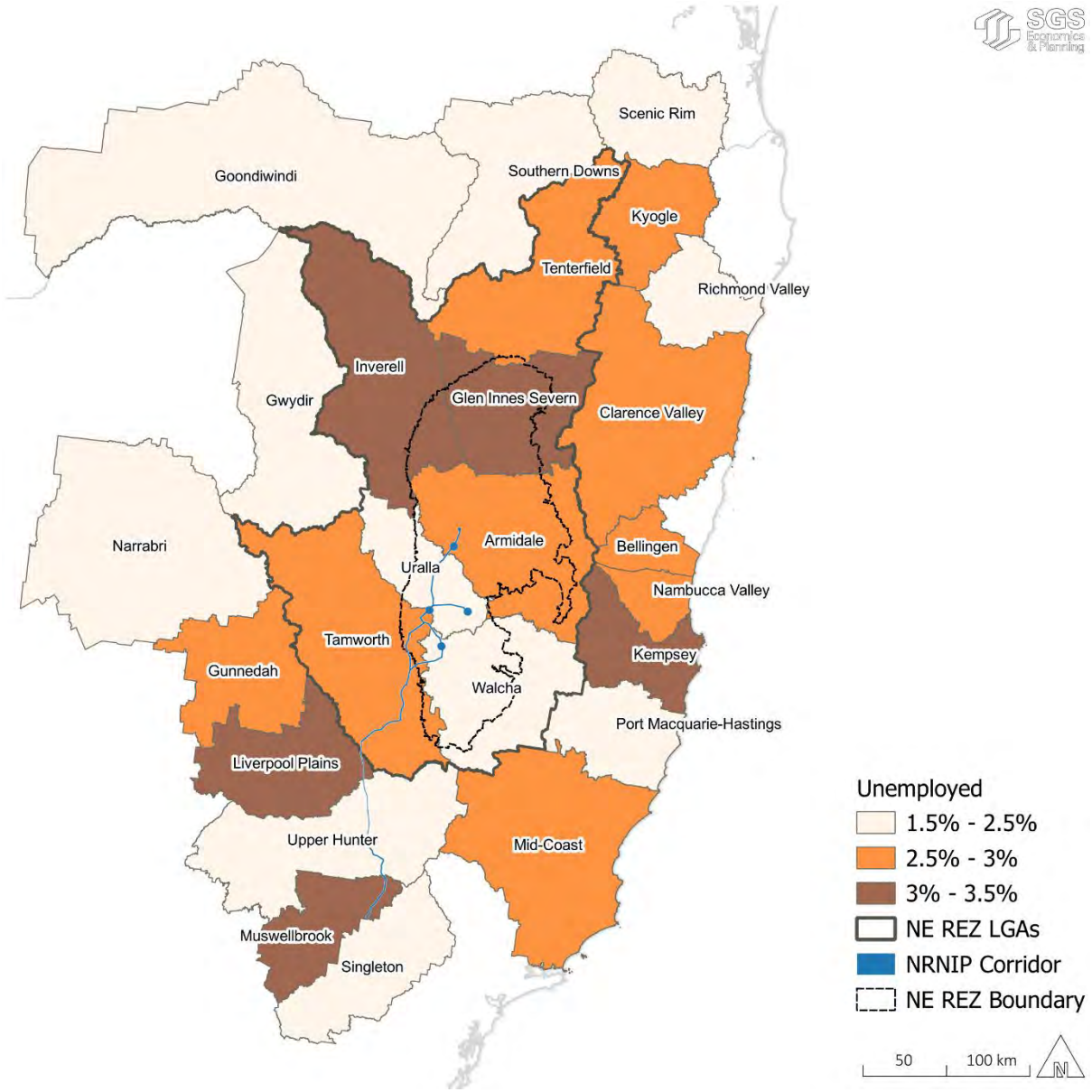
Figure 8: Employment in the New England REZ region, NRNIP Corridor and surrounds, 2021



Source: SGS Economics and Planning, 2024

Within the New England REZ region, LGAs with the highest unemployment rates are clustered in the north (Inverell and Glen Innes Severn LGAs).

Figure 9: Unemployment in the New England REZ region, NRNIP Corridor and surrounds, 2021

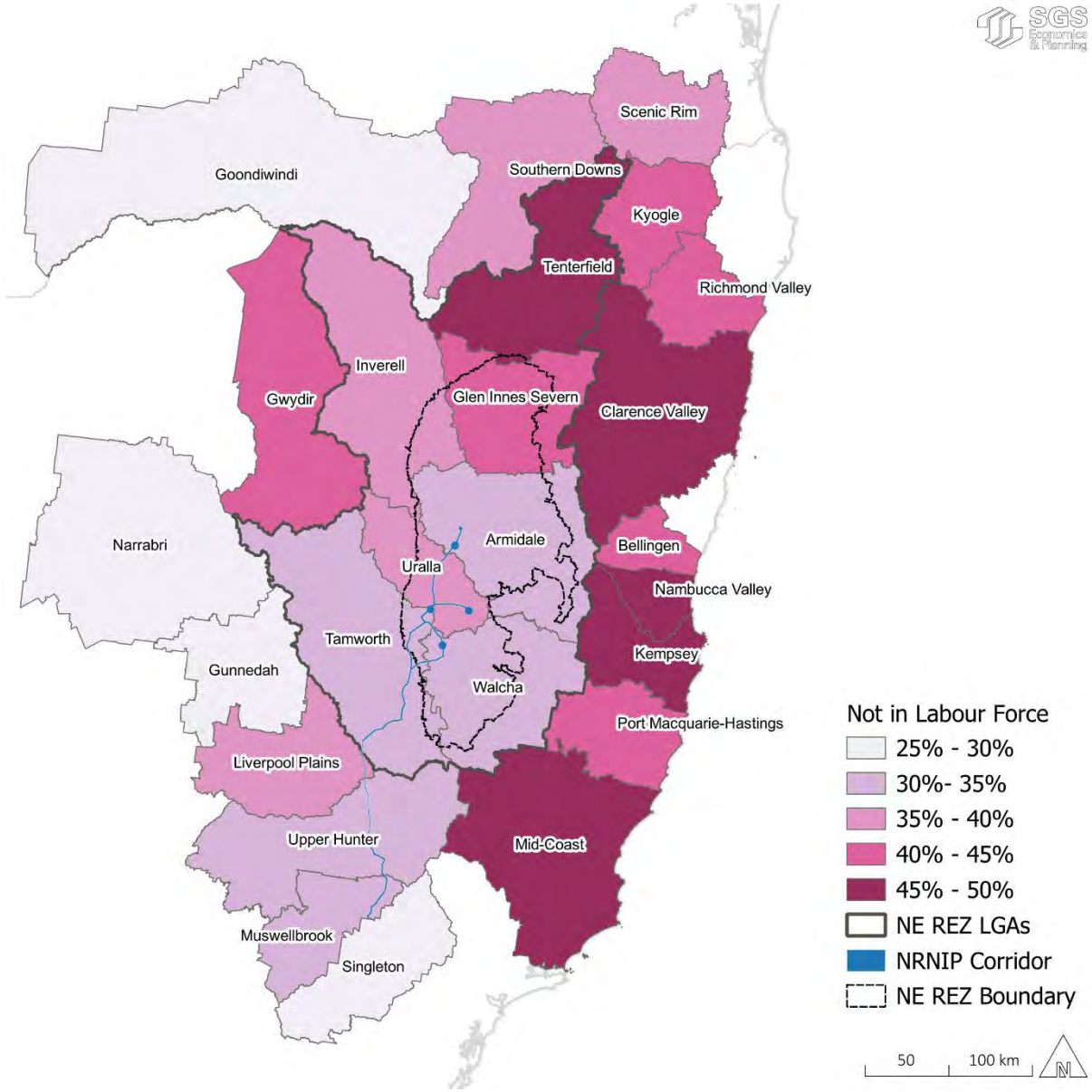


Source: SGS Economics and Planning, 2024.

Note that map colours may not correspond exactly with the Table 13 unemployment rates due to rounding. For example, Armidale Regional's employment rate of 2.99% is rounded to 3.0% in Table 13 but displayed in the 2.5% to 3% category here.

Within the New England REZ region, Tenterfield Shire has the highest proportion of population not in the labour force. This is followed by the Mid-Coast, Nambucca Valley, Kempsey, Tenterfield and Clarence Valley to the east of the New England REZ.

Figure 10: Population not in the labour force, New England REZ region, NRNIP Corridor and surrounds, 2021



Source: SGS Economics and Planning, 2024

The workforce participation rate measures the proportion of the working age population that is either employed or actively seeking employment. The workforce participation rate is an indicator of labour supply available in the economy. The workforce participation rate varied across the study area. In the New England REZ region, the highest participation rates were in Tamworth Regional (59.5%), Uralla Shire (57.1%), Walcha Shire and Armidale Regional LGAs (approximately 56% each). However, these participation rates were still lower than the national rate of 65.2% in 2021[17]. Along the NRNIP Corridor, workforce participation was highest in Upper Hunter Shire (60.5%).

Table 15: Workforce participation rate, 2021

	LGA	Workforce participation rate
NE REZ Region	Armidale Regional	56.4%
	Glen Innes Severn	47.2%
	Inverell Shire	52.2%
	Tamworth Regional	59.5%
	Tenterfield Shire	44.5%
	Uralla Shire	57.1%
	Walcha Shire	56.7%
NE REZ Region sub-total		**56.1%**
NRNIP Corridor	Liverpool Plains	52.0%
	Muswellbrook Shire	60.1%
	Upper Hunter Shire	60.5%
NRNIP Corridor sub-total		**58.6%**
NE REZ Surrounds	Bellingen	51.3%
	Clarence Valley	46.4%
	Gunnedah	61.1%
	Gwydir	50.3%
	Kempsey	44.9%
	Kyogle	47.5%
	Mid-Coast	43.9%
	Nambucca Valley	44.2%
	Narrabri	59.3%
	Port Macquarie-Hastings	51.3%
	Richmond Valley	49.7%
	Singleton	64.5%
	Goondiwindi (QLD)	61.4%
	Scenic Rim (QLD)	55.4%
	Southern Downs (QLD)	52.3%
NE REZ Surrounds sub-total		**50.1%**

Source: Author analysis, ABS, 2021.

Aboriginal and Torres Strait Islander employment and unemployment

Across all LGAs of the study area, a higher proportion of Aboriginal and Torres Strait Islanders are unemployed and looking for either full- or part-time work. The drivers of this are widely documented and include lower levels of education, training and skill levels, poorer health and lower levels of job retention. Potential means to better engage Aboriginal and Torres Strait Islander communities in the labour force can include via formal education, as well as non-standard recruitment strategies and cross-cultural training.[18]

There is a major opportunity to re-orient the current economic system to ensure that Aboriginal and Torres Strait Islanders residents have equitable access to employment, education and training opportunities. This would contribute much-needed progress towards the Closing the Gap Targets related to youth employment and education.

Table 16: Aboriginal and Torres Strait Islander employment by LGA, 2021

	LGA	Employed, worked full-time	Employed, worked part-time	Employed, away from work	Unemployed, looking for full-time work	Unemployed, looking for part-time work	Not in the labour force
NE REZ Region	Armidale Regional	21.9%	15.9%	4.1%	4.1%	2.1%	49.0%
	Glen Innes Severn	15.6%	15.8%	5.3%	5.3%	3.0%	51.7%
	Inverell Shire	19.9%	16.8%	3.2%	5.3%	2.6%	49.3%
	Tamworth Regional	31.2%	17.5%	4.1%	4.3%	2.4%	38.5%
	Tenterfield Shire	7.6%	11.1%	1.0%	7.3%	1.9%	68.2%
	Uralla Shire	25.5%	18.2%	2.5%	5.9%	4.8%	42.3%
	Walcha Shire	23.0%	10.1%	2.9%	5.0%	2.9%	48.2%
NE REZ Region sub-total		**26.2%**	**16.7%**	**3.8%**	**4.6%**	**2.5%**	**43.6%**
NRNIP Corridor	Liverpool Plains	23.0%	16.0%	3.1%	4.9%	3.0%	46.5%
	Muswellbrook Shire	32.4%	17.4%	4.6%	4.2%	2.6%	37.7%
	Upper Hunter Shire	30.9%	17.9%	4.1%	4.1%	1.8%	38.3%
NRNIP Corridor sub-total		**29.2%**	**17.1%**	**4.0%**	**4.4%**	**2.5%**	**40.5%**
NE REZ Surrounds	Bellingen	27.6%	24.0%	3.3%	1.4%	1.7%	40.1%

	LGA	Employed, worked full-time	Employed, worked part-time	Employed, away from work	Unemployed, looking for full-time work	Unemployed, looking for part-time work	Not in the labour force
	Clarence Valley	18.5%	16.2%	4.1%	4.1%	2.1%	52.8%
	Gunnedah	35.2%	17.2%	4.0%	4.8%	1.9%	33.9%
	Gwydir	21.1%	14.3%	5.1%	2.5%	3.0%	50.2%
	Kempsey	15.8%	13.5%	3.5%	4.7%	2.6%	56.6%
	Kyogle	17.2%	12.5%	3.3%	2.7%	3.0%	57.6%
	Mid-Coast	20.9%	18.8%	4.6%	4.5%	2.3%	45.6%
	Nambucca Valley	18.4%	17.5%	3.5%	4.3%	2.5%	48.7%
	Narrabri	30.3%	15.2%	4.1%	5.0%	1.8%	40.2%
	Port Macquarie-Hastings	28.1%	21.6%	5.5%	2.4%	2.1%	38.6%
	Richmond Valley	21.8%	17.6%	4.5%	4.7%	1.3%	47.2%
	Singleton	36.7%	20.6%	5.1%	2.8%	2.2%	31.0%
	Goondiwindi (QLD)	24.2%	15.6%	4.5%	5.1%	3.5%	42.3%
	Scenic Rim (QLD)	26.1%	19.4%	7.6%	3.1%	2.1%	40.2%
	Southern Downs (QLD)	24.8%	19.5%	3.2%	4.3%	2.7%	42.4%
NE REZ Surrounds sub-total		**23.6%**	**17.8%**	**4.5%**	**4.0%**	**2.2%**	**45.1%**

Source: Author analysis, ABS, 2021.

Forecast labour supply

Table 17 shows the forecast workforce for the New England REZ by LGA for milestone years during NRNIP construction stages 1 and 2.

The Tamworth Regional workforce is forecast to grow the most by over 800 workers between 2024 and 2027, followed by an increase of approximately 97 workers in the Armidale Regional workforce over the same period. By the end of Stage 2 of the NRNIP, Tamworth Regional is expected experience the largest growth in workforce of all LGAs.

Table 17: Workforce forecast by LGA, 2024-40

	LGA	2024	2027	2030	2032	2034	2024-27 Change	2027-2032 Change (Stage 1)	2030-2034 Change (Stage 2)
NE REZ Region	Armidale Regional	10,927	11,024	11,097	11,179	11,296	97	155	200
	Glen Innes Severn	3,426	3,413	3,393	3,386	3,385	-13	-26	-8
	Inverell Shire	6,671	6,652	6,630	6,628	6,640	-19	-24	10
	Tamworth Regional	27,727	28,532	29,234	29,727	30,246	806	1,195	1,012
	Tenterfield Shire	2,064	1,973	1,884	1,831	1,784	-90	-143	-100
	Uralla Shire	2,857	2,741	2,611	2,531	2,456	-115	-210	-155
	Walcha Shire	1,459	1,452	1,448	1,448	1,452	-7	-4	4
NE REZ Region sub-total		**55,130**	**55,788**	**56,296**	**56,730**	**57,259**	**657**	**943**	**962**
NRNIP Corridor	Liverpool Plains	3,300	3,264	3,218	3,188	3,158	-36	-76	-60
	Muswellbrook Shire	5,628	5,659	5,646	5,643	5,644	31	-17	-2
	Upper Hunter Shire	7,981	7,882	7,767	7,694	7,624	-99	-188	-143
NRNIP Corridor sub-total		**16,909**	**16,805**	**16,631**	**16,525**	**16,427**	**-104**	**-281**	**-205**
NE REZ Surrounds	Bellingen	5,562	5,578	5,562	5,569	5,593	16	-9	31
	Clarence Valley	19,417	19,518	19,512	19,563	19,668	101	45	156

LGA	2024	2027	2030	2032	2034	2024-27 Change	2027-2032 Change (Stage 1)	2030-2034 Change (Stage 2)
Gunnedah	6,125	6,187	6,264	6,319	6,379	62	132	115
Gwydir	2,792	2,786	2,771	2,765	2,764	-6	-21	-7
Kempsey	11,380	11,422	11,456	11,516	11,614	43	94	158
Kyogle	3,637	3,494	3,331	3,229	3,134	-53	-265	-197
Mid-Coast	37,770	38,533	39,195	39,695	40,252	763	1,161	1,057
Nambucca Valley	7,426	7,385	7,340	7,333	7,347	-41	-53	6
Narrabri	6,116	6,048	5,949	5,894	5,849	-69	-154	-100
Port Macquarie-Hastings	38,662	39,348	40,005	40,496	41,041	686	1,148	1,036
Richmond Valley	11,239	11,315	11,349	11,396	11,466	76	81	117
Singleton	12,479	12,376	12,177	12,033	11,877	-103	-343	-300
NE REZ Surrounds sub-total	**162,605**	**163,991**	**164,912**	**165,808**	**166,985**	**1,386**	**1,816**	**2,072**

Source: TZP, 2022; SGS Economics and Planning, 2024. Notes: These figures are interpolated from the 5-yearly TZP22 forecasts, available between 2026 and 2066. 2024 figures in TZP22 were being updated at the time of this report. TZP24 projections were released in January 2025, following the completion of the Training and Skills Study regional profiling. Population forecasts are not included for Goondiwindi, Scenic Rim, and Southern Downs in the Queensland portion of the 'REZ Surrounds', as the TZP forecasts are NSW based.

2.4. Summary

The labour market in the New England REZ is tight and the unemployment rate is below the NSW average, which corresponds with the clear population divide across the New England REZ into young people and individuals close to retirement age. People aged 55-59 years make up 6.8% of total New England REZ population, and 5-8% of the total New England REZ population is in the age bracket 15-19 years olds – which offers real opportunities for school leavers to join the energy transition workforce.

At present, there is insufficient awareness and limited uptake of clean energy jobs in the New England REZ, this is confirmed by low VET completions in clean energy occupations (less than 10%). The LGAs with the most VET completions relevant for the clean energy sector are in Tamworth Regional, Muswellbrook Shire and Armidale Regional. In these LGAs, the developments related to building the REZ are highly visible.

To capture 15–19-year-olds in the New England REZ, there is a strong demand for advocacy and real-world examples in school education, apprenticeships, and tertiary education, that demonstrate career pathways in the clean energy sector and future job prospects in the region.

3. Employment Projections for New England REZ: Labour Demand & Supply

In this section, the results for the projections of labour demand and supply are presented:

- Employment demand projections for renewable energy, storage and transmission in the New England REZ and NRNIP Corridor;
- Employment demand for non-renewable energy projects;
- Labour supply within the New England REZ and NRNIP Corridor; and
- Labour supply-demand balance for renewable energy occupations in the New England REZ and NRNIP Corridor.

3.1. Employment Demand in Renewable Energy Occupations in New England REZ

This study modelled the total workforce numbers for generation, storage, and transmission line construction in the New England REZ and along the NRNIP Corridor. An employment factor approach has been used, applying the labour intensity specific to each technology to each megawatt (MW) of installed capacity.

Jobs are presented as the total full-time equivalent (FTE) employment per quarter and annually, running from now through to 2036. This study models the workforce associated with the construction and operations and maintenance of renewable energy. For transmission line infrastructure, the jobs associated with the construction of new lines and associated infrastructure (e.g. substations) are estimated, not ongoing maintenance roles. The employment associated with this build out has been attributed to the New England REZ rather than the NRNIP Corridor.

Employment is presented as full-time equivalent (based on a standard working week of 35 hours) but to estimate the number of workers that are local and non-local, survey data from renewable energy developers was collected on the average working hours to convert FTE into the number of workers. For more information on the methodology, see Appendix 4.

Renewable energy, Storage and Transmission Scenarios

Workforce modelling has been projected based on two scenarios using data provided by EnergyCo:

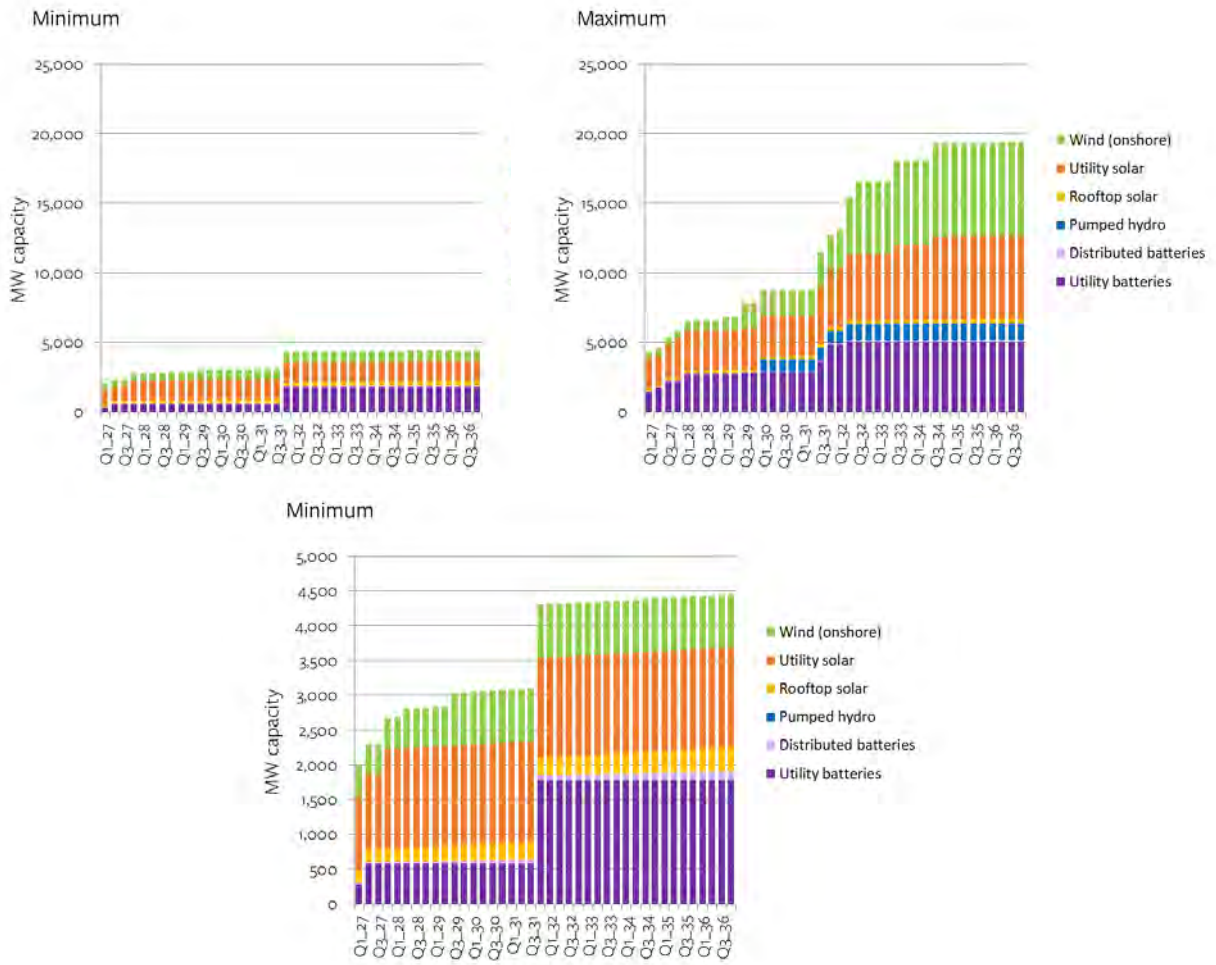
- the **'minimum' scenario**: only projects classified as 'high' probability of proceeding were included. In the minimum scenario, there is about 4.5 GW built in New England REZ and about 800 MW built in the NRNIP Corridor; and
- the **'maximum' scenario**: projects classified as 'medium' and 'high' probability of proceeding were included. In the maximum scenario, there is about 19.5 GW built in the New England REZ and about 6 GW in the NRNIP Corridor.

It is noted that the 'minimum' and 'maximum' scenarios for workforce modelling are based on a 'point-in-time' analysis using information currently available. These scenario's include renewable energy projects that are currently at various stages of the project development lifecycle (pre-planning, planning, construction and operation) and includes renewable energy projects that may connect to other transmission networks.

While it is noted that the exact number and configuration of renewable energy projects within the New England REZ is subject to change, the ultimate generation figure is anticipated to fall between these scenarios, being influenced by factors such as generation availability and network connection capacity within the region. It is considered that these scenarios are sufficient to form a basis for the development of the key findings in this study which respond to the challenges and opportunities brought by REZ development.

Figure 11 shows the cumulative installed capacity (MW) of wind, solar (rooftop and utility), pumped hydro and distributed batteries at each quarter for the New England REZ. In the minimum scenario, utility solar is the largest type of development followed by wind and large-scale batteries until 2031, after which most new capacity is utility battery storage. In the maximum scenario, solar farms and large-scale battery storage leads the way until 2031, after which there is a large growth in wind farms along with smaller volumes of utility solar and batteries.

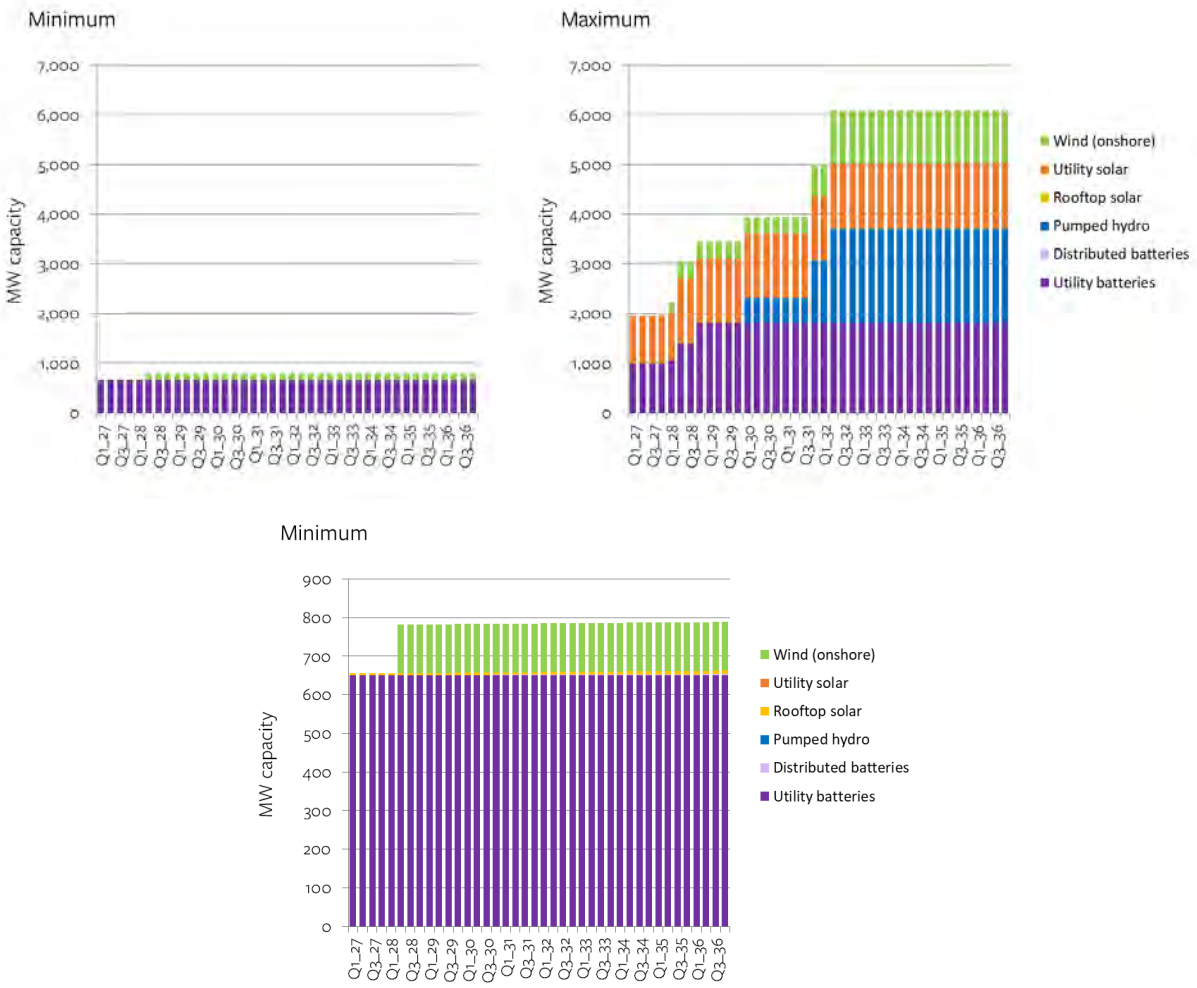
Figure 11: Installed Capacity by Technology, New England REZ, Quarterly



Note: the top two graphs present the data using the same scale, whereas the third (bottom) graph shows the minimum scenario with the scale set for maximum readability. These scenarios aim to provide insight into the size of the potential challenge, and are not intended to reflect the final makeup of the power generated in the REZ.

Figure 12 shows the installed capacity per MW by quarter for the NRNIP Corridor area. In the minimum scenario, capacity peaks at just under 800MW by Q2 2028 and remains there for the rest of the period. The majority of new capacity comes from utility batteries, with a small portion of wind. In the maximum scenario, installed capacity reaches 6,000MW by Q2 2032. Around two-thirds of the new capacity is storage (pumped hydro and battery) and one-third of the new capacity is large-scale wind and solar.

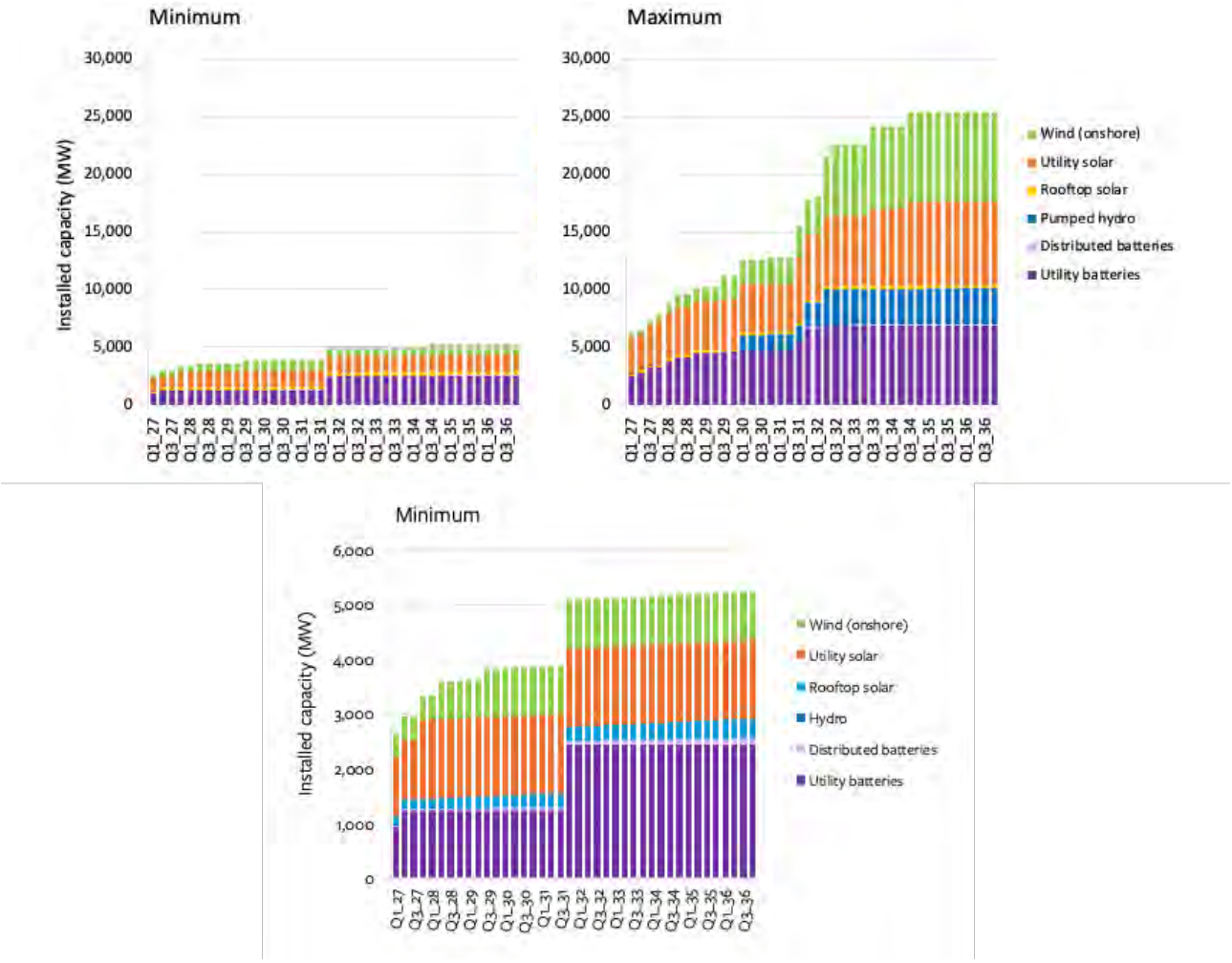
Figure 12: Installed Capacity by Technology, NRNIP Corridor, Quarterly



Note: the top two graphs present the data using the same scale, whereas the third (bottom) graph shows the minimum scenario with the scale set for maximum readability. These scenarios aim to provide insight into the size of the potential challenge, and are not intended to reflect the final makeup of the power generated in the REZ.

In Figure 13, the cumulative installed capacity is shown for the New England REZ and NRNIP Corridor. In a minimum scenario, capacity peaks at just over 5,000MW by Q4 2032. In the maximum scenario, installed capacity is almost five times the minimum, reaching a peak of around 25,500MW by Q3 2034.

Figure 13: Installed Capacity by Technology, New England REZ & NRNIP Corridor, Quarterly



Note: the top two graphs present the data using the same scale, whereas the third (bottom) graph shows the minimum scenario with the scale set at 6000 MW (compared to 30,000 MW for the top graphs) to maximise readability. These scenarios aim to provide insight into the size of the potential challenge, and are not intended to reflect the final makeup of the power generated in the REZ.

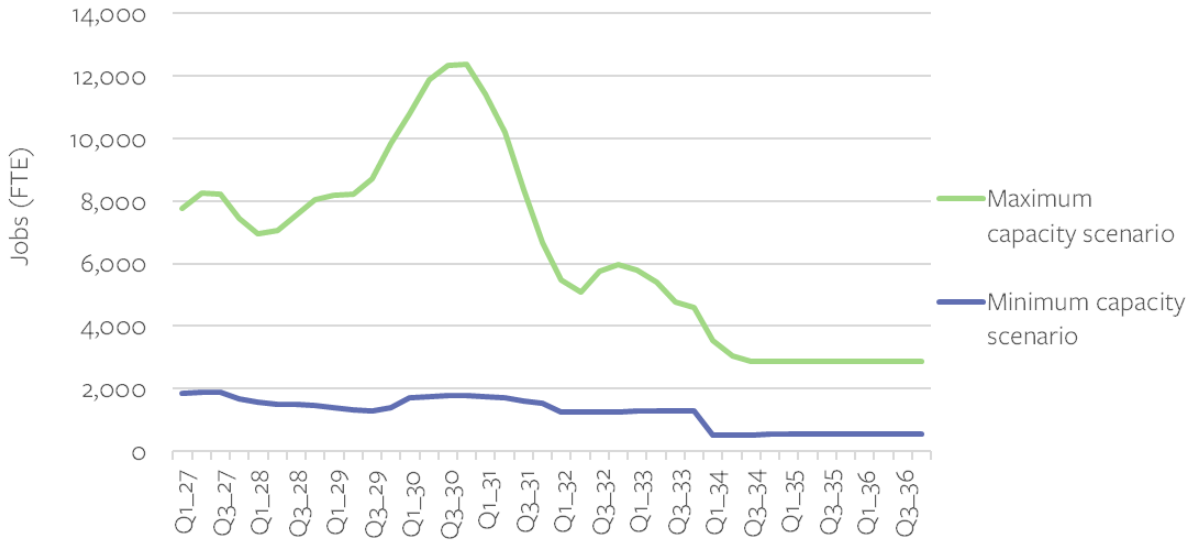
How many Jobs? Renewable Energy Employment in the NE REZ and NRNIP Corridor

There is a large difference in the employment demand of the minimum and maximum scenarios, primarily reflecting the significant differences in modelled construction activity. Under the minimum capacity scenario, FTE jobs range from a peak of 1,900 FTE (Q2 2027) and drop to around 500 FTE from 2034 onwards.

In comparison with the minimum scenario, FTE jobs in the maximum scenario peak are over six times higher and are far more volatile.

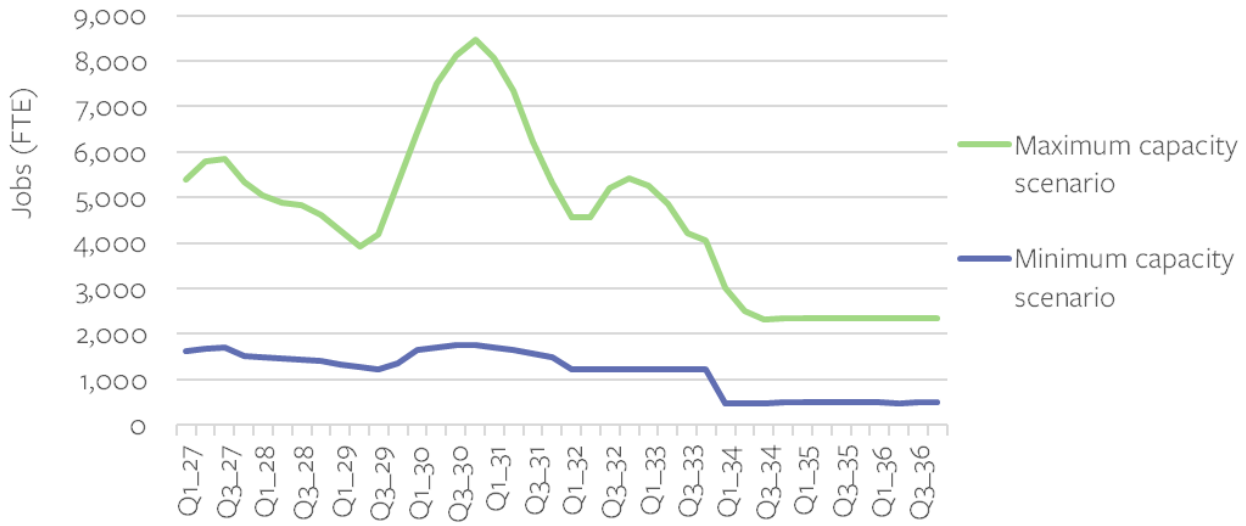
In the maximum scenario, employment rises quickly to over 8,000 FTE in Q3 2027, dips to below 7,000 FTE in 2028 before peaking in Q4 2030 at just under 12,500 FTE jobs. This is followed by a rapid drop to 5,100 FTE by Q2 2032, with a brief rise and then a decline to 3,000 FTE in Q2 2034, after which employment remains fairly constant (Figure 14).

Figure 14: Total Renewable Energy Employment, New England REZ and NRNIP Corridor, Quarterly



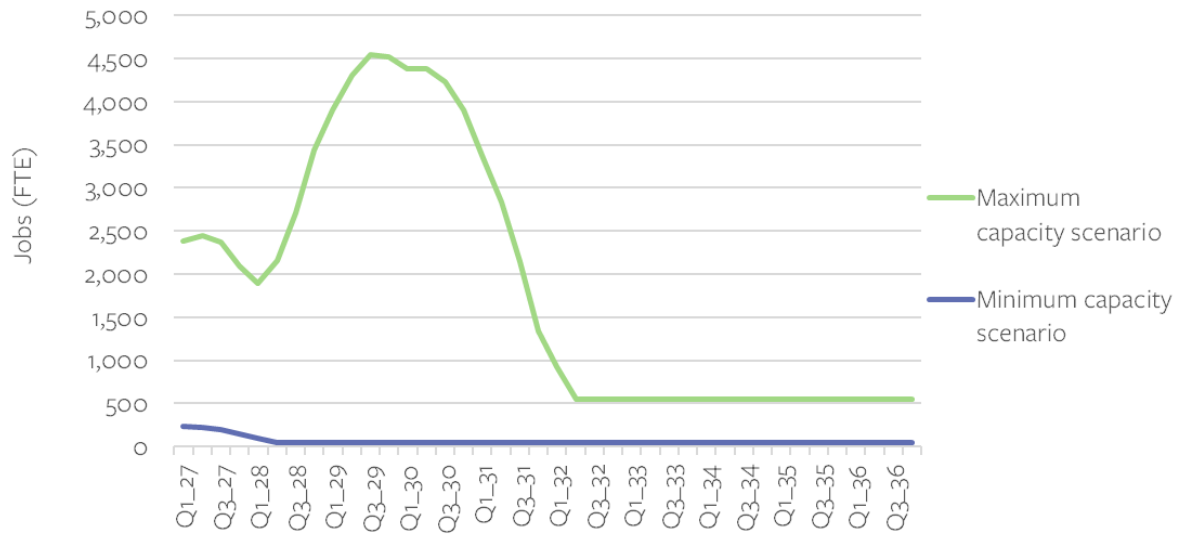
The profile of employment in the New England REZ (Figure 15) is similar to the total renewable energy employment chart. The minimum scenario has a more consistent profile, with the total jobs ranging from 1,200 to 1,750 FTE until Q4 2033, when jobs drop to 500 FTE and remain there. The maximum scenario follows the same volatile profile as New England REZ and NRNIP corridor, peaking in Q4 2030 at 8,500 FTE and plateauing in Q2 2034 at around 2,400 FTE (Figure 15).

Figure 15: Total Renewable Energy Employment, New England REZ, Quarterly



In the minimum scenario in the NRNIP Corridor, very little employment is required with a peak of 200 FTE in 2027, before declining after 2028. In the maximum scenario, jobs peak in Q3 2029 at 4,500 FTE before dropping drastically to reach just 500 FTE jobs by Q2 2032 (Figure 16).

Figure 16: Total Employment, NRNIP Corridor, Quarterly



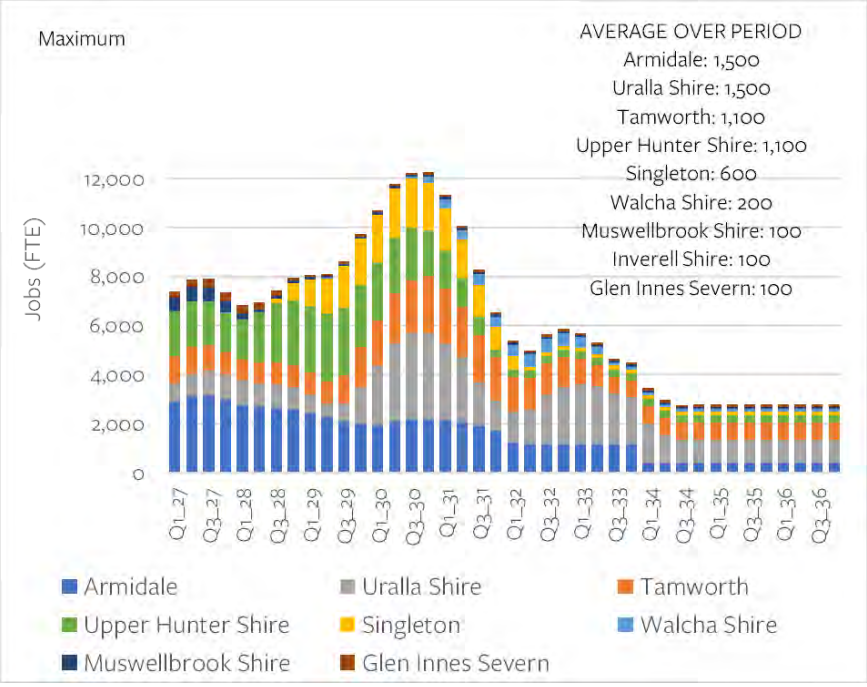
Where are the Jobs? Renewable energy employment by LGA

The New England REZ and NRNIP Corridor areas include ten LGAs. Figure 17 illustrates the split of employment by LGA per quarter for the maximum scenario. Figure 18 shows the same split, annually, under the maximum and minimum scenarios respectively.

Under the maximum scenario, Armidale Regional and Uralla Shire sees the highest number of jobs with an average of 1,500 FTE, followed by Tamworth Regional, and the Upper Hunter Shire which average 1,100 FTE. A group of LGAs have very low employment with an average of 100-200 FTE jobs over the period. There are also differences in timing of employment; employment demand is earlier in the Upper Hunter Shire and Armidale Regional for example.

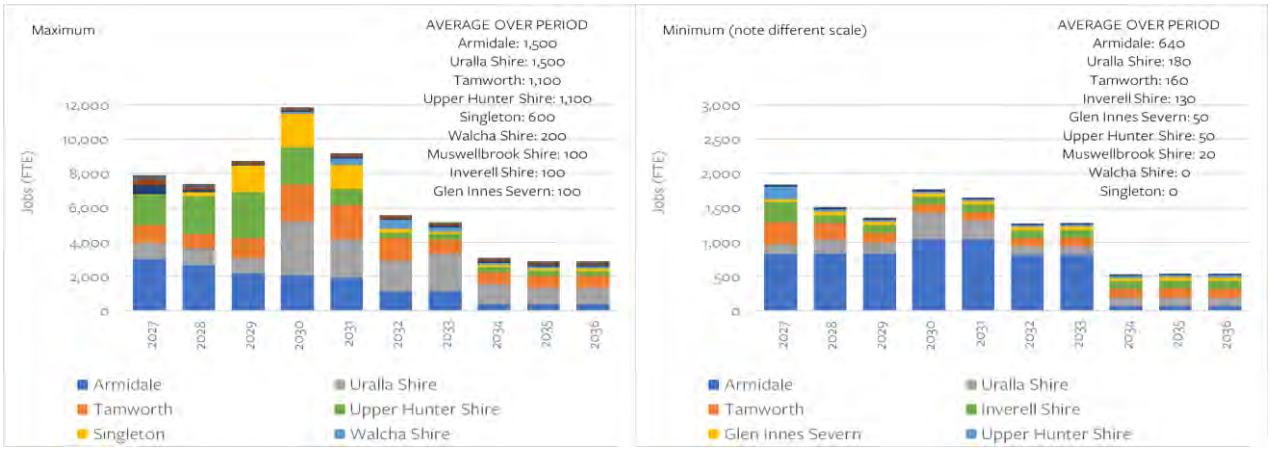
In the minimum scenario, Armidale Regional sees the highest number of jobs with an average of 640 FTE, followed by Uralla Shire with 180 FTE, and Tamworth Regional with 160 FTE, this is then followed by Inverell Shire at 130 FTE and the other remaining LGAs less than 100 FTE.

Figure 17: Total Employment, LGA, Quarterly, Maximum Scenario



Note: Liverpool Plains and Tenterfield are not included in the figure as there is no employment projected for these LGAs.

Figure 18: Total Employment, LGA, Annual, Maximum and Minimum Scenario



Note: the figures have significantly different scales.

What is the mix of renewable energy employment between local and non-local workers?

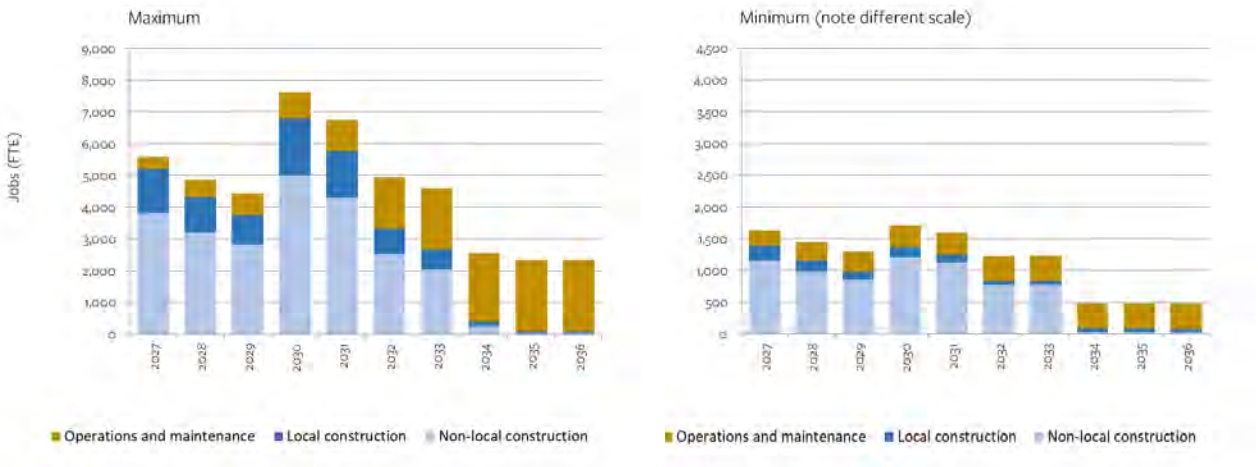
For this study, proponents of renewable energy projects working in the New England REZ (at various stages of development) were surveyed to understand the anticipated split of local versus non-local workforce during the construction of their projects. A total of 11 responses were received, and from these responses, there was a median split of 28% local employment and 72% non-local employment. This split was applied to the overall employment and underpins the estimate of local and non-local construction employment in Figure 19.

In the maximum scenario, the construction workforce peaks in 2030 with a total of 7,600 FTE using a year-on-year average. This consists of a non-local construction FTE peak of 5,000 FTE, and a local construction FTE peak of just under 2,000 FTE, with the remainder being operations and maintenance jobs.

From 2027 through to 2033, when construction for renewables will be peaking in the New England REZ, the non-local workforce dominates the employment profile. However, by 2033 a majority of employment is in operations and maintenance (2,000 FTE jobs). Whilst data has not been collected on the projected split between local and non-local for operations and maintenance (noting the survey participants were primarily development companies), it is anticipated that a larger proportion of these ongoing roles can be filled by a skilled local workforce.

In the minimum scenario, there is much less fluctuation in the workforce numbers with a peak of 1,700 FTE in 2030 using a year-on-year average. This consists of a non-local construction FTE peak of around 1,200 FTE, and a local construction FTE peak of around 250 FTE, with the remainder being operations and maintenance jobs.

Figure 19: Local and Non-Local Workers (FTE), New England REZ, Annual, Maximum and Minimum Scenarios



In order to support work being undertaken on local accommodation requirements for the non-local workforce, survey data was collected from the developers on the average working hours per week to estimate the number of workers. Using the median response (which was 50 hours per week), the FTE jobs projections were converted into persons (i.e. a headcount) in Figure 20. The peak for the non-local construction workforce is around 3,900 persons in Q4, 2030 with 2,000 persons or more from 2029 – 2031.

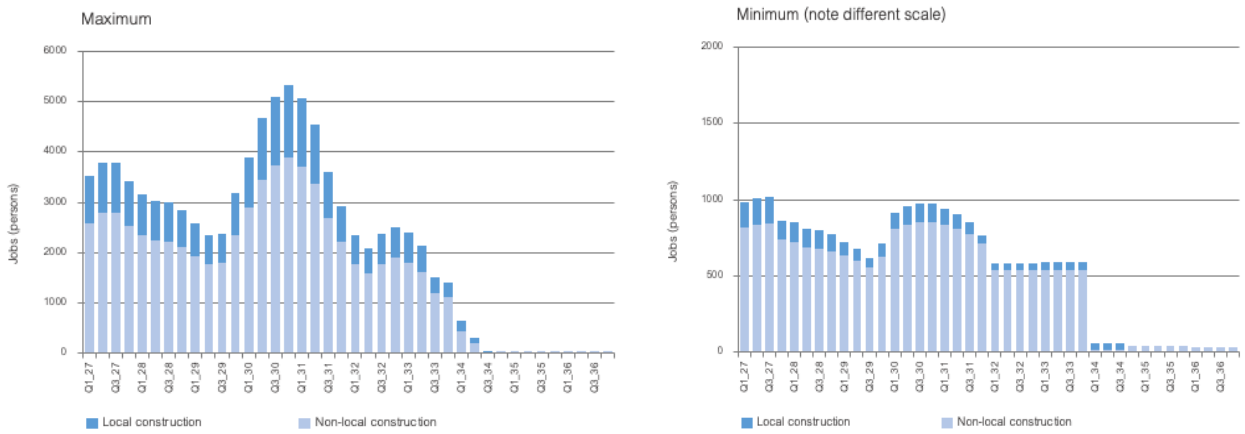


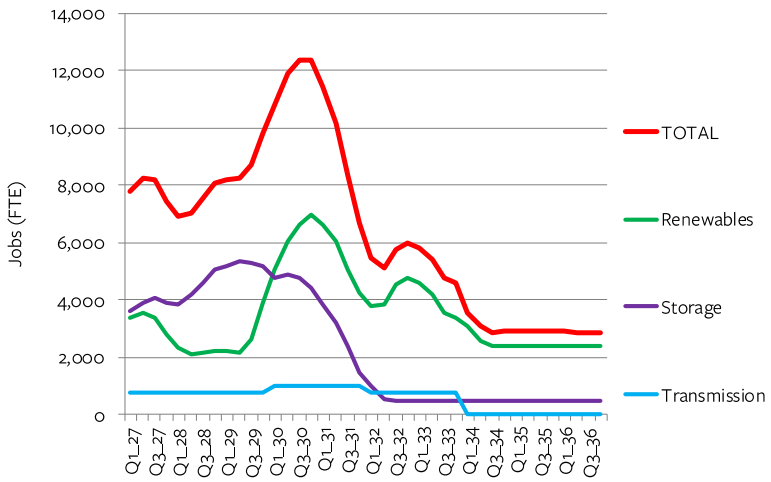
Figure 20: Local and Non-Local Construction Workers (Persons), New England REZ, Quarterly, Maximum and Minimum Scenarios

Note: this figure includes around 1,000 transmission construction workers in the peak year. No survey data could be collected on the local and non-local split but it is likely a very high proportion of this workforce will be non-local due to specialised skills (e.g. lineworkers). The transmission workforce will also be required to move along a large corridor.

How is the renewable energy employment distributed across technologies?

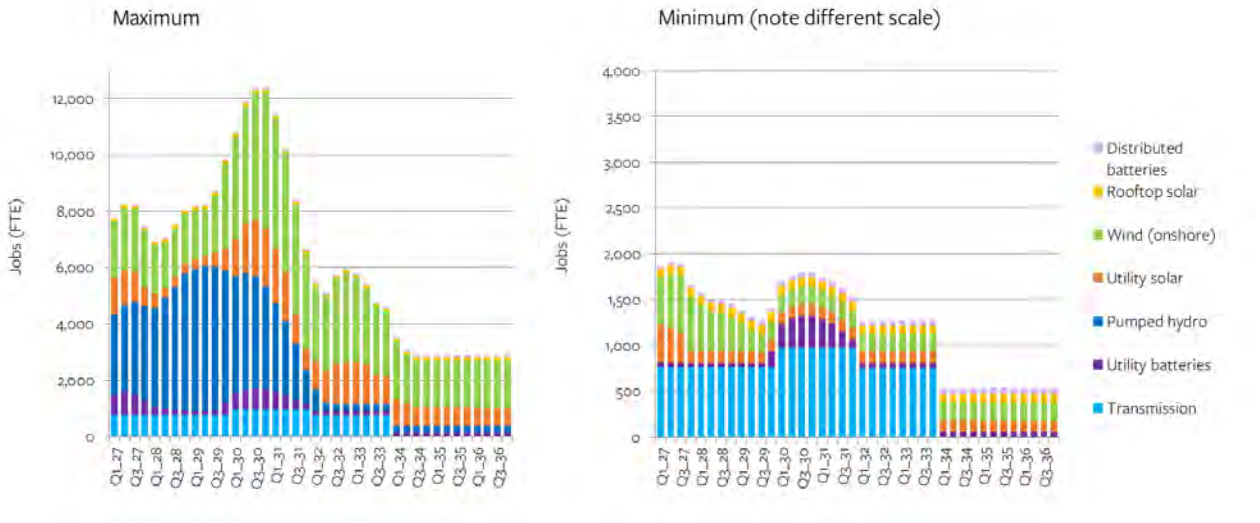
Figure 21 shows the total employment by technology grouping for both the New England REZ and NRNIP Corridor for the maximum scenario. Employment in storage averages 2,350 FTE jobs over the period, with demand front-loaded for the first five years, before dropping down to around 400 FTE. Renewable generation employment averages 3,540 FTE and follows a more volatile profile across the construction cycles but also provides jobs longer term (around 2,500 from Q2 2034 onwards).

Figure 21: Employment by Technology Group, New England and NRNIP Corridor, Quarterly, Maximum Scenario



In Figure 22, total employment per quarter is shown according to technology for the maximum and minimum scenarios in both the New England REZ and NRNIP Corridor regions. Pumped hydro dominates the employment mix in the earlier years, with a workforce peak of 5,140 FTE in Q2 2029 before petering out by 2032. Wind farms are a consistent source of employment with an average of 2,840 FTE jobs over the period and a workforce peak of 4,840 FTE in Q4 2030.

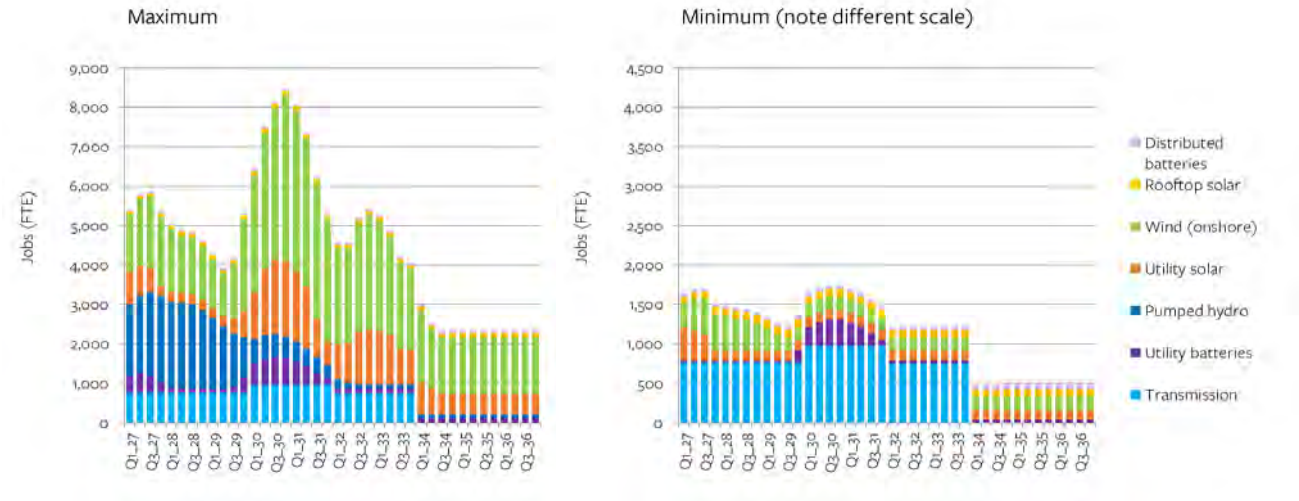
Figure 22: Employment by Technology, New England REZ and NRNIP Corridor, Quarterly, maximum scenario (left) and minimum scenario (right).



Note: The scale is in the maximum figure is 3 times the scale in the minimum figure

Figure 23 illustrates employment by technology per quarter for the New England REZ in both scenarios. As with the combined regions, pumped hydro drives employment in the first three plus years, but wind drives a majority of employment with an average of 2,130 FTE jobs over the period and a peak of 4,210 FTE in Q4 2030. Utility solar averages 810 FTE jobs over the study period.

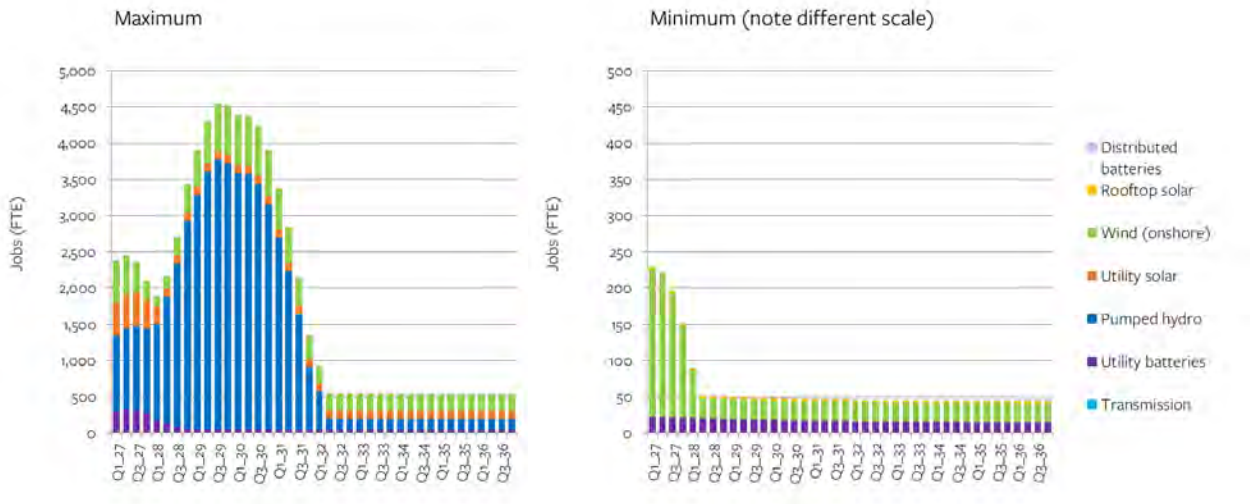
Figure 23: Employment by Technology, New England REZ, Quarterly, maximum scenario (left) and minimum scenario (right)



Note: The scale in the maximum scenario is double the scale in the minimum scenario.

In Figure 24 the technology composition for total employment in the NRNIP Corridor area is shown in the maximum scenario. Pumped hydro drives the bulk of employment, with an average of 1,280 FTE jobs over the study period and peak of around 3,700 FTE.

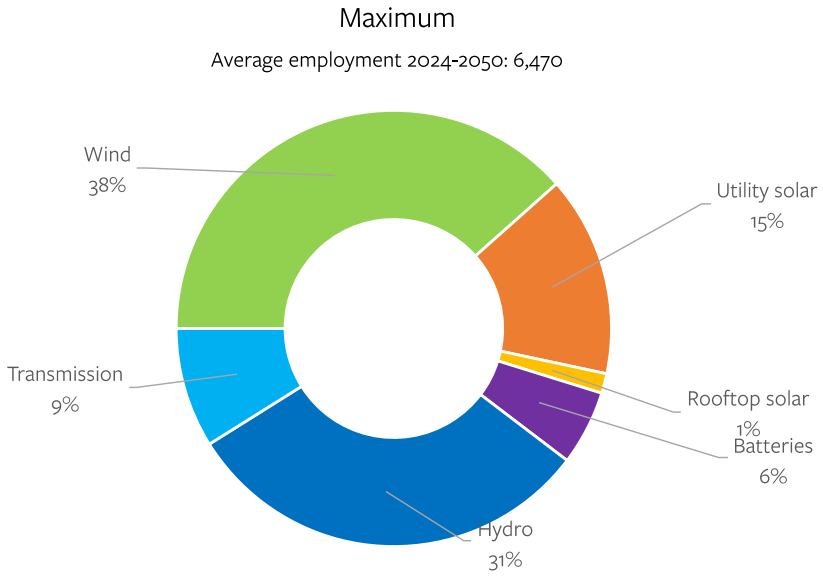
Figure 24: Employment by Technology, NRNIP Corridor, Quarterly, maximum scenario (left) and minimum scenario (right)



Note: The scale in the maximum scenario is 10 times the scale in the minimum scenario. The employment associated with transmission construction has been attributed to the New England REZ (Figure 23) rather than the NRNIP Corridor.

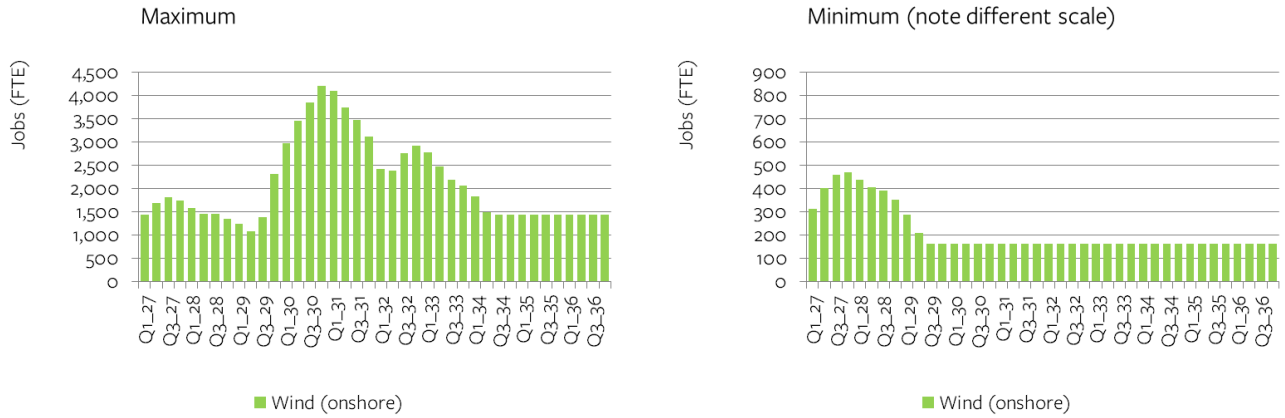
Figure 25 illustrates the share of each technology when looking at average employment over the duration of the build-out across the New England REZ and NRNIP corridor in the maximum scenario. Wind makes up the largest portion of the workforce at 38%, followed by 31% hydro and 15% utility solar.

Figure 25: Average Employment by Technology, New England REZ and NRNIP Corridor, Maximum Scenario



The following set of figures illustrate the employment profile of the major technologies. Figure 26 shows the employment profile of wind per quarter for the New England REZ. In the maximum scenario, there is an early construction boom from Q1 2027, which dips in Q2 2029, before growing dramatically to reach a peak of 4,210 FTE jobs in Q4 2030. Employment decreases steadily before plateauing at 1,500 FTE jobs in Q2 2034. In the minimum scenario, there is an earlier, more modest peak of around 470 FTE jobs which scales down to around 150 FTE jobs from 2029.

Figure 26: Wind Employment, New England REZ, Quarterly

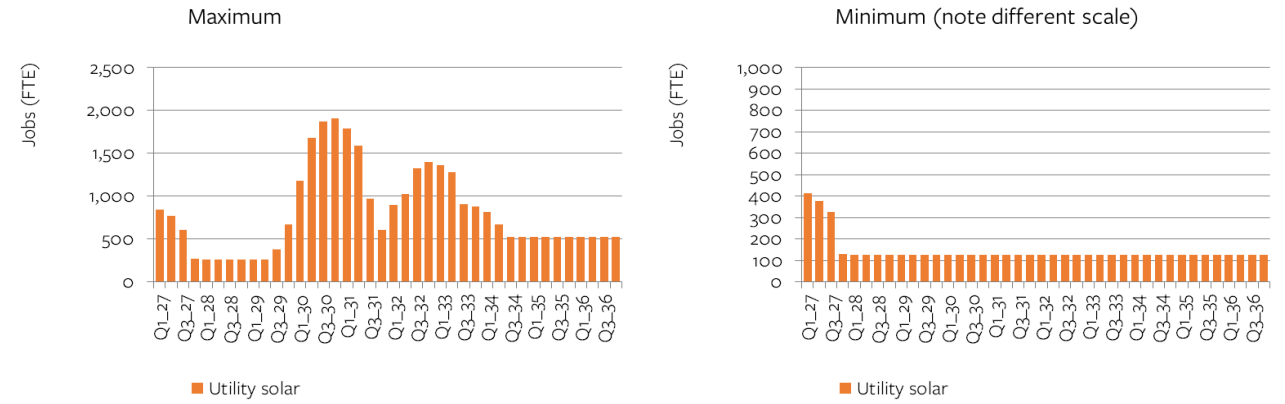


Note: the scale in the maximum scenario is 5 times the scale in the minimum scenario.

The employment profile of utility solar is shown in Figure 27. In the maximum scenario, a construction peak starts in Q3 2029 driving rapid growth and peaking in Q4 2030 at 1,910 FTE jobs, before dropping down to 500 FTE in Q3 2031. This is followed by another construction peak of 1,400 FTE jobs in Q4 2032.

In the minimum scenario, there is an early peak of around 400 FTE jobs before it flattens to under 150 FTE.

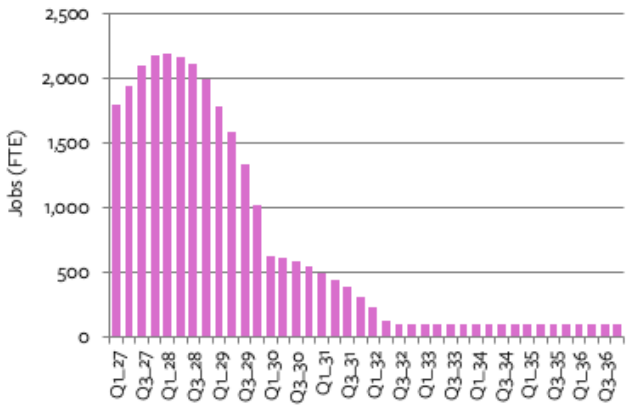
Figure 27: Utility Solar, New England REZ, Quarterly



Note: the scale in the maximum scenario is 2.5 times the scale in the minimum scenario.

Figure 28 illustrates the employment profile associated with pumped hydro in the New England REZ per quarter. Employment starts high in 2027, at 1,800 FTE jobs building to a peak of 2,200 FTE by Q1 2028. In Q1 2029, the workforce requirements begin to steadily decrease over the next three years before reaching 100 FTE in Q3 2032, where they sit for the remainder of the period.

Figure 28: Pumped Hydro, New England REZ, Quarterly, Maximum Scenario



How is renewable energy employment distributed across project phases: construction and operations & maintenance

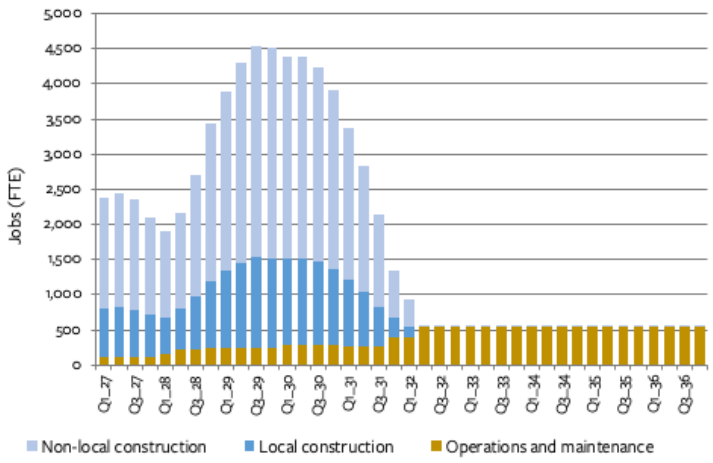
As previously noted when demonstrating the local versus non-local construction workforce, the workforce associated with both construction and operations and maintenance (O&M) phases was modelled. As is the case with project and construction-based employment, the employment profile fluctuates. Figure 29 shows the employment by project phase for the New England REZ per quarter. The peaky profile runs from 2027 through to 2033. However, also during this time the O&M workforce grows steadily to reach a consistent figure of over 2,000 jobs by Q3 2033 under the maximum scenario.

Figure 29: Renewable energy employment by Project Phase, New England REZ, Quarterly (FTE)

Note: the scale in the maximum scenario is two times the scale in the minimum scenario.

Figure 30 displays the employment by project phase for the NRNIP Corridor. Like the New England REZ, there is an early construction peak of 4,500 FTE in Q2 2029. While this employment tapers off by Q1 2032, the O&M workforce grows steadily over the entire period, reaching over 500 by Q2 2032.

Figure 30: Renewable Energy Employment by Project Phase, NRNIP Corridor, Quarterly (FTE), Maximum Scenario



Note: this graph does not include transmission construction

Employment by occupation

ANZSCO Trades and technicians are the largest occupation in demand, averaging just under 1,200 FTE jobs across the 2027–2036 period, driven largely by the wind sector. Professionals, such as community engagement officers, engineers, and finance professionals (white collar workers) average just over 1,000 FTE jobs; again, wind is the dominate employer. Labourers average just over 800 FTE jobs with a technology mix of pumped hydro, utility solar and wind. Managers (site, construction) average around 650 FTE jobs (Figure 31).

Figure 31: Employment by Occupation, New England REZ, Average (1-digit) 2027–2036, Maximum Scenario

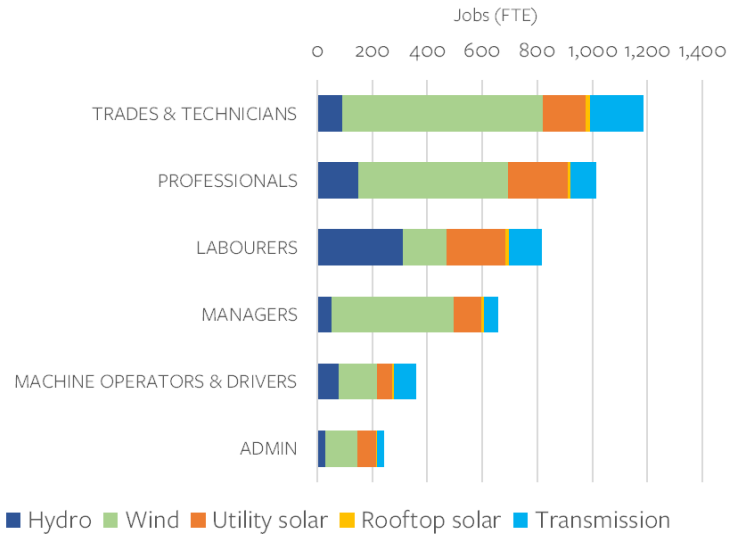


Figure 32 shows the average employment by occupation according to the 1-digit ANZSCO code for the NRNIP Corridor in the maximum scenario. Labourers average just over 600 FTE jobs, with demand coming primarily from pumped hydro. Professionals, white collar workers such as lawyers, finance professionals and engineers, average 400 FTE jobs. Trades and technicians average around 320 FTE jobs but the technology sources of demand are more mixed.

Figure 32: Employment by Occupation, NRNIP Corridor, Average (1-digit) 2027–2036, Maximum Scenario

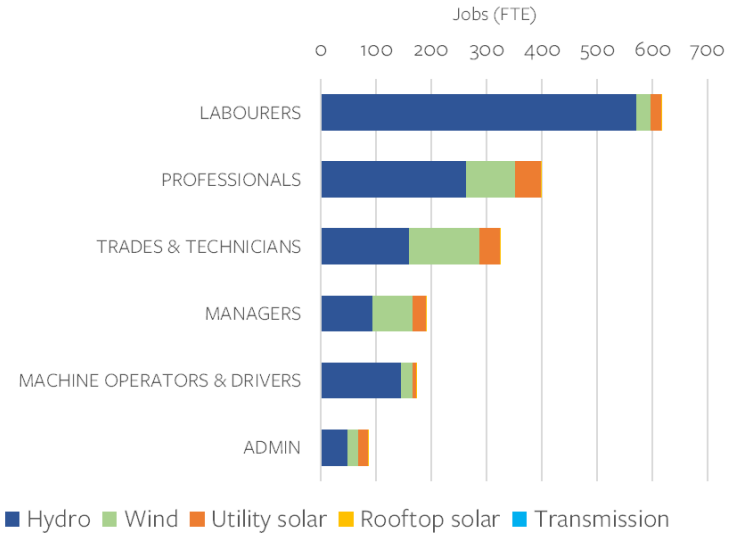
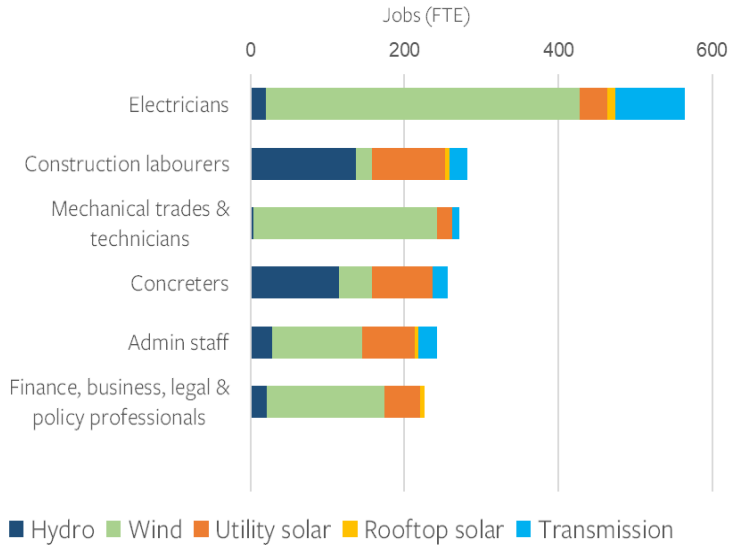


Figure 33 shows the six most in-demand occupations in the New England REZ as an average over the study period (2027-2036). Electricians are the most in-demand, averaging just under 600 FTE jobs with wind the major source of demand. Construction labourers follow, with an average of just under 300 FTE jobs, with pumped hydro driving demand. Mechanical trades and technicians also sit just under 300 FTE average jobs, with wind again dominating. Concreters, like construction labourers, are in demand driven by pumped hydro. Finance, business, legal and policy professionals, along with administrative staff average at just over 200 FTE jobs.

Figure 33: Employment, In-Demand Occupation, New England REZ, Average 2027–2036, Maximum Scenario



The same averages for in-demand occupations are shown in Figure 34 for the NRNIP Corridor. Construction labourers and concreters are the two top occupations, with an average of 270 and 230 FTE jobs respectively, driven by the pumped hydro sector. Truck drivers and electricians follow, averaging around 120 FTE jobs, with wind driving over half of the demand for electricians and pumped hydro driving demand for truck drivers. Structural steel construction workers, and admin staff are under 100 FTE jobs, with pumped hydro being the major employer.

Figure 34: Employment, In-Demand Occupation, NRNIP Corridor, Average 2027–2036, Maximum Scenario

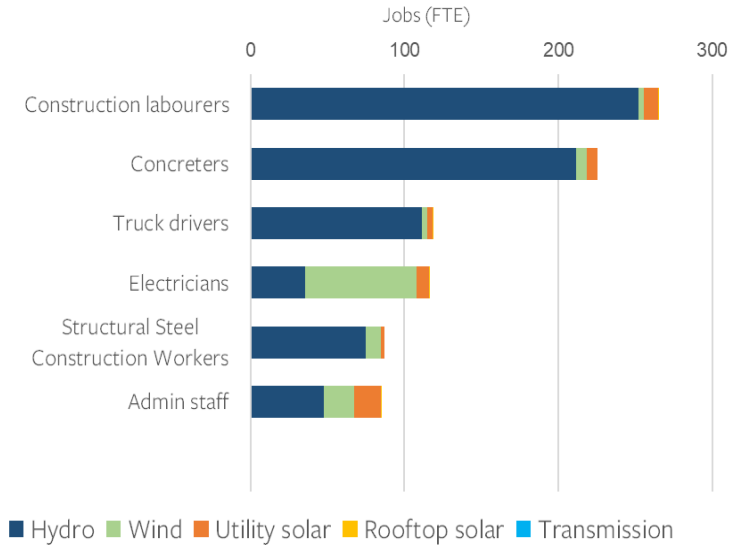


Figure 35 illustrates in more depth the employment profile of each in demand occupation over the projected period for the maximum scenario in the New England REZ. It also shows the technology driving demand.

Figure 36 does the same for the six most in-demand occupations for the NRNIP Corridor.

Figure 35: New England REZ six most in demand occupations, Maximum Scenario (note different scales between graphs)

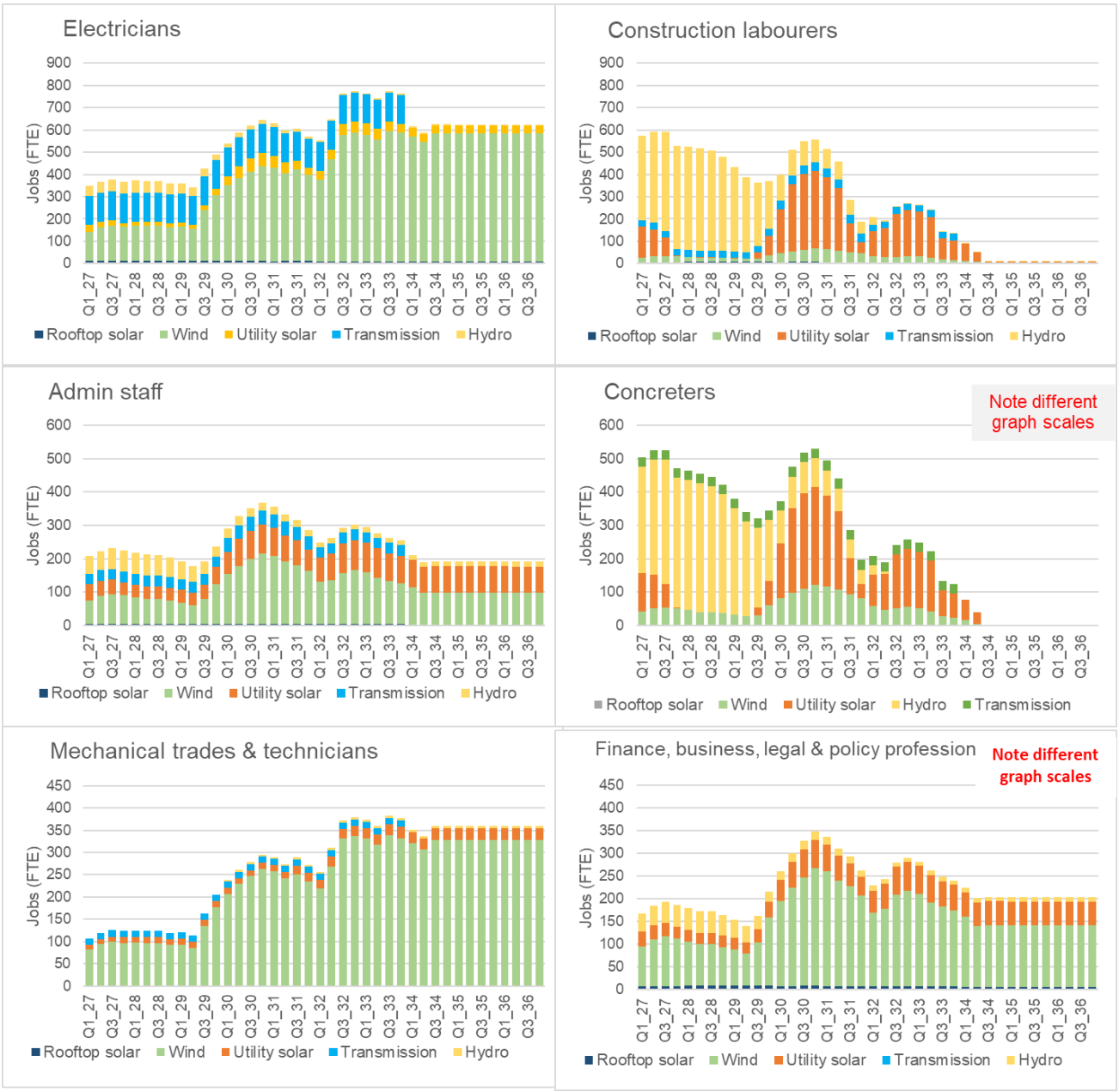
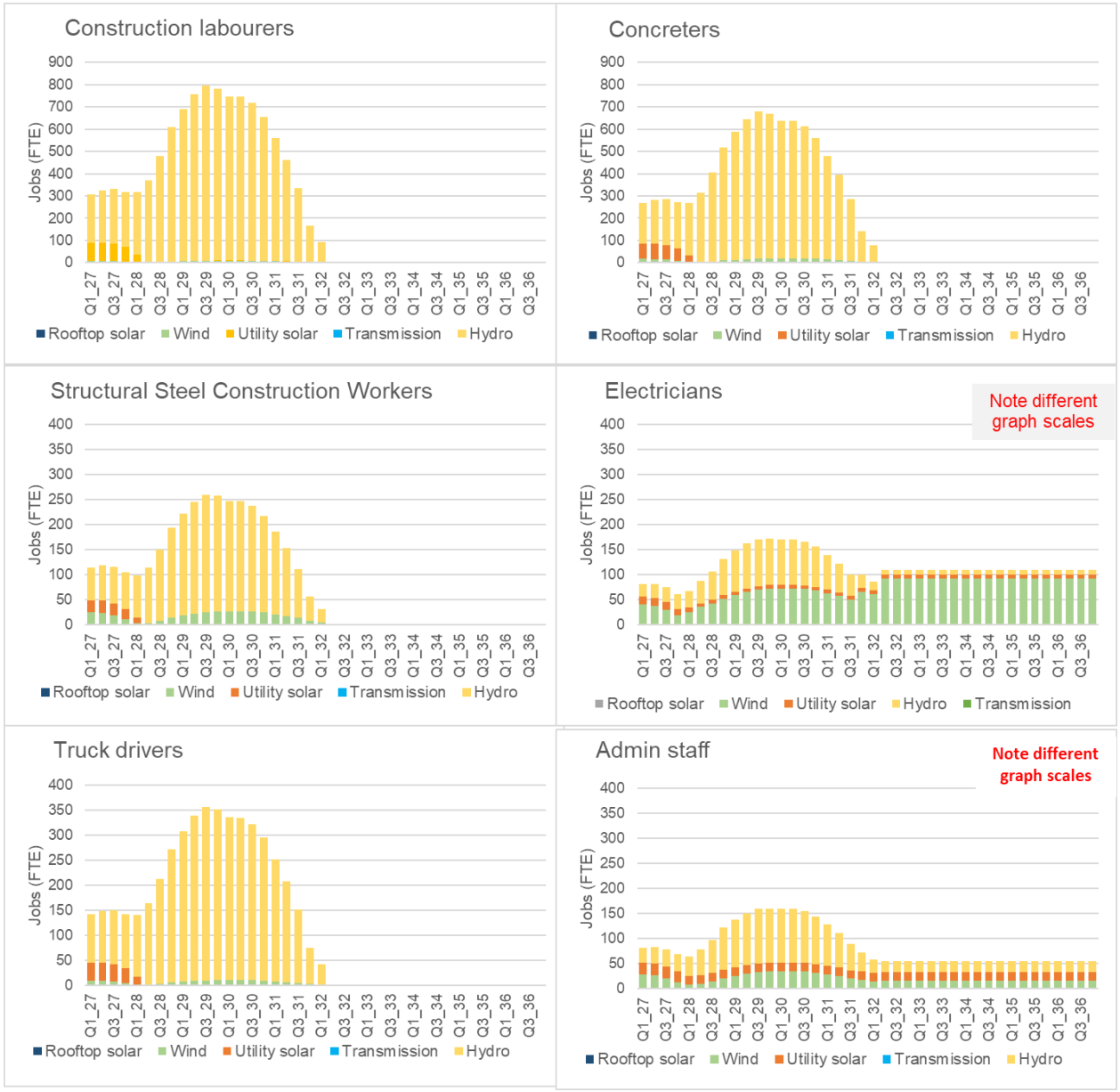


Figure 36: NRNIP Corridor six most in-demand occupations (note scale varies between graphs)



Note: the scale varies for the occupations based on scale of demand.

Estimated workforce demand from non-renewable energy projects

The NE REZ Data & Assumptions Book 2.1 dated November 2024 contains 37 projects classified as 'non-renewable'. There is varying level of detail for these projects regarding the availability of jobs data, capital investment value, and construction start and end dates. Table 18 shows estimated workforce demand by occupation for non-renewable projects in the New England REZ region for key years during construction and operational phases. While these figures are generally modest, they are included as they form part of overall employment demand in the region. See Appendix 3 for details on the methodology for the estimated workforce demand.

Table 18: Estimated workforce demand for non-renewable projects, REZ region

ANZSCO Unit Group	2024	2027	2030	2032	2034	2040
Civil Engineering Professionals	0	4	4	4	4	4
Clerical and Administrative Workers	102	121	121	121	121	121
Concreters	4	21	21	21	21	21
Crane, Hoist and Lift Operators	2	20	20	20	20	20
Earthmoving Plant Operators	6	59	59	59	59	59
Electrical Distribution Trades Workers	2	3	3	3	3	3
Electricians	41	59	59	59	59	59
Fabrication Engineering Trades Workers	18	26	26	26	26	26
Mechanical Engineering Trades Workers	30	42	42	42	42	42
Occupational and Environmental Health Professionals	0	1	1	1	1	1
Structural Steel Construction Workers	2	13	13	13	13	13
Telecommunications Engineering Professionals	0	1	1	1	1	1
Truck Drivers	29	295	295	295	295	295
Construction and Mining Labourers	7	40	40	40	40	40
Electrical Engineers	0	1	1	1	1	1
Construction Managers	10	20	20	20	20	20
Production Managers	4	8	8	8	8	8
Supply, Distribution and Procurement Managers	4	7	7	7	7	7
Trades & technicians (other)	51	73	73	73	73	73
Environmental Scientists	0	1	1	1	1	1
Telecommunications Trades Workers	323	461	461	461	461	461
Architectural, Building and Surveying Technicians	3	4	4	4	4	4
Total	**639**	**1,280**	**1,280**	**1,280**	**1,280**	**1,280**

Source: SGS Economics and Planning (2024).

3.2. Labour Supply in Renewable Energy Occupations in New England REZ and NRNIP Corridor

The renewable energy industry sources labour from different sources, ranging from international firms and labour markets, inter-state as well as from regional and labour markets. The focus for this study is how to increase local and regional labour supply but it is important to understand the context within labour is sourced for renewable energy, storage and transmission projects.

Table 19: Labour Supply for Renewable Energy, Local & Regional, Inter-State and International

Scale	Recruitment	Pathway	Notes
Local & regional	• Jobs sourced local to the project site vary significantly depending on location and local labour market – but generally labourers, machine operators, trades & technicians, construction and project managers and site administrators can be recruited locally. Other types of professionals and managers are not generally recruited from the regional workforce. • Where recruitment occurs at a regional or local level, trades, technicians, machine operators and labourers are often sourced from larger towns or regional centres – or capital cities - and then move from project to project once they have experience.	Recruitment from within the industry between projects	• Increased competition and 'poaching' once there are multiple projects. • Workers may not be retained where there is no continuity of employment or employment with another project is not timely.
		Recruitment from other sectors	• Recruitment may be challenging due to tight labour markets and competition with higher-paying sectors. • If retraining or upskilling is required, there can be barriers such as length of time to retrain relative to project timelines, accessing training etc.
		New entrants (e.g. apprentices, traineeships)	• Mostly school-leavers but also mature-aged workers retraining from other sectors. • There are a range of barriers and practices that have led to low use of apprenticeships including low awareness of opportunity, fit between training qualifications and industry requirements, short project timeframes and intense cost-competition.
		Unemployed or not in the labour force	• Under-employed, unemployed persons and those not currently in the labour force can be another source of labour. This requires targeted strategies for disadvantaged groups such as First Nations.
		Upskilling of workers on-the-job	• Industry reports that due to shortages, experienced skilled workers are supervising and training increased numbers of workers and being 'stretched thin'. Capacity to undertake on-the-job training in context of high competition and tight project deadlines can be difficult.
Interstate	• Recruitment for managers, professionals, experienced and skilled trades and technicians and machine operators.	Recruitment from within the industry	• Some barriers to inter-state movement (e.g. different licencing requirements for electricians, line workers). • Different training funding rules across states.

Scale	Recruitment	Pathway	Notes
Interstate		Internal workforce redeployment and training	• Renewable energy companies redeploy and upskill internal workers from other regions.
		Recruit and upskill from adjacent sectors	• Industry reports that recruitment and retraining has been occurring from some sectors inter-state e.g. WA oil and gas.
International	• Specialist skills that are in shortage in Australia across managers, professionals, trades, technicians & labourers.	International skilled migration. On-the-job training for local workers from international recruits	• There can be barriers to engaging international workers on local projects and increase in demand across many other nations increases competition.

Renewable Energy Occupations: Current Employment in New England REZ and the NRNIP Corridor

As shown in Table 20, current employment in clean energy occupations is generally low in the region, accounting for less than 10% of all employment. While this is partially attributable to current phase of New England REZ construction, there are also wider factors at play. Low VET completions in clean energy aligned occupations – both in terms of student volume and proportion of all VET completions – could indicate low awareness and/or interest in pursuing these vocational pathways, and potentially a lack of suitable and accessible training programs. The data also indicates that VET completions in clean energy occupations were predominantly by male students. The rapid growth in the renewable energy sector and its workforce requirements therefore presents an opportunity to overcome the gender imbalance in the wider, conventional energy sector.

Tamworth Regional and Uralla Shire LGAs have the highest proportion of the population employed in clean energy occupations, driven by Clerical and Administrative Workers, Truck Drivers, Mechanical Engineering Trades Workers, Electricians, Concreters, and Earthmoving Plant Operators. The most common clean energy occupational category among the current workforce of the REZ Region is Clerical and Administrative Workers, followed by Truck Drivers, Mechanical Engineering Trades Workers, and Electricians.

Table 20: Employment in renewable energy occupations by LGA, 2021

	LGA	Crane, Hoist & Lift Operators	Earth-moving Plant Operators	Other Mobile Plant Operators	Con-creters	Steel Construc-tion	Telco Trades	Electrical Distribution Trades	OHS	Civil Engineers	Mech Engineers	Fabrication Engineers	Electri-cian	Truck Drivers	Admin	Total
NE REZ Region	Armidale Regional	3	51	7	17	0	8	9	22	26	54	59	92	144	1,406	1,898
	Glen Innes Severn	0	33	0	13	0	3	3	6	0	25	16	19	56	363	537

	LGA	Crane, Hoist & Lift Operators	Earth-moving Plant Operators	Other Mobile Plant Operators	Con-creters	Steel Construc-tion	Telco Trades	Electrical Distribution Trades	OHS	Civil Engineers	Mech Engineers	Fabrication Engineers	Electri-cian	Truck Drivers	Admin	Total
	Inverell Shire	0	37	5	8	4	8	13	4	14	61	49	66	93	657	1,019
	Tamworth Regional	13	131	15	86	11	34	32	57	68	388	267	331	652	3,280	5,365
	Tenterfield Shire	0	23	0	0	0	5	5	0	3	13	18	19	65	265	416
	Uralla Shire	0	20	0	18	0	3	3	6	0	19	15	17	37	324	462
	Walcha Shire	0	13	0	0	0	0	4	0	0	12	8	6	15	122	180
NE REZ Region sub-total		**16**	**308**	**27**	**142**	**15**	**61**	**69**	**95**	**111**	**572**	**432**	**550**	**1,062**	**6,417**	**9,877**
NRNIP Corridor	Liverpool Plains	0	29	4	7	0	0	3	12	0	34	38	25	95	296	543
	Muswellbrook Shire	25	46	0	20	41	0	11	20	15	387	167	126	309	691	1,858
	Upper Hunter Shire	20	59	0	11	12	0	3	10	9	165	128	83	205	575	1,280
NRNIP Corridor sub-total		**45**	**134**	**4**	**38**	**53**	**0**	**17**	**42**	**24**	**586**	**333**	**234**	**609**	**1,562**	**3,681**
NE REZ Surrounds	Bellingen	0	28	3	13	0	7	9	3	15	27	18	52	78	543	796
	Clarence Valley	14	150	17	83	34	19	30	28	48	163	166	186	429	2,216	3,583
	Gunnedah	9	69	0	5	0	5	6	12	0	165	82	73	201	559	1,186
	Gwydir	0	21	0	0	0	0	4	0	0	16	14	13	38	188	294
	Kempsey	6	67	3	40	9	11	8	10	12	77	61	105	211	1,100	1,720
	Kyogle	0	32	3	9	0	0	10	4	9	33	25	36	73	345	579
	Mid-Coast	20	227	12	120	40	35	37	41	57	274	190	331	644	3,596	5,624
	Nambucca Valley	9	65	0	30	17	12	5	4	15	41	57	67	125	741	1,188
	Narrabri	6	74	0	4	0	3	11	9	6	121	57	67	188	587	1,133

	LGA	Crane, Hoist & Lift Operators	Earth-moving Plant Operators	Other Mobile Plant Operators	Con-creters	Steel Construc-tion	Telco Trades	Electrical Distribution Trades	OHS	Civil Engineers	Mech Engineers	Fabrication Engineers	Electri-cian	Truck Drivers	Admin	Total
	Port Macquarie-Hastings	18	150	30	122	36	42	32	56	72	250	193	364	534	4,378	6,277
	Richmond Valley	9	72	0	47	3	17	15	15	19	112	80	87	281	980	1,737
	Goondiwindi	0	74	4	15	0	3	3	8	7	81	57	40	146	506	944
	Scenic Rim	25	149	10	88	38	18	31	44	32	245	208	230	504	2,151	3,773
	Singleton	29	96	4	14	24	5	14	42	23	567	172	216	386	1,307	2,899
	Southern Downs	5	122	8	57	3	12	24	25	20	150	158	118	448	1,560	2,710
NE REZ Surrounds sub-total		**150**	**1,396**	**94**	**647**	**204**	**189**	**239**	**301**	**335**	**2,322**	**1,538**	**1,985**	**4,286**	**20,757**	**34,443**

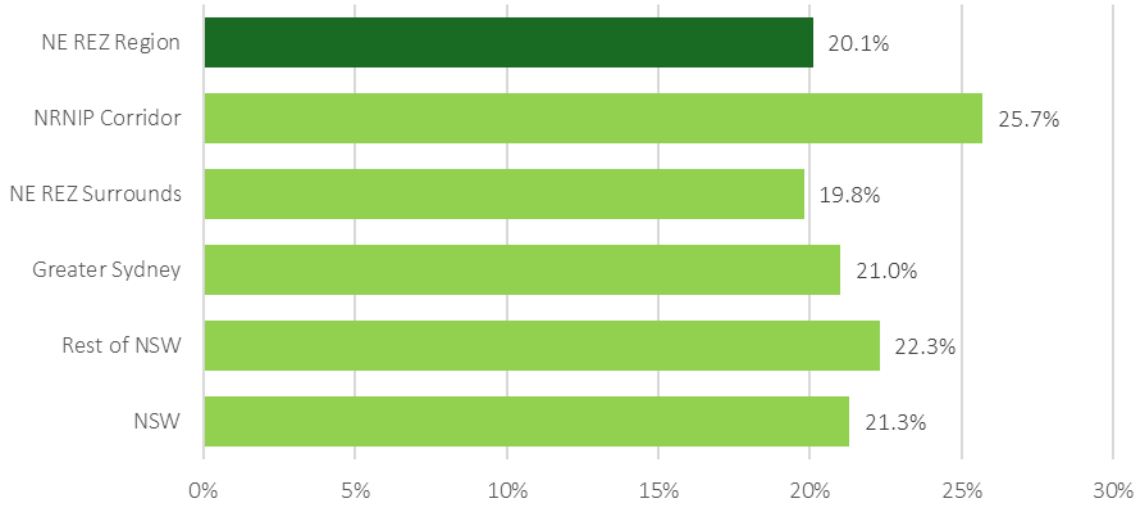
Source: ABS 2021

Estimated renewable energy workforce supply in the New England REZ region

Workforce supply in renewable energy occupations is derived from the workforce projections published by Transport for NSW. The TZP22 workforce projections are based on anticipated population changes and historical labour force data. The forecast represents a likely future based on current data, trends, and an understanding of policy and structural changes that may impact the future[19]. To disaggregate these projections by renewable energy occupation, the study authors assume the existing distribution of occupations within the region, as reported by the 2021 ABS Census data.

As per Figure 37, the New England REZ region has a slightly lower proportion of workers in renewable energy occupations than regional NSW, with 20.1% of the workforce employed in renewable energy occupations in 2024. Most of these are clerical and administrative workers (62.5%), followed by truck drivers (9.3%) and electricians (5.1%). It is worth noting that much of the New England workforce in renewable energy occupations is made up of clerical and administrative workers, an occupational group which is not inherently tied to clean energy projects, and that most of these workers will likely be employed in other industries. Excluding clerical and administrative workers, the workforce in renewable energy occupations accounts for 8.2% of the workforce in the New England REZ region.

Figure 37: Renewable energy workforce as proportion of total workforce, New England REZ, 2024

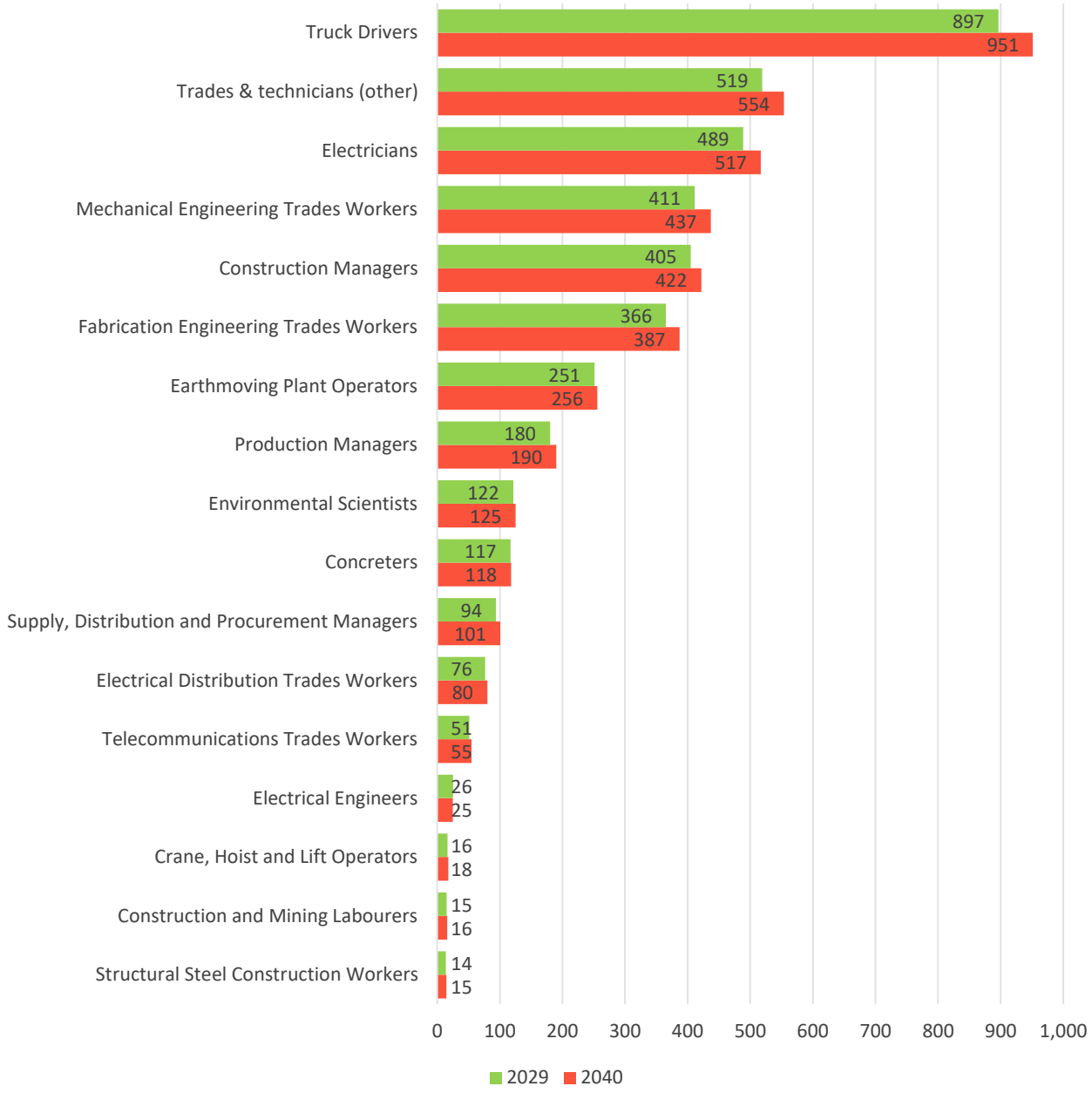


Source: Author analysis (2024), TZP (2022), ABS (2021).

The New England REZ region's workforce in renewable energy occupations is projected to grow by 8.0% between 2024 and 2040, an increase of 750 workers. Figure 38 shows the occupational break down of this workforce during peak construction (2029) and when the New England REZ is fully operational (2040). Clerical and administrative workers are excluded from this analysis as this category is not inherently tied to renewable energy projects.

Workforce growth in the majority of relevant occupations is limited, although the number of truck drivers and trades and technicians in the New England REZ region is projected to grow by 6%, followed by a 5% increase in electricians (Figure 38). It is also important to note that this is the current forecast and can therefore be changed by government initiatives to grow the workforce.

Figure 38: Forecast New England REZ region workforce by renewable energy occupation, 2029 and 2040



Source: TZP, 2022; ABS 2021; SGS Economics and Planning, 2024. Note: 'Clerical and Administrative' workers excluded from chart.

Table 21: Renewable energy occupation projections, 2024-40

ANZSCO Unit Group		2024	2027	2030	2032	2034	2040
NE REZ Region							
Civil Engineering Professionals	# of workers	111	112	113	114	115	117
	% of total workforce	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%
Clerical and Administrative Workers	# of workers	5,870	5,962	6,036	6,096	6,165	6,353
	% of total workforce	12.7%	12.9%	11.5%	11.5%	11.5%	12.9%
Concreters	# of workers	117	117	117	117	117	118
	% of total workforce	0.3%	0.3%	0.2%	0.2%	0.2%	0.2%
Crane, Hoist and Lift Operators	# of workers	16	16	16	17	17	18
	% of total workforce	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Earthmoving Plant Operators	# of workers	250	251	251	252	253	256
	% of total workforce	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Electrical Distribution Trades Workers	# of workers	75	76	77	77	78	80
	% of total workforce	0.2%	0.2%	0.1%	0.1%	0.1%	0.2%
Electricians	# of workers	477	484	491	496	502	517
	% of total workforce	1.0%	1.0%	0.9%	0.9%	0.9%	1.0%
Fabrication Engineering Trades Workers	# of workers	356	362	367	371	375	387
	% of total workforce	0.8%	0.8%	0.7%	0.7%	0.7%	0.8%
Mechanical Engineering Trades Workers	# of workers	400	407	413	418	423	437
	% of total workforce	0.9%	0.9%	0.8%	0.8%	0.8%	0.9%
Occupational and Environmental Health Professionals	# of workers	88	89	90	91	92	94
	% of total workforce	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%
Structural Steel Construction Workers	# of workers	13	14	14	14	14	15
	% of total workforce	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Telecommunications Engineering Professionals	# of workers	0	0	0	0	0	0
	% of total workforce	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%
Telecommunications Trades Workers	# of workers	50	51	52	52	53	55
	% of total workforce	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
Truck Drivers	# of workers	873	888	901	910	921	951
	% of total workforce	1.9%	1.9%	1.7%	1.7%	1.7%	1.9%
Construction and Mining Labourers	# of workers	15	15	15	15	16	16
	% of total workforce	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Electrical Engineers	# of workers	26	26	25	25	25	25
	% of total workforce	0.1%	0.1%	0.0%	0.0%	0.0%	0.1%
Construction Managers	# of workers	399	403	406	409	412	422
	% of total workforce	0.9%	0.9%	0.8%	0.8%	0.8%	0.9%
Production Managers	# of workers	176	179	181	183	185	190
	% of total workforce	0.4%	0.4%	0.3%	0.3%	0.3%	0.4%
Supply, Distribution and Procurement Managers	# of workers	91	93	95	96	97	101
	% of total workforce	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%

ANZSCO Unit Group		2024	2027	2030	2032	2034	2040
Trades & technicians (other)	# of workers	519	526	531	535	540	554
	% of total workforce	1.1%	1.1%	1.0%	1.0%	1.0%	1.1%
Environmental Scientists	# of workers	120	121	122	122	123	125
	% of total workforce	0.3%	0.3%	0.2%	0.2%	0.2%	0.3%
Architectural, Building and Surveying Technicians	# of workers	170	172	174	176	178	184
	% of total workforce	0.4%	0.4%	0.3%	0.3%	0.3%	0.4%
NE REZ Region Total	**# of workers**	**10,212**	**10,365**	**10,488**	**10,587**	**10,702**	**11,014**
	% of total workforce	**20.1%**	**20.1%**	**20.0%**	**20.0%**	**20.0%**	**20.0%**

Source: TZP, 2022; ABS 2021; SGS Economics and Planning, 2024.

Sensitivity testing

Compared to regional NSW, the New England REZ region has a lower rate of labour force participation and a higher unemployment rate. The New England REZ region also has a marginally lower share of renewable energy occupations within the workforce, at 20.1% compared to 22.3%.

Investment in the New England REZ region may increase the number and diversity of jobs available, leading more people to enter the workforce or enter into employment. Similarly, as the New England REZ becomes operational, there may be an uplift in the portion of workers employed in renewable energy occupations. Analysis has been carried out to consider what the REZ renewable energy workforce would look like under several different scenarios:

- Employment rate equals that of the Rest of NSW region;
- Participation rate equals that of the Rest of NSW region;
- Both employment and participation rates equal that of the Rest of NSW region;
- Clean energy workforce share is equal to that of the Rest of NSW region;
- An assumption of full employment (i.e. there is no unemployment and all in the labour force are employed).

As shown in Table 22, variations to the employment and participation rates in the region would have some impact on workforce projections. However, the New England REZ renewable energy workforce is inherently constrained by its relatively small population and even an assumption of full employment will only see an increase of approximately 1,000 workers from the base forecast. Based on this analysis, the size of the New England REZ renewable energy workforce would likely be between 11,000 to 13,500 workers by 2040.

Table 22: Impact of changes in employment and participation rates

	2024	2027	2030	2032	2034	2040
Base forecast	10,212	10,365	10,488	10,587	10,702	11,014
Participation rate equal to Rest of NSW	10,633	10,769	10,871	10,955	11,054	11,327
Employment rate equal to Rest of NSW	10,522	10,653	10,774	10,874	10,994	11,318
Both participation and employment equal to Rest of NSW	10,956	11,068	11,167	11,252	11,356	11,640
Clean energy workforce shares equal to Rest of NSW	11,965	12,273	12,502	12,563	12,755	13,427
Full employment	11,328	11,375	11,473	11,506	11,633	12,039

Source: TZP, 2022; ABS 2021; SGS Economics and Planning, 2024.

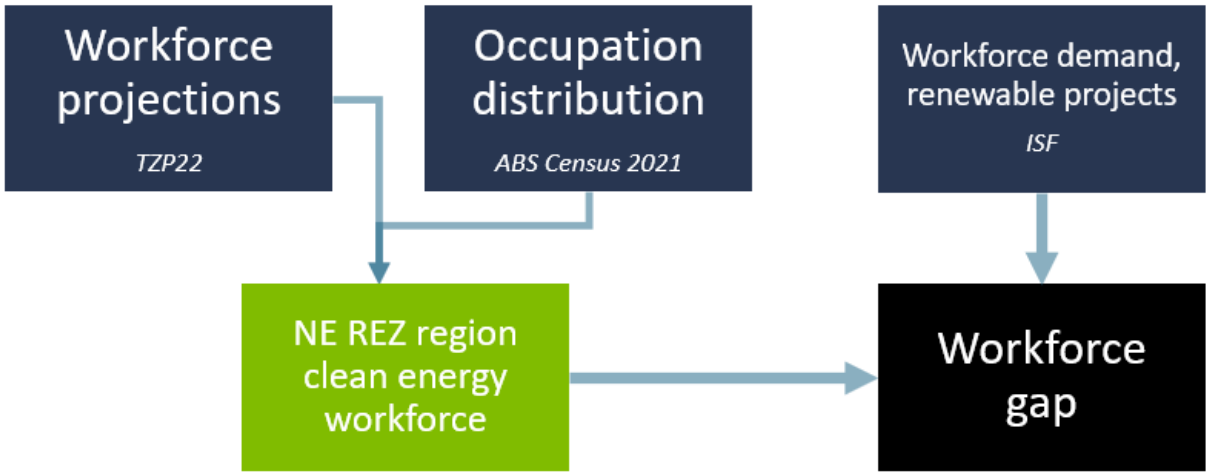
Workforce Gap Analysis: Renewable Energy Occupations

The objective of the workforce gap analysis is to estimate the scale and occupational characteristics of projected workforce demand compared to local supply (Figure 39). These estimates may be used to inform the timing, location, and capacity of training and education programs and facilities as well as other initiatives to support locally based training and skills development in the New England REZ region.

The workforce gap analysis is based on (a) – (b) where:

a) **Projected workforce demand for renewable energy projects**, by occupation and location (estimated by ISF)
b) **Projected workforce supply** by occupation and location (estimated by SGS).

Figure 39: New England REZ region workforce gap analysis



Source: SGS Economics and Planning, 2024.

Workforce gap analysis typically compares forecast demand with the labour market profile from the most recent data collections (e.g., ABS Census of Population and Housing). However, this approach may not be suitable in regions undergoing significant economic and social change, leading to materially significant over- or under-estimation of skills and occupational need.

By the anticipated completion date of the New England REZ, the local and regional labour force will have shifted from the profile captured by the 2021 ABS Census. This shift should be accounted for to inform the training and skills context throughout New England REZ delivery, operation, and decommissioning. It is therefore important to assess projected supply and demand in comparable years.

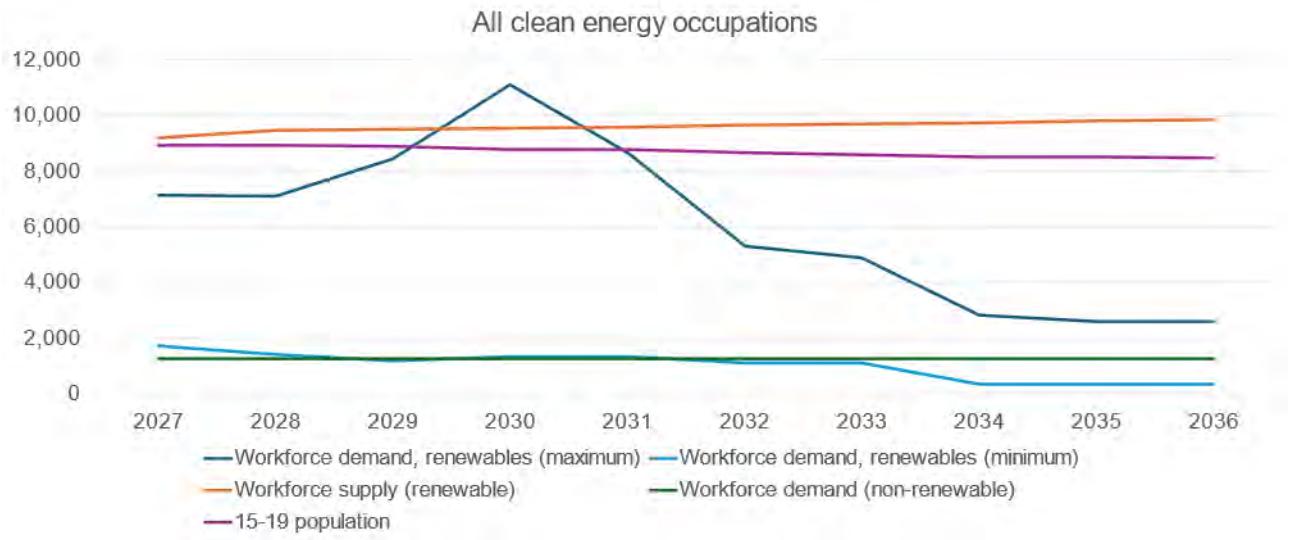
It is complex to estimate supply-demand balance in the context of the New England REZ for several reasons. Using the largest occupation (electricians) as an example, the current and future electrician workforce can be projected as can the demand for electricians, but many of these electricians will work in other sectors so the actual local supply is uncertain. The unemployed can be taken as a measure of spare capacity but whilst the unemployed may work in some roles (e.g. construction labourers) it is very unlikely they will train to become an electrician. Consequently, the assessment uses several measures to assess supply-demand balance.

Total Labour Demand Supply

The result below compares the projected demand for labour against the existing size of the workforce in clean energy occupations in the New England REZ region. Figure 40 shows the minimum and maximum scenario demand forecasts for all renewable energy occupations against the projected workforce, demand for these occupations in non-renewable projects and the population aged 15-19 (this age group is a proxy for the potential new workforce entrants). It should also be noted that the projection is in FTE whereas on average renewable energy projects work longer than the average working week so the actual number of employees will be lower:

- Under the maximum scenario, workforce peak demand represents the total New England REZ renewable energy workforce in 2030. Demand for workers under the maximum scenario is likely to significantly exceed regional supply. Many of these workers will already be working in other sectors and would be unable to meet the demand of the New England REZ without causing labour shortfalls across other industries. There are several factors which may influence the extent of the labour gap, including the rate at which workers migrate to or from the New England REZ region, the rate of labour force participation, and the extent to which new workers enter into renewable energy occupations. Changes to any of these factors may result in a larger or smaller labour shortfall than estimated.
- Under the minimum scenario, the workforce demand for both the renewable and non-renewable projects on the other hand is within the regional supply and could be accommodated.
- The 15-19 year old population exceeds or is equivalent to a large share of the projected demand. Whilst many of the jobs require specialised skills or experience and students will enter a wide range of vocations, it does highlight the potential for students to make a material difference to labour supply with the right programs.

Figure 40: Demand and supply of renewable energy workers, New England REZ region (2027-2036)



Source: SGS Economics and Planning, 2024.

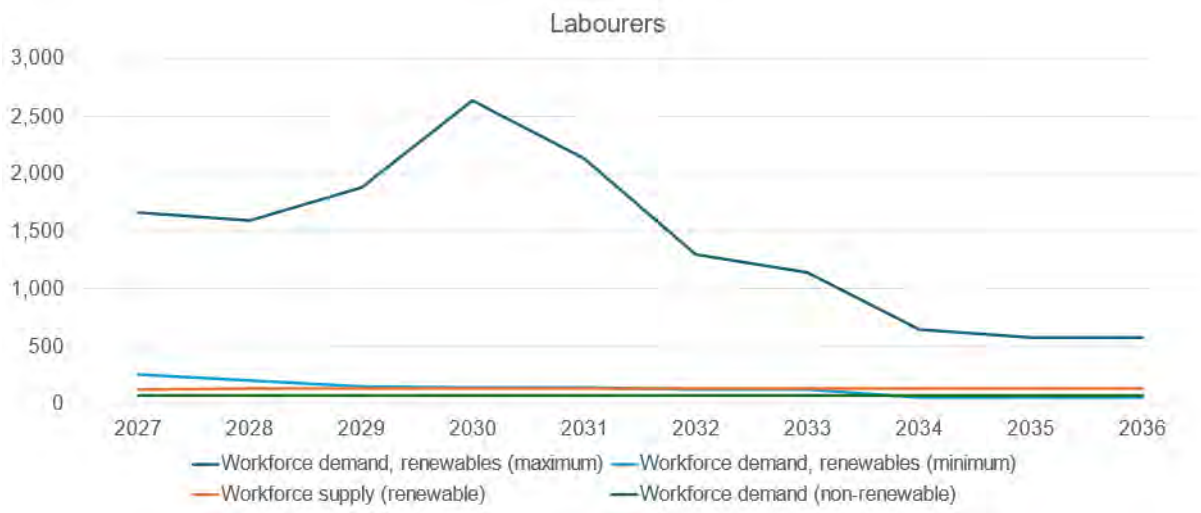
Note: the projections for employment demand are in FTE

Labour Supply-Demand Balance for Key Occupational Groupings

Figure 41 to Figure 44 show projected demand for key occupational groupings (1-digit ANZSCO) – labourers, machine drivers and operators, trades and technicians and professionals - against the projected workforce in the New England REZ region. Projected demand from both renewable and non-renewable projects are displayed; while this study focuses on the occupational supply-demand gap for renewable projects, occupational demand from non-renewable projects is included to demonstrate a potential competing source of demand.

For construction labourers, under the maximum scenario there is projected to be a significant shortage over the construction period to 2034. Although demand for these workers is high, it is also relatively short-term, and workers will require limited formal qualifications. Therefore, there may be opportunity to meet some of this demand from within the unemployed, recent school leaver populations or those not in the labour force. As shown above, there are approximately 1,000 unemployed persons within the New England REZ region and approximately 8,000 persons within the 15-19 age bracket, some of whom could fill additional labour demand. Under the minimum scenario, renewable energy project demand is modest relative to local supply.

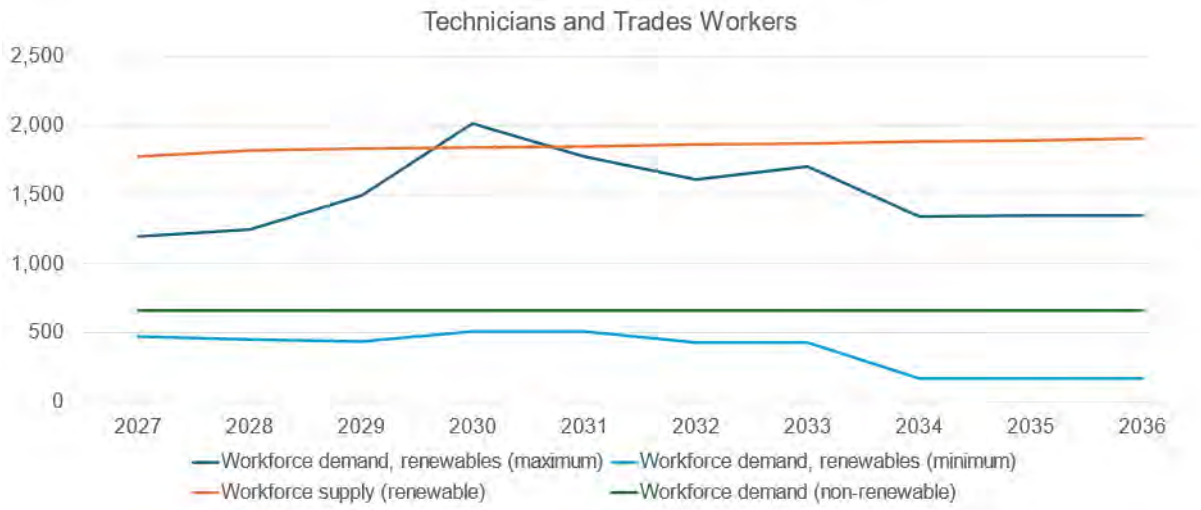
Figure 41: Demand and supply of construction labourers, New England REZ region (2027-2036)



Source: SGS Economics and Planning, 2024.

In relation to technicians and trades workers, the demand under the maximum scenario is equivalent to 70 to 110% of existing supply within the region. Under the minimum scenario, it is much lower but there is also significant competing demand for these workers from other sectors which may limit workforce supply.

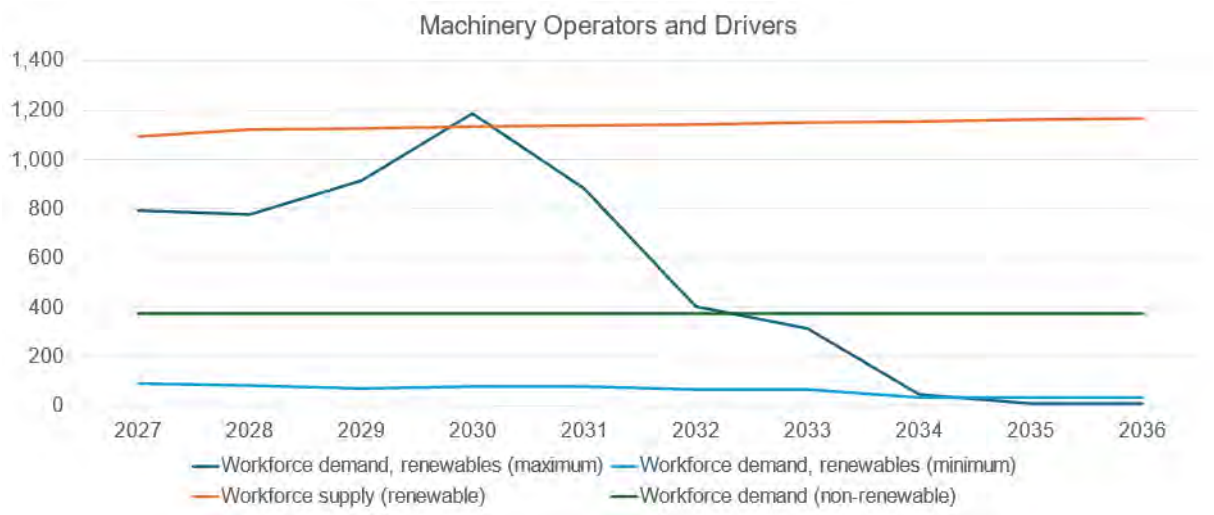
Figure 42: Demand and supply of technicians and trades workers, New England REZ region (2027-2036)



Source: SGS Economics and Planning, 2024.

Similarly, under the maximum scenario, the demand for machinery operators and drivers is around 70 to 105% of the regional workforce to 2031, after which demand will decline. These workers are required principally over construction phases and demand is therefore relatively short-term. As with labourers, these workers require minimal formal qualifications and there may be opportunity to meet some of this demand from within the unemployed and recent school leaver populations.

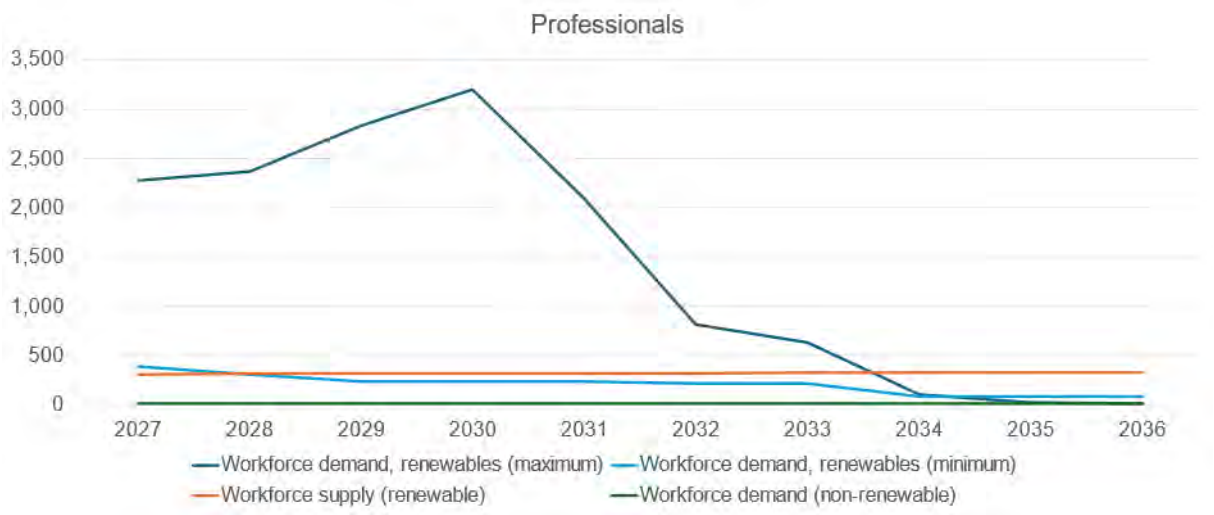
Figure 43: Demand and supply of machinery operators and drivers, New England REZ region (2027-2036)



Source: SGS Economics and Planning, 2024.

The demand for professionals far exceeds supply within the New England REZ under the maximum scenario; however, it is likely that many of these workers will be located outside the New England REZ region. Demand for professionals peaks during construction (2030) but remains high throughout the forecast period.

Figure 44: Demand and supply of professionals, New England REZ region (2027-2036)



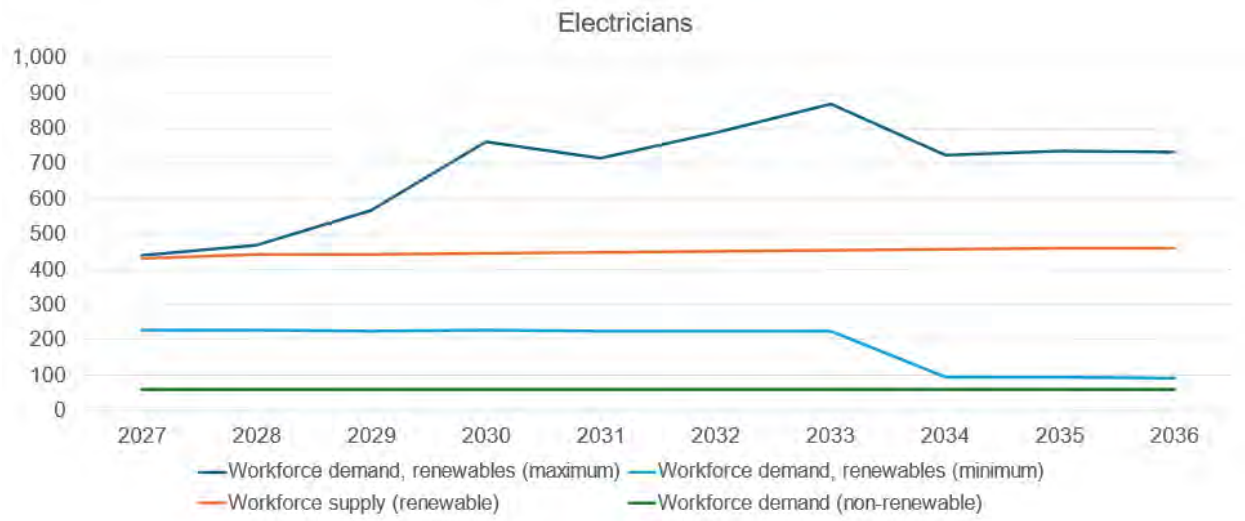
Source: SGS Economics and Planning, 2024.

Labour Supply-Demand Balance for Key Occupations

Figure 45 to Figure 48 show projected demand for some of the key occupations (4-digit level ANZSCO) against the projected workforce in the REZ region. Demand for electricians and mechanical engineering trades workers under the maximum scenario is projected to exceed workforce supply from 2029, indicating a significant shortfall within the region. Demand for construction labourers and electrical engineers will also exceed supply under the maximum scenario, especially during construction phases when demand is greatest.

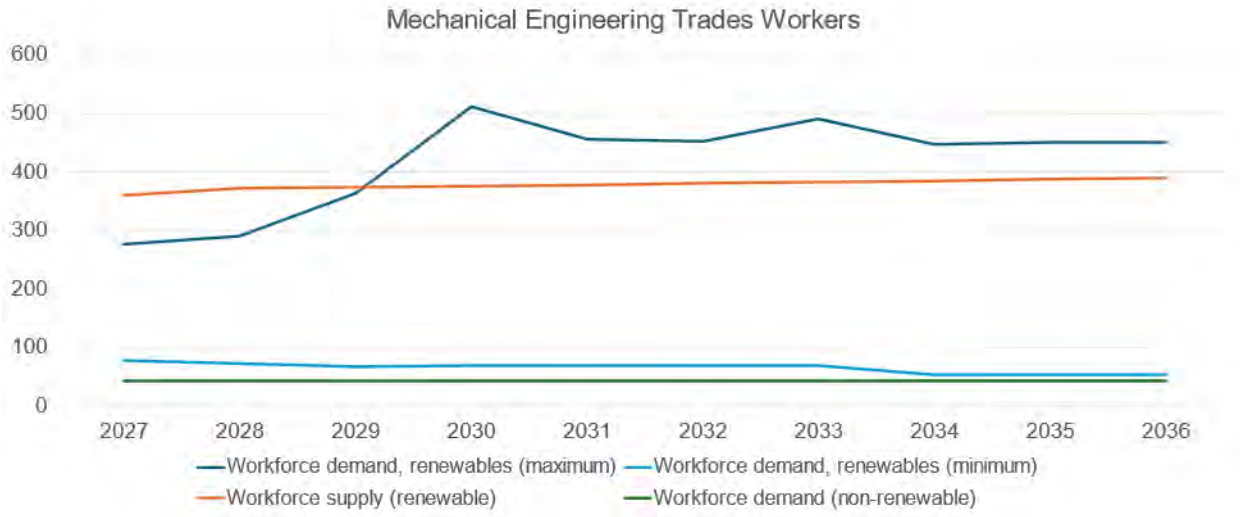
Under the minimum scenario, demand for electricians from renewable and non-renewable projects could still represent a significant portion of supply and in the case of construction labourers is more or less equivalent to supply, but as explained the supply of labourers can be increased relatively quickly.

Figure 45: Demand and supply of electricians, New England REZ region (2027-2036)



Source: SGS Economics and Planning, 2024.

Figure 46: Demand and supply of mechanical engineering trades workers, New England REZ region (2027-2036)

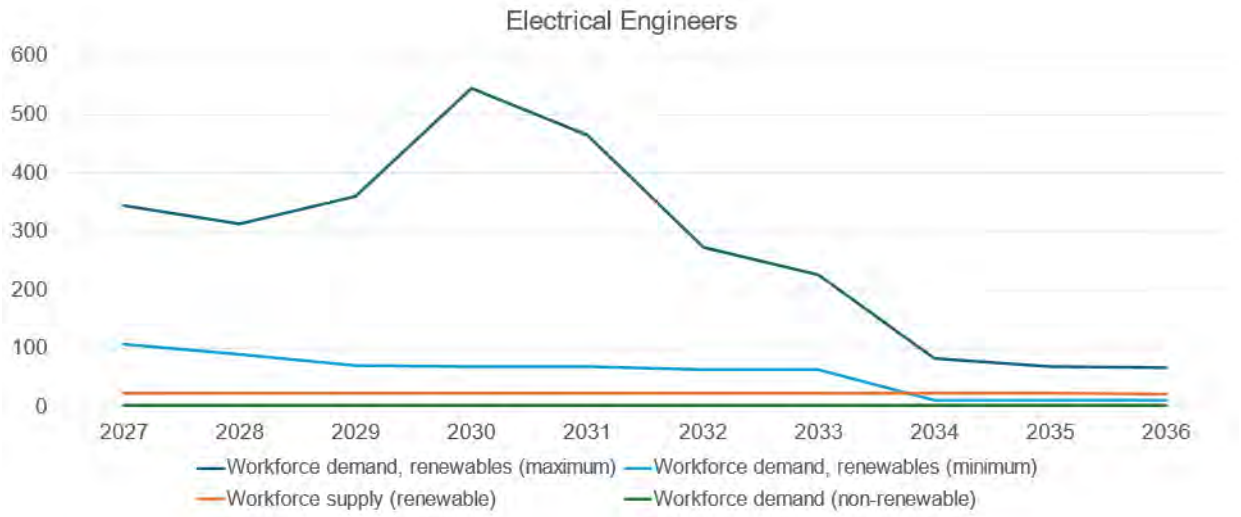


Source: SGS Economics and Planning, 2024.

Figure 47: Demand and supply of construction labourers, New England REZ region (2027-2036)

Source: SGS Economics and Planning, 2024.

Figure 48: Demand and supply of electrical engineers, REZ region (2027-2036)



Source: SGS Economics and Planning, 2024.

4. Training Infrastructure in the New England REZ

The focus of this section of the study is on the current estimates of capacity and throughput of education and training facilities within or close to the New England REZ, with the aim of identifying opportunities to increase training capacity in the region. As part of the study, education and training facilities at the University of New England (UNE), TAFE NSW, council facilities, and private providers have been assessed.

4.1. Overview

The UNE has facilities in several regional locations with the main campus being located in Armidale.

TAFE NSW has 154 campuses across NSW (as at 10 June 2025) with 49 of these being reviewed as part of an initial assessment. Many of these training facilities are within a day's driving distance of the New England REZ, such as for example the TAFE NSW Net Zero Manufacturing Centre of Excellence based in Hunter / Newcastle. Following this initial review, six TAFE NSW facilities within the immediate study area have been considered in detail as part of the study including:

1. Tenterfield
2. Inverell
3. Glen Innes
4. Armidale
5. Tamworth
6. Muswellbrook.

Council facilities are typically community halls or similar that offer space for a range of micro education or other community activities. Private providers are focused on short courses that require limited or no capital investment, low cost and high profit, and can often be run on work sites.

Desktop analysis has provided estimates of current building capacities based on public reports and industry examples of allocation of education space derived through satellite imagery of buildings. This analysis was supported by in-person site visits conducted with staff at the facilities to improve the estimates of capacity. Table 23 presents one view of the approximate capacity; facility owners have confirmed these modelled estimates are reasonably close to their experience.

Table 23: Education and Training Facilities, and Capacity

Location	Floor Space (sqm)	Estimated Training Space (sqm)	Approx. capacity (number of students possible)
Tenterfield TAFE	750	300	-
Inverell TAFE	950	380	-
Glen Innes TAFE	1,480	592	-
Muswellbrook TAFE	7,000	2,780	675
Armidale TAFE	5,512	2,205	618
Tamworth TAFE	14,371	7,280	1,124
UNE Armidale	39,795	15,918	35,531
University of Newcastle – Upper Hunter	1,300	520	126

Stakeholders advised that Tamworth TAFE is the regional service centre for electrical trades, while Armidale TAFE is used for construction and carpentry trades. UNE seeks to provide most of its education services via online training. TAFE NSW is in discussions with UNE for development of a joint training facility in Tamworth.

Other key providers of specialist training in the region include the energy providers. Transmission training is typically provided by Transgrid, Essential Energy, and Endeavour Energy, some have training centres in the region. TAFE NSW are interested in possible joint training facilities to increase the utilisation of training.

A key constraint on training is provision of qualified training staff, who are in high demand from industry. TAFE NSW staff are confident that they can meet a large increase in demand but need to know in advance to retrofit facilities and hire new trainers. Many facilities are likely to be capable of meeting future demand but may require some capital spending to enable increased use.

Given the low levels of unemployment in the region, people typically available in the population to meet the increased demand for employment are often found to have more complex training needs than other students. TAFE NSW identified they are experienced in managing disabled students, and students that have low levels of education or employment experience. Facilities may need adjustment to enable education and training of students with disability or low levels of education as there is a need for “wrap-around” services.

4.2. University Training Facilities

The major university in the New England region is the University of New England (UNE) which has its main campus in Armidale and a number of other facilities in other regions. UNE also works with Country Universities Centre (CUC) group to share facilities and educators. The other major university located in the New England region is the University of Newcastle, however, this is outside of the study area.

The UNE Armidale campus currently has 152 buildings. The UNE Chief Operating Officer identified that some of these buildings are planned to be removed, some are being mothballed, and the rest are being used more intensely to reduce operation costs. The COVID-19 pandemic drove the university to move much of its operations online, which has contributed to a reduction of students on campus.

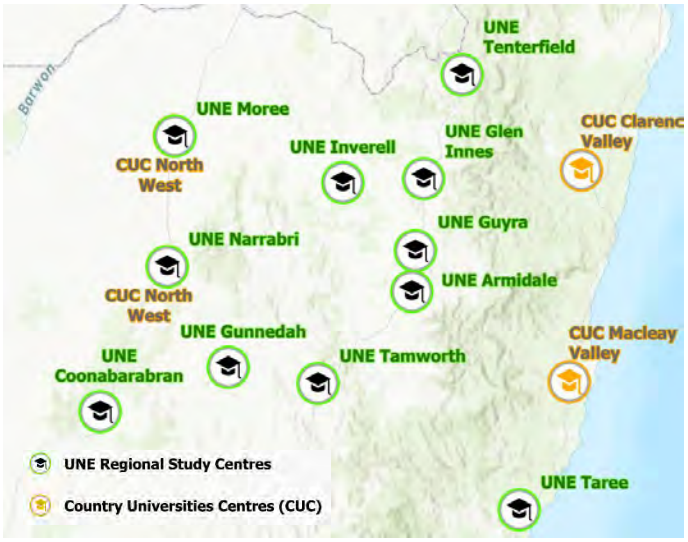
The main areas of university education which are relevant to the development of the New England REZ are engineering, architecture, and town planning. UNE previously provided engineering courses with around 50 students completing the course each year, however the engineering program is no longer offered. The Armidale UNE campus still has facilities and some equipment for engineering training but no allocated staff.

In 2017, in partnership with Muswellbrook Shire Council, UNE established a research and education facility called Upper Hunter, located within the Tertiary Education Centre in what is known as the Hunter Region Innovation Precinct – a precinct which also houses TAFE NSW and the library in Muswellbrook[20]. Undergraduate and postgraduate students can access opportunities to develop applied research skills and enhance employment opportunities across a wide range of industries.

Overall Map of UNE Facilities

UNE maintains facilities in many areas around the New England REZ region in addition to the 152 buildings in Armidale, including a three-story building in Tamworth (Figure 49). Currently, the UNE is moving forward with the development of a new facility in Tamworth that is partly supported by TAFE NSW. The focus areas for the new facility are predominately health and aged care training, but this may also support other education courses. Figure 49 provides a map of the UNE and associated CUC group facilities.

Figure 49: UNE facilities and associated Country Universities Centre facilities in the New England region



Current Facilities Capacity

UNE Armidale campus has some 300 hectares of land and 152 buildings with over 39,800sqm of classroom/lecture/office space. The maximum number of students on campus is estimated to be 35,531 per year. The outdoor space is also being developed to provide renewable energy training opportunities as well as supplying behind-the-metre energy for the university, shown in Figure 50.

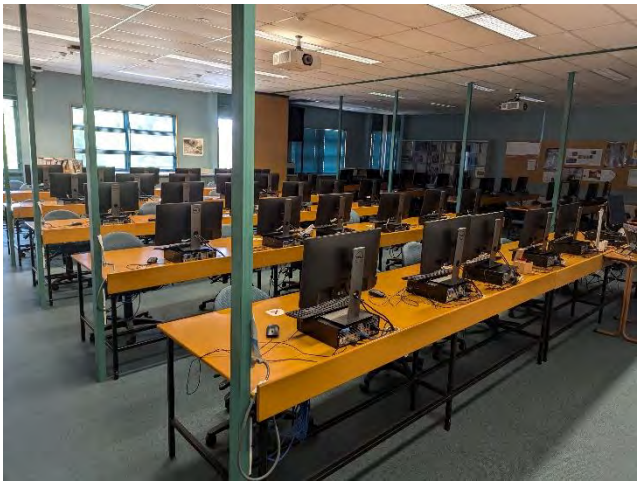
Figure 50: UNE solar farm facility on the Armidale campus

The facilities that are presently operating are of a high quality and offer classrooms, lecture theatres, offices, open plan study/research areas, and practical laboratories. The laboratory pictured in Figure 51 can hold 120 students in one room and a further 60 students in a second room.

Figure 51: UNE Armidale science labs

The engineering training area of the university still has large rooms of high-end computers used for AutoCAD training and large practical training areas filled with specialist equipment as pictured in Figure 52.

Figure 52: UNE Armidale engineering computer room and practical training area



Lecture halls are modern and well equipped to provide large group education offerings and are connected to classrooms and other facilities. An example of a UNE lecture theatre is provided in Figure 53.

Figure 53: UNE Armidale example lecture theatre

Current Facilities Demand

The annual number of students attending UNE is just over 21,000, however most (over 18,000) are attending online. Some students need to attend campus for short intensive parts of their courses or to complete assessments, but typically only around 3,000 students are on campus at any one time. UNE has a long history of providing their courses online as shown in Figure 54 and Figure 55, however, the COVID-19 pandemic restrictions required the expansion of this type of offering.

With only 3,000 students on campus in Armidale and 152 buildings, there is currently less than 20 students per building. The number of people on site is likely closer to 4,000 at peak times allowing for staff and students attending for intensive training. There is still significant excess capacity given the approximate possible maximum number of students of 35,531 per year.

Figure 54: UNE, Historic Completions

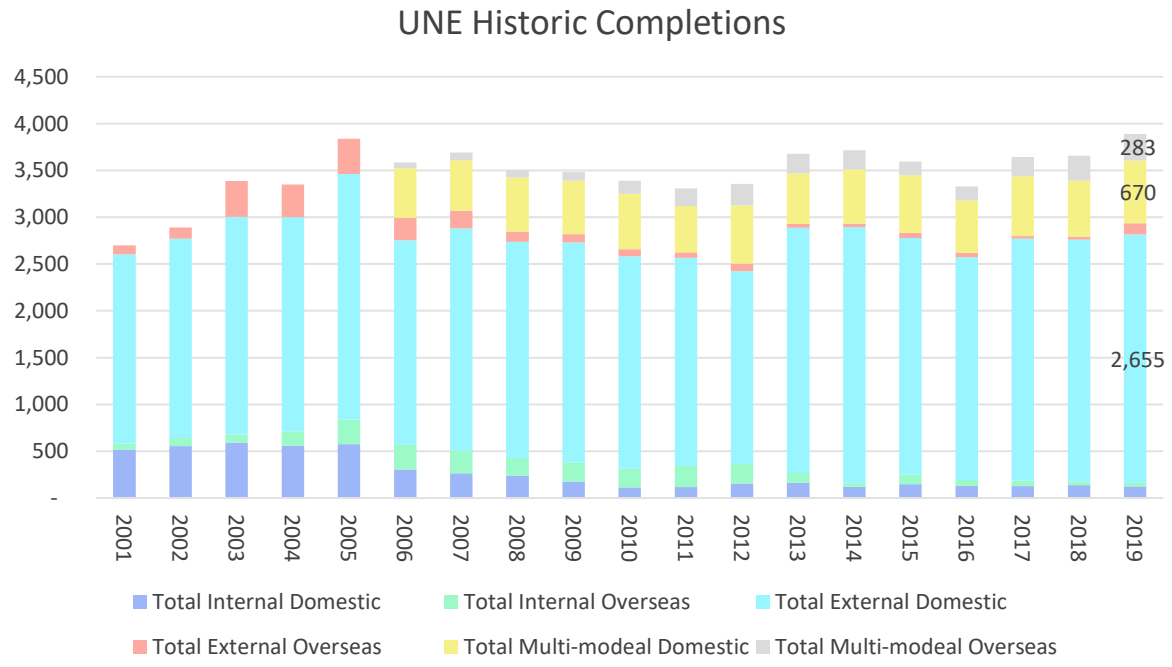
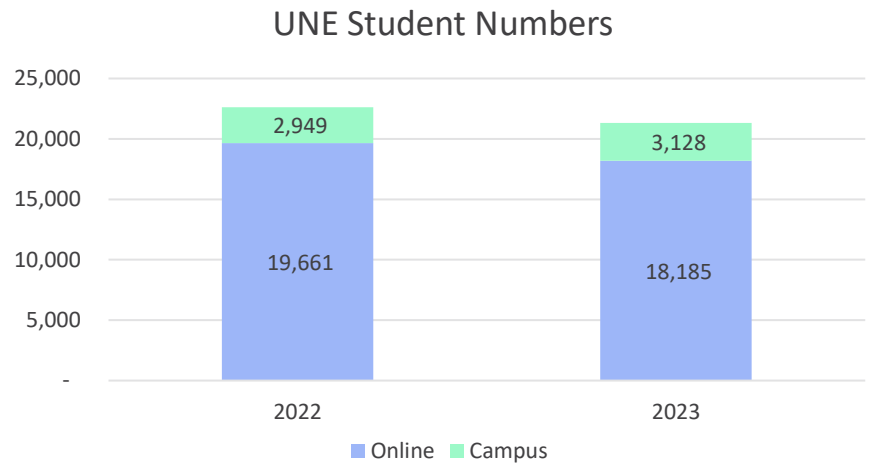


Figure 55: UNE, Student Enrolments



Digital Training

UNE is a leader in providing online digital training for students in many areas of study. Many subjects still require some portion of the degree to be completed on campus, including engineering. The cost of expanding digital training is very low due to the higher fixed costs and low incremental costs, approaching zero extra cost per new student. Therefore, digital training is considered a high value approach to increasing student numbers. The issue for the New England REZ is that students completing digital training may not live within the New England REZ and therefore do not add to the requirements of local education and training.

Areas of Constraint

Demand for engineering and other REZ-related education courses at UNE remains low for several reasons, primarily linked to how universities are rated, funded, and priced. The market generally perceives city-based universities as more prestigious than regional ones, which is reflected in their generally higher academic entry requirements. Despite this, both city and regional universities charge roughly the same upfront fee for Commonwealth Supported Places. As a result, city-based degrees can be seen as more attractive to potential students.

Notwithstanding, UNE would be capable of re-establishing its engineering and other related programs if a sufficient number of students were interested in studying this degree course at the campus. Attracting an academic to run the new program would be complex, but possible with the right incentives.

Opportunities

Engineering is an important skill set required throughout the development and management of renewable energy projects, however, there is a reported (stakeholders and industry) shortage in engineering skills. UNE have indicated that they are willing to work with agencies to consider an approach to increasing the local training outcomes for the New England REZ as required. If there was interest in re-establishing local engineering courses in Armidale through mutual agreement amongst relevant parties in the future, initial estimates from UNE to restart their engineering program are between $600,000 and $1 million per year and an establishment timeframe of between 12 to 18 months to start the courses.

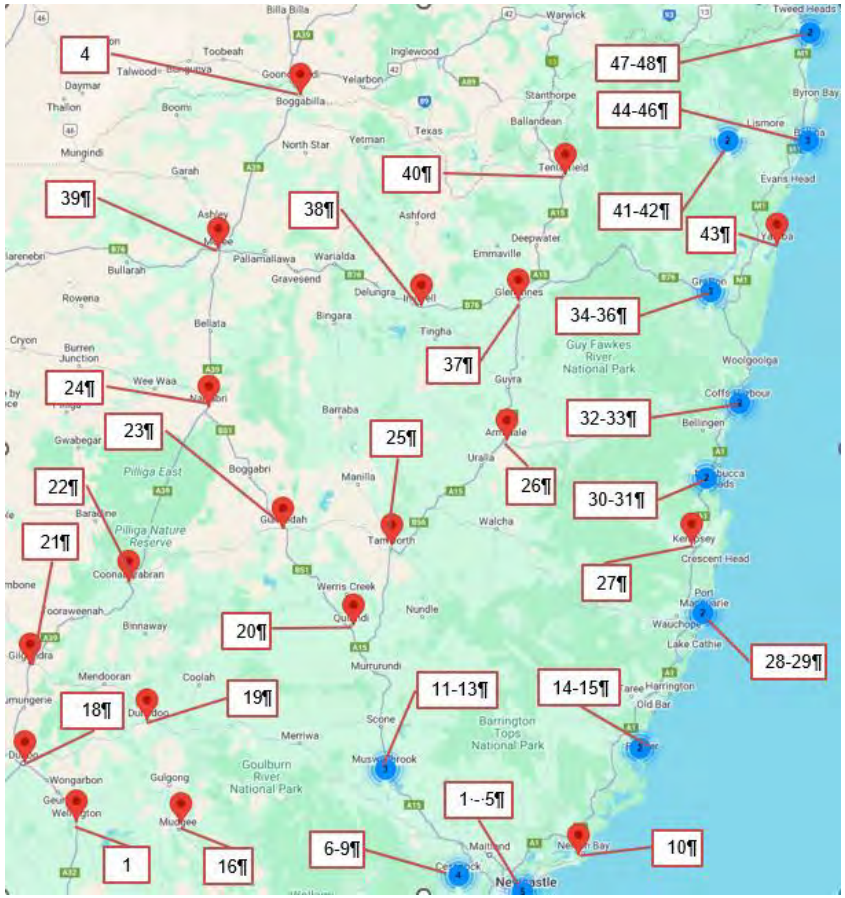
4.3. TAFE NSW training facilities

An initial assessment identified 49 TAFE NSW campus sites within the vicinity of the study area which are listed in Table 24 and shown in Figure 56. Six TAFE NSW are located within the immediate study area and were considered further including: Tenterfield, Inverell, Glen Innes, Armidale, Tamworth and Muswellbrook.

Table 24: TAFE NSW campus sites considered in the analysis

Map Number	TAFE campus	Map Number	TAFE campus
1	Newcastle	26	Armidale
2	Hamilton	27	Kempsey
3	Hunter Street	28	Wauchope
4	Glendale	29	Port Macquarie
5	Belmont	30	Macksville
6	Cessnock	31	Nambucca Heads
7	Kurri Kurri	32	Coffs Harbour Education CHEC
8	Maitland	33	Coffs Harbour
9	Singleton	34	Grafton
10	Tomaree	35	Trenayr
11	Muswellbrook	36	Maclean
12	Scone A	37	Glen Innes
13	Scone B	38	Moree
14	Great Lakes	39	Lightning Ridge
15	Taree	40	Tenterfield
16	Mudgee	41	Yamba
17	Wellington	42	Casino
18	Dubbo	43	Lismore
19	Dunedoo	44	Wollongbar
20	Quirindi	45	Ballina
21	Gilgandra	46	Byron Bay
22	Coonabarabran	47	Murwillumbah
23	Gunnedah	48	Kingscliff
24	Narrabri	49	Boggabilla
25	Tamworth		

Figure 56: Map of the TAFE NSW facilities considered in the analysis



Armidale TAFE and Tamworth TAFE are the main hubs that provide services to all the surrounding regions in the study area, as TAFE NSW operates on a 'hub and spoke' business model. Armidale TAFE is the hub for construction and carpentry with specialist facilities to allow students to build small scale houses, practice concreting, work at heights, classrooms, and a library. Tamworth TAFE has a very large campus and is the regional hub for electricity related trades, with specialist facilities for most types of electricity work, plumbing, gas, and renewable energy.

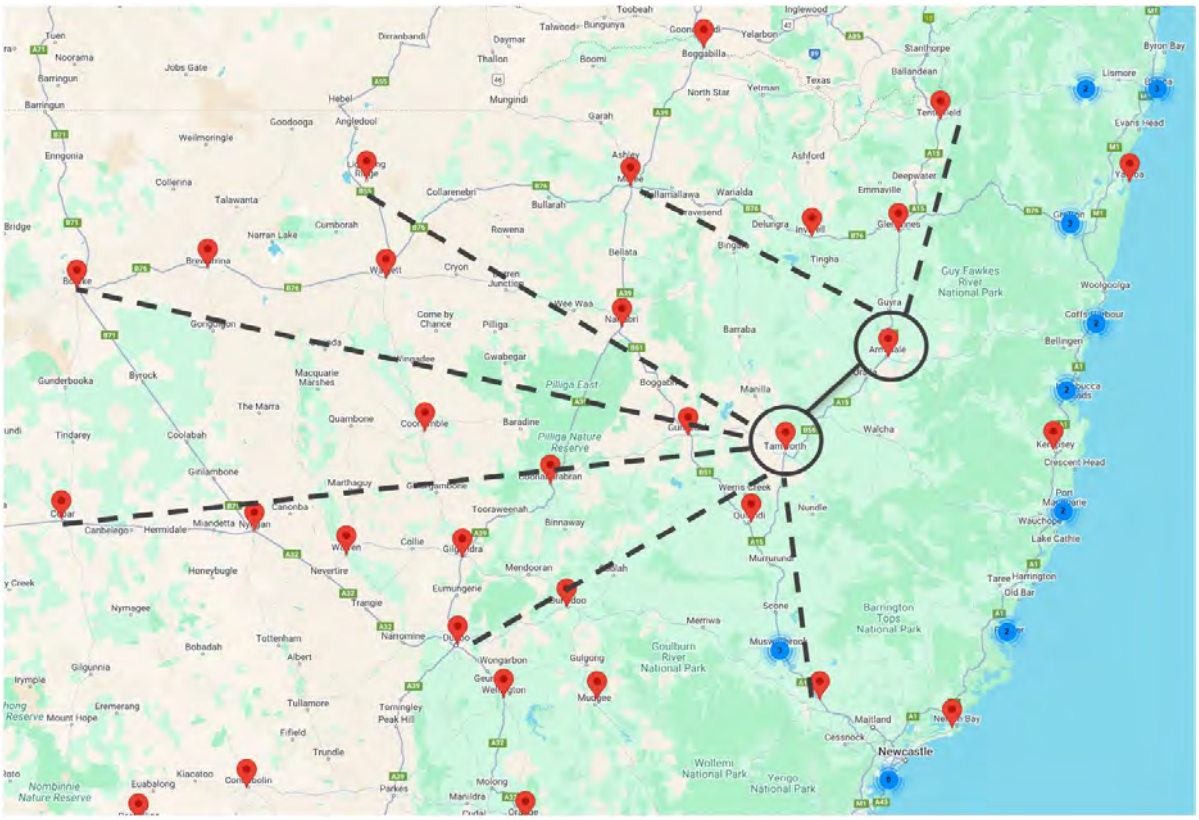
Students at TAFE NSW include apprentices or those completing short courses. Typically, each class will have a minimum of 18 and aim for 20 students, but 85% of the training for an apprentice is completed by the employer.

Illustrating TAFE's 'Hub and Spoke' Model

Figure 57 shows the TAFE NSW facilities which surround the New England REZ, with Tamworth and Armidale acting as hubs for the wider region. The smaller facilities and minor service centres are connected to the hubs and leverage operational support.

TAFE NSW facilities near the coast are larger and some specialise in particular areas of training. As discussed above, Tamworth focuses on electrotechnology (electrical trades) but has many other buildings that offer training in areas considered not directly relevant to the REZ construction, however likely to be required as a result of increased economic activity in the region resulting from the REZ development, including catering, childcare, and health care. Armidale has a focus on construction and carpentry training but also has other offerings. Both the training hubs offer strong wrap-around training for students to enable them to move into careers.

Figure 57: TAFE NSW hub and spoke model demonstrated – Tamworth & Armidale hubs to the region



Current Facilities Capacity

Capacity information for TAFE NSW facilities at Tenterfield, Inverell, Glen Innes, Armidale, Tamworth and Muswellbrook are provided in Table 23 above. Further details on capacity information for TAFE NSW in Muswellbrook, Armidale and Tamworth is provided in this section as the key hubs in the study area.

Muswellbrook TAFE

Muswellbrook TAFE facilities are large with over 47,920sqm of land hosting more than 15 training buildings and 20 accommodation buildings. The facility is attached to the Muswellbrook South Public School. The facilities include a library, mining skills centre, business, electrotechnology, healthcare, and engineering training. The student accommodation is modern and open to TAFE or university students[21]. The approximately 6,735 square metres of training facilities is likely to accommodate approximately 675 students at any one time. A statement from the council during consultation processes indicated that there is some scope to increase utilisation of this facility.

Table 25: Muswellbrook TAFE information

Feature	Details
Total Land Area	47,920 sqm
Training Facility Area	6,735 sqm
Estimated Study Area	3,383 sqm
Student Capacity	More than 1,000 students
Training Buildings	More than 15
Accommodation Buildings	20
Student Accommodation	Modern, open to TAFE and university students
Attached to	Muswellbrook South Public School
Training Facilities	Library, mining skills centre, business, electrotechnology, healthcare, engineering
Utilisation Status	Underutilised (as per council reports)

Tamworth TAFE

Tamworth TAFE is a regional hub that features wide ranging courses, from certificate through to advanced diplomas. The facilities provide a practical, hands-on learning environment for courses as diverse as Aboriginal and Torres Strait Islander cultural arts, carpentry, plumbing, civil construction, gas fitting, hairdressing, retail management, web-based technologies and electrotechnology. This section provides a summary of the electrotechnology facilities at Tamworth TAFE which were inspected as part of the study.

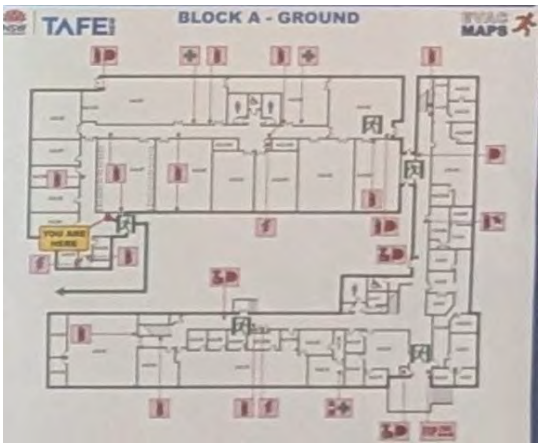
The main building used in Tamworth for electrotechnology is Block A, which TAFE NSW advised has 4,459sqm of space available. Block A was originally built in 1948 (around 77 years old) and is likely to have undergone significant renovations over its life. It was noted during the site visit for this study that Block A appeared dated and that the amenity and flexibility for students or teachers could be improved through targeted upgrades. TAFE NSW identified that Block A has a condition rating of 2.99 (2 = good, 3 = avg) and weighted average remaining life of 24.30 years.

Table 26: Tamworth TAFE electrotechnology facilities, Capacity

Building	SQM	Available working space (sqm)	Sqm per student	Size of rooms (sqm)	Number of rooms
A Block	4,459	1,940	2.56	64	30
K Block	2,754	900	2.56	64	14
M Block	3,725	2,200	15.00	240	9
C Block	3,433	2,240	15.00	240	9
Total	**14,371**	**7,280**			**63**

Block A has approximately 16 trade training rooms with many specially designed and built rooms to allow for trainees to practice working on electrical devices using low level currents and with many built in safety features. Figure 58 shows the Tamworth electrotechnology facility map of rooms and a list of room names.

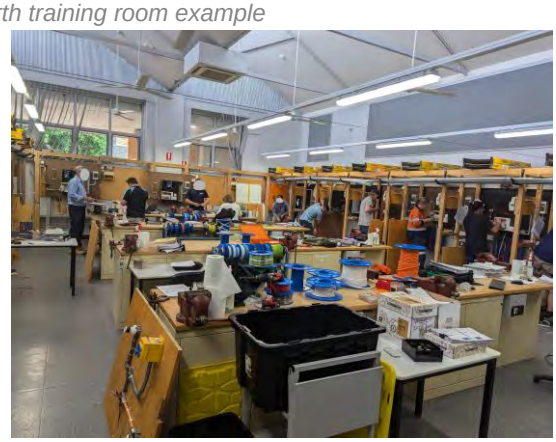
Figure 58: TAFE NSW electrotechnology facility in Tamworth floor map and related room names and numbers



ROOM NAME	ROOM NUMBER
HEAD TEACHER OFFICE	AG · 31
STAFF TOILET	AG · 32
SEMINAR ROOM	AG · 33
TEACHERS OFFICE NO. 1	AG · 34
TEACHERS OFFICE NO. 2	AG · 35
RESOURCE STORE	AG · 36
STAFF AMENITIES	AG · 37
ELECTRICAL THEORY LAB 1 (SP1)	AG · 38
GENERAL PURPOSE WORKSHOP 1 & WASH BAY	AG · 39
TOOLS & EQUIPMENT STORE	AG · 40
GENERAL PURPOSE WORKSHOP 2	AG · 41
REFRIGERATION / AIR CONDITIONING THEORY LAB (SP2)	AG · 42
ELECTRICAL & REFRIGERATION WORKSHOP	AG · 43
ELECTRICAL THEORY LAB 3 (SP3)	AG · 44
ELECTRICAL THEORY LAB 4 (SP4)	AG · 45
ELECTRICAL WIRING LAB 2	AG · 46
ELECTRICAL WIRING LAB 1	AG · 47

The training rooms at Tamworth TAFE are specially designed and constructed to allow students to practice and be tested on modern equipment in a safe environment. These training rooms have been designed to handle up to around 20 students at any one time but are fixed and generally use the available underroof space as efficiently as possible given the current building design, example shown in Figure 59.

Figure 59: TAFE NSW electrotechnology facility in Tamworth training room example



All trade students are introduced to their apprenticeship with basic trade skills training including woodwork, project management, planning, tools, and safety. Block A includes rooms to provide these types of training for large groups, as shown in Figure 60.

Figure 60: TAFE NSW trade training facility in Tamworth

Block A includes many classrooms that have links to the practical space in or adjacent to the classroom. The classrooms can manage the current flow of students, Figure 61 shows an example, but a more modern building may allow for alternative configurations of the space to maximise the full potential for students.

Figure 61: TAFE NSW electrotechnology classroom examples in Tamworth

The Sustainable Learning Centre (SLC) on the campus, shown in Figures 62 and 63, is another asset managed by the electrotechnology department. It was built to specifically train students in the renewable energy areas of practice, including solar panels, wind turbine energy, vehicle charging, batteries, and related appliances.

Figure 62: TAFE NSW Sustainable Learning Centre in Tamworth

Tamworth TAFE's SLC appears to be mostly focused on domestic renewable energy installations. However, TAFE NSW advised during the site visit that the principles behind the small-scale items are transferable to large industry scale systems. There is an opportunity to review these training facilities to consider ways to improve the training outcomes for students seeking to work in the industrial level renewable energy industry. During the site visit and discussions with TAFE NSW staff it was observed and explained that the underroof training spaces are large and could be improved with funding to design spaces to maximise student experience, throughput, and add air-conditioning to improve conditions during summer high temperatures.

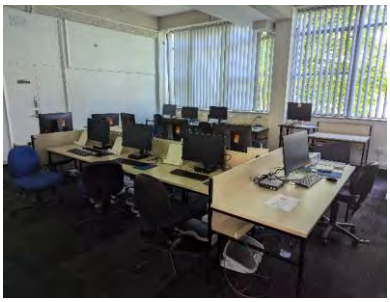
Figure 63: TAFE NSW Sustainable Learning Centre in Tamworth



Armidale TAFE

Armidale TAFE campus is the other central hub campus servicing the New England region, with a focus on construction, carpentry, and digital. The Armidale TAFE campus has a large library, extensive classrooms, open roofed building space, warehouse type training area, accommodation, and other support facilities. Figure 64 shows some examples of the TAFE NSW Armidale campus.

Figure 64: TAFE NSW Armidale

Building sizes:

- Building A – two floors of approximately 1,300sqm Career Pathways, Aboriginal Languages and Employability Skills, Student Services, Business Administration, Information Technology
- Building C – one level of approximately 741sqm Digital Lab, Library/Resource Centre
- Building W – one level of approximately 1,600sqm Automotive, Construction, Engineering
- Building D – one level of approximately 580sqm TAFE NSW Digital Headquarters.

Further details of the capacity of the Armidale TAFE facilities are provided in Table 27.

Table 27: Armidale TAFE, Capacity

Location	SQM	Available working space (sqm)	Sqm per student	Size of rooms (sqm)	Number of rooms
Building A	2,596	1,030	2.56	64	16
Building C	741	430	2.56	51	8
Building W	1,595	930	15.00	240	4
Building D	580	360	2.56	51	7
Total	**5,512**	**2,205**			**35**

Figure 65 shows the building layout for TAFE NSW Armidale campus with the construction and carpentry practical training space marked as Building F, R, T, and adjacent building in the map. Information on utilisation was not available.

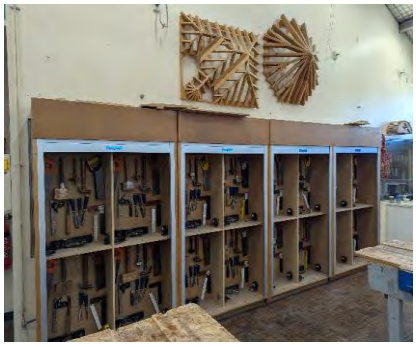
Figure 65: TAFE NSW Armidale site map

Figure 66 shows the practical training area attached to Building W (shown on the map in Figure 65). Each of these facilities are attached to enclosed buildings that are used as storage and other training areas. Each student designs and builds parts of a small house-type building, gaining experience in carpentry, concreting, project management, working at heights, and other aspects of construction.

Figure 66: TAFE NSW Armidale campus construction and carpentry practical training space

Figure 67 provides examples of the internal training facilities in Buildings W and A. During the site visit it was observed that these training rooms appear to be aging, and could be upgraded to improve flexibility and enable higher levels of training throughput.

Figure 67: TAFE NSW Armidale campus construction and carpentry practical training space



Current Facilities Demand

Although it is difficult to fully understand the demand for the current TAFE NSW facilities in the region, the current numbers of apprentices for electrotechnology in Tamworth and construction/carpentry in Armidale were discussed with TAFE NSW managers during the site visit. The current student load estimates were:

- Tamworth electrotechnology – around 200 to 300 apprentices (around 50 completions per year)
- Armidale construction/carpentry – around 200 apprentices (around 50 completions per year).

An estimate of capacity of the TAFE NSW hubs of Tamworth and Armidale is shown in Table 28. It is considered that there may be scope for targeted upgrades to increase utilisation of these facilities.

To confirm the utilisation of these facilities, a further detailed study of time and use, developed in consultation with TAFE NSW, and referring to industry guidelines such as the Tertiary Education Facilities Management Association (TEFMA) guidelines on space utilisation, would be required.

Note: For Tamworth TAFE, this does not include apprentices for carpentry or plumbing trade training spaces.

Table 28: Estimate of TAFE Facilities Capacity

TAFE NSW	Floor Space (sqm)	Estimated Training Space (sqm)	Capacity (number of students possible)
Armidale	5,512	2,205	618
Tamworth	14,371	7,280	1,124

TAFE NSW Mobile Training

Both Tamworth and Armidale TAFE facilities are supported by mobile training units, as shown in Figure 68. These mobile training units can be taken to sites or other TAFE buildings in the wider region as required.

Figure 68: TAFE Mobile Training Units

Historically, Australia has used Bookmobiles (library buses) to service small towns and remote regions with reading and study materials. Bookmobiles are a limited service that offer access to materials for a limited size population. Recently, many organisations have tried to expand this method of distributing learning experiences to provide full mobile training centres. The report from users indicates mixed experiences. While these services enables access to training which might not otherwise be available, key considerations include limits on capacity, a need for high levels of coordination of training activities, high ongoing cost support, and better training experiences when combined with fixed facility training access.

More recently, VET and university providers are adapting this training practice to deliver training for trades.

Some examples are provided in the box below

Mobile learning - case studies

UTAS - MILETruck

UTAS is currently trialling a Mobile Interactive Learning Environment (MILE) Truck, with the aim of widening participation in higher education, with an emphasis on low Social Economic Status (SES), regional, rural, and remote students. Its aim is to provide school students with "a range of engaging educational experiences, encouraging curiosity, and building confidence to pursue their aspirations"[22] It can be set up in locations around Tasmania.

The MILE truck potentially offers a model for TAFE NSW to provide mobile teaching of the practical components of TAFE courses if it is feasible to adapt trucks to the practical elements of VET courses, and if the costs of establishing MILE-type trucks/vehicles specific to certain educational areas is less than alternatives such as providing student accommodation facilities.

According to UTAS, "research shows that such activities and experiences, in conjunction with exposure to role models, and the development of educational networks, can positively influence school and work decision-making"[23]

Charles Darwin University - Mobile Adult Leaning Units (MALUs)[24]

Charles Darwin University has two mobile adult learning units (MALUs) to deliver VET mobile classrooms and workshops via truck around remote areas of the Northern Territory. It has a Business MALU and a Trades MALU. They travel across the Territory to Alice Springs, Adelaide River, Daly River and Dundee Beach, providing delivery of courses in remote areas.

Source: https://www.flickr.com/photos/charlesdarwinuni/7367874598

TAFE Queensland - mobile van

TAFE Queensland invested in a mobile van for delivery of VET in Queensland's Southwest, starting in 2018. Initially based in Toowoomba, the mobile van serviced the regions of Toowoomba, Warwick, Ipswich and Dalby in the automotive trades, light vehicle, heavy vehicle and auto electrical programs. The mobile van is fitted as a contemporary learning space with Wi-Fi technology throughout, teacher and student desk stations and tools and workshop equipment suitable to conduct onsite training workshops. As the mobile business develops, the intention is to service the wider regional community with delivery circuits encompassing Goondiwindi, Roma and Chinchilla. A similar concept is also being considered for the construction trades. The mobile training van will increase opportunities and access to training and education for students in rural areas, better service the apprenticeship market and increase numbers of regional students in the automotive fields.

As of 2019, there were eight such mobile vans owned by TAFE Queensland, delivering training in automotive, construction, plumbing and heavy vehicle courses. Some employers that benefit from the TAFE Queensland's workplace training include Origin Energy, Regional Councils, Isuzu, Volvo and Star Entertainment group.[25]

PORT MACQUARIE MOBILE LIBRARY

The mobile library van has been travelling around the Port Macquarie Hastings region since January 2013. The service has primarily been aimed at rural schools.

https://mnclibrary.org.au/services/mobile-library/

Bachelor of Education (Early Childhood) - Mobile prac-based learning

Mobile interactive technologies are also being used in prac-based learning and assessment tasks for Bachelor Education (early childhood) students at UTAS, Central Queensland University and University of Southern Queensland. In the assessment tasks for their degree, the early childhood education students recorded themselves singing, playing songs or nursery rhymes, or completing painting or drawing activities, then students were asked to plan a micro-lesson, link it to the curriculum, record themselves teaching it to a child and then reflect on it afterwards. Very positive feedback was received after the first iteration in 2017 as 91% of people thought it was a good way to assess their learning; and 95% of students thought their overall learning experience was good, very good or outstanding.

Mobile technology classrooms - Europe

In Estonia in Europe, one company, Merkuur, has developed mobile technology workshops for students interested in technology, maths, sciences and engineering. The workshops introduce various trades and offer training in techniques and tools used in the metal and wood industries, electronics, bionics and many other engineering tasks. The workshops are delivered via a self-built mobile classroom. Initially, Merkuur offered the workshops as non-formal learning, but from 2018, they developed partnerships with schools, vocational schools and colleges.[26]

Operating requirements

Mobile training facilities can be moved from place to place to service a wide range of people for a variety of training offerings; however, the associated staff and equipment will need to be matched to the local demand for training to be cost effective. Most trade training provided by TAFE NSW requires specialist trainers and equipment. When moving trainers and equipment onto a mobile platform like a bus or truck, there is a need for this to be supported by an appropriate level of coordination and funding. TAFE NSW advise that there is a central base of coordination staff and facilities to support the operations to ensure the range of elements of service delivery are available and delivered in the right locations, at the right times, and within set budgets.

Staff requirements

A barrier to increasing a mobile training offering is that TAFE NSW trainers may not qualified to drive large trucks or buses, which are likely to be required to facilitate the transport of equipment to training sites. Therefore, either trade training qualified staff will need to be trained in driving these large vehicles or additional qualified support staff will be needed to drive these vehicles.

Another staffing aspect of the mobile training facility is the accommodation and contracting requirements. Staff may need to travel to regional areas and could be onsite for weeks at a time, which means they will likely need local accommodation provided and may want additional compensation for being away from their family and home.

Discussions with organisations that have trialled these types of facilities previously indicated that most staff do not enjoy this type of offering due to the requirement to spend a lot of time and effort to train a small number of students, while spending time away from their family and home. Retention of staff can be an issue for this type of service.

Equipment requirements

TAFE NSW generally have two different types of mobile training units:

- Truck Unit: Isuzu N Series NLR 45-150 truck with a specially built back (Clean Energy Training Kit and an Advanced Solar Training system) (similar to picture in Figure 69)
- Ute & Trailer Unit: Dual Cab Hilux Ute with a specially designed trailer (6.6 Ft Wide Tandem Axle Hot Dip Galvanised Car Trailer 3500KG ATM) TSA Clean Energy Training Kit

Each of these mobile training units is assumed to have two trainer staff to enable the management of teaching time and coordination of activities.

Figure 69: TAFE NSW mobile training vehicle example

Mobile training requires a significant amount of investment in equipment to support operations. The core equipment requirement is the training platform, which can be a truck, bus, or other vehicle either custom built or convert a standard vehicle. The other aspect of equipment is the training equipment that would be attached to the mobile platform.

The specific type of training to be provided will direct the design of the equipment. One approach is to use the mobile platform to only undertake classroom style training that can make the one platform design suitable for all training. This approach would require students to travel to the central TAFE NSW facility for practical training elements of each course. However, if the objective is to provide classroom style training, an easier and lower cost and risk option is to hire local facilities when training in that area is required.

It is assumed that TAFE NSW would typically prefer moving practical training equipment on a platform from a hub site to regional areas. The typical training equipment may include heavy welding equipment, metal working equipment, spray painting equipment, electrical training equipment, and many other types of large and heavy equipment. All these types of equipment can be retrofitted to be mobile, but will require special designs made, work to alter fixtures, and required approvals to allow them to be fitted to a vehicle.

Storage of equipment can also be costly as the mobile equipment may need to be changed over on the mobile platform to accommodate different types of training for different groups over time. Therefore, a safe and secure storage facility is required and the associated equipment to load/unload the mobile equipment on/off the mobile platform.

Coordination requirements

Discussions with organisations that have used mobile training platforms suggests the on-the-ground experience showed large coordination issues became apparent during the operational phase. Aspects of coordination included the right courses, for the right locations, at the right time, for the right students but also included movement of teaching staff and equipment on the platform to the required location.

The objective of the mobile training facility is to provide TAFE NSW training to regional locations with small populations that are not sufficient to justify a permanent TAFE NSW facility. The small population sizes make for very small class sizes when training specific skills. Moving a truck full of equipment, with one or two teaching staff and a vehicle driver to train 5 to 10 students is a high-cost exercise. Often, some students may decide not to attend or have some other incident that interferes with their intended training. Therefore, there may be more staff than students for some classes. A high level of coordination with intended students, staff, timetables, and other TAFE NSW operations is required to reduce negative impacts of these types of events.

Another coordination requirement is related to having sufficient platforms to meet the demand. Mobile platforms are high-cost items and require time and effort to refit for each type of training that is to be provided. A lot of planning is required to ensure the platform is fitted out, available, has a sufficiently qualified driver, and is in the right place at the right time for training needs. Ensuring that vehicles are organised, appropriately fitted out, moved to the required location, with the associated accommodation bookings and related parts of the training operation are time intensive activities. Therefore, the mobile training platform would need to be supported by a strong organising and administrative team that understand the TAFE NSW teaching needs. Mapping of the TAFE NSW course program against the student's needs, teacher availability, vehicle set up and availability are all important considerations.

Travel and parking is another complex part of the mobile training facilities. Large vehicles are limited to certain routes on main roads and some vehicles are not allowed to travel in certain areas at set times. The heavy vehicle regulator would have views on some of the types of possible vehicles used for mobile training. Parking of a large vehicle can be difficult and limits on space are often imposed by town councils to control the availability of space for local businesses. The optimal arrangement would be for the mobile training facility to be parked directly adjacent to a local facility that can be used for classroom training and/or breakout areas. However, these types of facilities are often in the centre of a town and may not be suitable for parking a large mobile training facility. A high amount of coordination with local authorities is needed to enable this element of the operations to happen.

Digital Training TAFE

Digital training is providing many people access to TAFE NSW that were previously unable to participate in courses. For example, in the electrical area there is a self-guided course offered, which has some 100,000 students. However, many TAFE NSW courses are not suited to being provided online and require special purpose facilities to enable correct training. The TAFE NSW hub and spoke model of training works for digital courses as well, where TAFE NSW buildings offer access to computers, library services, internet, and other related assistance for online training. Figure 70 shows the Armidale TAFE NSW digital building.

Figure 70: NSW TAFE Armidale

Areas of Constraint

Several areas of constraint are possible barriers to TAFE NSW expanding its current capacity and service delivery offering in response to the anticipated REZ demands, including:

- **Funding** – TAFE NSW are funded per apprenticeship to cover the activity. Each TAFE region has set levels of funding caps for apprenticeships.
- **Certainty of demand** – given TAFE NSW funding is linked to the number of apprenticeships signed up, there is limited certainty of having sufficient funding for any significant facility or staff expansion to meet some predicted future demand. However, TAFE NSW advised that they will generally take an approach to fund infrastructure for skills areas that require it even without cost recovery.
- **Scope of training available** – apprentices need to work on a wide range of work to cover all parts of the training required for certification. For example, electricians are required to work on domestic, commercial, industrial, vehicles, and other types of application of their trade to be fully qualified. Therefore, they are not able to be qualified if only working on a renewable energy project.
- **Student non-educational costs** – travel (per km fee), accommodation (around $60/night), childcare, and other student needs during training is only partly funded by TAFE NSW, which is a large part of the cost of attending a course.
- **Hub/spoke travel** – potential distance/travel issues with Tamworth and Armidale servicing students from hundreds of kilometres away, which is a long way for students to travel to attend the hubs.
- **Trainers available** – TAFE NSW find it difficult to attract qualified trainers to train apprentices. Competition with private sector jobs and the requirement for trainers to receive an appropriate level of training to be qualified are possible barriers to expansion.
- **Other student support** – wider society issues are constraints on students, including housing supply, availability of childcare, and lack of public transport in regional areas.
- **Ongoing employment** – a key constraint in attracting more apprentices is the ability to secure ongoing employment once a project is completed.

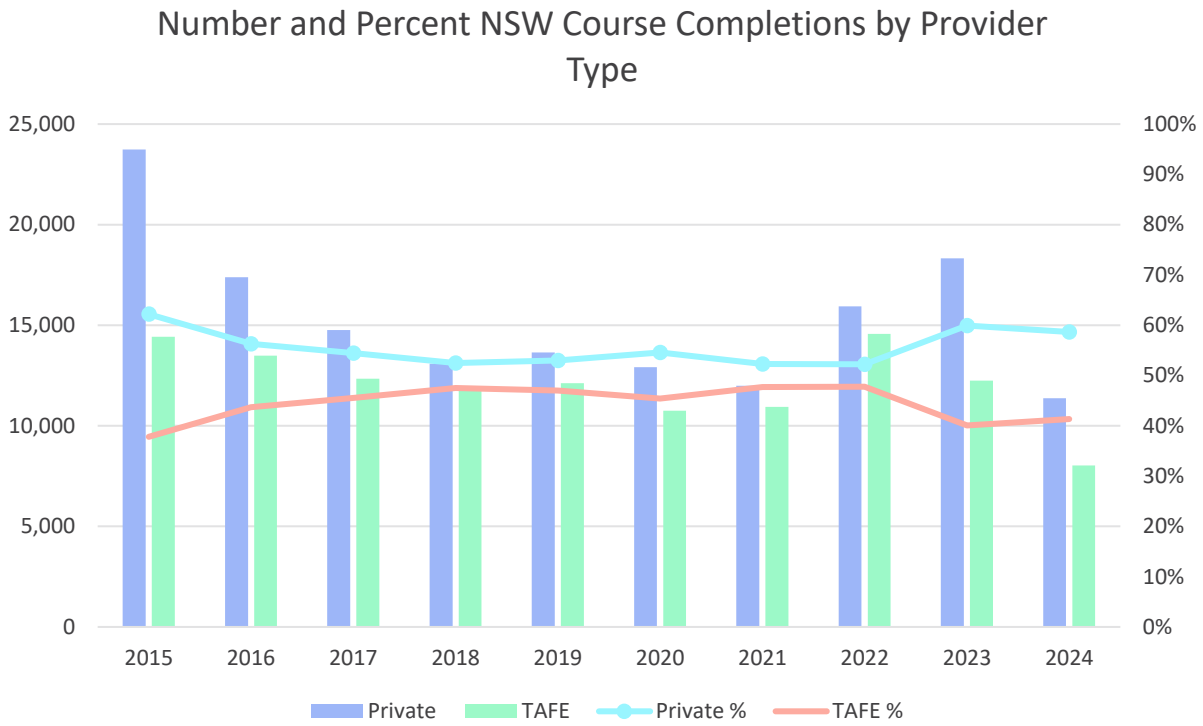
TAFE NSW only has some control over some of the current constraints on improving output of qualified apprentices.

4.4. Other training facilities

Mapping training facilities as part of this assessment has shown that the non-university and non-TAFE NSW facilities are many and diverse, but are typically small with a focus on short or very specific types of training. There is a very large and active market for private providers in the education and training sectors, which are likely to quickly move to the region to provide much of the shorter and more profitable courses required by REZ workers. As the graph in Figure 71 shows, more than half of the number of training course completions in NSW were historically provided by private providers.

It is noted that Figure 71 is a graphical representation of data provided on the National Centre for Vocational Education Research (NCVER) site: https://www.ncver.edu.au/research-and-statistics/data/databuilder#.

Figure 71: NSW Course Completions by Provider Type



Note: TAFE NSW data reflects in-year completions only. It is acknowledged that TAFE NSW have a number of courses that continue across multiple years.

Areas of constraint

Private providers typically do not have large capital-intensive facilities or surge capacity in times of high demand. TAFE NSW have filled the role of offering highly subsidised courses that require high capital investments. Private providers are often reluctant to invest in additional capacity before the demand is required, which would mean their capacity would lag the demand shift for the New England REZ needs.

Summary of existing training infrastructure

UNE is the main university level training provider in the region and has significant educational facilities, including 152 buildings at the main Armidale campus. Some buildings have been removed and some closed to reduce operating costs. Over time, the demand for on campus education has reduced, further enforced by the COVID-19 period that forced almost all education online. The engineering and architecture program at UNE was removed but the facilities remain with much of the required equipment. The UNE management are open to restarting the engineering program to assist in building skills in the REZ and said the cost of re-establishing the course would be up to $1 million per year.

TAFE NSW facilities in the New England REZ are designed to operate as a hub and spoke model, with Tamworth and Armidale acting as the regional hubs. Armidale is the hub for construction trades, with carpentry, concreting, and working at heights. Tamworth is the hub for electrotechnology with a Sustainable Learning Centre focused on household renewable energy solutions, many specifically designed and build training rooms for electricians, trade training and other training areas. There are opportunities for both of the TAFE NSW campuses to be improved with targeted upgrades where supported by long-term demands, access to funding and securing of the necessary approvals.

Attracting new TAFE NSW trainers can be challenging due to competition from industry, and a high barrier to entry for new trainers. Each new trainer is required to complete an appropriate level of training (e.g. a course of typically more than 6 months) to learn how to be a TAFE NSW trainer. TAFE NSW are currently offering free courses to trainers in areas of need but the availability of more competitive salaries is a large deterrent to new trainers joining TAFE NSW.

TAFE NSW also maintain a mobile training system, which is part of the hub and spoke model of service delivery, where the trades can have practical training offered onsite or in a regional TAFE NSW facility using specially built trailers. There are potential difficulties with expanding this mobile training system for REZ development, including the requirements for special driving licences, need for high levels of coordination of trainers, students, facilities, and scalability. Often mobile training is offered to small groups of students for specific employers, rather than a large coordinated systematic driver of increasing skills.

Digital training is a large part of both UNE and TAFE NSW offering in the REZ. Most UNE students (80%) are trained online. TAFE digital training for trades is limited due to the requirement for students to complete practical training and testing. The digital training offering is reported as being effective and has low marginal cost of production making it a good option for future education and training development.

5. Challenges and Opportunities: Increasing Local Employment and Training in the New England REZ

This section distils the existing literature on workforce development, skills and training for insights relevant for a New England REZ strategy focussing on:

- Key Challenges and Barriers: many of the challenges are common across renewable energy projects albeit with local variations within each REZ;
- Opportunities: the opportunities for increasing the local workforce, labour supply and community benefits (e.g. increasing employment participation by women, First Nations people etc);
- Solutions: options to address these challenges and realise the opportunities to increase local employment and deliver lasting community benefits to the region.

The aim of this section is to build upon existing studies to inform the analysis and opportunities of this study.

What Stakeholders Reported

The study involved surveying, interviewing and running workshops with First Nations stakeholders and stakeholders from across the education, training, renewable energy, community, employment services, council, government and not for profit sectors. Stakeholders identified several barriers to building local workforce participation, such as poor communication between developers and contractors and the community impeding skilling-up and preparing local workers; a tight labour market, with other local industries competing for workers; challenges with the training system, including access to training facilities, course offerings, a lack of trainers and so forth.

Yet there was also a palpable sense of optimism shared by stakeholders, as they identified several opportunities for increasing employment and training opportunities for the region. Opportunities for getting more people employed in renewables included, school-based programs, like VET in school, careers expos, experiential learning and site visits; creating employment opportunities for First Nations, migrant and refugee communities, long-term unemployed through pre-employment programs and building the capacity of small to medium contractors; and innovative transport solutions to overcome barriers to accessing training and employment.

5.1. Increasing Local Employment in the New England REZ: Key Challenges

The context within which renewable energy, storage and transmission projects in the New England REZ will be developing a workforce is challenging. These challenges are sectoral, yet with regional variations.

The challenges include:

1. Fluctuating employment demand profiles;
2. Tight labour markets, high labour demand from other infrastructure sectors and skill shortages in key occupations;
3. Lack of diversity in the electricity workforce;
4. Training capacity in a ‘thin market’;
5. Insufficient investment in training by renewable energy firms; and
6. Use of skilled migrants.

Key Challenge 1: Fluctuating Employment Demand Profiles

Renewable energy and transmission have peaky employment profiles for several reasons:

- In order to minimise costs, once a renewable energy project secures finance they mobilise quickly and typically have agreements with completion dates linked to penalties for delays.

- Over the next decade, construction is the dominant activity in Australia for renewable energy and transmission (as opposed to operation and maintenance, for example) and by its nature, it is project-based with peaks and troughs.
- Project development is often linked to government programs which can lead to sharp increases in activity as they scale up.
- Sharp employment peaks and troughs increase the risk of skill shortages and socio-economic impacts within host regions (e.g. boom-bust cycles of development).

Case Study – the Ripple Effects of Construction Booms in Regional Communities

In the Gippsland region of eastern Victoria, the community still recalls the impacts of the Wonthaggi desalination plant being built in the late 2010s. What locals now refer to as the 'De-Sal effect' was the very quick drain of skilled workers and apprentices from across the region to work on the large infrastructure project (the desalination plant). Nearly overnight, young apprentices left their jobs in local businesses to obtain the higher wages offered by the project. Having become accustomed to the higher wages, and now experienced working in construction, these young workers also left the region when the project finished in search of the next large-scale project and job. This regional drain of workers, and the cannibalising of local industries and businesses for large scale infrastructure, has had lasting effects on the community. It is in part a product of boom-and-bust cycles of development, but it is also a sign of poor workforce coordination.

Key Challenge 2: Tight Labour Markets, High Labour Demand from other Infrastructure Sectors and Skill Shortages in Key Occupations

In the context of tight labour markets with unemployment very low, even in the context of historically high employment participation rates, the National Skill Shortage Priority List identifies one-third of all occupations in national shortage – almost double the number in 2021. Almost half of professional and trade and technician occupations are in shortage. Electricians are in significant shortage; to meet demand there needs to be a 40% annual increase in apprentices, this is equivalent to 20,500 apprentice electricians each year[27]. Consequently, there are skill shortages in many of the key occupations within renewable energy, a selection of which can be found in Table 22.

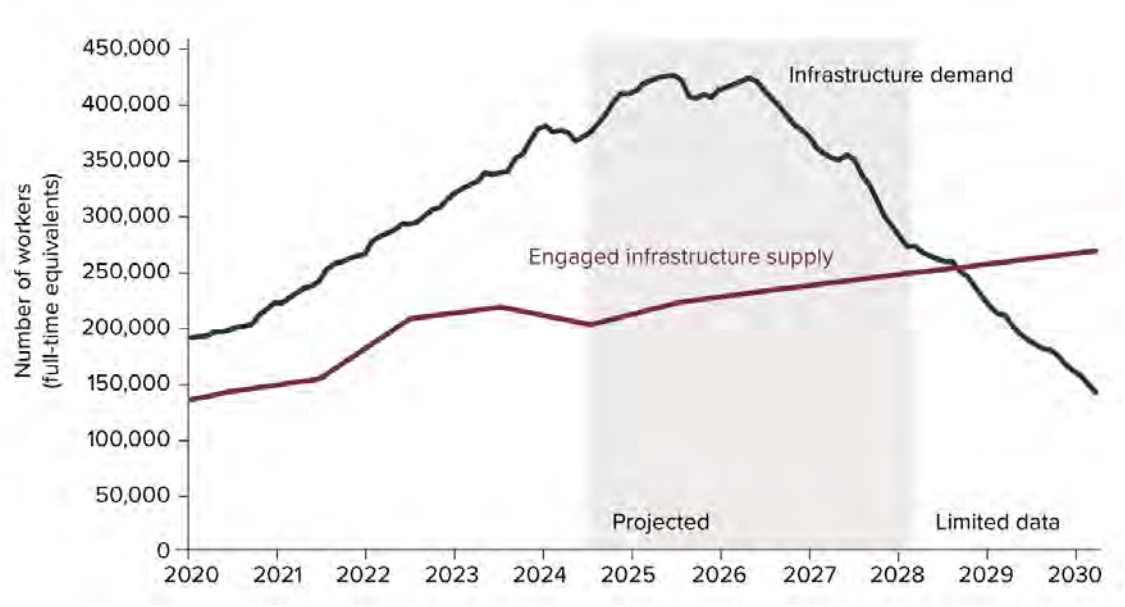
Table 29: Recruitment difficulty and skill shortages, selected occupations

Occupation	National Skills Priority List, 2023 Rating	Future Recruitment Demand compared with Economy Average
Construction manager	Shortage (all states)	At economy average
Engineering manager	Shortage (all states)	At economy average
Mechanical technician	Shortage (all states)	At economy average
Electrical engineer	Shortage (all states)	At economy average
Civil engineer	Shortage (all states)	At economy average
Electricians	Shortage (all states)	Below economy average
Electrical line worker	Shortage (all states)	At economy average
Rigger	Shortage (all states)	At economy average
Crane operators	Shortage (all states)	At economy average
Concreters	No shortages	At economy average
Earthmoving plant operators	Shortages (all states excluding Victoria)	At economy average
Truck Driver	Shortage (all states)	At economy average

Source: Jobs Skills Australia (2023) *Skills Priority List.*

Competition from other infrastructure has been a major issue for renewable energy with an excess of demand relative to supply. Infrastructure Australia (2025) has observed that governments have taken significant steps to smooth what it previously described as an 'unprecedented' infrastructure pipeline, resulting in an 8% decrease in overall investment from 2023-2024.

Figure 72: National supply and demand for public infrastructure workers



Source: Infrastructure Australia 2024, Market Capacity Report 2024 p.51. Demand and supply of infrastructure workers from 2020-2030.

Whereas Infrastructure Australia was projecting a major shortage, the cancelling or postponing of infrastructure projects now means their projections are for supply-demand to be in balance by 2028,[28] which may indicate the pressure is easing. However, the supply-demand balance is still tight and could change (e.g. new government infrastructure commitments) and will need to be monitored. Furthermore, there is global competition for renewable energy expertise and workers.

Similarly, renewable energy developers, interviewed in this study noted that a few large projects had finished in urban areas, such as Sydney, and this was contributing to an easing of skills shortages in areas like civil works. However, in the region, stakeholders communicated that the local labour market is tight, particularly for low skilled, trades and apprentice labour. Existing industries, such as food processing, glasshouse agriculture, mining and metal works are all seeking workers.

Key Challenge 3: Lack of Diversity in the Electricity Workforce

Diversity in the energy sector is a widely acknowledged challenge, yet it also presents an opportunity as it signals that there are underutilised and untapped labour sources. Across most Australian industries, the energy sector has the "lowest representation of women (16.5%), and the second lowest representation of recent migrants (2.1%)"[29]. First Nations employment is also comparatively low, with only 1.9% of the workforce identifying as First Nations, compared with a 2.2% average across all other industries and sectors[30]. Indeed, the energy sector workforce has the highest number of VET trained, full time employed under 50 workers. This means that the talent pool that the energy sector is sourcing from is limited and not reflective of the wider Australian society. At a regional level this will be more pronounced.

> 'We can't grow the workforce at the pace and scale required if large groups of the population are excluded, including women, First Nations people, people with disability, and recent migrants whose skills' potential are underutilised' (Jobs Skills Australia, p17).

Associated with this challenge, past reviews have uniformly found there is low awareness of the job opportunities and pathways amongst communities within REZs. For example, the Clean Energy Council stated last year:

> "Communities in regional locations have little sense of what ongoing employment opportunities exist on a wind, solar, battery or hydropower site. Training organisations are also unsure of the skills and qualifications to offer locals in preparation for upcoming renewable energy projects in the region." (Clean Energy Council, Jobs Skills Australia, p.209).

Key Challenge 4: Gaps in Training Resources and a 'Thin Market'

The NSW training market for renewable energy and transmission can generally be considered a 'thin market', meaning that in regional areas, there is low demand for training spread across regions making the economics of specialised training challenging and creates gaps in access to training. For example, there is no in-person electrical course offered at Armidale TAFE and students must travel to Tamworth to access in-person electrical training.

> 'RTOs can only deliver training sustainably where there is a supply of learners willing and able to enrol. This can be particularly difficult for specialised training where the number of workers needed is small, limiting the number of students prepared to commit to that career path. In the past, employment in energy supply has been concentrated in a handful of regions, allowing education and training providers to scale up delivery for local industry needs. This approach is difficult to apply to clean energy because the sector is more mobile and often dispersed where tertiary markets are thin. Clean energy training can also be capital and equipment intensive, making it unviable for smaller, regionally located providers to offer.' (Jobs Skills Australia, p.209).

The following section includes an analysis of current training capacity and infrastructure in the New England REZ. While the training market may be thin for now, the scale of developments slated for the New England REZ warrant strategic investment in regional training to help build capacity and skills locally.

Key Challenge 5: Insufficient Investment in Training by Renewable Energy Firms

There is a general recognition that investment in training by the renewable energy sector is relatively low. There are several factors that lead to insufficient investment in workforce by renewable energy firms e.g. the short timeframes of construction phases, uncertainty around projects going ahead and a lack of transparency regarding the timing of projects limit the ability to take on apprentices for longer contracts (especially solar projects which are typically 12 months) and to invest in training.

There is an associated issue with the fit between the training system and the renewable energy sector. The Clean Energy Council has acknowledged a 'persistent disconnection' between the renewables industry and training bodies in Australia (Jobs Skills Australia 2023). Industry representatives have observed in past studies that the training qualifications and resources aren't always considered useful, firms sometimes have concerns about IP and there may be a lack of awareness or experience with the system:

> 'Apprenticeships can only take place if employers are familiar and willing to engage with the VET system. There is a risk that employers in the clean energy sector may not be fully engaging with the VET system due to their lack of familiarity with it. This could be driven by the fact there are many overseas firms joining the sector, and some employers have stronger connections with higher education and research institutions, with inherent preferences to hiring skilled workers rather than investing in apprentices. It's important that governments actively engage with clean energy industries and support employers to:
>
> - hire apprentices and support them through to completion
> - access incentives and in-training supports
> - support course design and updates
> - allow trainers to maintain the currency of their industry skills and knowledge, and
> - provide opportunities for on-site training by industry and RTO trainers.' (Jobs Skills Australia, p.211)

Key Challenge 6: Use of Skilled Migrants

Currently the clean energy sector has comparatively low levels of migrants employed in the industry, with 26 per cent of the workforce born overseas[31]. Jobs and Skills Australia (2024) state that recent migrants (migrating to Australia between 2017-2021) make up just 2.1 per cent of the energy workforce, which is the lowest of any sector[32]. This is also occurring in the context of declining numbers of migration. Furthermore, there is no specific skilled migration program at present that focuses on the clean energy sector, and similarly, a supported pathway for international students with aligned qualifications to obtain employment in the sector and residency[33].

There are a range of barriers to the use of skilled migration to fill labour market gaps in energy related professions. A significant barrier is the way in which VET qualifications are recognised between jurisdictions, particularly because regulations, standards and industry codes can differ between countries and there is a significant risk that overseas workers could cause endanger human safety, systems and infrastructure due to an unfamiliar working context. In addressing this, Energy Skills Australia has developed two bridging courses (Minimum Australian Context Gap) to support overseas workers understand the Australian context for both Certificate III in Electrotechnology Electrician and Certificate III in Refrigeration and Air-conditioning[34] qualifications.

The Federal Government is developing a National Energy Workforce Strategy (NEWS)[35] to formulate a plan for a workforce adequately skilled and resourced to deliver net zero ambitions. Assessing the role of skilled migration in addressing workforce and skills shortages in the energy sector is a part of this. While skill shortages in the clean energy sector could be eased somewhat through changes to skilled migration, visas and the translation/recognition of international qualifications, focus on the New England REZ and NRNIP context is on increasing local employment and training opportunities and outcomes.

5.2. Increasing Local Employment in the New England REZ: Key Opportunities

There are a range of opportunities to increase local employment and increase the supply of labour, such as:

1. Increasing Employment Participation amongst the First Nations Population;
2. Increasing Female Participation in the Renewable Energy Workforce;
3. Increasing Employment Participation of Underrepresented and Diversity Groups (long-term unemployed, people with a disability and migrants);
4. Building Pathways for School Students to the Renewable Energy Workforce; and
5. Redeploying Construction Workers between Renewable Energy and Other Infrastructure Projects.

Opportunity 1: Increasing Employment Participation amongst the First Nations population

The New England REZ has one of the highest First Nations population shares across the REZs[36] – as illustrated in the demographic profile in this study. Employment participation by First Nations Australians is significantly lower than the wider population across the labour market and is also low in renewable energy. Consequently, there is an opportunity to contribute to reducing the socio-economic disadvantage of First Nations people and increasing the labour supply available to renewable energy projects in the region.

There are three main avenues for growing the First Nations workforce in the New England REZ:

- Existing workers in adjacent occupations with the right skills shifting into renewable energy: in practice, this group is limited to a smaller group of occupations (e.g. truck-drivers) but there could be opportunities for employment amongst this group.
- School leavers entering the workforce: there is a large group of First Nations students that could be candidates for traineeships, apprenticeships and to progress to tertiary education and work in professional roles, such as law, finance and stakeholder engagement.
- Unemployed or those not currently in the labour force: there are entry-level jobs in solar farms that are suitable with pre-employment training and support programs.

Case study – Avonlie Solar Farm

Beon is an engineering, construction and procurement (EPC) company that specialises in building solar projects that deliver both megawatts and local employment opportunities for underrepresented and diversity groups. For their Avonlie solar farm, a 245MW, 500,000 panel project with the capacity to power 100,000 homes, connecting and working with the local Narrandera First Nations community was a key priority.

For the First Nations community in Narrandera photo identification turned out to be the first barrier to employment. So, Beon supported the idea to run an ID Day, which had the Aboriginal Cooperative Gundyarri providing birth certificates, setting up Medicare cards and Unique Student Identifiers to make enrolling in white card courses accessible. From the 100 people that turned up on the day, 30 were keen to pursue employment on the solar farm. For some, this was their first ever job.

Of the 30 First Nations people employed on the solar farm, 90 percent of them have gone on to find ongoing jobs after the project's end. In some cases, this has been with an employer that has never employed a First Nations person before. This opportunity, for First Nations workers to be supported to participate in the workforce, on Country and staying in their community, has had a profound impact on their lives.

Opportunity 2: Increasing Female Participation in the Renewable Energy Workforce

While the clean energy workforce performs significantly better than traditional energy when it comes to female employment with 39 percent of the workforce being women, female representation in trades and apprentices remains low. Women make up a large portion of the administrative and professional workforce, and less of the technical roles.

Powering Skill's Organisation found that there are just 2.3% women in energy trade roles and that just 4.9% of apprentices are women. There are many barriers to women's full participation in more technical and trades roles, such as a lack of proper amenities, ill-fitting and unsuitable personal protective and safety gear, a lack of support and female role models, inflexible work arrangements not suited to care and parenting, as well unsafe and unwelcoming workplace cultures.

While these barriers are significant, there is ample opportunity to shift these trends and support industry, training and education providers to growing female participation in the clean energy sector across all roles.

Case study – Beon's Women in Solar

As explored above in the Avonlie case study, Beon an EPC, has delivered innovative workforce programs as a part of their community engagement approach for many of the solar projects they deliver. As a part of their 120MW Bomen Solar Farm near Wagga Wagga, Beon in partnership with Chandler McCleod, developed its Women in Solar' program that provided training and employment to 11 local women. The group included five long-term unemployed women, three First Nations women and three single mothers. The program included a four-week intensive preemployment course, which delivered both formal (accredited courses) and informal training and skills development, such as confidence and self-esteem boosting.

Opportunity 3: Increasing Employment Participation of Underrepresented and Diversity Groups (young people, long-term unemployed, people with a disability and migrants)

As the Jobs and Skills Australia study argues, expanding the clean energy workforce – at the necessary scale and pace to meet emissions reduction targets – will not be possible if significant portions of the population are excluded:

> "The net zero transformation requires a shared commitment between industry, government, and communities to share the benefits of clean energy work, through foundational and pre-vocational training, clear diversity targets, and a transition framework built around the individual worker" (2024, p.17).

As demonstrated in section 2.3 of this study, in the New England region and neighbouring areas, there are large portions of the working age population who are out of the labour market (long-term unemployed) and are disadvantaged in some way and require extra support in gaining employment. There have been examples in the renewable sector, where solar projects[37] have delivered excellent employment outcomes for disadvantaged groups by offering pre-employment training and on the jobs support.

Young people, those under the age of 25, represent an important cohort to support by increasing their employment participation. Specific programs and targets focused on this cohort can prevent cycles of disadvantage by proving meaningful employment opportunities and avoiding long-term unemployment.

Case study – Mosaic

Mosaic Multicultural Connections is a not for profit supporting people from refugee and migrant backgrounds to settle into the communities and regions they now call home. Mosaic in Armidale works extensively with the local Ezidi community, refugees from Northern Iraq and Syria. Mosaic offers a variety of services, such as support to access training, tickets and certification, translation and assistance in getting a job (working alongside local employment service providers). To date, Mosaic has worked with 6 people from the local Ezidi community to get them placed in renewable energy jobs locally. They have also been working to build relationships with developers, advocates and the community in order to create employment opportunities for the Ezidi population; many have obtained white cards, first aid training and working at heights, certifications in preparation.

Opportunity 4: Building Pathways for School Students to the Renewable Energy Workforce

In past studies, there has been a widespread view that programs and resources need to focus on regional schools to increase participation in the sector. Students are one of the larger potential sources of new labour supply. In relation to First Nations people, there is a disproportionately young population and therefore if renewable energy is to make a difference in reducing socio-economic disadvantage students need to be a key target group. There is some existing program capacity in the form of Training Services (a network of regional officers undertaking activities within schools) and Careers NSW (careers advisory services). Students also looking to take a gap year and stay locally are well positioned to take of low skilled labour roles, with the added advantage of being housed locally, reducing the burden on housing.

Case study – Careers Network Inc

Careers Network Inc., a not for profit that works across NSW and in the New England Northwest to support students with VET in school. They focus on supporting industry placements, working with the education sector, RTOs and TAFE, and industry to get students learning vocationally while in grade 11 and 12. Careers Network currently supports 2000 students across the NENW region with their in-school VET studies. Across NSW, this number grows to 40,000 students enrolled in VET and supported through Careers Network.

Opportunity 5: Redeploying Construction Workers between Renewable Energy and Other Infrastructure Projects

There is a large volume of infrastructure projects occurring across a range of sectors in addition to renewable energy. Consequently, improving the cross-skills and redeployment between infrastructure projects could also be a source of additional labour:

> ‘a large pool of qualified workers in areas like construction could move into clean energy if short, accessible and affordable training were available. These could prove particularly important for workers in transitioning industries, like coal-fired power generation, who would benefit from short skilling pathways that can bridge gaps to new opportunities’ (Jobs and Skills Australia 2024: 116).

Opportunity 6: Local business services and on-going employment in operations and maintenance

There are a range of services that could be supplied by local businesses including catering, fencing, site maintenance, cultural heritage and environmental assessments etc. With support renewable energy could lead to the creation or expansion of local businesses.

The employment modelling also highlights a larger opportunity in on-going employment in operations and maintenance than is often recognised with local communities. Some of these jobs are not going to be local (e.g. operations centres, professional services) but there is also significant local employment required, such as electrical and mechanical technicians to maintain wind farms.

Section Summary

In the context of a tight labour market in a region with an economy dominated by agriculture, the employment opportunities for the New England REZ are primarily likely to be in training students and new entrants into occupations for renewable energy, increasing training and employment opportunities for First Nations, migrant communities and other underrepresented groups. Some of the existing workforce, especially in electrical and construction roles, could also work in renewable energy and move between sectors.

However, there are a range of inter-linked barriers and challenges to developing a local workforce for renewable energy for all regions including the New England. There are skill shortages and high competition across the labour market for labour, the regional depth in key occupations is exceeded by employment demand peaks, and the training system needs to be scaled up and improve its engagement with the industry and community to increase labour supply. The next section covers the evaluation of the local education and training system and how it can play a role in increasing training and employment opportunities.

6. Options for Increasing Local Training and Employment Opportunities

Our evaluation of education and training infrastructure suggests that existing facilities could be improved with targeted upgrades and therefore the case for building new facilities is not supported. Ultimately, the objective is to understand the opportunities for local employment, and to scope localised training initiatives and infrastructure to increase the supply of skilled labour to avoid skill shortages and maximise local benefits as the industry scales up under the NSW Electricity Infrastructure Roadmap.

Consequently, the focus of our evaluation of options shifted during study development from a detailed evaluation of new training facilities to a range of options that can achieve these goals through either:

- Increasing local training capacity (section 6.1): options to increase local training capacity and make best use of assets;
- Increasing local supply (section 6.2): options to increase the volume of locals with the right skills and qualifications;
- Industry partnerships (section 6.3): partnerships between industry and other stakeholders to create training and employment opportunities for locals.

In section 6.4, each of the options evaluated based on four key criteria:

- **Level of employment demand and skill shortages**: the focus should primarily be on jobs where there is higher demand, especially where there are skill shortages. Based on our analysis, this means a focus on engineering, electricians, mechanical trades and construction trades. There will be other employment opportunities (e.g. businesses contracted to provide services, community engagement etc) but our focus will be on the larger employment sources.
- **Local socio-economic benefits**: what types of initiatives or jobs create the highest socio-economic benefit for the region and its people. For example, will the initiative create capacity or infrastructure with on-going benefit, new skills and careers or help reduce unemployment?
- **Financial**: each initiative needs to be considered in terms of the up-front funding and any on-going financial implications.
- **Stakeholder support**: what are the priorities and preferences of local stakeholders.

6.1. Increased Training Capacity

There are many possible interventions that can be made to increase the skilled labour force in the New England REZ region. This section discusses the pros and cons of a set of broad, possible options:

- New training facilities.
- Upgrading existing training facilities: for example, a current facility is old and not fit for purpose to meet increasing demand. Support facilities may also provide additional support for students to reduce barriers for students to attend from regional areas, including accommodation buildings.
- New courses at current facilities.
- Increased trainer workforce.
- Increasing private RTO capacity.

New training facilities

Current Utilisation and Demand

Our assessment indicates that existing university and TAFE NSW facilities in the New England REZ region are more than sufficient to meet current demand. There is limited need for additional buildings to be constructed to accommodate present or anticipated demand.

A new facility could however provide several advantages, including:

- Community Engagement – Demonstrating investment in education and training.
- Improved Student Experience – Offering modern, comfortable, and flexible learning spaces.

- Adaptability – Accommodating various training needs efficiently.
- Optimised Land Use – Relocating to a lower-cost site and repurposing high-value land.

While community engagement is important, past developments have shown that new buildings do not necessarily lead to increased skilled labour or employment. However, while improving student experience may boost enrolments, its effect on workforce outcomes remains uncertain.

Strategic Land Use Considerations

Many regional TAFE facilities were originally built on low-cost land at the outskirts of towns. As urban areas expanded, these sites in many cases have become high-value land, better suited for housing, retail, or other community assets. Selling these sites and relocating to lower-value land could yield significant financial and economic benefits.

Challenges and Constraints of a New Facility

Despite potential benefits, building a new training facility presents several challenges:

- Excess Capacity – Risk of adding underutilised education infrastructure.
- No Guarantee of Increased Skilled Labour – New buildings alone do not create more skilled workers.
- High Costs and Long Timeframes – Development would take at least four years, plus another four years to produce graduates.
- Complex Approval Processes – Planning, funding, and business case development add further delays and costs.
- Ongoing Operational Costs – New facilities may reduce maintenance costs, but overall expenses must be carefully evaluated.

Cost Estimates and Case Study

Estimating the cost of a new TAFE facility is complex and requires a detailed business case. As a reference point, the Morwell Trade Skills Centre in Gippsland, Victoria, completed in 2021, cost $35 million ($40.7 million in 2024) for a 5,000 sqm facility, equating to approximately $8,138 per sqm. This facility includes high-spec electrotechnology, new energy technologies, instrumentation, and plumbing training spaces. Given its size and features, it represents a medium-cost estimate for our analysis.

Conclusion

While a new training facility may offer benefits, it does not directly address the core challenge of increasing skilled labour in the New England REZ region. The high financial costs and long lead times suggest that alternative approaches, such as upgrading current buildings or enhancing training programs, may provide more effective solutions.

Modern TAFE facility example[38]

The Tamworth TAFE Building A is the main training area for the electrotechnology students and is estimated to be 5,800sqm, which appears to be of similar size to the Morwell facility. Using Building A as an example, the Table 30 provides a range of capital cost estimates for a new facility to be constructed as a replacement. The capital cost currently does not include demolition of the old building, which is likely an additional $2 million to $3 million depending on issues such as potential asbestos contamination.

Table 30: Tamworth, New Facility Upgrade, Indicative Costs

Investment	SQM	Cost per sqm	Capex $M
Low	5,800	$4,876	$28.28
Medium	5,800	$8,138	$47.20
High	5,800	$10,173	$59.00

Land value is also not included in the current capital costs, which can be significant. TAFE NSW may have land available already that is suitable for a new building site and might be able to sell the current site to reduce the overall financial costs. There are economic benefits to moving the facility out of town as it will release the high value land to the market, where it can be repurposed to a higher value activity.

TAFE may be able to develop a lower cost design such as by using a single level building, using already established connected services, avoiding building new car parking, retaining old equipment, etc. The very low unemployment rate in the region is likely to add upward pressure to the cost of construction and may be competing with the renewable energy project for builders, equipment, and materials.

Construction training centres like Armidale are often lower cost to develop given it can be a very simple open shed training area used to practice building and other construction activities. However, the workshops are likely to cost approximately the same per square meter with the same set of risks and uncertainties. Building W in Armidale TAFE is likely to be the focus of the building replacement site, which could cost between $8.8 million and $18.3 million not including demolition of $1 million to $2 million.

Table 31: Armidale, New Facility Upgrade, Indicative Costs

Investment	SQM	Cost per sqm	Capex $M
Low	1,800	$4,876	$8.78
Medium	1,800	$8,138	$14.65
High	1,800	$10,173	$18.31

Upgrading existing training facilities

Both TAFE and UNE present many opportunities for upgrading or renovating current training facilities to enable higher throughput capacity for the skilled labour within the New England REZ region. TAFE buildings in Tamworth and Armidale are comparatively old, with aging equipment and lower levels of student comfort and flexibility than offered by more modern buildings. UNE buildings are a mix of modern and heritage buildings of different ages and qualities, but there would be some value in improving teaching space for engineering, architecture, and town planning students. Accommodation buildings at UNE are many and some upgrading is currently underway for one building.

The pros of upgrading existing facilities include much lower cost and timing compared to new facilities, improved amenity, improved capability to include disabled students, with much of the adjacent support infrastructure is already in place. Upgrading existing buildings can be lower cost and greatly reduce the approval timing to achieve higher student throughput compared to a new facility. Enabling better access to training facilities for disabled people can assist in accessing the long-term unemployed and may be partly supported by NDIS funding. More disabled people being trained up can improve the overall welfare of the entire community and improve economic outcomes by adding new workers to the economy and improving the life outcomes for the disabled people.

The cons of upgrading existing facilities includes limited ability to build a bespoke building to enable multi-use flexible buildings, high risk of hidden costs, difficult to continue current operations, no guarantee of increased skilled labour, and the cost benefit balance may be lower than other options.

Architects may be able to better design a new facility compared to having to work within the current building footprint. Old buildings often have large hidden costs during upgrading projects such as from asbestos, poor engineering, potential heritage requirements, and/or need to meet new planning and regulatory requirements. A range of building specifications come into play when a certain percent of a building is upgraded, including energy efficiency, disability access, and safety. All the modern specifications can add large costs to building upgrades and end up costing more than a new facility without the benefit of bespoke building design.

Understanding the potential costs of renovating Tamworth TAFE Building A is also complex due to the very wide range of possible options and circumstances. However, there is a range of possible costs based on current market information and experience.

Table 32: Tamworth TAFE Facility Upgrade, Indicative Costs

Investment	SQM	Cost per sqm	Capex $M
Low	5,800	$4,576	$26.54
Medium	5,800	$5,720	$33.17
High	5,800	$7,150	$41.47

Armidale TAFE campus Building W could also be renewed with some expenditure and the costs are dependent on the specifications of the facility.

Table 33: Armidale TAFE Facility Upgrade, Indicative Costs

Investment	SQM	Cost per sqm	Capex $M
Low	1,800	$4,576	$8.24
Medium	1,800	$5,720	$10.30
High	1,800	$7,150	$12.87

Mobile training expansion

TAFE mobile training offering has some potential to be expanded to assist with servicing regional towns and lowering the barriers to training for students. Currently, the TAFE mobile training activities are limited to small

groups and a limited range of services and limited distance covered. Expanding the mobile training offering to more subjects and with a more structured capability coordinated with other parts of the training network would assist more students to gain skills. Offering entry level and pre-employment training through the mobile training might assist students in accessing employment that can lead to being employed as an apprentice. However, the mobile training can be complex and difficult to activate, coordinate, and staff but can offer opportunities for people that find it difficult to attend the TAFE hubs in Armidale and Tamworth. The key for mobile training is to have a very well-coordinated effort by TAFE management, trainers, and vehicle drivers. Additional funding and efforts added to the current system could enable many more students to be engaged in training and increase the skills available in the region.

New courses at current facilities

Both TAFE and UNE have suggested starting new courses at current facilities, including running electrotechnology courses at the Armidale TAFE and UNE re-opening their engineering program. TAFE Armidale is not currently capable of running electrotechnology courses on site due to a lack of specially built facilities. Part courses might be run using a combination of digital training and mobile training, but that system would need to be staffed and designed to meet the TAFE standards. Using other student supports might be a more efficient method to meet the Armidale demand, including running minibus transports.

UNE have previously produced approximately 50 engineering students per year but stopped offering engineering a couple of years ago. Engineering type subjects are likely to be in high demand in the REZ given the need for civil engineering, structural engineering, electrical engineering, and associated engineering design. Local students would now need to travel to larger city-based campuses to complete engineering courses, which would likely lead to employment in that region. Re-establishing engineering courses at UNE is a low cost and productive way to improve skilled employment in the region. UNE leadership estimated the cost of re-establishing engineering would be approximately $600,000 to $1 million per year, depending on the facility startup cost. Several renewable energy generators interviewed for this project noted an interest in partnering with UNE to develop courses, including engineering.

Both TAFE and UNE are offering micro-credentials for students, which can be a good low-cost way for people to start or re-start their education/employment pathway. Micro-credentials are short, targeted courses designed to provide specific skills or knowledge in a particular area. In Australia, they are increasingly popular to upskill or reskill quickly, often focusing on industry-relevant skills that can enhance employability. These credentials are usually shorter than traditional qualifications, such as degrees or diplomas, and can be completed online or in-person. They offer a flexible learning option, allowing individuals to gain recognition for mastering skills without committing to lengthy study periods. There is likely to be good benefits in exploring ways to partly fund students in the region in completing some employment focused micro-credentials training with TAFE or UNE.

Increased trainer workforce

TAFE NSW finds it difficult to attract qualified teachers due to industry offering more competitive salaries. To be a teacher in the Vocational and Educational Training (VET) Sector, a Certificate IV Training and Assessment (TAE40122) or an equivalent qualification is required. This qualification can take 6 months or more to complete depending on the study method. The lower wages and qualification requirements can be a barrier to entry for experienced tradespeople joining TAFE NSW, which has seen lower levels of teacher availability. However, much can be done to assist in attracting more teachers into the region if required by increased demand for certain subjects. The difficulty in just increasing the number of teachers is that it may not be required if there are no students to train and there is no guarantee more teachers will lead to more skilled labour in the region. Additional teachers need to be part of a wider strategy.

Private RTOs

Private providers should be considered in any possible investments for education and training in the region. A combination of private and institutional providers is likely to offer the lowest cost and highest payoff solutions. An example of where a private RTO might be better suited is the provision of Global Wind Organisation training that is required before personnel can work on turbines.

Apprenticeship Subsidies

TAFE apprenticeships are underpinned by the student first gaining employment with an organisation that is able to sponsor them for the apprenticeship. Employers hire a person, and all three parties (RTO, Student, and Employer) typically sign an agreement to partly fund and support the student through the apprenticeship.

One approach to increase training capacity could be to offer financial support for new apprenticeships in the REZ region. Offering financial support to either or both, employer/employee, to start and complete apprenticeships in targeted areas could activate the entire supply chain of providers to do whatever is necessary to train more skilled workers. Apprentice subsidies will need to be developed in coordination with TAFE NSW, councils, NSW Government, schools, and other key stakeholders.

The specific type of support, requirements, and implementation of this approach is complex and will need to be considered carefully to maximise the outcomes. First year apprentices are lower paid and therefore, if the company holds the benefits, it may drop experienced apprentices after each year to effectively have subsidised general labourers. The employee is the one that will benefit most from fully completing the apprenticeship and therefore, has the greatest incentive to remain engaged throughout the apprenticeship. Given our assessment that the low level of unemployment in the region would require the activation of long-term unemployed people to meet demand, NSW Government might be able to provide additional support for certain underrepresented and diversity groups in the community. Indigenous people, women, disabled people, and other specific groups are often overrepresented in the long-term unemployed and would need special support to allow for their participation in completing an apprenticeship.

Estimating the cost of this option will depend on many aspects of the agreement made and the market for skilled labour. Another possible scenario to understand the scale of this option. Assuming the apprenticeship subsidy is offered as $10,000 per year (real terms) per apprenticeship and the total number of new apprenticeships is 1,000, where 200 new apprenticeships are added each year up to year 5 of the program, the total nominal financial outlay is likely approximately $43.6 million. The number of people receiving subsidy would reduce after a peak due to the first cohort completing their training after 4 years.

Table 34: Apprenticeship Subsidy Program, Indicative Costs

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Total
New	200	200	200	200	200					**1,000**
Finish					200	200	200	200	200	**1,000**
Wage	$50,000	$51,250	$52,531	$53,845	$55,191	$56,570	$57,985	$59,434	$60,920	
Subsidy	$10,000	$10,250	$10,506	$10,769	$11,038	$11,314	$11,597	$11,887	$12,184	
Total cost	**$2,000,000**	**$4,100,000**	**$6,303,600**	**$8,615,200**	**$8,830,400**	**$6,788,400**	**$4,638,800**	**$2,377,400**	**$0**	**$43,653,800**

Summary

Reducing barriers to increasing the number of apprentices by an incremental amount to support the New England REZ is a complex problem as there is not one action that will resolve all the barriers sufficiently. One issue is clear, there is currently sufficient scale of facilities to meet the expected demand.

A summary of the options:

- **Build new education and training facilities**: Although a new building could potentially replace the current old buildings, it would be very costly and too slow to meet the expected demand. TAFE NSW do own a lot of land on the outskirts of the major towns in the area and there would likely be large economic value in TAFE NSW selling off intown land and moving to new facilities out of town due to the opportunity cost of holding valuable land for students who can just as easily be trained on lower cost land.
- **Renovate current facilities**: there is likely to be some benefit of renovating the current facilities to some extent to increase the potential throughput, make the experience of staff/students better (more

attractive), and increase the flexibility/usability of the current space. Issues with renovations would include high upfront costs with no guarantee of additional student attendance or availability of staff, ability to continue current operations while renovations take place, gaining agreement with TAFE what should be done and budget, timing may become an issue as this type of development can take years to approve and complete.

- **New Courses**: re-establishing the UNE engineering program is likely the highest net value option given the low ongoing costs and the ability to leverage UNE's existing capabilities to deliver critical skills. Expanding TAFE courses in the current hubs to include electrotechnology in Armidale and construction in Tamworth would reduce the barriers to entry for students. Developing support for institutions to progress micro-credentials will serve as a skills builder for long-term unemployed students.
- **Increasing Trainer Workforce:** TAFE NSW difficulty in attracting new trainers will become a serious barrier to increasing the number of students, finding methods to support the development of new trainers will ensure when students apply for more courses TAFE can meet the demand.
- **Private RTOs:** the private sectors ability to react quickly to market changes and incentives should be used in conjunction with the institutional providers to maximise the industry ability to respond to increased demand. That is, there are opportunities to include the private sector in delving the solutions. An example of using private sector is to have some the trainers in the RTOs qualified to work at TAFE so when the demand arrives the private sector can be contracted as additional trainers for short term delivery peaks.
- **Apprenticeship Subsidies**: the greatest barrier to activating more education and training resources is the lack of demand from students, offering organisations incentives to employ more apprentices will directly reduce the barrier and let the whole training system activate. Benefits of a financial incentive like this is it can be scaled to be more/less effective, will leverage other organisation funding, can be directed to specific skills, can be activated easily/quickly, can be stopped at a set time, clearly demonstrable outcomes, low risk compared to building facilities, can target specific community groups, can be limited per person and as an overall budget.

All these approaches have some merit and a combination of them might be most suitable for maximising outcomes.

Arranging the implementation of these solutions to increasing training capacity in the New England REZ region will be complex and may require several business cases. The New South Wales (NSW) Treasury Business Case process[39] provides a structured framework to guide the development, assessment, and approval of investment proposals, primarily for government projects. The goal is to ensure that public funds are used effectively, delivering maximum value and benefits for the community.

6.2. Increased Supply of Locals with the Skills and Qualifications to Work in Renewable Energy

Measures to increase the capacity of training systems will be more effective if they are complemented by other initiatives which can increase the supply of locals into training courses and acquiring skills for employment in renewable energy. These measures are generally lower cost and will increase utilisation of existing capacity as well as being required to underpin new training capacity. Complementary measures will also be required to improve equity and increase employment participation. Beyond increasing the capacity of the local training system, there are a range of other initiatives that can be taken to increase the supply of local people with the right skills for renewable energy in the New England REZ:

- **Increasing the pool of people with skills and qualifications for entry-level jobs**: short-term training measures can position school leavers and the unemployed for entry-level jobs.
- **Increase local supply of apprentices and university students**: it is one to create the training capacity but there also needs to be an increase in the supply of candidates. There are a range of options to complement initiatives to increase training capacity by increasing candidates for training.

- **Increase the pool of organisations that host apprentices**: an apprenticeship requires a host employer and therefore initiatives to increase the pool of organisations able and willing to host an apprentice is also part of the solution.
- **Increasing the supply of training candidates and workers from underrepresented and diversity groups**: bespoke measures can increase the supply and participation of groups where there is low representation in the electricity sector.

A range of initiatives for each of these options are outlined in Table 35.

Table 35: Options for Increasing the Local Supply for Training and Employment

Option	How does it work?
Objective: Increase local supply for entry-level jobs	
Pre-employment programs for construction	Renewable energy project developers in the CWO REZ and New England REZ have put forward a range of initiatives that could be implemented to prepare local workers for construction jobs: 'job-readiness programs' to address employability barriers (e.g. literacy, numeracy), drives to get students, the unemployed and those not in the labour force tickets (e.g. 'white card' for construction sites) and licences (e.g. truck and forklift licences, safety). Specific pre-employment programs delivered through First Nations employment services or training companies can prepare local First Nations peoples for entry-level jobs on solar farms. There are a number of examples where this has worked successfully to create jobs for First Nations people (e.g. Avonlie solar farm) who have then gone onto other jobs with solar farms or in other sectors. It is primarily in solar farms that pre-employment programs could have the biggest impact as most jobs on wind farms, transmission and battery storage require more specialised or trade-qualified workers. This option reduces constraints including: certainty of demand
Objective: Increase local supply of apprentices and university students	
Fund pre- apprentice programs	Supported pathways are programs to improve the accessibility of education and training. Jobs Skills Australia (2023: 128) has observed that 'supported pathways' are rarely utilised for clean energy e.g. only 2,300 students were in clean energy related supported pathways programs. Pre-apprenticeships are a type of supported pathway program that can provide a pathway into an apprenticeship by enabling candidates to address skill gaps, obtain some of the basic skills and test if they are suited to the field. An example of a pre-apprenticeship program is the 'Positive Power Mob' program - a targeted, 18-week pre-employment program at The Spot Community Services, Brisbane which included a: • 6-week 'soft skills program' (focusing on core life and work skills, physical fitness and heights/safety training) • 12-week numeracy and literacy course at TAFE (Certificate II – Skills for Work and Training). • Applicants then applied for the apprenticeship through the normal process. Another example is a 7-week pre-apprenticeship program between Transgrid and Belmont TAFE which includes learning modules on 240-volt electrical systems, OHS and the basics for fixing electrical equipment. Powering Skills Organisation, the peak body, has identified Certificate 2 programs as an opportunity to increase candidates into apprenticeships. TAFEs in the New England region could be provided funding to develop pre-apprenticeships for electrical or other trades to increase the supply of candidates. This option reduces constraints including: certainty of demand, student funding

Option	How does it work?
Awareness campaign for school students on pathways into renewable energy jobs	There is universal agreement in the stakeholder engagement undertaken in New England (and other regions) that there is an opportunity for training and developing school students but low awareness or understanding of jobs in renewable energy and the training pathways into these jobs. Whilst there is a network of officers undertaking activities in schools within Training Services and some industry engagement, there is widespread agreement that more needs to be done to capture the interest of students, highlight the opportunities and create the training pathways. A complementary initiative would be an awareness campaign to engage with school students to raise understanding and interest in renewable energy (e.g. industry visits to schools, site visits, role model campaigns etc). Any education initiatives should include outreach activities designed to reach First Nations students.
Fund school-based programs	There are a range of programs that could be used to create pathways into courses and jobs in the renewable energy sector. • 'Taste tester' courses – short-course training offerings for students with a half-day or full-day offerings and a site visit • VET in school, with specialised renewable energy offerings. Careers Network Inc is an organisation supporting 2,000 students to undertake VET studies in school in the New England Northwest region (40,000 in NSW). Year 11 and 12 students graduate with certificate level qualifications and are then halfway through an apprenticeship or are ready to enter into trade level occupations. Programs like this can be leveraged to create a pipeline of job ready graduates over the next 2+ years. VET in school programs do need to have willing businesses to support students with vocational placements, so some degree of coordination is required. • Career expos, experiential learning (VR or in-person site visits integrated into the curriculum), having ambassadors or young people who are working in renewables to do school visits and share their experiences are all ways to integrate renewable energy opportunities into learning. This option reduces constraints including: certainty of demand, funding, student non-education costs, and hub/spoke travel, trainers
Aid students through non-training cost relief	There are a range of other barriers that have been identified to students entering or completing courses such as access to and cost of travel, childcare and accommodation, and general cost of living pressures. Other supports could be provided to students that undertaking training to work in renewable energy through direct payments, building of accommodation, purchasing vehicles (cars for students to use, buses for TAFE), childcare support, and more. UNE has many unused accommodation facilities and are currently spending some $5 million to renovate one of the accommodation buildings. TAFE NSW might be able to negotiate some student use of the UNE facilities. This option reduces constraints including: other student support
Transport support for students to attend training	The distance between training and home for young apprentices is consistently identified by industry and training specialists as a major barrier which leads to non-completions. One option to address this barrier is to develop mobile training units (bring the training to the students), the other option is to provide transport for students (bring the students to the training) to reduce the cost and time to attend training. This option reduces constraints including: hub/spoke travel

Option	How does it work?
Objective: Increase the pool of organisations that host apprentices	
Funding for councils and other employers to engage apprentices in trades that can be employed in renewables projects	One of the barriers to increasing opportunities for apprentices is also increasing the pool of employers who can be the host for an apprentice. Renewable energy firms can take on more apprentices but there are a range of barriers such as the uncertainty of project timing and the duration of projects. Relying solely on renewable energy firms to be the hosts for apprentices is likely to lead to lower supply than would be desired. Another option is to support other organisations to host apprentices in trades that will be in demand by renewable energy projects (e.g. electricians, mechanical trades, construction trades) which could then work on renewable energy projects as they come online. A coordinated approach between councils, schools and TAFEs is one option with funding and non-funding support for councils in particular to identify and host apprentices which are earmarked for trades that could then receive on-the-job training and employment by renewable energy projects. Apprentices working for a council would be able to work on a wide range of activities to meet their requirements for certification. Council's would likely be positively disposed to adding new workers to their workforce to improve their asset maintenance, especially if the worker is a local who is likely to remain in the area once their apprenticeship is completed. There may be other employers that could be identified for a similar approach through EOIs. This option reduces constraints including: certainty of demand, ongoing employment
Program for housing retrofits that hosts apprentices that can be employed in renewables projects	A similar approach could be deployed through government programs for housing retrofits to improve their energy performance, such as energy upgrades for social housing and First Nations housing. Under some programs, there are competitive tenders for providers to undertake the retrofits. Commitments to apprentices in relevant trades (e.g. electricians) could be part of tenders with support to identify and recruit candidates. If the apprentices were engaged by a Group Training Organisation, housing retrofit programs could be a 'bridge' to the peak in renewable energy construction that will occur in 2030 as, for example, electrical apprentices undertaken the domestic component of their apprenticeship before working on large-scale renewables projects. This option reduces constraints including: certainty of demand, ongoing employment
Collaboration with electricity networks to host apprentices	Electricity networks are another organisation that could be a host for increased supply of apprentices in specialised electrical roles and lineworkers. Transgrid has been expanding its apprenticeship program. Traditionally, public sector utilities played a key role in developing apprentices which then might work in the private sector. Funding could be provided to Transgrid to take on additional apprentices.
REZ-wide tender for Group Training Organisations	Some firms are reluctant to take on apprentices due to short project lengths and risk they may not have work or apprentice may leave them. Group Training Organisations can provide a solution by engaging the apprentices and moving them between projects. However, renewable energy stakeholders often say there is a shortage of GTOs in the REZs. Demand uncertainty can be a barrier for RTOs to offer services in the REZs. A REZ-wider tender for one or more GTO's to provide services could ensure there are GTO's available to create a pool of apprentices for firms to choose from to meet connection agreement requirements.

Option	How does it work?
Objective: Increase local supply from under-represented and diversity groups	
Diversity programs	There are a range of diversity programs that work across the many underrepresented and diversity groups in the labour market, some specifically for the clean energy sector and other fields which could be replicated to renewables. Key to the success of diversity programs or policy mechanisms is understanding clearly what the barriers are for the underrepresented and diversity groups, and tailoring initiatives to remove those barriers. Programs can include: • Pre-employment training • Scholarships and financial support • Wrap-around services, such as a workplace support officer, childcare and transport access • Mentoring and awareness raising • Cultural awareness training and capacity building of employers so that they provide safe work environments **Programs to reach more women:** Women face many barriers to gaining employment in renewables and construction, such as working hours not conducive to family and caring commitments, a lack of role models and unfit workplaces, be it facilities or cultures. Awareness of the opportunities is also a barrier. Construction on Country is a program running in the New England region designed to encourage more women, particularly First Nations women and those from CALD backgrounds, into the construction sector by providing information, training, support and accreditation. They also provide free childcare on days that they're running activities and have facilitated site visits to local solar farms. Beon's Women in Solar Program (explored in a case study earlier) is another example of a program offering pre-employment training, certification and on the job support. Australian Women in Solar Energy (AWISE) – is a network of women supporting and advocating for more women in solar, providing mentoring and events. Supporting women in solar, Solar Victoria is the Victorian government funding a range of programs (such as AWISE above) to encourage and support more women to work in the clean energy and solar sector, including its Apprenticeships for Women initiative, which provides extra financial incentives to female apprentices and host employers. **Programs to reach more First Nations Australians:** First Nations Australians are more likely to experience compared to non-Indigenous Australians. Barriers to employment include living regionally and remotely, poor health, education, access to services and transport. First Nations communities represent a large portion of REZ regions, and providing opportunities for their participation in the clean energy sector could create generational wealth building. While there are target for First Nations employment in legislative frameworks such as the LTSEAs, targets alone do not create the context conducive to increased participation; targets need to work hand in hand with programs that remove barriers. An example of Beon's work with the Avonlie Solar Farm was previously highlighted, which supported the community in accessing IDs so they could gain employment. CareerTrackers is another example; it is a for-purpose organisation that works to increase First Nations employment, representation and ultimately, empowerment, by supporting First Nations students into paid internships over the course of their university studies. CareerTrackers works with employers to encourage culturally safe and empowering workplaces and experiences. 80% of CareerTrackers interns gain fulltime within 3 months of graduating.

Option	How does it work?
	Programs to reach culturally and linguistically diverse communities (CALD) (including refugees and migrants): CALD communities are diverse and have diverse needs when it comes to supporting employment. Some of the barriers these communities face include language, skills and qualifications not being recognised in Australia, and access to services. Programs and organisations, such as Mosaic (profiled in an earlier case study) aim to remove some of these barriers by providing translation and language education services, access to appropriate training and support finding employment. Other examples include CareerSeekers – founded by CareerTrackers, offers similar supports for refugees and asylum seekers. Its program provides in-depth preparation and support to both refugees and people seeking asylum who are either currently studying at university or looking to restart their professional career in Australia. And NSW Growing Regions of Welcome (GROW) – Supporting regional employment for migrants and refugees, through migration and community support. **Programs to reach people with disability:** People with disability are a diverse cohort, with differing needs and therefore face a wide range of barriers in gaining employment. With programs that educate and support employers to make adjustments and ensure physically, culturally and technologically inclusive workplaces, people with disability can participate more fully in the workforce. As explored in a previous case study, Beon successfully employed four people with disability on their Karadoc solar farm. In other industries, Australia Spatial Analytics (ASA) – a work-integrated, not-for-profit social enterprise – provides professional data services and Geospatial and Digital Engineering careers for young neurodivergent adults. **Programs to reach ex-offenders:** Supporting people who have been incarcerated into meaningful employment is a powerful intervention in breaking the cycle of reoffending. In the US there are a range of programs and organisations working with ex-offenders and skilling them up for careers in solar, from installation to manufacturing. In Australia, social enterprise Reboot Australia – supports the dignity of employment for those who have been incarcerated through connecting them with tailored employment opportunities, providing support services and candidates to employers.

6.3. Industry Partnerships

Industry partnerships between other stakeholders including community/not-for-profits, training providers and governments are another mechanism for increasing training and employment opportunities. Some of these options focus on specific jobs and opportunities and others are more general initiatives that increase industry investment in training or create pathways for locals into training or employment opportunities.

Table 36: Options for Industry Partnerships

Option	How does it work?
Objective: Improved coordination across renewable energy sector and between stakeholders	
New England REZ working group	A working group comprising industry, council, training and government stakeholders currently operates in CWO REZ. Multiple generators and community stakeholders interviewed in New England referred to the importance of coordination across projects to increase the prospects of redeploying workers and aligning training and labour market programs. A review of the CWO working group is not part of the scope of this study this but there were several observations in the interviews that whilst it's a good concept, the operation in practice has not included sufficient participation by the parties that make workforce decisions (especially EPC contractors) and should facilitate more direct connections between these parties and training providers.
Objective: Increase local wind maintenance technicians	
Collaboration between wind firms, employment and training providers on apprenticeship program	In the Jobs Strategy for the First Nations Clean Energy Network, strong interest was found for a coordinated scheme by wind farm operation and maintenance firms to engage First Nations apprentices and trainees as mechanical technicians. There was very strong interest across the wind OEMs interviewed due to skill shortages and recognition of the opportunity. The barrier to entry were considered low with only Global Wind Organisation safety training (1 week course). Jobs are long-term and often on-country or 'drive-in, drive-out' within a region once wind farms are installed. It was recommended a program be coordinated by government with wind farm operators and First Nations communities with both the industry and First Nations organisations stating wrap-around services are required. A broader program could be developed with a mix of First Nations and non-First Nations candidates. Wind farm operators interviewed stated candidates could do a range of mechanical trade qualifications as apprentices supplemented by their on-the-job training. In Victoria, Federation TAFE established an apprenticeship which is an extension of the Certificate III of Engineering (Composites). The blade technician apprenticeship includes 1-month in-person blocks at the beginning and middle of the year, supplemented by on-line training. To the best of our knowledge, there is no equivalent in NSW. Some developers have previously advocated for an equivalent to the Federation TAFE centre in Victoria where wind farms partnered with Federation TAFE to fund the construction of a tower for training and associated training courses. Others noted the development of the tower had been a lengthy exercise with significant cost, and on-site training could be a quicker, cheaper solution. Others observed also that there can be challenges in establishing collaboration between wind technology companies with different turbine designs and IP. The specific approach would need to be co-designed between the industry, employment and training providers and First Nations organisations.

Option	How does it work?
Objective: Support industry achieve training and employment targets	
Industry support officers	• The NSW Infrastructure Skills Legacy Program is a good model of a program that provides industry support alongside employment and training targets. It is mandatory for all NSW government infrastructure projects and includes: • skills, training, and diversity targets based on contract value (e.g. 20% of the trades workforce are required to be apprentices, 20% of workforce must be learning workers, 2% of the trades workforce must be women and 8% of the project to be young people). • Mandatory application of the Aboriginal procurement policy which includes targets for Aboriginal business participation and Aborginal employment. • The program is administered by Training Services NSW; in some cases, Training Services NSW embeds specialist officers within projects to facilitate recruitment, sourcing of training and other services, this can support industry in the achievement of diversity targets. • A variety of stakeholders have noted the renewable energy industry will need support to achieve more ambitious employment and training targets. There is a fragmented contracting structure with many smaller contractors, there are skill shortages and capacity issues within the renewable energy firms and their connection with the training system is generally not considered strong. Placement of support officers to work with a firm or group of firms to source training, students and employees is an option to improve local training and employment.
Objective: Increase First Nations employment	
Partnership between renewable energy and First Nations organisations to develop cultural heritage assessors	• Renewable energy firms interviewed in the New England REZ have identified the volume of cultural heritage assessors as both a potential constraint and opportunity for employment and business creation. In other regions, the researchers have heard similar input from renewable energy developers and First Nations organisations. There are different levels of opportunity for formally qualified and the use of cultural knowledge from First Nations groups. Consequently, there is an opportunity to examine the potential for employment creation for First Nations people in cultural and heritage assessment.
Increase First Nations business participation	• Renewable energy developers have expressed interest in collaborative initiatives between industry, First Nations organisations and government to increase First Nations business partnership in contracting for services such as catering, fencing. There are examples from past projects where contracting has helped develop First Nations businesses in these areas with business support to help them develop the skills.

6.4. Summary of Options

Table 37 provides a summary table of options to facilitate comparison. Indicative funding estimates have been produced for some options, where reasonably possible, but these should be regarded as no more than indicative before more detailed scoping can be undertaken. Each option is considered against the criteria used to evaluate options in this study. These should not be considered as recommendations but are provided as an input to policy development by EnergyCo and other government stakeholders.

Table 37: Summary of Options

Option	Reducing skill shortages /meeting employment demand	Local socio-economic benefit	Indicative funding	Stakeholder support
Objective: Increasing training capacity				
New training facilities	**Low** New training facilities were not found necessary in this specific context and therefore the opportunity cost from diverting funding from other uses is high.	**Medium** A new training facility adds to the stock of infrastructure (and generates jobs during construction), but its benefit depends on developing uses for existing facilities in addition to the new facility.	**High** Our preliminary capital cost estimate is: Tamworth: $28.8m (low) to $59.9 (high) Armidale: $8.8m (low) to $18.3m (high)	**Low** Council stakeholders engaged through this project agreed with the evaluation that new training facilities were not required.
Upgrading existing training facilities	**Medium-High** There is scope and benefit from upgrading existing training facilities to offer modernised, expanded offerings for skills in demand for the New England REZ.	**Medium-High** Upgraded training facilities would leave a legacy of improved training capacity for the region beyond the New England REZ.	**High** Upgrading training facilities is only marginally cheaper than building new facilities and subject to a significant level of budget uncertainty (e.g. detailed assessments may find additional work is required). Our preliminary estimate is: Tamworth: $26.5m (low) to $41.5 (high); Armidale: $8.2m (low) to $12.9m (high)	**Medium** Council stakeholders engaged through this project agreed there was scope for targeted upgrades of current facilities.

Option	Reducing skill shortages /meeting employment demand	Local socio-economic benefit	Indicative funding	Stakeholder support
New courses	**High** Good option to use current facility excess capacity and reduce barriers to participation.	**High** Offers opportunities to local people to attend courses and will attract new teachers/lecturers to the region	**Low-Medium** UNE say less than $1 million per year to produce a full engineering degree course for locals. No costings have been undertaken for new courses at TAFE. Micro-credentials can be a low-cost way to target specific skill gaps. TAFE may require new staff and upgraded facility	**High** UNE and TAFE are enthusiastic about re-establishing the courses, but lack funding/ students. Industry stakeholders also referred to the opportunity to collaborate with UNE.
Mobile and digital training delivery	**Low-Medium** Mobile training delivery is one option to increase student enrolments and completions across the New England REZ. Depending on the actual approach the number of additional students can be significant. Digital training good where suitable.	**High** Very helpful solution for lower socioeconomic and long-term unemployed people due to lowering the barriers to attendance. Mobile training could be used to increase apprenticeship enrolments and completions but should be considered in conjunction with providing transport support to students.	**Low-Medium** A significant amount of funding is required to make a mobile solution work well, vehicles, drivers, coordination staff, and course materials. Digital training is already well funded and has low marginal costs.	**Low-Medium** Given the low level of funding historically, the results from past mobile training were not significant. Digital training has experienced success where appropriate, however, is limited in the trades.
Increasing the trainer workforce	**Low-Medium** The size of the trainer workforce is a barrier to unlocking existing training capacity.	**High** Local RTOs offer jobs to trainers and better training opportunities for locals.	**Medium** Costs will depend on the approach taken to increase the trainer workforce.	**Medium** TAFE management would appreciate new trainers.
Apprentice subsidies	**Medium-High** Impact depends on the size of the subsidy, difficulty in securing the approvals, and willingness of local organisations to participate. However, if subsidies work, they could play a key role in stimulating the student demand required to underpin increased training capacity.	**High** Very good targeting of local students.	**High** A scenario used to illustrate cost in this report totalled $43.7m. The cost would depend on the volume of the subsidy, uptake and length of program. Notwithstanding, there is a high level of spending needed to make the system effective.	**High** Organisations, students, and community are supportive of these types of programs as clear financial benefit to locals.

Option	Reducing skill shortages /meeting employment demand	Local socio-economic benefit	Indicative funding	Stakeholder support
Objective: Increasing local supply for training and employment				
Pre-employment programs for construction	**Medium** Construction labourers are less subject to skill shortages than more specialised jobs but there are concerns that shortages could emerge during peak demand.	**High** Pre-employment programs can have a high socio-economic impact by assisting people to escape or avoid unemployment. One job often leads to another job, especially within tight labour markets. Increasing the labour force has a longer-term benefit to the economy of the New England REZ. These programs can also be a bridge into an apprenticeship.	**Low-Medium** Whilst the program would need to be costed, our expectation is that the cost would be modest and funded through grants to expand the capacity of existing providers. The programs could be one-off initiatives (e.g. drives to increase locals with 'white card') or periodically undertaken across New England REZ build-out (e.g. annually). If the programs are to succeed in increasing employment amongst disadvantaged groups and long-term unemployed, additional wrap-around services are likely to be required to assist people with other social issues (e.g. health, housing) maintain employment.	**High** Local stakeholders have expressed high support for programs that can leverage renewable energy to reduce unemployment and address social disadvantage.
Fund pre-apprenticeship programs	**Medium** Pre-apprenticeship programs could be used to increase apprenticeship entry levels for key trades in shortages such as electricians.	**High** If they are successful, pre-apprenticeship programs could increase the skill base and employment amongst students and recent school leavers. Pre-apprenticeship programs can reduce the level of unemployment and associated impacts for groups that may not have moved smoothly in transition from school to training or work.	**Low-Medium** Whilst the cost would depend on the scope of programs, these are discrete courses that could be funded through grants to TAFE or private RTOs. If the programs are successful, they may be run on an on-going basis drawing on either New England REZ or alternative funding sources.	**High** Whilst this option was not specifically tested, there is high stakeholder support for measures that increase apprenticeships. Pre-apprenticeship programs and other initiatives were raised as an option for young people who have not finished school at the First Nations workshops.

Option	Reducing skill shortages /meeting employment demand	Local socio-economic benefit	Indicative funding	Stakeholder support
School programs	**High** Given the high population of young people in the region and the lead time for workforce peaks, students are an ideal cohort to invest in upskilling. Making renewable energy appropriate VET in-school training available across the region could increase the labour supply. Currently there are 2,000 students in the NENW region in the VET in school program.	**High** Arguably, the largest opportunity for increasing local employment is from creating pathways for students. If young people are educated and trained early, in their region, and are then able to go into a trade or career, then this could increase the volume of young people staying in the region, creating ongoing socio-economic benefit and stability.	**Low-Medium** VET in schools already exists, what is required in tailoring the offerings to ensure they line up with the required skills and job types needed across the New England REZ. Investment would need to go into building training capacity, and access to the facilities.	**High** Stakeholders widely expressed strong support for anything that targets and supports school aged/young people. Integrating schooling with gaining qualifications is also highly supported.
Awareness campaign focussed on school students	**High** High school students are well poised to pursue study, then employment in the renewables sector. However, there is very low understanding or awareness of the opportunities, and what kinds of pathways they need to take in order to get there. Building awareness is the first step to encouraging greater uptake of renewable professions. An awareness raising campaign could be run along with efforts to support easy access and pathways into training).	**Medium-High** As above, with more students aware of the opportunities and pursuing qualifications and employment in the renewables sector, then local employment can be maximised.	**Low** There are existing networks, organisations and initiatives to leverage off in the case of running an awareness campaign.	**High** Stakeholders were very supportive of encouraging young people into careers in the renewables sector. Some people, however, did express concern over the short-term nature of renewable construction jobs and how there is a risk that young people might be ‘set up to fail’.
Funding for councils and other employers to engage apprentices in trades that can be employed in renewables projects	**Medium** Impact depends on the size of the subsidy, willingness of local organisations to participate, and attract participants.	**High** Very good targeting of local people and increases both the local skill base and capacity within Councils as well as for the renewable energy industry.	**Medium-High** High level of spending needed to make the system effective.	**High** Organisations, students, and community are supportive of these types of programs as clear financial benefit to locals. LALCs suggested in workshops that they could be the host for apprentices and trainees with funding.

Option	Reducing skill shortages /meeting employment demand	Local socio-economic benefit	Indicative funding	Stakeholder support
Program for housing retrofits that hosts apprentices that can be employed in renewables projects	**Low-Medium** The impact would depend on the size of the pool of apprenticeships generated through the initiative. Some of the trades for housing retrofits do not feature in large-scale renewables projects (e.g. air-conditioning technicians) but a pool of electricians could be created that could be transferred across to large-scale projects.	**Medium-High** Housing retrofits could create a pool of apprenticeships across occupations for renewable energy projects but also the housing sector where there are constraints.	**Low** The primary mechanism for delivering this initiative would be procurement targets for housing retrofit providers. Additional support would be required for successful implementation with costs to be determined (e.g. pre-apprenticeship programs, facilitation by training providers etc.).	**Medium** This option was not specifically tested with stakeholders but there is high support for initiatives to leverage opportunities for new apprenticeships.
Collaboration with electricity networks to host apprentices	**Medium** The impact would depend on the size of the pool of apprenticeships generated through the initiative. However, the electricity networks are natural hosts for energy apprentices that could contribute to the pool of workers in the region.	**Medium** The pool of energy workers with high-voltage and other specialisations is relatively low in the region. Adding to the pool of specialised energy workers would increase the local benefit share.	**Low-Medium** Electricity networks have existing systems to engage apprenticeships. Additional funding would be required for hosting and initiatives to attract more apprentices.	**Medium** This option was not specifically tested with stakeholders but there is high support for initiatives to leverage opportunities for new apprenticeships
New England REZ-wide tender for Group Training Organisations	**Medium** The expansion of GTO is considered by industry and training organisations to be one of the ways apprentice numbers can be increased in the context of renewable energy characteristics. Funding support to increase GTO could unlock higher apprenticeships in sector.	**Medium** One of the strengths of GTOs is that the apprentices could work on renewable energy projects and other employers in the region. It is therefore a way of increasing productive capacity and increasing opportunities for young people in the region	**Medium** This option has not been costed. It is likely to be comparable to other initiatives to increase hosts for apprentices.	**Low-Medium** Other options ranked higher in the survey of council workshop attendees, although it was raised by some stakeholders.

Option	Reducing skill shortages /meeting employment demand	Local socio-economic benefit	Indicative funding	Stakeholder support
Diversity programs	**Medium** Diversity programs include pre-employment training, scholarships and financial support, wrap-around services, such as a workplace support officer, childcare and transport access, mentoring and awareness raising and cultural awareness training and capacity building of employers so that they provide safe work environments. These programs can be targeted to different underrepresented and diversity groups, such as women, First Nations or people with disability. The impact of diversity programs hinges on the willingness of industry to participate, the number of participants (or the pool from which the program targets) and the efficacy of the program itself.	**High** Programs targeted at disadvantaged and marginalised groups, who are often left out of the labour force, can have a huge benefit to the community, by moving people out of disadvantage and unemployment. Obtaining employment can disrupt a cycle of inter-generational disadvantage.	**Low- Medium** For diversity programs to be successful at scale, they will require multiple stakeholders and investment in social supports and services. Smaller scale initiatives, like a solar farm working directly with an organisation such as Backtrack, to contract staff, can have a big impact for little outlay.	**High** Stakeholders expressed strong support for initiatives that deliver legacy benefits and social impact. First Nations stakeholders advocated strongly for a range of diversity initiatives at workshops in New England and Scone.
Objective: Industry partnerships				
New England REZ Working Group	**Medium** Coordination across renewable energy companies and between the industry and training providers is consistently identified as a major barrier to increasing local training and employment opportunities. It is difficult to quantify, but if a successful coordination mechanism could be developed which enabled redeployment of workers and better linkages with the training system the impact could be significant.	**Medium** It is also difficult to quantify the impact on local socio-economic benefits, but a well-functioning coordination mechanism can be an enabler for other initiatives.	**Low** Administration of a working group is relatively low-cost compared to other initiatives.	**Medium** Improving coordination and community with the renewable energy sector is a key theme in stakeholder views. However, there is also consultation fatigue with industry and community stakeholders, so the challenge is designing a mechanism which is effective in getting the active participation of people who make decisions on employment and training to make the time-commitment worthwhile. Participants in the First Nations workshop in Armidale advocated strongly in favour of a working group that could assist in uniting their community and higher engagement.

Option	Reducing skill shortages /meeting employment demand	Local socio-economic benefit	Indicative funding	Stakeholder support
Wind maintenance technician program	**High** Wind OEMs have identified wind technicians as a current, worsening skill shortage in recent work undertaken by the research team.	**High** The opportunity is the creation of long-term, well-paid jobs in the region for the duration of the wind farms. Apprenticeships and jobs could be created for students, including First Nations students where an opportunity was identified in the Powering First Nations Jobs Strategy.	**Low-medium** Costs need to be scoped but would primarily be in government coordination, initiatives to attract and place applicants and wrap-around services for First Nations or disadvantaged students. Funding for coordination may be able to be leveraged from the Indigenous Employment Skills Program.	**High** This option was not specifically tested with stakeholders but there is high support for initiatives to leverage opportunities for new apprenticeships.
Industry support officers	**High** The NSW Infrastructure Skills Legacy Program has a demonstrated record in delivering higher rates of learning workers and the employment of underrepresented and diversity groups, and reviews have identified industry support officers as a key component of the program.	**High** If the success of the Infrastructure Skills Legacy Program can be replicated, increasing participation of underrepresented and diversity groups can deliver socio-economic benefits and increase the productive capacity of regional labour markets.	**Low-medium** Administrators of the Infrastructure Skills Legacy Program can provide insights into costs. Costs would occur from administration and the employment of industry support officers.	**Medium** Stakeholders stated that industry support officers were their second-highest preference, as an industry partnership initiative that should be prioritised. Further consultation would be required with industry to gauge wider support.
First Nations Business Participation	**Low-Medium** There are a range of opportunities for First Nations businesses to contract to renewable energy which contributes to meeting employment demand, with past cases including traffic control, catering, fencing, ongoing vegetation management on solar farms. In a tight labour market, this contributes to labour supply but for the most part the contracts that have been operational to date are also not in areas of major skill shortage or constraint.	**High** If local First Nations' businesses can be supported to grow, develop, and contract for business in the New England REZ, this can mean ongoing jobs and wealth generation for the wider community. First Nations business also employ more First Nations workers than non-First Nations businesses. With a pipeline of projects that are coordinated and staggered, First Nations businesses can provide steady employment to their community.	**Low-Medium** Initiatives such as Indigenous Business Australia and Reach Out by the ATO already exist and could be of benefit. However, some additional renewable energy specific and place-based in-person support (e.g. pre-tender meetings to support applications) could be hugely beneficial and relatively low-cost.	**High** In conversation with two developers the idea of supporting the capacity of local First Nations businesses to participate in the New England REZ roll out came up. Both developers were supportive and wanted to see more First Nations involvement in the sector. At both the New England and Scone workshops, First Nations stakeholders placed a high priority on First Nations business participation.

Option	Reducing skill shortages /meeting employment demand	Local socio-economic benefit	Indicative funding	Stakeholder support
First Nations cultural heritage assessment and cultural competency training for industry	**Low-Medium** Meeting employment demand locally to ensure maximum regional benefit, specifically for First Nations people, requires engaging First Nations consultants where possible. Cultural heritage assessment and cultural competency training for industry is best undertaken by local knowledge holders and traditional owners.	**High** Prioritising First Nations businesses and consultancies can deliver ripple benefits throughout the community. There is a social benefit for First Nations communities from being able to participate in cultural heritage assessment and cultural competence training.	**Low** Government funding to enable these activities should be low. Developers are required to undertake and fund cultural heritage assessment as a part of their EIS's. Cultural competency training could be a requirement for industry and/or considered as part of First Nations economic participation expenditure by industry.	**High** At both the New England and Scone workshops, First Nations stakeholders identified these services as key opportunities.

Note: the ratings of high, medium and low primarily reflect our assessment of the impact, cost or support. In the case of funding, initiatives or programs that would cost >$10 million were classified as high, >$1m as medium and <$1m as low. These are however indicative cost estimates and, in some cases, based on assessments without firm costs. In relation to skill shortages, the rating reflects an assessment of which types of jobs would be impacted and the significance of the measure in our view. In the case of socio-economic benefit, no modelling has been undertaken but the rating reflects our view based on past experience. The rating of stakeholder support is based on engagement undertaken for this project. It should be noted that consultation with industry was often with developers at early stages of their project and not all had strong experience with employment, skills and training.

7. Conclusion

This study investigated the training and skills landscape in the New England REZ and the NRNIP Corridor, with a key emphasis on understanding how the New England REZ development can maximise local and regional employment, while highlighting any challenges. The study supports the planning and strategy for employment, training and skills development in the New England REZ.

7.1. Key findings

The study identified the following key findings grouped into four themes:

1. Employment demand profile

- Employment requirements and fluctuations for the New England REZ and NRNIP Corridor vary significantly depending on the development scenario.
- The local construction workforce peak in the New England REZ ranges from 175 to 1,400 jobs and the non-local workforce 850 to 3,900 jobs.
- The New England REZ will require a significant on-going operations and maintenance workforce.
- There are variations in occupational demand: the largest grouping in the New England REZ is trades and technicians and in the New England REZ network infrastructure project corridor it is labourers.

2. Labour supply

- Labour supply for renewable energy projects within the New England REZ is relatively constrained. It is a tight local labour market, underpinned by structural trends such as a hollowing out of the working age population which limits workforce growth.
- Labour supply-demand balance is heavily influenced by the development pathway: under the maximum scenario, New England REZ demand exceeds local supply, but local supply exceeds demand for most occupations under the minimum scenario.

3. Training facilities and capacity

- Provision of new training facilities within the New England REZ is not recommended instead the focus should be in unlocking additional capacity of existing training facilities.
- There are a range of interrelated options to increase training capacity including upgrading facilities, mobile training units, new courses, increasing the trainer workforce and private RTOs.
- Measures to increase the local supply into employment or training will be required alongside measures to increase training capacity.

4. Regional opportunities

- Industry partnerships brokered by government can enable training and employment opportunities.
- The major opportunities for local employment will come from tapping into new, underrepresented and diversity groups, such as young people and students, women, First Nations, unemployed and migrant populations.

7.2. Summary of options

Considering the key findings, the study highlighted three major types of options to increase local employment and training:

1. **Unlocking training capacity to develop skilled labour within the region:**

- New training facilities are not recommended but there are a range of ways in which existing spare training capacity can be unlocked, including upgrading existing training facilities, developing new courses and increasing the trainer workforce.

2. **Increasing the local supply for training and employment: alongside measures to unlock training capacity, initiatives to enable and support local people to enter training and employment opportunities are required:**

- **Pre-employment programs for construction:** Pre-employment programs can have a high socio-economic impact by assisting people to escape or avoid unemployment
- **Renewable energy in schools' programs:** Programs to increase the awareness of the opportunities for school students and build employment and training pathways into the sector.
- **Funding for local councils, land councils and businesses to host apprentices:** Finding organisations to host apprentices in trades that will be in demand by renewable energy projects (e.g. electricians, mechanical trades, construction trades) which could then work on renewable energy projects as they come online, is a core opportunity to ensure more learning workers are supported through the REZ.
- **Diversity programs can increase the labour pool and create more equity in the workforce:** Diversity programs can be targeted to different underrepresented groups, such as women, First Nations or people with disability.

3. **Industry partnerships: enabling partnerships between industry and local stakeholders can unlock employment and training opportunities:**

- **Developing a mechanical apprenticeship program for wind farm maintenance, especially focussing on First Nations youth:** The opportunity is the creation of long-term, well-paid jobs in the region for the duration of wind farms as mechanical technicians.
- **Developing a network of industry support officers to enable renewable energy companies to increase intakes of learning workers:** The opportunity is to apply a demonstrated program model, the NSW Infrastructure Skills Legacy Program, to the New England REZ.
- **First Nations cultural heritage assessment and cultural competency training for industry:** There are a range of opportunities for First Nations businesses such as catering, fencing, roads. Two specific, high-value opportunities that emerged from the stakeholder consultation were the provision of cultural heritage assessment services and cultural competency training for renewable energy projects.

As this study has shown, there are several tangible opportunities to avoid skills shortages, drive local employment outcomes and deliver regional benefits. Implementing these and ensuring a successful roll-out of the New England REZ and NRNIP Corridor will involve collaboration across government departments, industry, training and education providers, local governments, civil society and the wider community. Importantly, local priorities and capacities should be taken into to account, so that renewable energy infrastructure investment delivers meaningful impact in the region.

Appendix 1: Technology Job Roles, Qualifications and Pathways

Solar

Table 38: Job Roles, Qualifications, Training and Workforce Pathways – Solar Farms

Job Role	Role Description	Qualifications/ Licences	Training and Workforce Pathways
PV Designer & Installer	Assemble, install, or maintain PV systems in compliance with site assessment and schematics.	UEE 30820 Electrotechnology Electrician (4 years) - Current Unrestricted Electrical Licence. RIIWHS204E - Work safely at heights (1 day) White Card via construction induction training with an RTO to work on construction sites CEC Accreditation - Solar Grid-connect With Battery Storage Course (UEERE4001 and UEERE5001)	UEE22020 - Certificate II in Electrotechnology (Career Start) (4-12 months) Electrical apprenticeship Solar experience with PV installer. In instances where no electrical work is being conducted and only manual labour is required, developers have made use of labour hire or informal job seekers.
Work Health & Safety Experts	Manages risks associated with work (e.g. work at heights, electrical risks) in accordance with regulations.	BSB41419 - Certificate IV in Work Health and Safety (7 days intensive or up to 12 months self-paced)	Recruitment from a variety of industry sectors including construction, manufacturing or resources sectors. Generic WH&S Training programs with contextualised exposure to the electrical industry.
Solar Electricians	Behind the meter solar connections can only be made by a licenced electrician. They may also be required to assemble	UEE 30820 Electrotechnology Electrician (4 years) - Current Unrestricted Electrical Licence. RIIWHS204E - Work safely at heights (1 day)	Developers have been recruiting electricians from a range of sectors to work on utility scale projects supplemented by on-the-job training.

Job Role	Role Description	Qualifications/ Licences	Training and Workforce Pathways
	install or maintain solar PV systems.	White Card via construction induction training with an RTO to work on construction sites Solar Accreditation Australia for installers.	
Cable Jointers	These are highly skilled and scarce expertise. It is especially the case in relation to the joining of paper-insulated, lead-sheathed cables.	UET30821 - Certificate III in ESI - Distribution Underground - Underground Cable Jointer (15 months)	Transmission or distribution sector or via the following trade pathways - Apprentice Electrician, Distribution Line worker, Transmission Line worker or Tele-Communications Technician.
SCADA Technicians	Maintenance and operation of all communication channels and equipment that is controlled remotely.	UETTDRSO45 - Operate and monitor system SCADA equipment	Experience in: • The installation, reception, and configuration of servers, networks, and equipment. • Data communication monitoring. • PLC circuit troubleshooting. Pathways from a variety of sectors including water and gas sectors, manufacturing and telecommunications vendor training.
Communications Technicians/ Communications and Control Engineering Officer	Maintenance, testing, commissioning, diagnostic and investigative services, and repairs of Communications and Control systems, equipment and Secondary Systems.	Certificate III in Electronics and Communications Trade (3-years). Associate Degree or Advanced Diploma in Electrical or Electronic Engineering or equivalent (3 years) Restricted Electrical licence	Maintenance, testing and commissioning of: • multiplex systems (PDH, SDH, and DWDM), MPLS-TP, fibre optic, and microwave; • Control and SCADA systems, in the field or test centre environment; • automated and microprocessor-controlled test instruments; and • analysing and fault finding on complex electrical circuitry and schemes.[40]

Wind

Table 39: Job Roles, Qualifications, Training and Workforce Pathways – Wind Farms

Job Role	Qualifications/Licences	Training and Workforce Pathways
Wind Farm Technicians Install, inspect, maintain, operate and repair wind turbines	Global Wind Organisation certification **Electrical technicians**: UEE22020 - Certificate II in Electrotechnology (Career Start) (4-12 months) UEE30820 – Electrotechnology – Electrician Apprenticeship (4 years) **Mechanical technicians** MEM30219 - Certificate III in Engineering - Mechanical Trade (4 years) UEE33020 - Certificate III in Electrical Fitting (4 years) UEP40622 - Certificate IV in Wind Power Generation (6 months–2 years) Other possible qualifications: • UEP40522 - Certificate IV in ESI Generation Maintenance (Mechanical) (6 months – 2 years)	Post-trade pathways for electrical and mechanical technicians. To date, wind farms have used a few training and workforce pathways: • Recruiting internationally qualified and experienced workers • Sending candidates back to parent countries for training • Recruiting electricians or mechanical fitters from adjacent sectors such as automotive and agriculture Some stakeholders consider the new Cert IV qualification will need to be supplemented by other more specialised micro-credentials or inclusion of wind Units in CPD programs.
Construction Labourers Construction workers in the wind industry are responsible for	Trade Certificates and tickets relating to the following: • Scraper Operators (Twin Power Experience) • Dozer Operators • Articulated Dump Truck Drivers • Excavator Operators	A variety of skilled and unskilled labour required. Pathways and tickets obtained through construction RTO's and vendor-based training certifications. Employment pathways through labour hire and construction job boards, regional jobs programs and local governments.

Job Role	Qualifications/Licences	Training and Workforce Pathways
building local access roads, siteworks and the foundations that support wind turbines.	• Loader Operators • Heavy Rigid Water Cart Operators • Crane Operators • Grader Operators • Roller Operators • General Labourers • Concrete batch plant Operators • Batch Plant Foreman • Water Cart Operators • Float Drivers	
Riggers Riggers combine with crane operators and dogmen to lift wind turbine equipment.	CPCCLRG3001, CPCCLRG3002, CPCCLRG4001 Licence to Perform Rigging Basic, Intermediate and Advanced (5 days each)	Construction industry experience essential.
HV Electrician Optimisation of the performance of the fixed plant via preventative maintenance, inspections, repairs, installation and construction associated with electrical maintenance	UEE22020 - Certificate II in Electrotechnology (Career Start) (4–12 months). Feeder program to electrical apprenticeship. UEE 30820 Electrotechnology Electrician - Current Unrestricted Electrical Licence (4 years) High Voltage Switching Operations	Pathways through electrical or linesman & distribution apprenticeship. Also available through a dual trade by combining UEE30820 Certificate III in Electrotechnology and UET30621 - Certificate III in ESI - Distribution Overhead.
Crane Operator Rigging and de-rigging of cranes and other type of equipment, operation and general maintenance of equipment.	TLI30122 - Certificate III in Mobile Crane Operations (2 years) and/or TLI40724 - Certificate IV in Mobile Crane Operations (2 years). Attainment/competency of the following: • valid Crane Operator certificate • Safe operation of non-slewing cranes • Safe execution of Dogging and Rigging activities • HC Class Drivers Licence • CO Class Crane Ticket • Forklift Ticket • MC Class Drivers Licence • EWP Ticket	Recruitment for these roles primarily through sub-contracting in the construction and civil engineering sectors.

Battery Storage

Table 40: Job Roles, Qualifications, Training and Workforce Pathways – Battery Storage

Job Role	Qualifications/Licences	Training and Workforce Pathways
Installers/ Electricians	Solar Accreditation Australia. UEERE4001 Install, Maintain and Fault Find Battery Storage Systems for Grid Connected Photovoltaic Systems UEERE5001 or VU22125 Design Battery Storage Systems for Grid Connected Photovoltaic Systems or Design a grid-connected battery storage system to meet client requirements	UEE22020 - Certificate II in Electrotechnology (Career Start) (4–12 months) UEE 30820 – Electrotechnology – Electrician Apprenticeship (4 years)

Transmission

Table 41: Job Roles, Qualifications, Training and Workforce Pathways – Transmission

Job Role	Qualifications/Licences	Training and Workforce Pathways
Transmission Line worker	UET30521 Certificate III in ESI – Transmission Overhead (4 years) This qualification covers work on transmission overhead powerlines, including the installation, inspection and maintenance of towers, poles, structures, conductors and hardware.	Apprenticeships via the transmission network business or a Tier-1 EPC has been the standard pathway. The sector has relied heavily on supplementing the existing workforce with international recruitment. A distribution lineworker could be upskilled to work as a transmission lineworker. A training stakeholder noted they may hold as many as 14/17 units for a Certificate 3 qualification. In practice, it can be more challenging, especially due to the absence of transmission towers for training.
Transmission Construction & Assembly	UET20321 Certificate II in ESI – Transmission Line Construction	Civil construction pathway into transmission or training to Certificate 2 level (and beyond). Industry stakeholders have reported the ability to use construction labourers from other sectors varies depending on the project characteristics. Civil construction workforce on foundations can move quite quickly across if they are working on greenfield site away from lines. Transmission rigging considered a specialist skill that requires at least 1-year training depending on experience.

Job Role	Qualifications/Licences	Training and Workforce Pathways
Sub-station commissioning/ technician	UEE 30820 Electrotechnology Electrician - Current Unrestricted Electrical Licence (4 years) UET40522 Certificate IV in ESI - Substations This qualification covers selecting, installing, setting up, testing, fault finding, repairing and maintaining electrical systems and equipment in buildings and premises. It also provides a career in installation and maintenance of substations, such as the maintenance of high voltage (HV) power system, including circuit breakers and transformers. It includes substation switching, inspection and diagnosing and rectifying faults. It includes the Electrical Regulatory Authorities Council (ERAC) requirements for an 'Electrician's licence'. Competency development activities in this qualification are subject to regulations directly related to licensing.	Until the recent changes to UET40521, a double qualification was effectively required as electrical qualification was a precondition. After around 1/3 of the electro-technology apprenticeship has been completed, it is now possible to deliver the qualifications concurrently which reduces the training period from 8-years to around 5-6 years.
Supervisors	UET40421 Certificate IV in ESI – Network Systems This qualification covers work on the network systems in the specific fields of live line transmission, live line distribution, live line rail traction and/or installation and maintenance of specialised underground cables. These roles may lead or supervise work teams and work in transmission, distribution, rail or cable jointing.	Industry has noted there is a shortage of experienced workers and challenges in developing supervisors. This qualification responds to a training gap observed by industry.
Power Systems Technical Officer, a High Voltage (HV) Substation Project Manager or a Senior Systems Operator.	UET50321 - Diploma of ESI - Power Systems Operations (Release 2) This qualification covers designing new overhead and underground powerline systems, overseeing the construction of electrical substations and related projects. These roles may also manage personnel, the business aspects of projects and give specialist advice to deal with day-to-day issues and problems.	
Power transmission and distribution systems engineer	UET60222 Advanced Diploma of ESI – Power Systems (18 months) This qualification covers high-level managerial, design, testing and system operation functions in the transmission and distribution sectors of the ESI. These roles may also install, commission, maintain, diagnose and repair the hardware and software of complex power system protection, control and metering systems.	Qualification has been restructured to create a set of core units with a collection of specialist electives (e.g. transmission system operator, designer etc). No longer requires an electrical qualification to enable university engineering student pathway.

Appendix 2: Geographic concordances

Table 42: SA2 to LGA concordance

	LGA	SA2s
NE REZ Region	Armidale Regional	Armidale Armidale Region - North
	Glen Innes Severn	Glen Innes
	Inverell	Inverell Inverell Region - East
	Tamworth Regional	Tamworth – East Tamworth – North Tamworth – West Tamworth Region
	Tenterfield	Tenterfield
	Uralla Shire	Armidale Region - South
	Walcha	Walcha
NRNIP Corridor	Liverpool Plains	Quirindi
	Muswellbrook	Muswellbrook Muswellbrook Region
	Upper Hunter Shire	Scone Scone Region
NE REZ Surrounds	Bellingen	Bellingen Urunga
	Clarence Valley	Grafton Grafton Region Maclean - Yamba – Iluka Dorrigo
	Gunnedah	Gunnedah Gunnedah Region
	Gwydir	Inverell Region – West Moree Region
	Kempsey	Kempsey Kempsey Region South West Rocks
	Kyogle	Kyogle
	Mid-Coast	Tea Gardens - Hawks Nest Old Bar - Manning Point - Red Head Taree Taree Region Wingham Bulahdelah – Stroud Forster Forster-Tuncurry Region Tuncurry Gloucester
	Nambucca Valley	Macksville - Scotts Head Nambucca Heads Nambucca Heads Region
	Narrabri	Narrabri Narrabri Region

	LGA	SA2s
	Port Macquarie-Hastings	Laurieton - Bonny Hills Port Macquarie – East Port Macquarie – West Port Macquarie Region Wauchope
	Richmond Valley	Evans Head Casino Casino Region
	Singleton	Wollangambe – Wollemi Branxton - Greta – Pokolbin Singleton Singleton Region
	Goondiwindi (QLD)	Goondiwindi Inglewood - Waggamba
	Scenic Rim (QLD)	Tamborine – Canungra Boonah Beaudesert
	Southern Downs (QLD)	Southern Downs – East Southern Downs – West Stanthorpe Stanthorpe Region Warwick

Source: SGS Economics & Planning, 2024

Appendix 3: Method for estimating employment from non-renewable projects

Method overview

The NE REZ Data & Assumptions Book 2.1 dated November 2024 contains 37 projects classified as 'non-renewable' and 'relevant'. There is varying level of detail for these projects regarding the availability of jobs data, capital investment value, and construction start and end dates.

Where the Data & Assumptions Book contains a construction or operational jobs estimate, SGS has disaggregated this figure by occupation. This is to enable a gap analysis by key occupational grouping and occupation (section 3.2). The disaggregation approach is based on an employment matrix of the typical distribution of occupations within selected industries and by location. The steps are:

1. Exclude the 20 projects that are already operational. It is assumed that employment demand for these projects is met by the existing workforce.
2. For the 8 projects that are not yet operational and which contain an operational jobs estimate, identify the relevant industry. For Construction jobs, the industry division will be 'Construction'. For Operational jobs, the industry is based on the project name, e.g. 'Drayton Mine Extension' is 'Mining'. These projects and their ANZSIC 2-digit industry are outlined in Table 43.

Table 43: Project industry mapping

Project name	ANZSIC 2-digit industry
Bayswater Power Station Upgrade	Electricity Supply
Baiada Integrated Poultry Processing Facility	Food Product Manufacturing
Queensland-Hunter Gas Pipeline	Gas Supply
HVO North/South Open Cut Coal Continuation Project	Coal Mining
Mount Pleasant Optimisation Project	Coal Mining
Tangaratta Feedmill	Agriculture
Muswellbrook Bypass Project (REF)	Not relevant - road upgrade so wouldn't attract any operational jobs. No industry attribution for the purposes of the modelling.
Willow Tree Gravel Quarry Extension	Non-Metallic Mineral Mining and Quarrying

Source: SGS Economics and Planning, 2024.

3. Develop assumptions for projects where one or more of the following details is not provided in the Data & Assumptions Book 2.1: Construction Start, Construction Finish, Operational Date. Detail on timing is needed so that workforce demand can be attributed to a year for the annualised gap analysis. The assumptions were informed by desktop research and are outlined in Table 44.

Table 44: Project construction and operation timing assumption

Project name	Timing
Bayswater Power Station Upgrade	Assumed operational start date of 2027, as construction ends in 2027
Baiada Integrated Poultry Processing Facility	Project detail in Data & Assumptions Book 2.1 sufficient for analysis.
Queensland-Hunter Gas Pipeline	Assumed construction period of 2025-2027; operations start from 2027, based on need to start physical works by October 2024[41]
HVO North/South Open Cut Coal Continuation Project	Assumed construction period of 2024-2025; operations start from 2025. Construction is related to infrastructure upgrades to support continued operations[42]
Mount Pleasant Optimisation Project	Assumed construction period of 2025-2026; operations start from 2026. The current license concludes in 2026 which is when the continuation would begin, so the modelling assumes a 1 year lead time for any upgrades[43]
Tangaratta Feedmill	Assumed operational start date of 2027, as construction ends in 2027
Muswellbrook Bypass Project (REF)	This seems to be a road upgrade so wouldn't attract any operational jobs. No industry attribution for the purposes of the modelling.
Willow Tree Gravel Quarry Extension	No information on timing in the dataset or online, therefore exclude from analysis.

Source: SGS Economics and Planning, 2024.

4. Develop assumption of 'peak jobs'. For the purposes of the model:
    a. 'Peak jobs' refers to the number of jobs at the height of construction. Therefore if the construction period spans 2 years and there are 600 peak construction jobs, the model allocates 300 jobs in the first year and 600 jobs in the second year.
    b. Operational jobs 'peak' from the first year of operation, i.e. there is no ramp up
5. Apply the employment matrix to estimate construction and operational jobs by occupation.
6. Attribute employment demand to the relevant years per the assumptions from step 3.

Where the Data & Assumptions Book does not contain a construction or operational jobs estimate, it is possible to estimate this detail based on Capital Investment Value. However, the four projects to which these circumstances apply are missing capex ($m) and therefore are not included in the estimate of direct employment for this gap analysis.

Appendix 4: Renewable Energy Workforce Projections Methodology

In line with international standard approaches to estimating energy sector employment, this study utilises an employment factor methodology.

To calculate construction, development, and manufacturing employment in the energy sector, an employment factor (full-time equivalent job-years/megawatt of installed capacity) is applied to the total of constructed capacity (MW) per annum. To estimate employment in operations and management, a factor for jobs per megawatt is applied to the aggregate capacity. Employment factors are reduced over time by applying a 'decline factor' to capture productivity improvements which is derived from CSIRO's (2023) GenCost estimates on projected cost reductions in renewable energy technologies.

Figure 73 provides a summary of the methodology.

Manufacturing employment for year	=	MW installed per year	x	Manufacturing employment factor for that year (job-years/MW)	x	% Onshore manufacturing
Construction employment for year	=	MW installed per year	x	Construction employment factor for that year (job-years/MW)	/	Average construction time
Operation and Maintenance jobs	=	Cumulative capacity	x	O&M employment factor for that year (jobs/MW)		
Fuel employment	=	GWh used per year	x	Fuel employment factor for that year (job-years/GWh)		
Employment factor for year	=	Base year employment factor	x	Technology decline factor for year (equals CAPEX for year / CAPEX for base year)		

Figure 73: Employment calculation: methodological overview

Employment factors for Australia have been derived over the course of a number of industry surveys in 2020 and 2021[44,45] supplemented by literature reviews, and were included in the AEMOs draft input and assumptions report in December 2022[46]. These were updated using decline factors to reflect that technology costs and employment tend to reduce as technologies mature.

The final employment factors used in this analysis are detailed in Table 45, including the local and non-local split for construction jobs. The full derivation of these employment factors is detailed in Rutovitz et al 2025[47], noting that decline factors for these projections are not contained in the preprint, they are derived from the technology cost projections underlying the 2024 Integrated System Plan (ISP).

Table 45: Employment factors for the 2024 Integrated System Plan workforce projections

Technology	Non-local construction	Local construction	Manufacturing (international)	O&M
	Job-years/MW	**Job-years/MW**	**Job-years/MW**	**Jobs/MW**
Hydro	20.61	8.83	3.48	0.14
Wind (onshore)	7.43	3.18	1.54	0.21
Utility Solar	4.50	1.93	3.08	0.09
Rooftop PV	11.73	5.03	2.86	0.13
Utility batteries	1.49	0.64	0.50	0.03
Distributed batteries	12.43	5.33	0.50	0.23
Pumped hydro	20.09	8.61	3.48	0.08
Transmission line construction				
Construction/installation (Job-years/km)				
Single circuit	**0.70**			
Double circuit	3.7			
Construction/installation (Job-years/$m)				
Transmission (other)	**1.90**			

Decline factors

Cost declines for renewable energy technologies are still significant as innovations and efficiencies continue. While these may not be directly correlated to employment generation, there is a strong case that manufacturing, and construction employment declines alongside overall cost reductions. That is to say, the time taken to construct and manufacture every MW decreases in line with the cost. The case is less clear for operation and maintenance, and decline factors are not applied to this employment. The decline factor is directly derived from the cost projections for each technology:

$$Decline\ factor\ for\ year\ X = \left(\frac{technology\ cost\ (yr\ X)}{technology\ cost\ (base\ yr)}\right)$$

This is applied to the initial employment factor for each a year, so that the employment factor for that year is equal to the base year factor times the decline factor:

$$Employment\ factor\ (yr\ X) = Employment\ factor\ (base\ yr)\ \text{x decline factor (year X)}$$

Decline factors are calculated from AEMO cost projections data[48] for all technologies other than rooftop solar. The decline factor is calculated from the generator build costs in the regional build cost summary, using the average of the medium cost for each state for each technology. Rooftop solar is calculated using the costs from the CSIRO, 2023[4920]. Table 46 lists the decline factors used for 2027, 2030 and 2036.

Table 46: Decline factors for 2027, 2030 and 2036

Technology	2027	2030	2036
Hydro	100%	94%	91%
Batteries	100%	80%	66%
Pumped hydro	100%	94%	91%
Wind (onshore)	100%	86%	81%

Technology	2027	2030	2036
Utility-scale PV	100%	87%	72%
Rooftop PV	100%	85%	61%

Local construction workforce

The percentage of local employment was derived from the developer surveys for this study and applied to the construction employment factors. Local employment in this case refers to individuals working in sufficient proximity to construction sites to commute. While developers differed somewhat, this was considered to be 80 – 100 km from the site. In contrast, non-local employment involves workers who will require temporary accommodations, or relocation.

Eight developers responded to the question regarding local and non-local employment. The average response was that 36% of employment is local for the construction phase, although the standard deviation was high (± 22 percentual points), which represents a considerable variation. Taking this into account, we adopted the median value of 30%, to take a more cautious approach to the employment characterisation.

Manufacturing is not included in this analysis as equipment will be produced in industrial centres and brought to local areas to be installed.

Quarterly workforce projections and construction timing

The construction time of solar and wind farms is usually less than two years, so annual modelling for construction employment does not reflect the workforce fluctuations over the period. Initial and later construction phases usually require less workforce, with the peak in the middle of the period. The study aims to identify peak accommodation requirements, so model the employment in fractions of the year was required. The study period goes from 2026 to 2037, so a quarterly approach was taken as a compromise between computational complexity and additional granularity.

Project histograms were used in order to derive a general workforce fluctuation for each technology and applied to the energy scenarios to derive workforce projections[50].

For solar farms, a histogram was taken corresponding to one year before and one year after the peak. For wind farms, the same was done, but with a two-years period before and after the peak. These are the average time required to build solar and wind farms respectively. For batteries, the historical histogram comprised a period of one year, so it was entirely used. From the histograms, the proportion of workforce demand was calculated corresponding to the proportion of construction time elapsed. Since the workforce peak is in the centre of the histograms, it was expected that these functions had an inflection point around 50% of the construction time. Taking this into account while trying to keep the modelling complexity low, a third-degree polynomial trendline was obtained for each technology, and used over the construction time of each project. This is reasonable, as the histograms have a parabola-like shape (its integral, i.e., the accumulated shape would be close to a third-degree polynomial). The coefficients of the trendlines are shown in the graphs, as well as the coefficient of determination that, in all cases, is over than 99%, denoting a good fitting to the data.

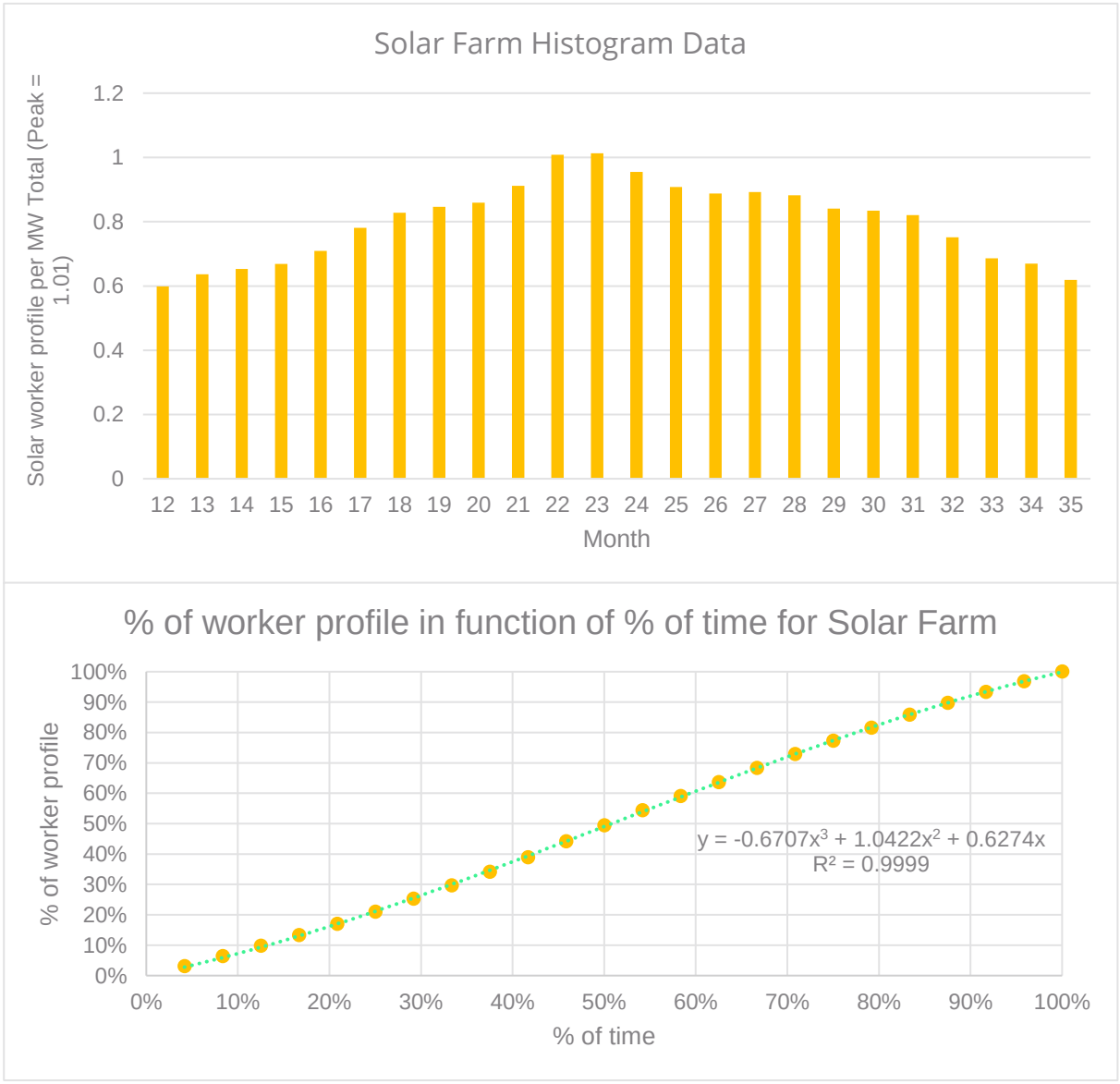


Figure 74: Solar construction histogram and percentage of workforce demand as a function of time

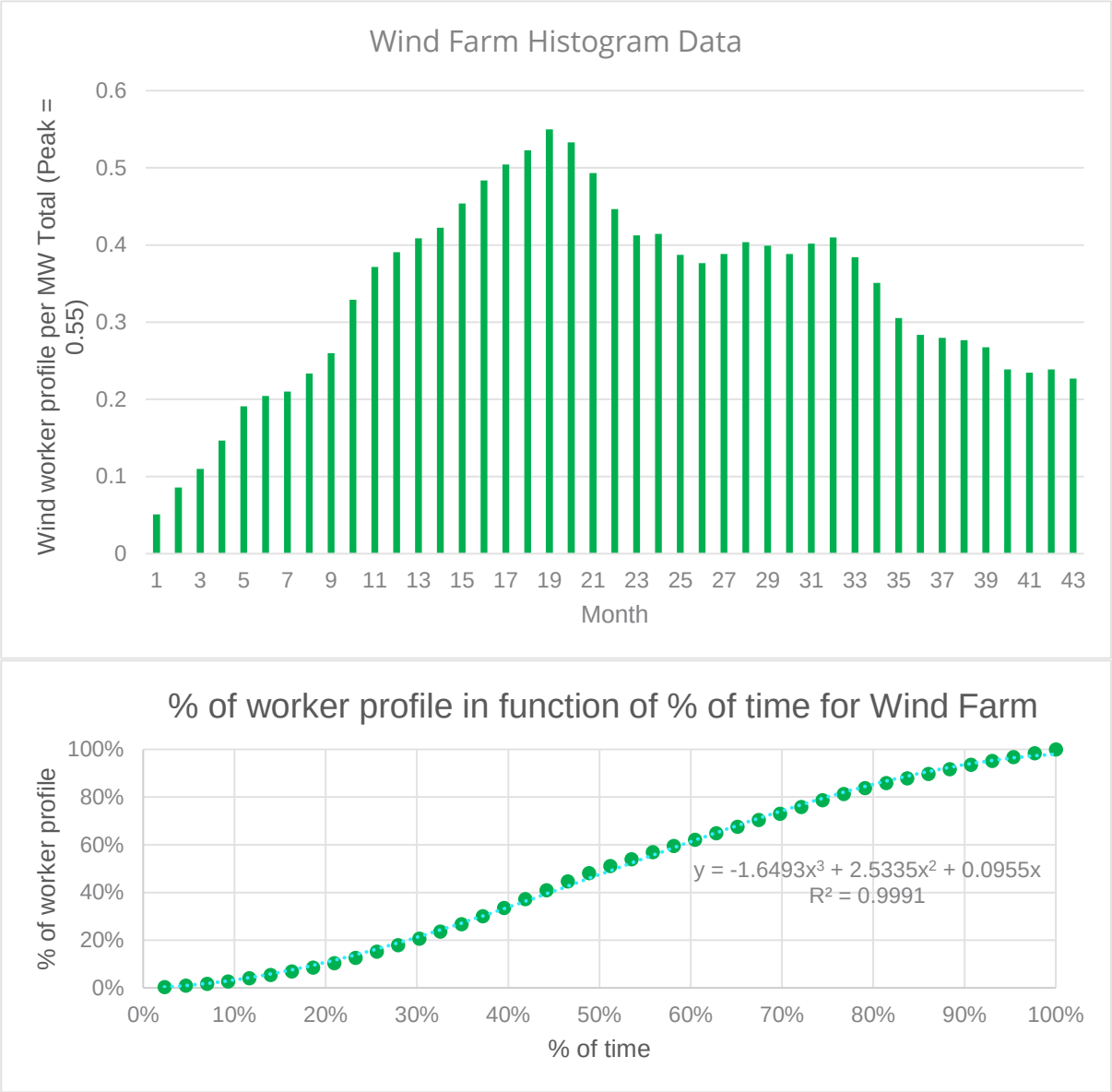


Figure 75: Wind construction histogram and proportion of workforce demand as a function of time

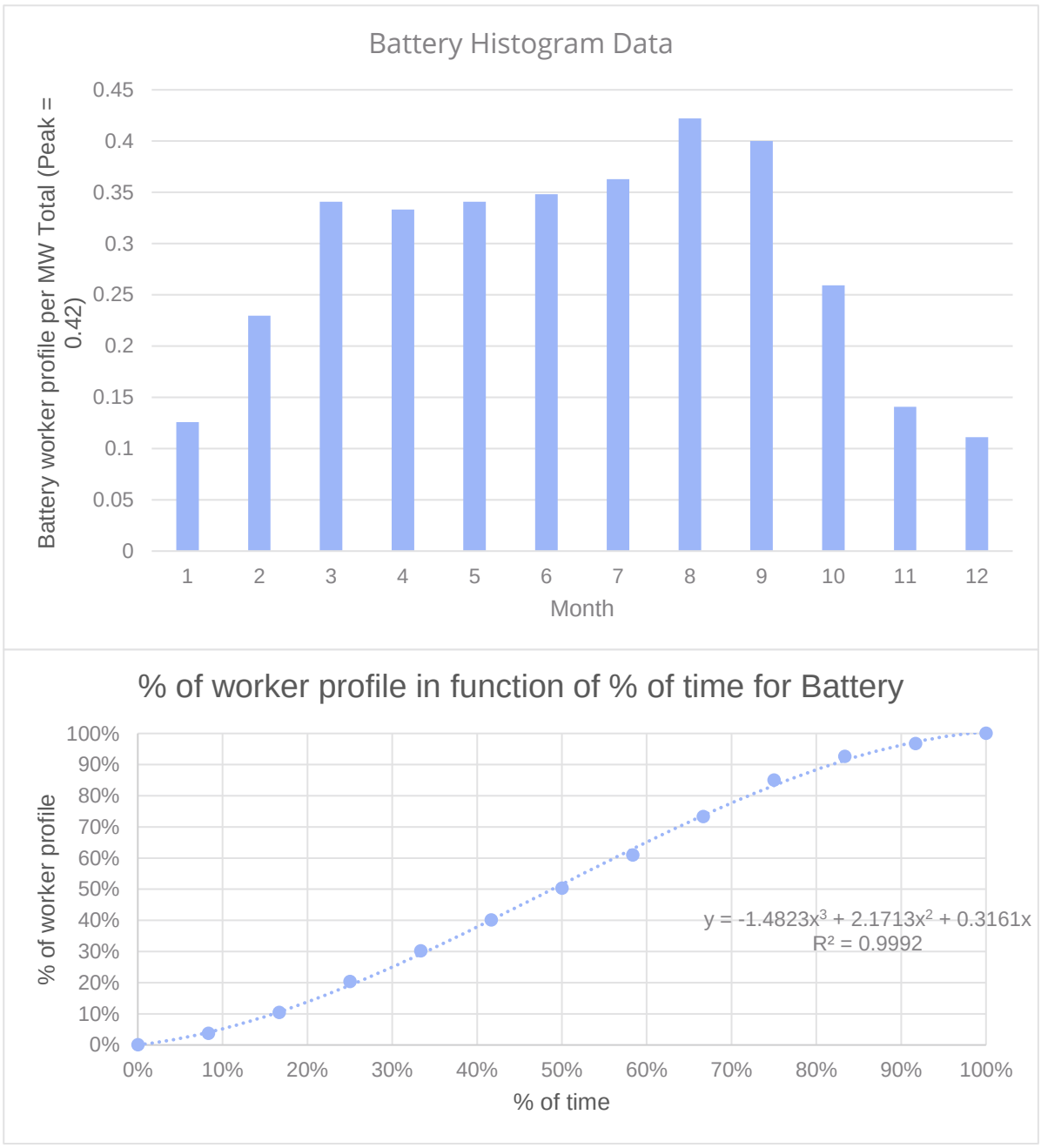


Figure 76: Utility battery construction histogram and proportion of workforce demand as a function of time

Energy scenarios

The NE REZ Data & Assumptions Book includes anticipated construction start and finish dates, as well as generation rating (in MW) and storage capacities (in MW and MWh). The operational start and finish date was included for most projects. Each project had a likelihood (low, medium or high). We used these to produce two scenarios:

- The High Scenario includes both medium and high likelihood projects: this results in the highest installed capacity and the highest employment
- The Low scenario incudes only high likelihood projects, resulting in a lower installed capacity and employment.

Construction employment was calculated based on the distribution of project capacity over its construction time, normalised by each technology histogram, to taking account of workforce fluctuations over the construction period.

Operational employment was calculated from cumulative installed capacity, with each project included from one month after the end of the construction period for each project, and it was considered uniform until the end of the model timeline.

Capacities by technology over the model timeline are shown in Figure 77, for both scenarios and the entire study area. Note these are the capacities used to calculate O&M employment and starts before the operational date for projects in some cases, as the period of commissioning is considered to involve at least the operational employment numbers.

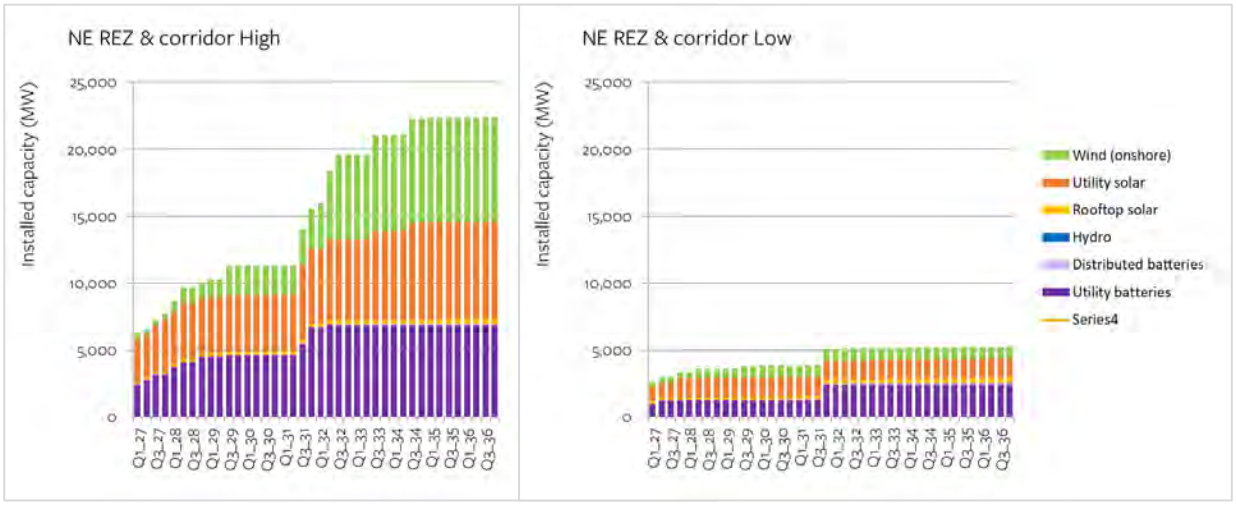


Figure 77: Installed capacities by scenario

Rooftop solar and distributed batteries

For rooftop solar and distributed batteries capacities we used the monthly postcode capacity data from Australian Photovoltaic Institute (APVI)[a], and GIS calculation to determine the overlap between postcode areas and LGA areas and obtain the proportional rooftop solar capacities for each LGA and then applied the growth rate for NSW distributed solar from the 2024 ISP[51]. Figure 78 shows the postcodes for which there was data from APVI. Since there was almost no data for the postcodes in Narrabi and Gunnedah, these LGAs were not included in the calculation.

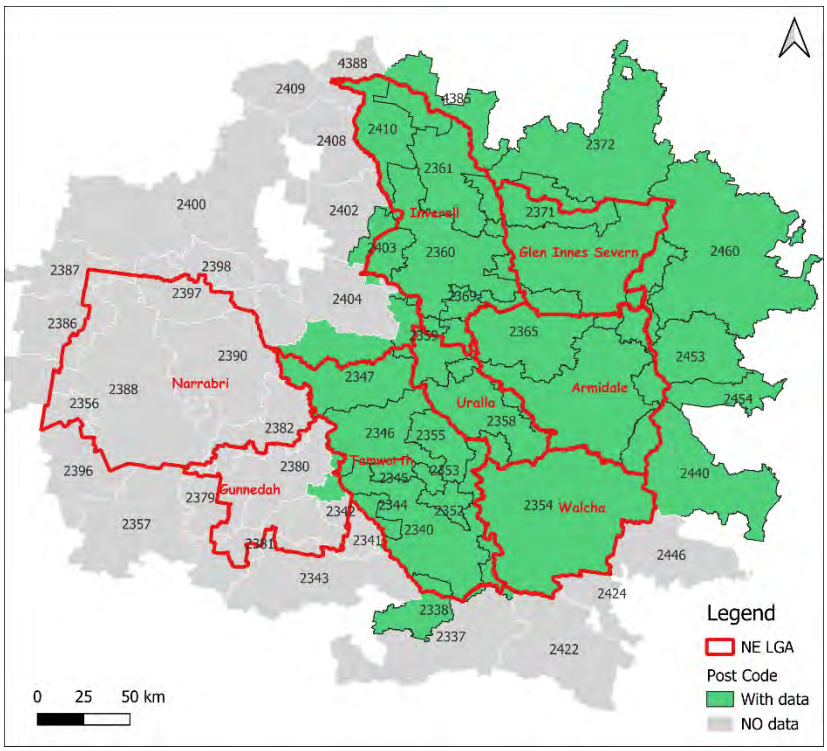


Figure 78: Correspondence between postcode areas and LGAs

For distributed batteries, we applied the ratio of distributed batteries to rooftop solar in NSW obtained from the 2024 ISP[52] to the derived PV capacities for each LGA. This ratio varied over time, starting from 12% in 2027 and increasing up to 26% by 2036.

We added three other LGAs (Muswellbrook Shire, Liverpool Plains and Upper Hunter Shire) as they were part of the transmission corridor and used the same GIS methodology to allocate solar PV and calculate distributed batteries.

References

[1] The model estimates employment in terms of full-term equivalent employment based on a 35-hour week. Developers were surveyed as to the expected working hours per week. The median response to the survey was a 50-hour week. FTE are converted into persons for the local and non-local workforce as an input to the workforce accommodation study.

[2] First Nations Clean Energy Network (2024), *Powering First Nations Jobs in Clean Energy*, https://assets.nationbuilder.com/fncen/pages/237/attachments/original/1722394132/FNCE_Jobs_Report_-_FINAL_%28Compressed%29.pdf?1722394132.

[3] Briggs, C., Gill, J., Atherton, A., Langdon, R., Jazbec, M., Walker, T., Youren, M., Tjondro, M., Rutovitz, J., Cunningham, R., Wright, S. and Nagrath, K., (2021). *Employment, Skills and Supply Chains: Renewable Energy in NSW,* Report for the NSW Renewable Energy Sector Board.

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