Bridging the Skills Gap: Workforces for Electrification

Power Session Webinar

17 June 2025

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Agenda and Housekeeping

Agenda

- Housekeeping and Introductions
- Drivers of Changes to Workforce Needs
- Workforce Impact Assessment
- Workforce Solution Development
- Takeaways and Recommendations
- Next Power Session Webinar

Housekeeping

This webinar is being recorded and distributed to all registrants along with this presentation

Add your questions to the chat. My colleague, Sara Gonzales, is monitoring the chat for the Q & A session

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Drivers of Changes to Workforce Needs

Federal and State Targets

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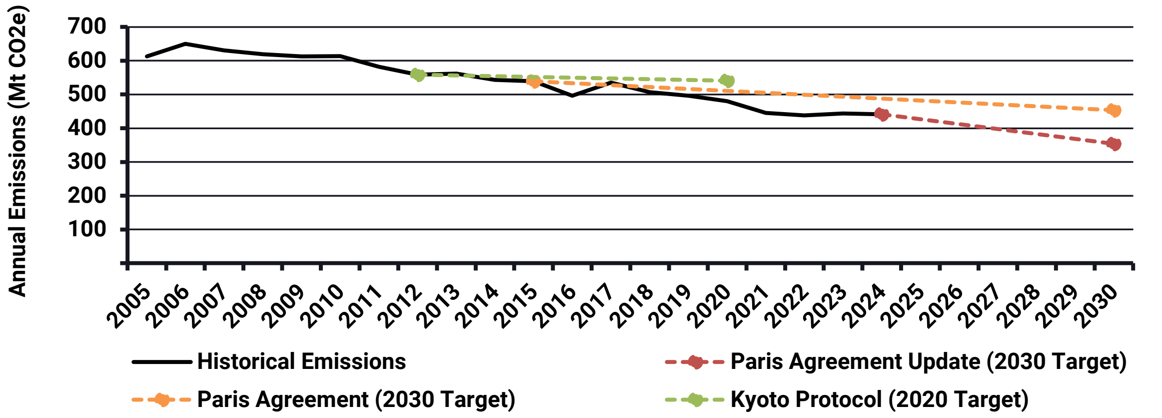
Paris Agreement and the AU

AU Historic and Target CO2e Emissions



Source: DCCEEW (2024), Note: Note: Target trajectories are shown from the year the target was set to the target year

- The Paris Agreement targets limiting global warming below 2°C, with an additional goal to keep global temperatures below 1.5°C, from pre-industrial levels
- The current AU targets include a 43% reduction in 2005-level (baseline) emissions by 2030, and a net-zero goal for 2050
  - Energeia notes that the Department of Climate Change, Energy, the Environment and Water (DCCEEW) has modelled AU emissions projections as achieving both their GHG emissions reduction target and emissions budget target by 2030
- Every 5 years, each country must submit a climate action plan, known as a Nationally Determined Contribution (NDC), with the latest NDC submitted in June 2022 and the next NDC to be submitted in 2025
- While countries are not legally obligated to achieve their targets under the Paris Agreement, Australia is committed to meeting both its single year target to reduce greenhouse gas (GHG) emissions and multi-year emissions budget by 2030
- Some AU states, which are detailed later, have committed to more ambitious emissions reduction targets, such as the ACT

Source: The Paris Agreement, United Nations (2015)

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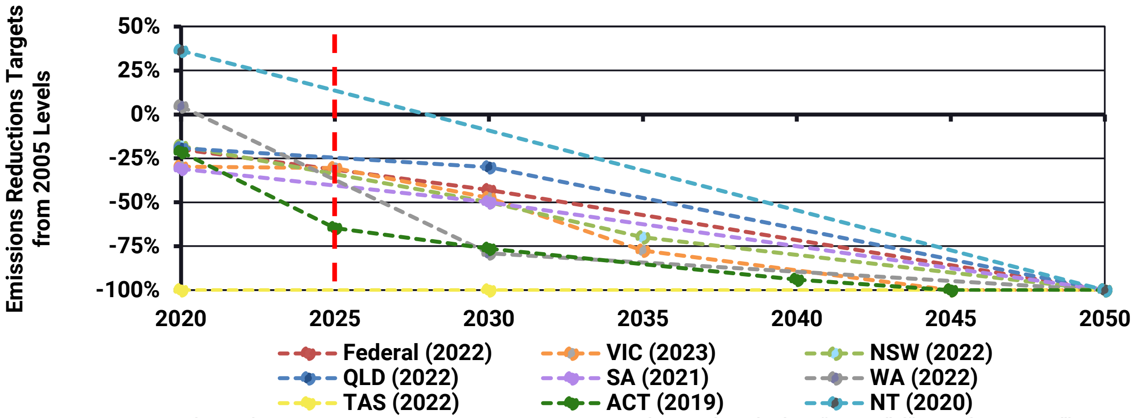
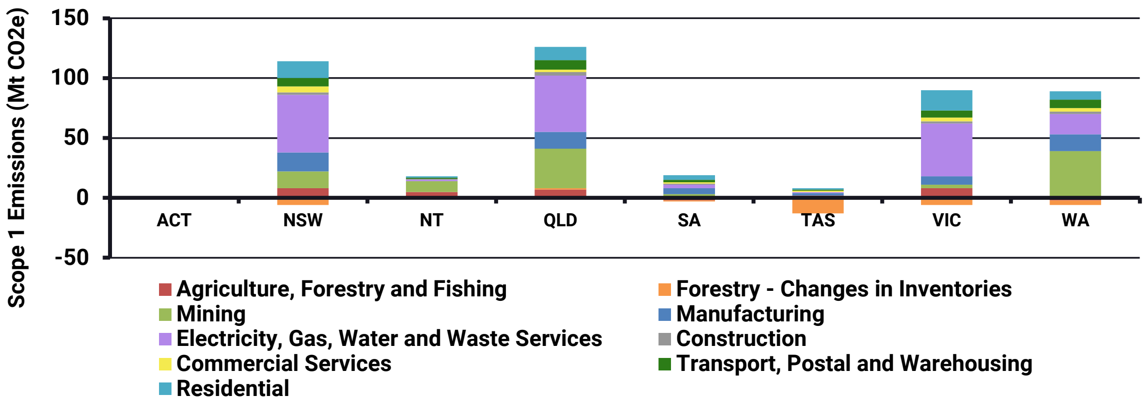
Australian CO2 Targets by Key State

Leading State and Federal CO2 Targets



Source: DCCEEW (2024), State Governments, Note: Energeia legend includes "State" ("Baseline Year") = Current Year, 2020 datapoint is historical, TAS has already exceeded net zero target and are net negative

Leading States Emissions by Economic Sector (2022)



Source: DCCEEW (2022)

- State government targets vary across Australia, with each committing to individual targets to meet overall federal emission targets. Currently, only ACT and VIC are committed to a 2045 target
  - Energeia expects more to follow suit in the coming years
- As shown in the graphic to the left, the second highest sources of emissions after the power and transport sectors are other industrial sectors, e.g. mining, construction, manufacturing, etc.
- The sources of emissions varies by state due to the economic mix, with varying workforce impacts across gas and electric utility, trade and other key workforce segments

A key question is how will these changes be enabled by and impact the workforce, and how can it be best positioned?

Key Drivers of Changes in Workforce Needs

- Building electrification
- Transport electrification
- Gas sector decarbonisation
- Gas system decommissioning
- Transport sector decarbonisation
- Power sector decarbonisation

Workforce Impact Assessment

Building Electrification

Gas Sector Decarbonisation

Electric Utility 100% Renewables Transition

Gas System Decommissioning

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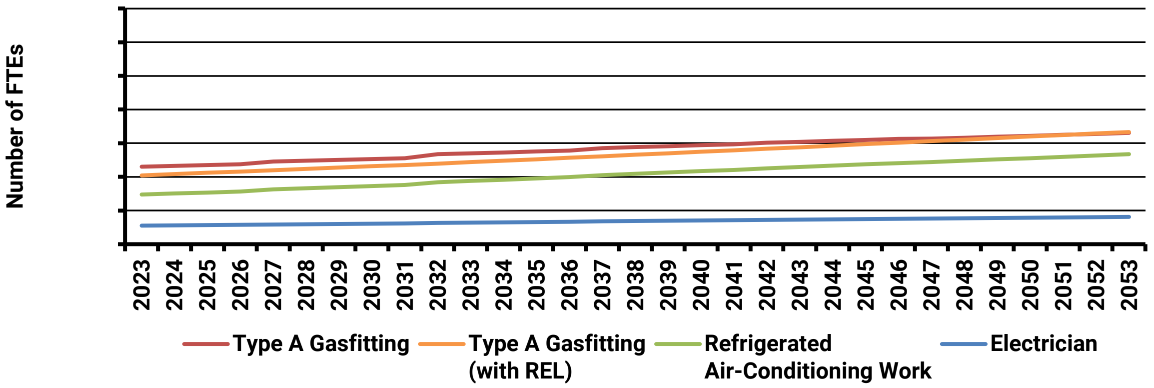
Building Electrification

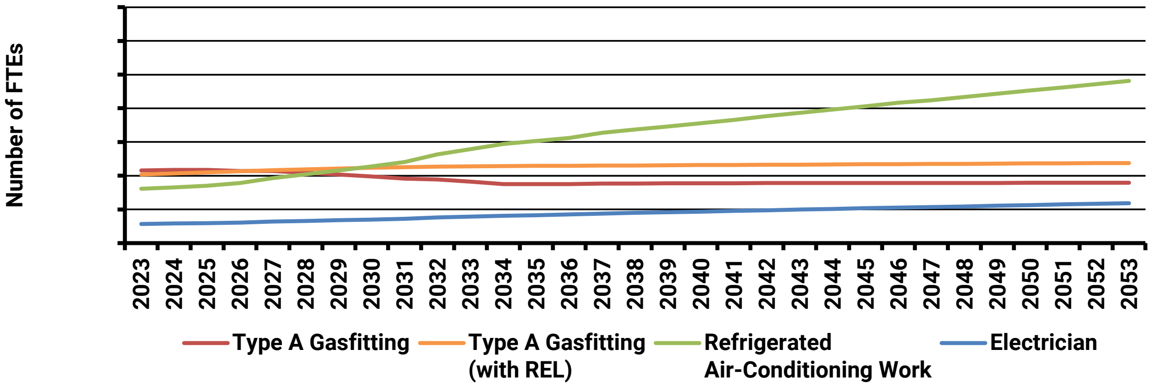
Business as Usual



Source: Energeia Analysis

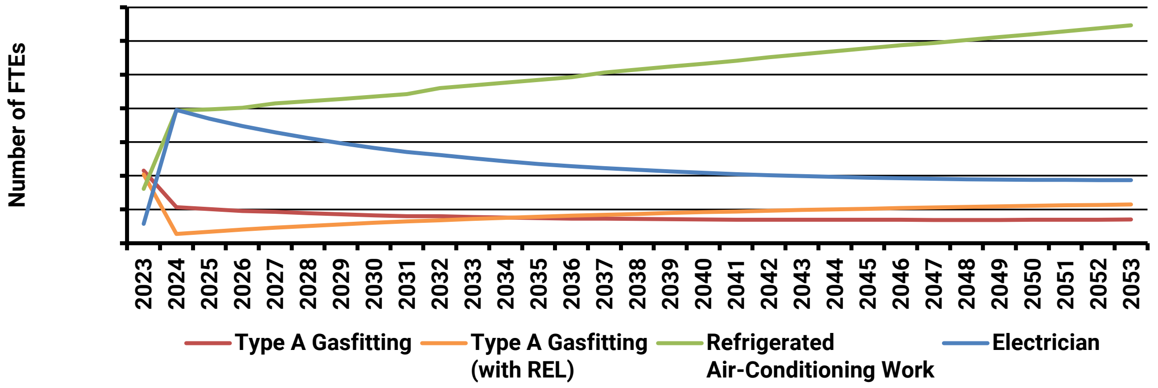
- A state government was considering policy options to achieve faster gas system decarbonisation
- We analysed the impact of banning gas in new premises, as well as at end of life (i.e., no more gas appliance sales in the state)
- The modelling showed that bans would have significant impacts on trade jobs
- A key recommendation was to set bans far enough in the future to allow the market to adjust, and to stagger bans
  - For example, start with residential water heaters, followed by space heaters, then commercial water heaters, then space heaters, etc.

No Gas in New Premises from 2023



Source: Energeia Analysis

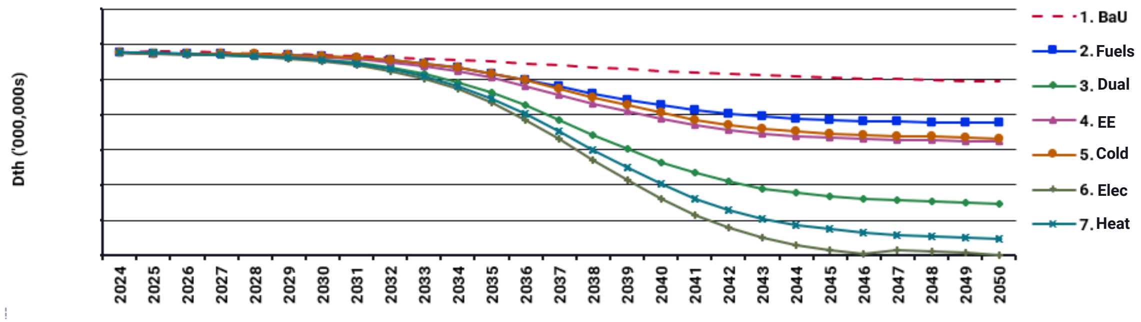
No New Gas Appliances Sold from 2024



Source: Energeia Analysis

Gas Sector Decarbonisation (1 of 2)

Gas Consumption by Scenario



Source: Energeia Analysis, Note: Dth = Dekatherms, BaU = Business as Usual, Fuels = Clean Fuels, Dual = Dual Fuel, EE = Energy Efficiency, Cold = Cold Climate Heat Pumps, Elec = Electrification, Heat = Thermal Utility

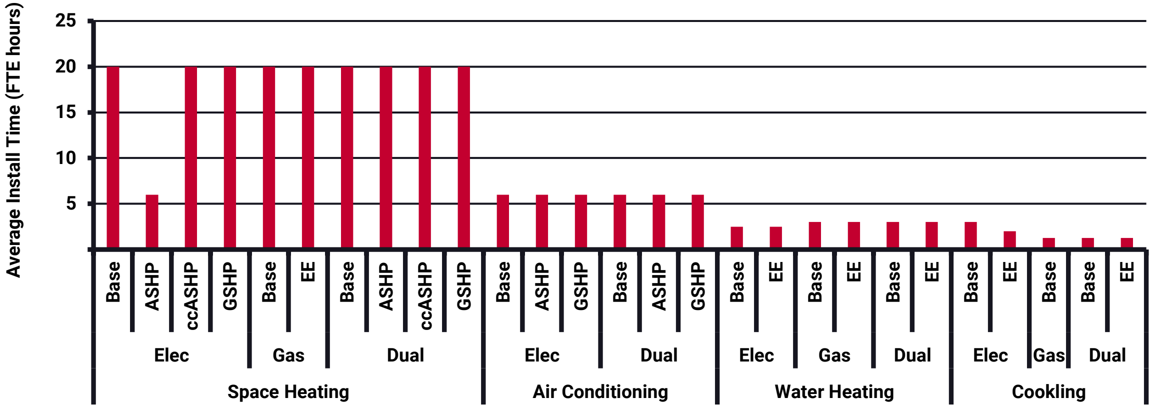
- A state is considering options to decarbonise its gas sector across a range of pathways, and not just electrification
- Energeia modelled the impact of each pathway on the sector, including utility and trade jobs
- Impacts were mainly estimated using state full time equivalent (FTE), throughput and installation labor estimates
- Workforce development was not part of the scope
- The analysis highlights the significant differences in potential impact depending on the pathway chosen

Total Gas Utility Sector Employment

Target Sector	NAICS Mapping	NAICS Description	2023 Count
Gas			
Upstream Jobs	21113	Natural Gas Extraction	
Midstream Jobs	4862	Pipeline Transportation of Natural Gas	
Distribution Jobs	2212	Natural Gas Distribution	
Electric			
Generation Jobs	22111	Electric Power Generation	
Transmission Jobs	221121	Electric Bulk Power Transmission and Control	
Distribution Jobs	221122	Electric Power Distribution	

Source: Energeia Analysis

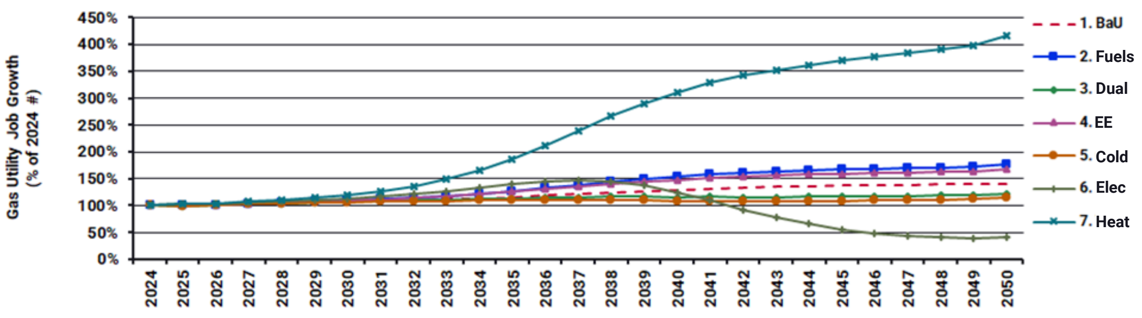
Average Installation Effort (FTE hours)



Source: Energeia Analysis

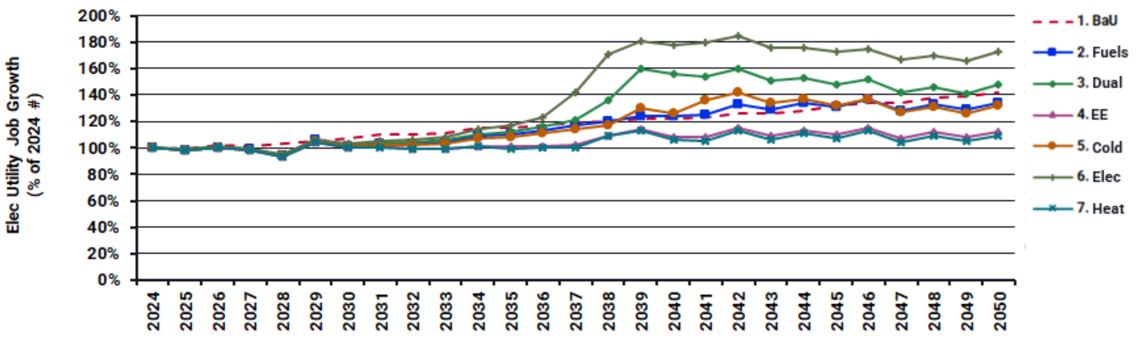
Gas Sector Decarbonisation (2 of 2)

Forecast Change in Gas Utility Jobs



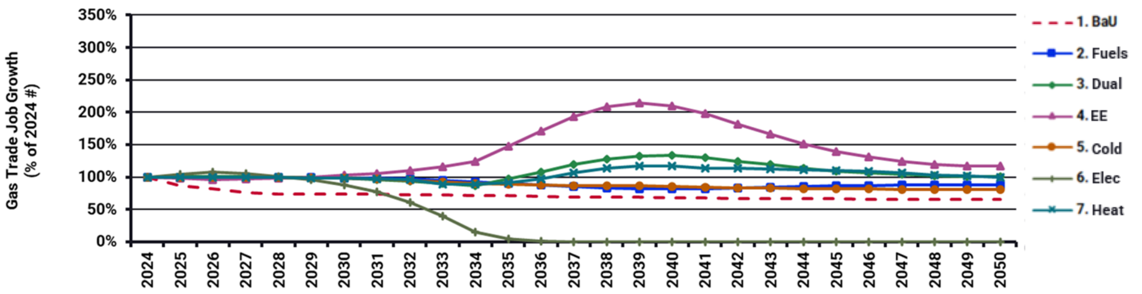
Source: Energeia Analysis, Note: BaU = Business as Usual, Fuels = Clean Fuels, Dual = Dual Fuel, EE = Energy Efficiency, Cold = Cold Climate Heat Pumps, Elec = Electrification, Heat = Thermal Utility

Forecast Change in Electric Utility Jobs



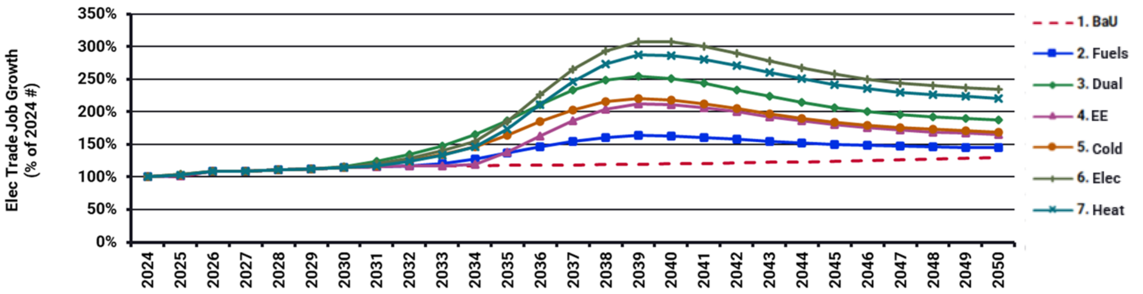
Source: Energeia Analysis, Note: BaU = Business as Usual, Fuels = Clean Fuels, Dual = Dual Fuel, EE = Energy Efficiency, Cold = Cold Climate Heat Pumps, Elec = Electrification, Heat = Thermal Utility

Forecast Change in Gas Trade Jobs



Source: Energeia Analysis, Note: BaU = Business as Usual, Fuels = Clean Fuels, Dual = Dual Fuel, EE = Energy Efficiency, Cold = Cold Climate Heat Pumps, Elec = Electrification, Heat = Thermal Utility

Forecast Change in Electric Trade Jobs



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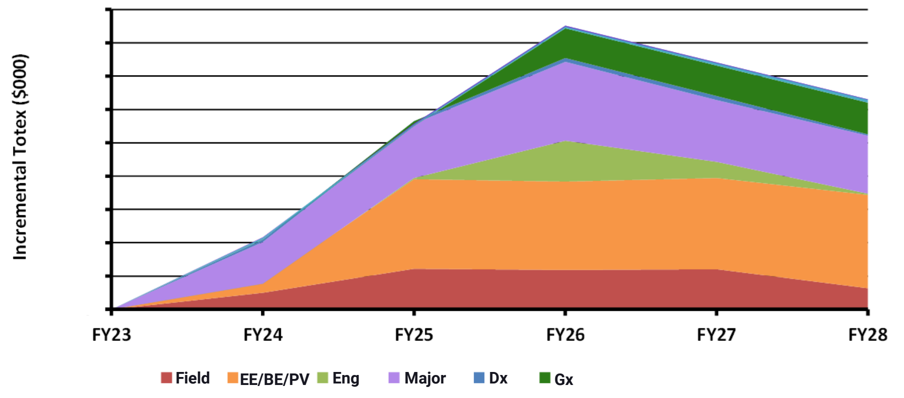
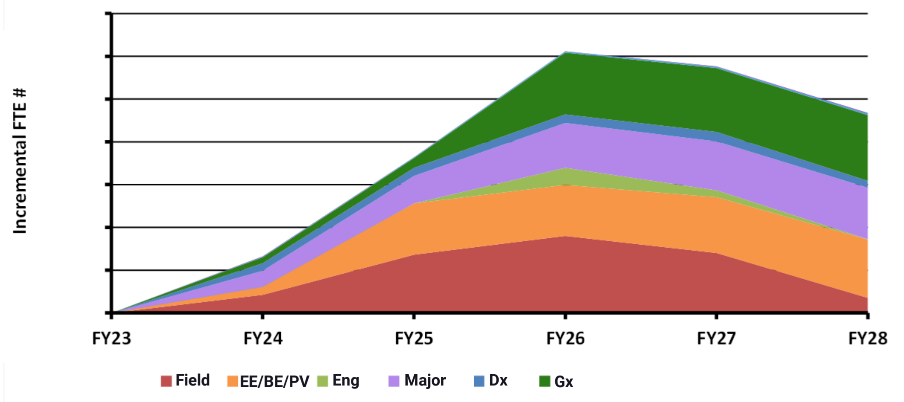
Electric Utility 100% Renewables Transition

Planned Expenditure Over Time



Source: Energeia Analysis

Forecast FTEs Needed Over Time

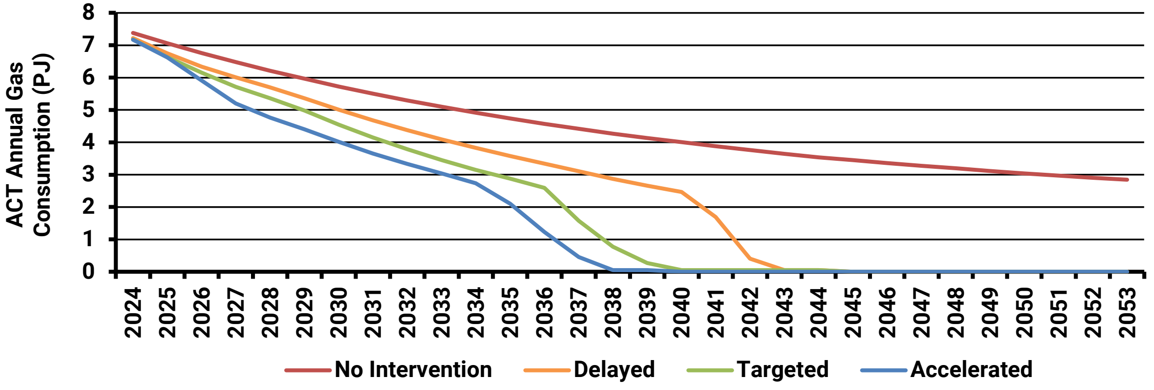


Source: Energeia Analysis

- A vertically integrated utility is aiming for 100% renewable energy in the next 10 years
- They identified that workforce development was a key risk to achieving their strategic goal
- Energeia was part of the team that developed estimates from strategic plans, Human Resources and finance datasets
- Future FTEs by class were estimated over time, based on planned investments in the distribution, transmission, generation and BTM program capacity and capabilities
- The project identified the workforce needs vs. supply gap based on current recruitment and training capacity, as well as potential strategies for addressing them
- Key recommendations from this work included the need to enhance their understanding of:
    - Future changes in job and skills mix
    - Strategies to increase capacity and capability
    - Strategies for optimising make vs. buy decision

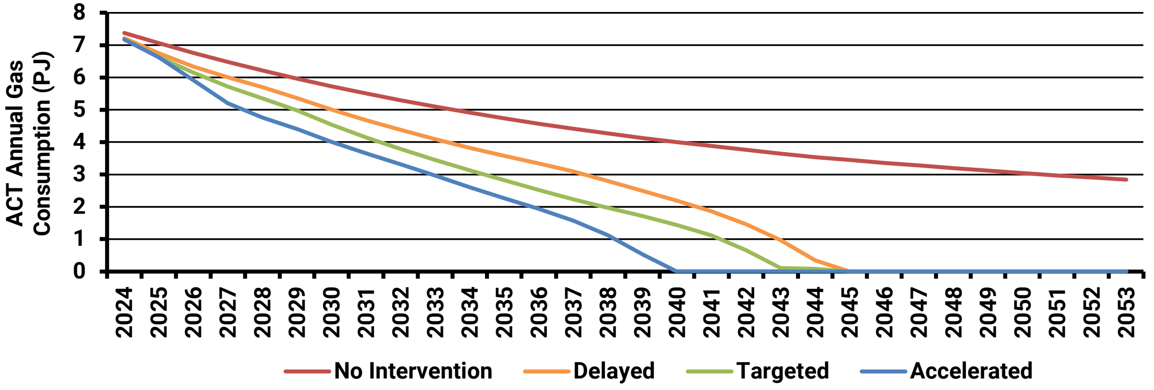
Australian Capital Territory (ACT) Gas System Decommissioning

Gas Consumption (30% Shutdown Threshold)



Source: Energeia Analysis

Gas Consumption (Phased)



Source: Energeia Analysis

- The ACT was considering policy options around decommissioning its gas system, which it partly owned
- Energeia analysed the impact of different decommissioning strategies, including different:
  - Timings, e.g. 5 or 10 years, i.e. 15 or 10 year durations
  - Triggers, e.g. < 20% or < 30% of current demand, and
  - Cost allocation approaches, e.g. front loaded, as incurred, etc.
- The modelling showed that different decommissioning strategies would have very different impacts on demand for gas and electricity, as shown to the left
- Key recommendations from the work included banning new appliances to avoid future asset stranding costs, pushing out decommissioning as far as possible to minimise stranding of existing assets, and managing price increases to avoid uneconomic switching over time
- Workforce impact analysis was not in scope, but the difference in network shutdowns by scenario show the potential for rapid change in utility and trade jobs between the gas and electric systems
- Energeia's detailed report can be found here

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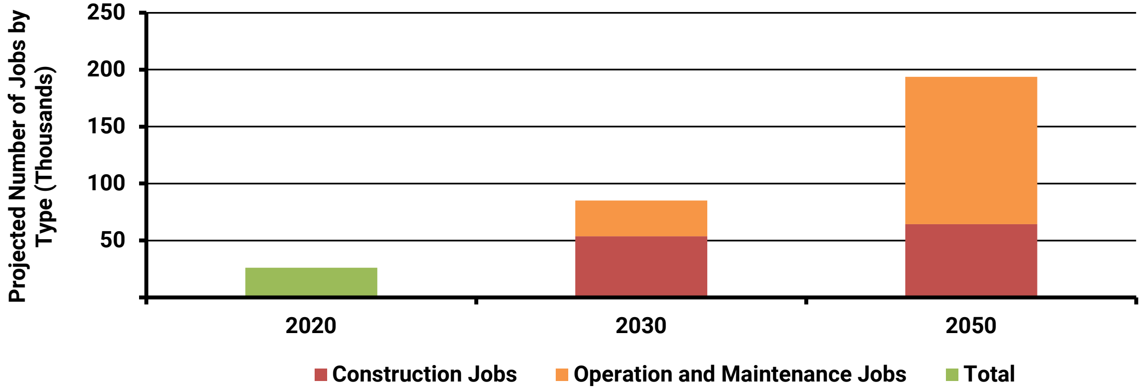
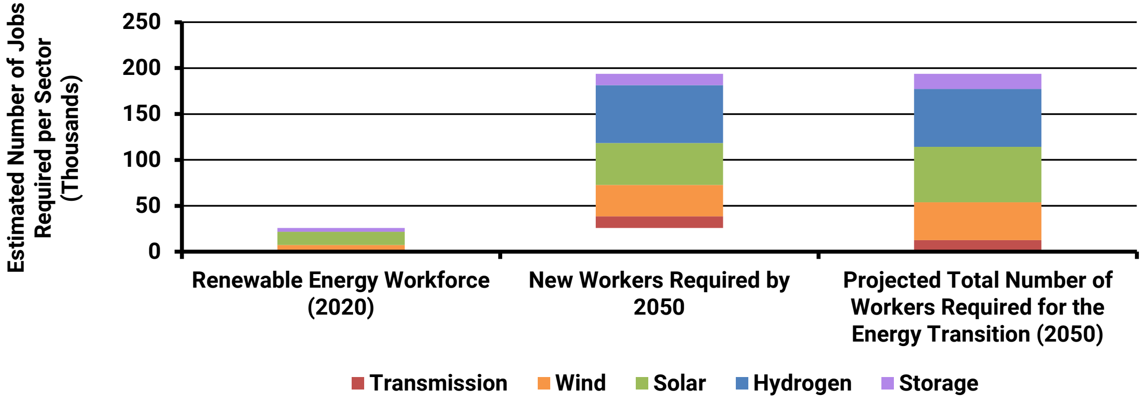
Renewable Energy Transition Jobs

Projected Number of Jobs by Type



Source: Accenture (2023): Skilling Australian Industry for the Energy Transition

Projected Number of Jobs by Renewable Sector



Source: Accenture (2023): Skilling Australian Industry for the Energy Transition

- ARENA funded study identified FTEs needed to transition the country's industrial energy demand to 100% renewable energy
- It followed a similar approach to our previous examples
- It largely focuses on utility scale renewables, hydrogen and batteries, and the transmission grid (not appliances or distribution)
- The study found the country will need almost 10 times more people by 2050

- In terms of the break-out by industry sub-sector, the study found that most FTEs would be needed in solar, wind and hydrogen
- Interestingly, transmission and storage were found to need less than half the amount of FTEs as the other sub-sectors
- The question of course, is which roles are impacted, both in terms of transitioning from the carbon economic, as well as transitioning to these sub-sectors

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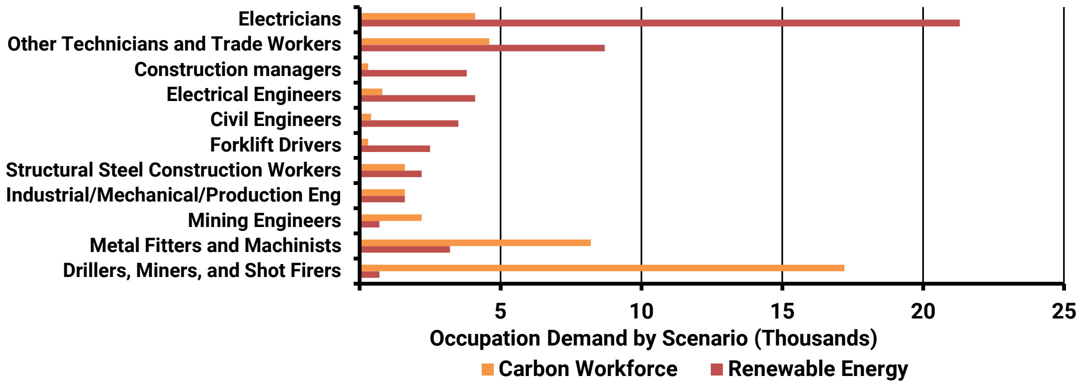
Existing vs. Current Needs and Supply Statuses

Difference in Occupational Demand by Scenario



Source: Accenture (2023): Skilling Australian Industry for the Energy Transition, Note: Eng = Engineers

2030 Jobs Supply Requirement vs. 2022 Shortage Status

Category	Occupation	Jobs Required by 2030 (Thousands)	Current National Shortage
Higher Skilled	Electricians	10.4	Shortage
	Engineering Professionals	7.9	Shortage
	Other Trades and Trades Workers	4.9	Shortage
	Construction, Distribution, and Production Managers	4.7	Shortage
	Building and Engineering Technicians	3.6	No Shortage
	Mechanical Engineering Trades Workers	1.6	Shortage
	Other	16	N/A
Lower Skilled	Mobile Plant Operators	5.6	Shortage
	Other Labourers	5.2	No Shortage
	Construction and Mining Labourers	4.9	Shortage
	Truck Drivers	2.1	Shortage
	Machine Operators	1.1	No Shortage
	Stationary Plant Operators	1.1	Shortage
	Other	13.1	N/A
Total		85	

Source: Accenture (2023): Skilling Australian Industry for the Energy Transition

- Analysis completed for the study identified, within specific career types, differences in demand by carbon and renewable economies
- Demand for electricians is expected to rise sharply, which demand for drillers, miners and shot firers is expected to fall precipitously

- Turning to near-term demand vs. the current supply situation, almost all of the top occupations are in shortage
- If these shortages are not addressed, then the planned transition will not be possible
- So how well equipped is Australia to meet this challenge?

Workforce Solution Development

Workforce Dynamics

Key Barriers

Wage Competitiveness

Best Practices

Key Strategies

Development Roadmap

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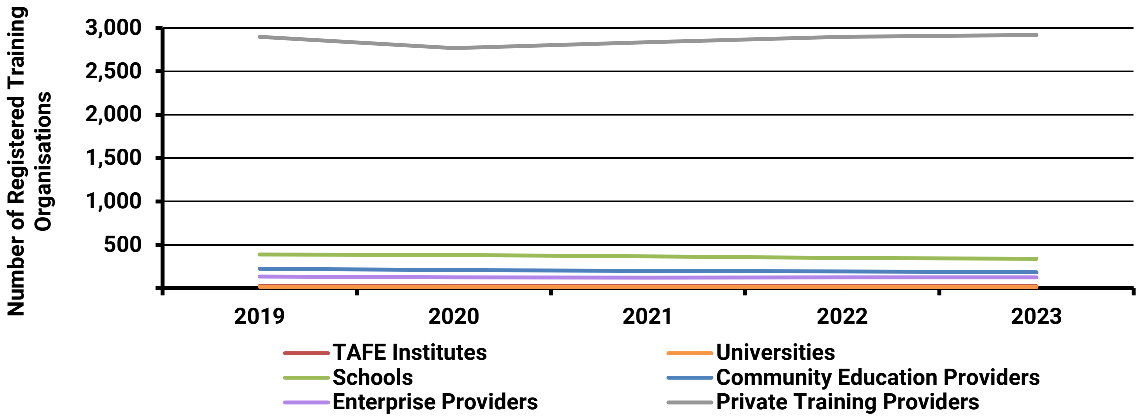
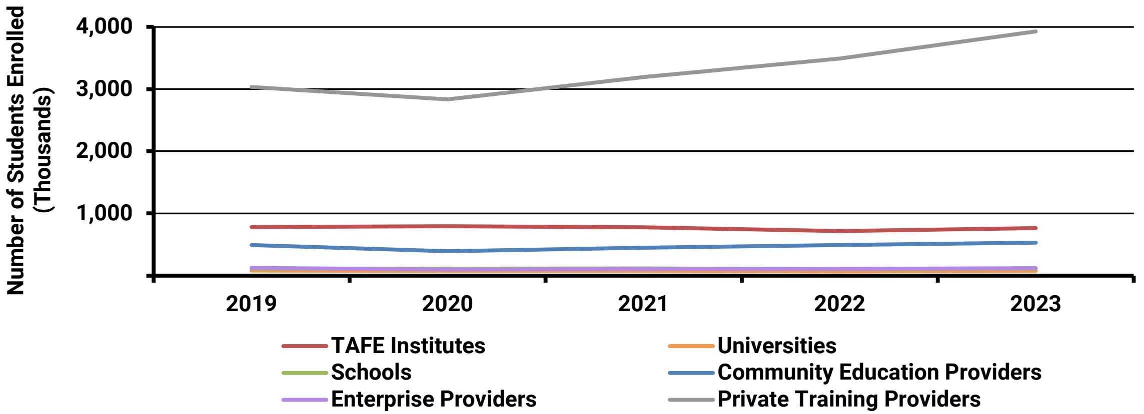
Vocational Education and Training (VET) Courses in Australia - 1/2

Number of VET Providers by Type



Source: National Centre for Vocational Education Research (2023)

Students Enrolled by Provider Type



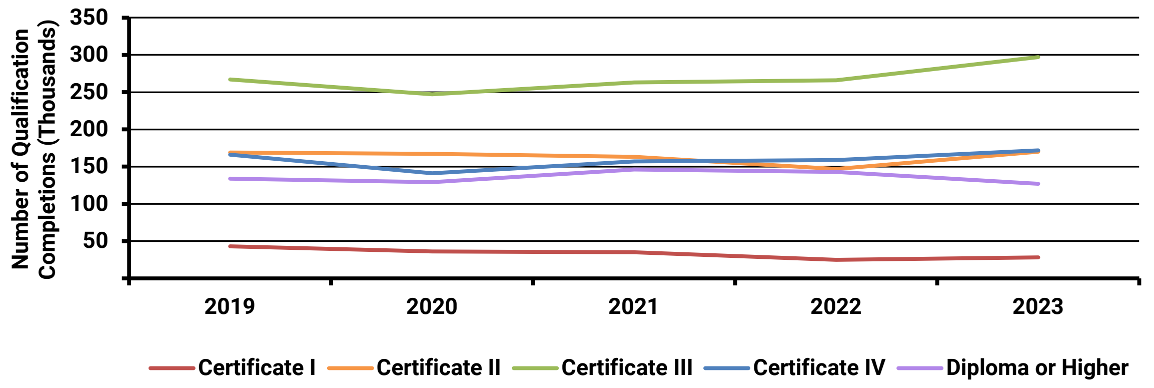
Source: National Centre for Vocational Education Research (2023)

- The majority of institutes that provide Vocational Education and Training (VET) services are run by Private Training Providers, followed by schools, and Community Education Providers
- Private training providers also have the most students enrolled, with the number of enrolments rising every year. Technical and Further Education (TAFE) Institutes and Community Education Providers also enrol a significant number of students every year

- Assuming most degrees are two years, 50% of these students will graduate each year, less drop-outs
- Assuming that current training covers current need, the training mix will need to adjust significant in the occupations identified
- This will not occur of its own, and Australia needs to ensure that training organizations are aware of economic needs over time
- Ideally, there will also be funding to support development of curriculums for emerging careers and retraining trainers

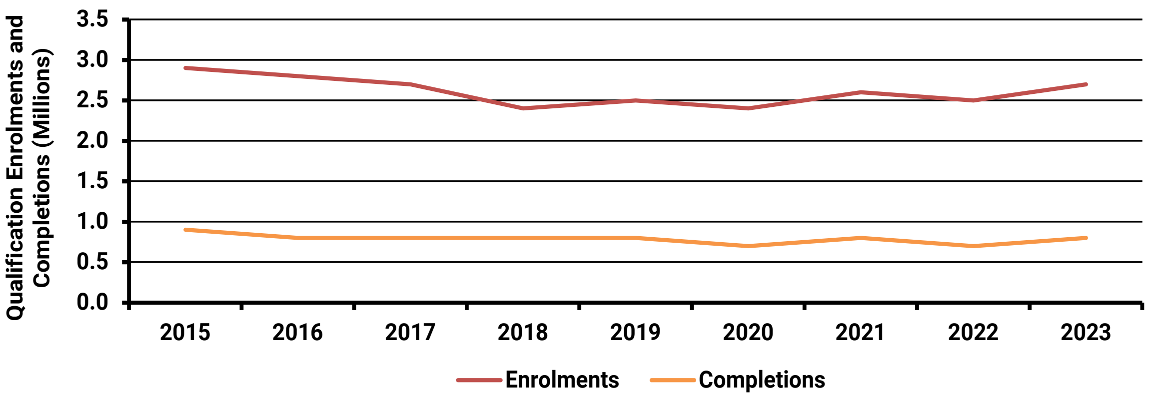
Vocational Education and Training (VET) Courses in Australia – 2/2

Completed Qualifications



Source: National Centre for Vocational Education Research (2023)

Annual Enrolments vs Completions



Source: National Centre for Vocational Education Research (2023)

- The majority of trades require a minimum of a Certificate III in order to become a licensed tradesperson, and as such, it has the highest completions of all the certificates
- This level of training suggests that the transition to the renewable, hydrogen and electrification industries, can be managed, as long as it is well planned and supported

- Enrolments and completions of VET courses has been steadily declining over the last several years
- As these emerging industries compete for fewer graduates, wages are likely to increase, increasing the cost of the transition

Key Barriers to Workforce Development

Key Workforce Barriers

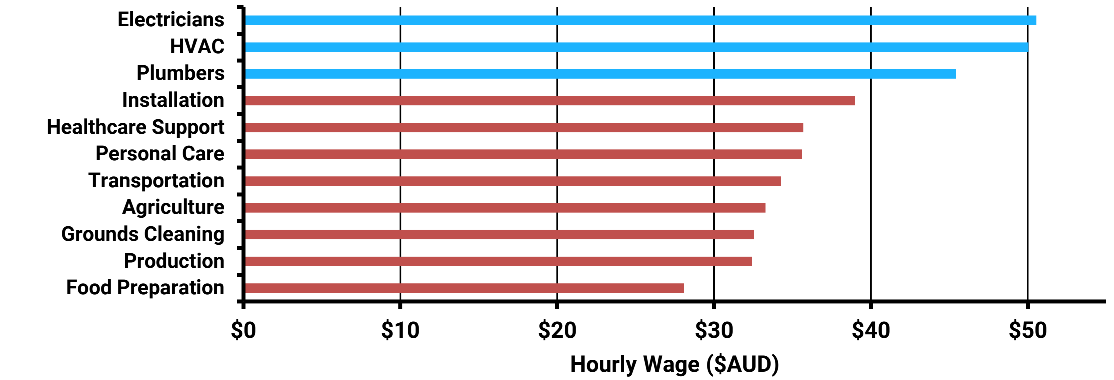
Barrier	Source
Competitiveness of wages	Interviews, Research
Blue collar stigmas	Interviews
Lack of incentive stability	Interviews, Research
Declining interest in energy sector jobs	Research
Shrinking pool of workers (birthrate)	Research
Lack of accessibility to training	Research
Entry requirements	Research
Cost of transition to alternate trades	Research

- Key workforce barriers shown are from both contractor interviews and best practice (mostly US) desktop research
- Interviewees cited barriers such as competitiveness of wages, blue collar job stigma, retraining incentive availability, and uncertainty around demand for green jobs
- Research identified barriers such as a decline in energy job interest, small pool of workers, lack of training access, and high entry requirements

Source: Interviews, Energeia Research

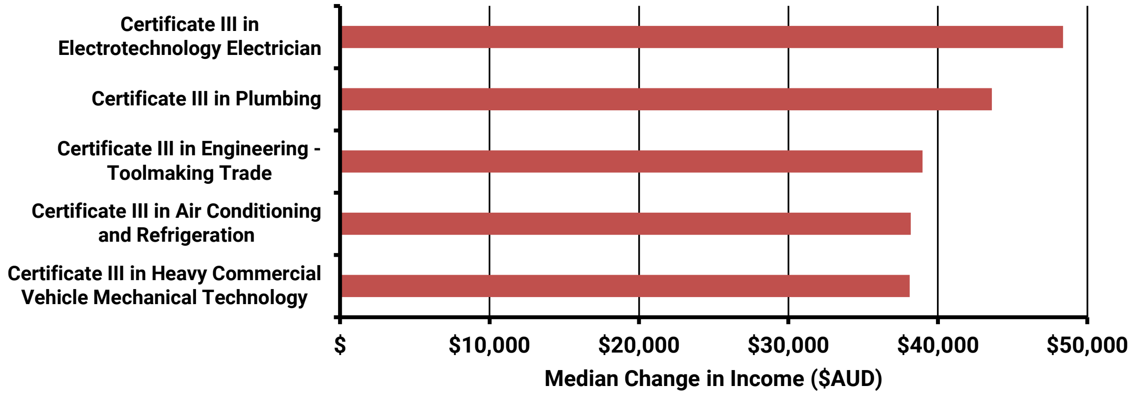
Contractor Wages – Career Attractiveness

Contractor Wages Compared to Blue Collar Trades



Source: Energeia Research

Top 5 VET Courses with the Highest Change in Median Income



Source: Australian Bureau of Statistics (2023): VET Student Outcomes – Top 100 courses

- Energeia analysed hourly wages for blue-collar jobs and compared them to the hourly wages of the contractors who install BE appliances
- Plumbers, electricians, and heating, ventilation, and air-conditioning (HVAC) professionals all make significantly more than most non-BE blue-collar jobs in this example
  - Electricians make ~$51/hr on average
  - HVAC professionals make ~$50/hr on average
  - Plumbers make ~$45/hr on average
- Plumbers, electricians, and HVAC professionals also have among the highest changes in median income levels when completing their VET courses
- The key takeaway here is that plumbers, electricians, and HVAC professionals have competitive salaries when compared to other trade jobs

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Best Practices – Workforce Development Strategies (US)

Barriers and Challenges to Workforce Development	Strategies to Increase BE Workforce	Detailed Description of Strategies
Declining Interest in Energy Sector Jobs	Increase Interest Among Younger Students	One obstacle to hiring is lack of interest in or awareness of the opportunity in the next generation of careers in the energy sector. Recruitment needs to start in middle and high school by allowing students to get field experience.
	Promotions and Campaigns	The ten key recommendations include providing technical assistance to workforce ecosystems, conducting recruitment campaigns featuring clean energy workers as “energy heroes,” and driving recruitment and retention by prioritising job quality
	Job Security (Expected Exponential Growth in BE Jobs)	Found that electrifying all of California’s existing and new buildings by 2045 would create over 100,000 full-time equivalent jobs in various sectors of the economy.
	High Wages	The U.S. Energy and Employment Report found that energy sector employees earn higher hourly wages compared with the national median and other sectors of the economy; this is true across all energy technology sectors.
Narrow Pool of Skilled Workers	Training and Access Programs	Many occupations within the clean energy economy tend to have lower educational requirements, which include occupations like electricians, carpenters and plumbers. However, training programs are required for entry
	Retraining Resources	Extended unemployment or wage replacement, retraining, relocation assistance, and wage insurance
Accessibility to Training	Online Education Programs and Webinars	Building up online presence with more live webinars and pre-recorded resources so information can be accessed more quickly and easily at times that best suit their business,
	Access For Underrepresented Populations	Recent data finds that 61% of the clean energy job holders across the United States are white non-Hispanic workers, with Black and Hispanic or Latino workers underrepresented as compared with the national average.
	Focus On Areas Affected by the Energy Transition	Provide skills-based hiring connections, workforce development and community support for communities affected. In 2019, nearly 1.7 mil people worked in these industries, because these jobs are typically geographically concentrated in certain counties
Job Requirements and an Evolving Labor Market	On The Job Training (Earn-as-you-learn) Programs	On-the-job learning through registered apprenticeships and experiential learning is especially helpful in the clean energy sector given the large role of tacit knowledge and the abundance of positions not requiring an associate or bachelor’s degree.
Existing Barriers From Workplace Development	Constant Creation and Updating of Current Workforce Programs	Current workforce development programs may have unintentional barriers that make the programs inaccessible to segments of the public. This includes requirements for certain educational attainment that may not be possible for some applicants.
Transition to Alternate Trades	Increase Retention Due To Bonuses	Retention and relocation bonuses to keep skilled and trained workers, Pension guarantee, and a "glide path" to retirement for older workers, training completion bonuses
	Incentivize Training Programs	In some programs researched, incentives were paid to qualified participating contractors. Air-source heat pump contractors had the option to keep the entire incentive amount or pass a portion on to the customer/end user.
Significant Amount of Retirements	New Federal Funding Available to Fund Workforce Development	The Infrastructure Investment and Jobs Act will provide at least $60 million to state and local energy efficiency workforce development programs. The funding is for training and education needs, including activities that address workforce gaps.
Cost of Programs	Minimise Costs of Above Programs	Displaced workers are guaranteed re-employment in jobs in the growing low-carbon economy, the electricity industry, or within the public sector.
	Promote Economic Opportunities with Stakeholders	By partnering with employers, labor organizations and other stakeholders, local elected officials can make a real impact in reducing workforce disparities and creating well-paying career opportunities
	Collaboration with Educational Institutions	Provide training and credentialing programs can prepare students for building retrofit jobs and address the workforce needs

- A lot of good ideas, but the costs and/or impacts of various strategies to date is not widely reported

Source: Energeia Research

Key Workforce Development Strategies

Workforce Development Strategies, Costs and Impacts

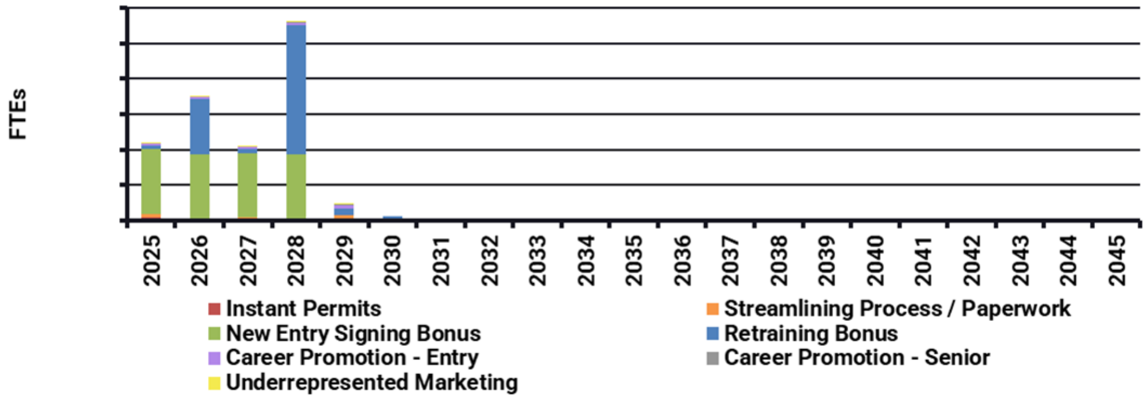
Strategy	Cost to SJCE ($)	Estimated Impact	Freq.
New Entry Signing Bonus	$5,000 per FTE	1 FTE	Annual
Retraining Bonus	$500 per FTE	1 FTE	Annual
Career Promotion	$10,000	2.5% increase in New FTEs	Annual
Underrepresented Marketing	$10,000	2.5% increase in New FTEs	Annual

Source: Energeia Estimates

- Energeia developed a set of strategies that address key workforce barriers, and capture estimated costs and workforce impacts of each
- Entry Level bonus reflects the average signing incentives provided to new entrants upon completing training in trades such as HVAC, electrical, and plumbing, based primarily on actual California industry data
- Retraining bonus is based on a Silicon Valley Clean Energy's (SVCE) Future Fit Fundamentals Program that offered a $500 training incentive to those who completed a training course
- Percentage impacts represent estimated values
- Energeia developed an estimate of the cost of process improvements and advertising campaigns based on experience, but these numbers should be validated

Workforce Development Roadmap

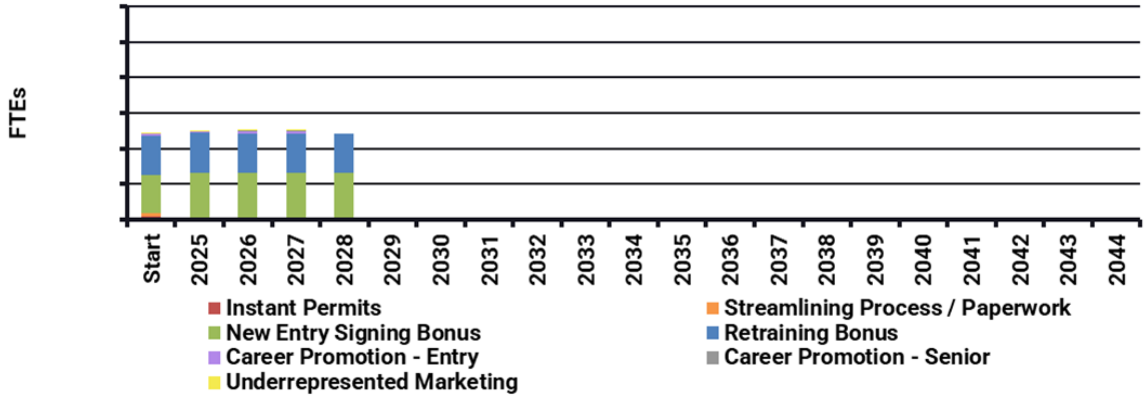
Workforce Development Roadmap by Strategy



Source: Energeia Modelling

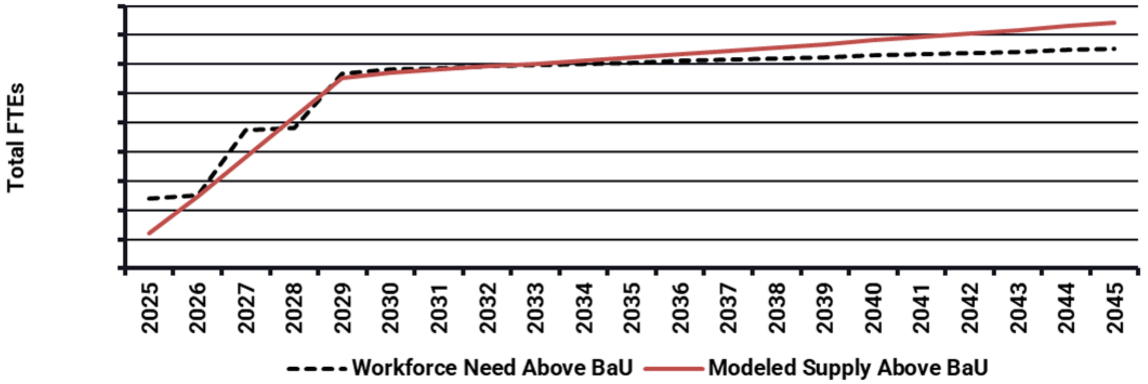
- The annual impacts of the workforce development program were estimated
    - Includes strategies for increasing the efficiency of the existing workforce, e.g., instant permits and streamlining
- The plan was smoothed to reflect the realities of hiring and program implementation (ideally, it should ramp up)
- The resulting workforce transition is shown below against the target needed to hit the building electrification goals
- Energeia recommended revisiting the plan each year due to the lack of readily available data on program impacts

Smoothed Workforce Development Strategy



Source: Energeia Modelling

Workforce Need Above BaU vs Modeled Supply



Source: Energeia Modelling

Takeaways and Recommendations

Takeaways and Recommendations

- **Takeaways**
  - Achieving federal, state and city decarbonisation targets will require significant workforce development
  - The impacts across the electric, natural gas, refined product, and utility sectors vary significantly by pathway
  - Best practice government and utility policy planning includes assessment of impacts, and workforce development strategies and plans
  - Workforce planning can effectively manage the transition in a timely and equitable basis
  - Workforce development infrastructure will need to grow and change to meet expected workforce development needs
  - Workforce development funding will need to grow to meet growing transition targets, and is a key gap at the moment
- **Recommendations**
  - Ensure that transition policy planning includes workforce impact and optimisation assessments, development strategies, plans and funding
  - Engage with workforce early to identify and address local issues and potential strategies, or risk significant pushback
  - Understand the timing and mix of workforce impacts, and develop strategies to ensure an equitable, timely transition
  - Significant education and support likely to be needed across a wide range of sectors, ensure programs and funding are commensurate

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Thank You!

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