Powering Skills Organisation Ltd

Foundation for Energy

Literacy and Numeracy for Energy Jobs

Final Report

Executive Summary

Australia's energy sector faces a workforce challenge that requires both growing the pipeline of new commencements and boosting completion through better preparedness.

The transition to net zero is accelerating demand for skilled trades workers, particularly electricians and related electrical trades, faster than the current system can supply them. The onshore apprenticeship system is the primary mechanism for building this future workforce. Yet three in ten apprentices who commence training do not complete.[1] For many, the factors contributing to non-completion may be foreseeable and therefore preventable.

The Foundations for Energy: Literacy and Numeracy for Energy Jobs project, led by Powering Skills Organisation (PSO), investigated one issue consistently raised by stakeholders in the apprenticeship system potentially holding back growth: foundational skills.

The project examined how these foundational skills, defined as literacy, language and numeracy (LLN), are developed across Australian secondary schooling relative to what's needed for vocational education and training (VET) and the energy trades; and how any gaps, confusion or inconsistencies between these domains may be affecting workforce growth now and in the future.

Delivered across four stages, the project applied a consistent Australian Core Skills Framework (ACSF) methodology across school curricula, VET qualifications, and occupational requirements.[2] The findings provide a basis for the development of targeted interventions and recommendations, while also feeding into PSO's overarching workforce planning agenda.

[1] PSO (2025). Workforce Plan 2025 – High Load, Short Supply. https://poweringskills.com.au/wp-content/uploads/2025/08/PSO_2025_WorkforcePlan_v24_WEB.pdf

[2] The full project detailed here: PSO (2026). Foundation for Energy: Literacy and Numeracy for Energy Jobs https://poweringskills.com.au/project/foundation-for-energy-literacy-and-numeracy-for-energy-jobs/

Secondary school numeracy pathways often fall below apprenticeship requirements.

The central finding is a numeracy gap within the LLN domain. Many commonly selected senior secondary pathways produce numeracy abilities at or below ACSF Level 3, while energy apprenticeships, particularly in electrotechnology, require ACSF Level 4 numeracy, including algebra, trigonometry, and the interpretation of complex technical information.

Notably, this gap is not because numeracy content is absent from school curricula. The pathways and subjects are available. Rather, the issue appears to stem from the subjects students choose, or are encouraged toward, not always aligning with the level of mathematical complexity required in later stage energy trade training.

The project identified two key points at which this gap becomes visible.

- In Years 9 and 10, when students make subject selections that shape their numeracy trajectory for years to come. At this stage, prospective energy apprentices may select subjects without a clear understanding of the mathematical demands associated with their intended career pathway, often resulting in lower-level numeracy subject choices.
- In the first and second years of the Certificate III apprenticeship, numeracy demands escalate sharply. Assessment reattempt data from core electrotechnology units indicates numeracy is a primary source of assessment difficulty during this period.

Outside this numeracy gap, the project suggests that the literacy and language dimensions of LLN do not present in the same problematic way. While important for broader participation and workplace capability, they do not appear to constitute a significant barrier.

The project uncovers emerging challenges for the future energy workforce: including growing demand for energy trades amid declining numeracy and apprenticeship non-completion.

The project strongly suggests that this numeracy gap may be a contributing factor in the non-completion of energy apprenticeships. The stage at which 85% of electrical apprenticeship cancellations occur is also the stage at which numeracy demands escalate sharply and assessment reattempts peak.[3] It is reasonable that attrition would increase when higher-than-expected mathematical requirements intersect with underdeveloped numeracy.

The project also uncovers an emerging challenge for Australia's future energy workforce. Demand for electricians continues to grow, while electrician remains one of the most popular career choices nationally, representing a large pool of potential apprentices.[4] The finding that many students may not be prepared for electrical apprenticeships becomes a much larger problem in this context. At scale, this could reduce the number of apprentices successfully progressing into the industry at a time of unparalleled trade demand. This challenge may be compounded by national declines in average LLN scores across all students, particularly numeracy.[5]

More positively, the project also identifies a student cohort that may be well suited to energy trades but is likely overlooked at present: mathematically capable and scientifically oriented students. The energy trades could be legitimately presented as STEM-aligned career pathways that match the strengths of these students. Low awareness of this pathway for students and those that can influence career choices at present may limit the attraction of significant talent to an industry needing growth.

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[3] National Centre for Vocational Education Research (NCVER). (2025). NCVER DataBuilder extract (Apprentices and trainees, Dec quarter 2024), electrotechnology trades, commencements 2022–2024, cancellations by year since commencement. https://vocstats.ncver.edu.au/webapi/jsf/login.xhtml

[4] Year13. (2024). Year13 Careers Index 2024 reveals the Most popular Jobs for School Students. https://year13.com.au/business/media-centre/year13-careers-index-2024-most-popular-jobs-for-school-students

[5] OECD. (2022). PISA 2022 Results (Volume I and II) – Country Notes: Australia. https://www.oecd.org/en/publications/pisa-2022-results-volume-i-and-ii-country-notes_ed6fbcc5-en/australia_e9346d47-en.html

The project enabled a range of recommendations including the need for earlier intervention in schools around numeracy development and enhanced career guidance

This project has generated substantial new evidence about where LLN demands are concentrated across energy trade pathways, at what points those demands emerge, and how gaps in foundational skills, particularly numeracy, affect apprenticeship progression and future workforce supply. Drawing on the occupational analysis, curriculum analysis, and gap identification conducted across the project stages, several high-level recommendations and intervention priorities are now clear.

Improving numeracy for prospective energy apprentices is one of the highest-leverage actions available to the industry, and responsibility for that improvement is shared across the entire pipeline, from junior secondary school through to the structure of first and second-year apprenticeship training itself. The first intervention point is not the apprenticeship; it is a clearer understanding of LLN requirements reaching students, families, and advisors as early as Years 7 and 8, so that subject choices in Years 9 and 10 are made with full awareness of what energy trades actually demand. The last intervention point is equally important: the project's analysis found that numeracy demands within electrotechnology training escalate sharply in the latter part of first year and into second year.

The limited scaffolding to support that progression, is a structural issue within VET curricula that no amount of better school preparation alone can fully resolve. The curriculum analysis confirmed that energy trade training demands ACSF Level 4 numeracy, yet many students enter apprenticeships having completed school pathways that develop numeracy only to Level 3, a gap that is structural, measurable, and consequential. Schools career guidance systems (schools, career advisors, and families) require clear and consistent communication that subjects such as General Mathematics, or their jurisdictional equivalents, represent a minimum entry threshold rather than the extent of mathematical preparation recommended for students intending to pursue energy trades. This does not require new subjects or new infrastructure. It requires clearer, better-targeted information reaching students before they lock in subject choices for senior schooling, and a commitment from Registered Training Organisations (RTOs) and industry to scaffold numeracy more deliberately through the early years of trade training. Bridging supports, including free and accessible resources, remain important for students who reach key transition points underprepared. However, they are likely to be most effective when embedded within clear and supported pathways rather than used only as last-resort interventions. Equity is non-negotiable here. Students without engaged families, informed schools, or supportive employers are most exposed at every critical transition point, and the current system does not serve them well. Closing that gap requires deliberate design, not goodwill.

More broadly, these findings for the energy sector provides an example of how declining LLN capability in the school system may have flow on effects for workforce supply in strategic growth industries over time if left unresolved. Concerns about literacy and numeracy preparedness have also been reported across multiple industries, with industry groups arguing that schools need to better prepare students with minimum literacy and numeracy capability before workforce entry. This project puts specific, quantified evidence behind those concerns for the energy sector. The next step is to use it: to inform curriculum review conversations, to sharpen pre-apprenticeship screening and support, to brief policymakers on the workforce supply risks of leaving the school-to-trade pipeline misaligned, and to ensure that the findings reach the students, families, and advisors who are making subject and pathway decisions right now. The cost of inaction is not abstract, it is measured in incomplete apprenticeships, skills shortages in a sector critical to Australia's energy transition, and young people who entered a pathway without the preparation they deserved.

Further recommendations and actions are expected as PSO and stakeholders continue to review, share, and integrate these findings into ongoing workforce, policy, and advocacy work.

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Introduction

Australia's energy sector faces significant workforce challenges. The opportunity of a net zero economy has driven unparalleled demand for more qualified energy tradespeople. Without intervention a shortfall of around 42,000 energy trades workers by 2030 is forecast, expanding further to 2040 and 2050.[6] This projected shortfall may now be larger given the addition of data centres.

While there are no quick fixes and a range of complex factors at play, evidence-based interventions and policy development within the national apprenticeship system remain a primary means of building the future workforce.

This research project was motivated by consistent concerns raised through industry consultation regarding foundational skills in this energy apprenticeship pathway.

These concerns were twofold: that foundational skills and LLN may be affecting apprenticeship progression and completion, and that sufficient evidence about the nature, implications and resulting actions to address expected issues had not yet been established.

For example, consultation undertaken for the 2025 Workforce Plan identified LLN skills under the Capability success factor as an area requiring further investigation. In 2026 consultations, employers continued to report LLN capability as a gap among applicants, particularly difficulty passing components of apprenticeship entry testing.[7]

Earlier industry investigations also found that around half of the 4,000 candidates tested for electrical apprenticeships failed LLN assessments.[8] Employers further reported that apprentices with weak foundational skills often struggled to progress, repeatedly failed assessments, and eventually disengaged from training.

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[6] PSO (2025). Workforce Plan 2025 – High Load, Short Supply. https://poweringskills.com.au/wp-content/uploads/2025/08/PSO_2025_WorkforcePlan_v24_WEB.pdf

[7] PSO (2026). 2026 Energy Workforce and Skills Survey – internal analysis.

[8] ABC News (2013). Half of electrical apprentices fail basic numeracy and literacy tests. https://www.abc.net.au/news/2013-11-01/apprentices-failing-basic-numeracy-and-literacy-tests/5064902

PSO's Foundations for Energy: Literacy and Numeracy for Energy Jobs project was initiated to clarify these issues and build the associated evidence base for intervention.

The project was undertaken to better understand which LLN capabilities matter across energy trade pathways, where those demands emerge, and how they may affect apprenticeship progression and future workforce supply.

Delivered across four stages – desktop research, occupational analysis, curriculum analysis, and gap identification – the project maps where literacy and numeracy capabilities develop, where they fall short, and where targeted action is most likely to improve outcomes.

This Final Report synthesizes findings across all four stages of the project.

It begins with a brief overview of each stage and the approach used. The main section then presents an integrated analysis of stages one to four, outlining the key pieces of evidence as they were revealed. This is followed by a consolidation of the findings and their implications, including general recommendations emerging from the project.

More recommendations and further actions are expected in future as PSO and stakeholders digest, share and integrate these findings into various streams of activity.

Project scope and approach

The project was delivered in four interrelated stages, each building on the findings of the previous stage to develop a comprehensive evidence base.

Stage 1
Desktop Analysis

A literature review and gap analysis examined national and international research, policy frameworks and datasets relating to literacy and numeracy in schooling, VET pathways and energy sector workforce requirements. This stage identified persistent literacy and numeracy skills gaps, limitations of existing benchmarking frameworks, and early evidence of misalignment with industry needs.

Stage 2
Occupational Analysis

Key energy sector occupations were analysed to identify literacy, numeracy and learning requirements embedded in everyday tasks. These requirements were mapped against relevant VET qualifications and units of competency to assess alignment and divergence across trades and technical roles.

Stage 3
Curriculum Analysis

A structured comparison framework grounded in the Australian Core Skills Framework (ACSF) was applied to senior secondary school curricula across jurisdictions. This analysis compared school based learning outcomes for Numeracy, Literacy and Learning with the functional demands of early energy trade training.

Stage 4
Gap Identification and Recommendations

Education to employment pathways were mapped from Year 9 through to early apprenticeship. Critical transition points were identified and analysed in relation to literacy and numeracy development, apprentice outcomes and system alignment.

Together, the four stages provide a robust, evidence based foundation for understanding where pathways succeed, where they falter, and where targeted intervention is most likely to improve outcomes.

Integrated analysis of stages one to four

Stage One – Literacy and numeracy in schooling

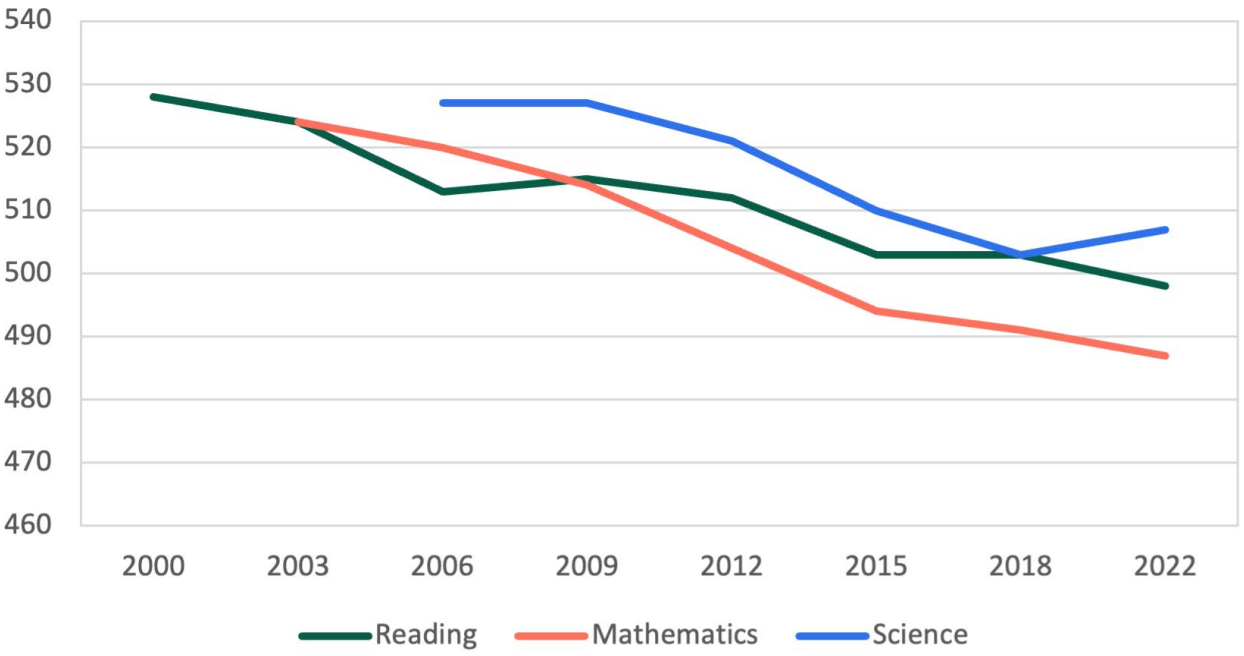
Stage one of the project identified persistent gaps in core literacy and numeracy achievement across Australian schooling, with significant implications for workforce readiness in technically demanding sectors such as energy. National assessment data indicates that approximately one in three students across Years 3, 5, 7 and 9, does not meet minimum literacy and numeracy benchmarks, with higher proportions among disadvantaged, regional and Indigenous cohorts.[9] These findings establish the system wide context within which transitions to vocational pathways occur.

This picture is reinforced by international evidence (**Figure 1**). Australia's results in the Programme for International Student Assessment show a sustained decline across all three domains – reading, mathematics and science – between 2000 and 2022. Mathematics mean scores fell from 524 in 2003 to 487 in 2022, a drop of 37 points over less than two decades. Reading and science scores follow a similar downward trajectory over the same period.[10] For sectors such as energy, where vocational training demands numeracy at levels that already exceed what many school pathways produce, a declining baseline make the existing misalignment harder to close.

[9] Duffy, C., & Young, E. (2024). NAPLAN results reveal one in three students not meeting basic literacy and numeracy expectations. ABC News Online, https://www.abc.net.au/news/2024-08-14/naplan-results-2024-revealed/104205514

[10] OECD. (2022). PISA 2022 Results (Volume I and II) – Country Notes: Australia. https://www.oecd.org/en/publications/pisa-2022-results-volume-i-and-ii-country-notes_ed6fbcc5-en/australia_e9346d47-en.html

Figure 1: Australian average scores on reading, mathematics and science.[8]



While national frameworks such as the ACSF and the Australian Qualifications Framework (AQF) provide a shared language for describing literacy and numeracy capability, the Stage 1 analysis found that these frameworks do not diagnose curriculum level gaps or identify how effectively skills are developed and retained through schooling.[11, 12]

As a result, they offer limited insight into whether students are functionally prepared for specific occupational contexts, particularly energy sector trades that require applied mathematical reasoning and interpretation of technical information.

[11] McLean, P., Perkins, K., Tout, D., Brewer, K., & Wyse, L. (2012). Australian Core Skills Framework. https://research.acer.edu.au/transitions_misc/12/

[12] Australian Qualifications Framework Council (AQF Council). (2013). Australian Qualifications Framework, Second Edition. https://www.aqf.edu.au/download/405/aqf-second-edition/3/aqf-second-edition/pdf

Numeracy emerged as a recurring area of concern across the literature. Although numeracy content is present in school curricula, evidence suggests that many students do not achieve or retain the level of complexity required for vocational pathways.[13] Underperformance in numeracy is compounded by declining participation in mathematics during senior secondary schooling, with students frequently selecting lower demand subjects or discontinuing mathematics entirely.[14, 15]

Stage one also highlighted gender based patterns in achievement and participation. On average, girls tend to outperform boys in literacy while boys demonstrate higher participation and performance in mathematics. These patterns influence subject selection and career expectations, with implications for access to energy sector careers and for workforce diversity, issues that become visible later in the education to employment pathway.[12]

[13] Jobs and Skills Australia. (2023). The Clean Energy Generation: Workforce needs for a net zero economy. Australian Government. https://www.jobsandskills.gov.au/work/clean-energy-capacity-study

[14] Reid O'Connor, B. and Zunica, B. (2025). How do we get more Year 12s doing maths? The University of Sydney. https://www.theconversation.com/how-do-we-get-more-year-12s-doing-maths-264337

[15] Mathematics Hub. (2024). Maths in construction – and other trades that count. https://www.mathematicshub.edu.au/students/student-resources/careers-with-maths/maths-in-construction-and-other-trades-that-count

[16] Australian Education Research Organisation. (2023). Supporting secondary students lacking foundational literacy and numeracy skills: Plain language summary. https://www.edresearch.edu.au/sites/default/files/2023-07/secondary-students-lacking-literacy-numeracy-skills-summary.pdf

Stage Two – Energy trade requirements

Stage two examined the literacy, numeracy and learning requirements of selected energy sector occupations, including electricians, electrical fitters, air conditioning and refrigeration mechanics, gas service technicians, electrical distribution workers and power generation plant operators. The roles examined and their aligned Certificate III qualifications are summarised in **Figure 2**.

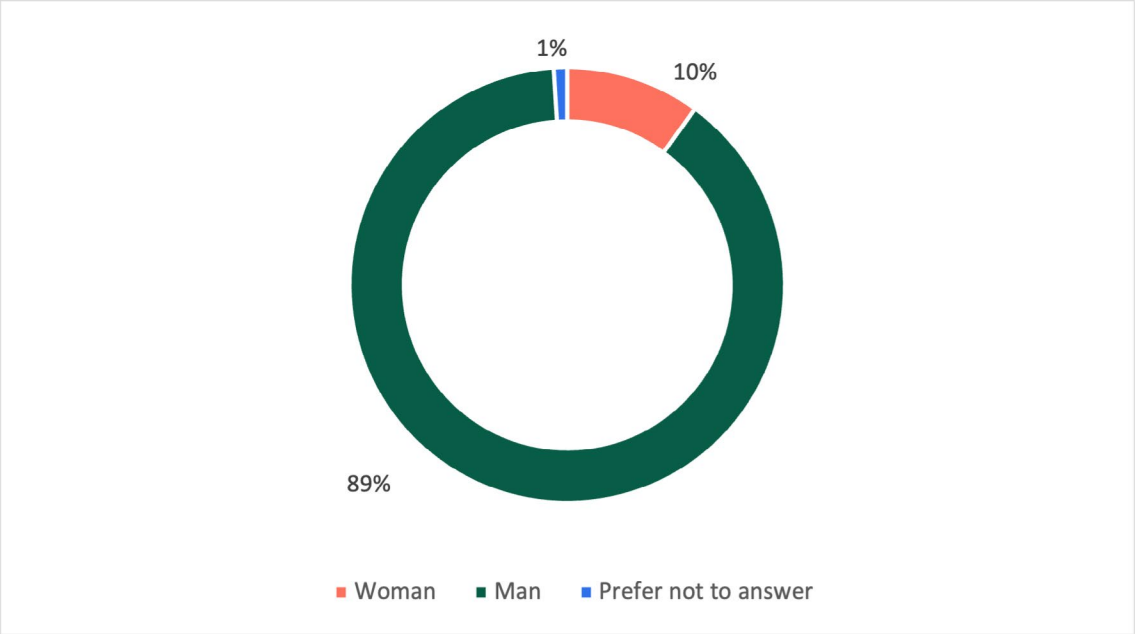
Figure 2: Alignment between job roles examined and qualifications.

Energy Sector Role	ANZSCO Code	VET Qualification
Electrician (General)	341111	UEE30820 – Certificate III in Electrotechnology Electrician
Air Conditioning and Refrigeration Mechanic	342111	UEE32225 – Certificate III in Air Conditioning and Refrigeration
Electrical Fitter	341111	UEE33020 – Certificate III in Electrical Fitting
Gas Service Technicians and Pipeline Technician Operators	334114	UEG30122 – Certificate III in Gas Supply Industry Operations
Power Generation Plant Operator	399213	UEP30322 – Certificate III in ESI Generations
Electrical Distribution Trades Worker	342200	UET30621 - Certificate III in ESI Distribution Overhead
Electrical Lineworker	342211	UET30521 – Certificate III in ESI Transmission Overhead

The analysis of literacy and numeracy requirements for the selected occupations was informed by data obtained from survey responses. In total, 83 responses were recorded for this assessment.

The participation data shows significant gender imbalance across energy sector occupations.[17, 18] As per the current make-up of the industry, the level of responses from women were considerably lower than those from men (**Figure 3**). This workforce characteristic reinforces the importance of strong, transparent and equitable pathways from schooling into energy careers.

Figure 3: Distribution of survey responses by gender.

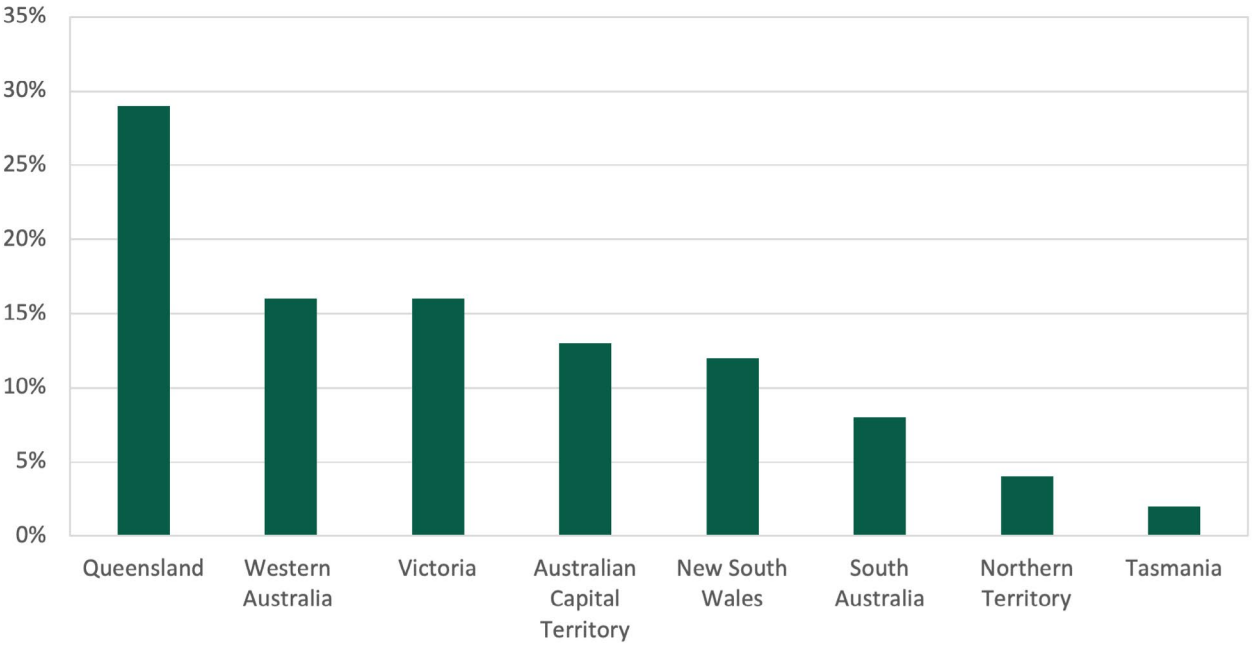


[17] National Centre for Vocational Education Research (NCVER). (2025). NCVER DataBuilder extract (Apprentices and trainees, Dec quarter 2024), electrotechnology trades, commencements 2022–2024, cancellations by year since commencement. https://vocstats.ncver.edu.au/webapi/jsf/login.xhtml

[18] Jobs and Skills Australia. (2025). Occupational profiles [Dataset]. https://www.jobsandskills.gov.au/data/occupation-and-industry-profiles

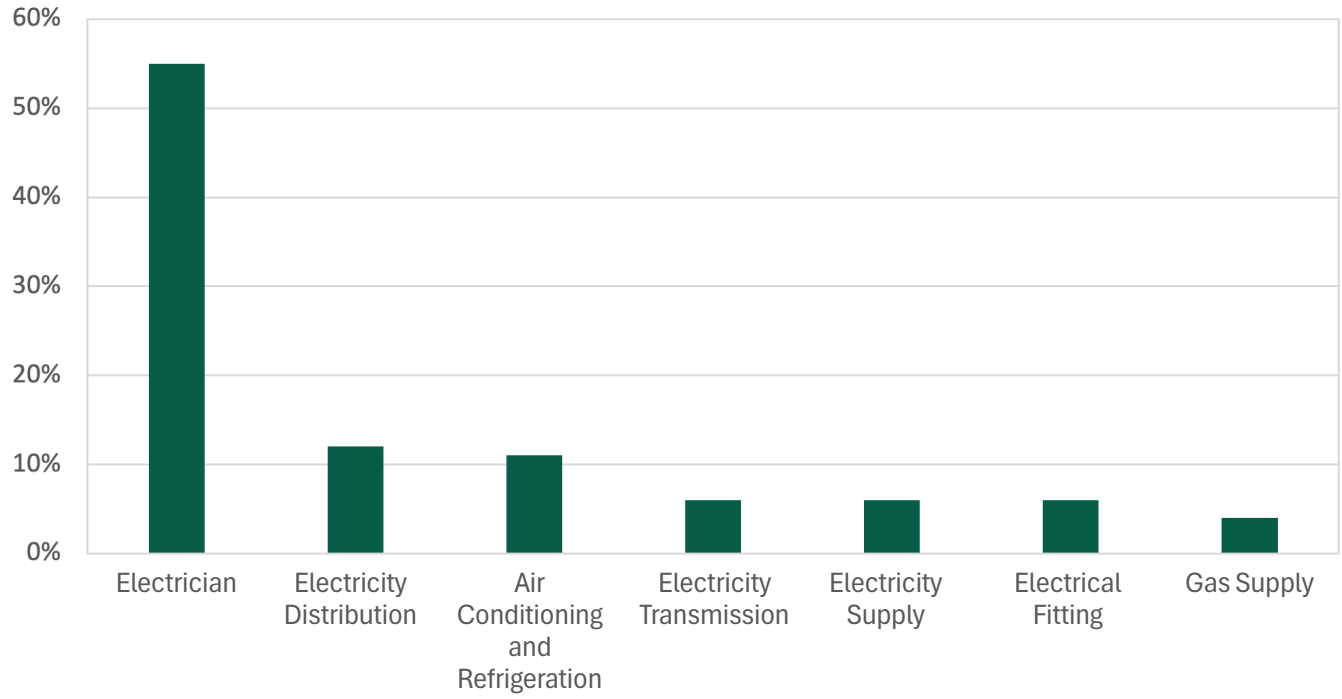
Responses were received from all jurisdictions nationwide (**Figure 4**). Queensland, New South Wales, and Victoria have the highest proportion of apprentices currently training within the energy sector. Although Queensland yielded the largest number of responses, notable contributions were also recorded from New South Wales and Victoria.

Figure 4: Geographic distribution of survey responses.



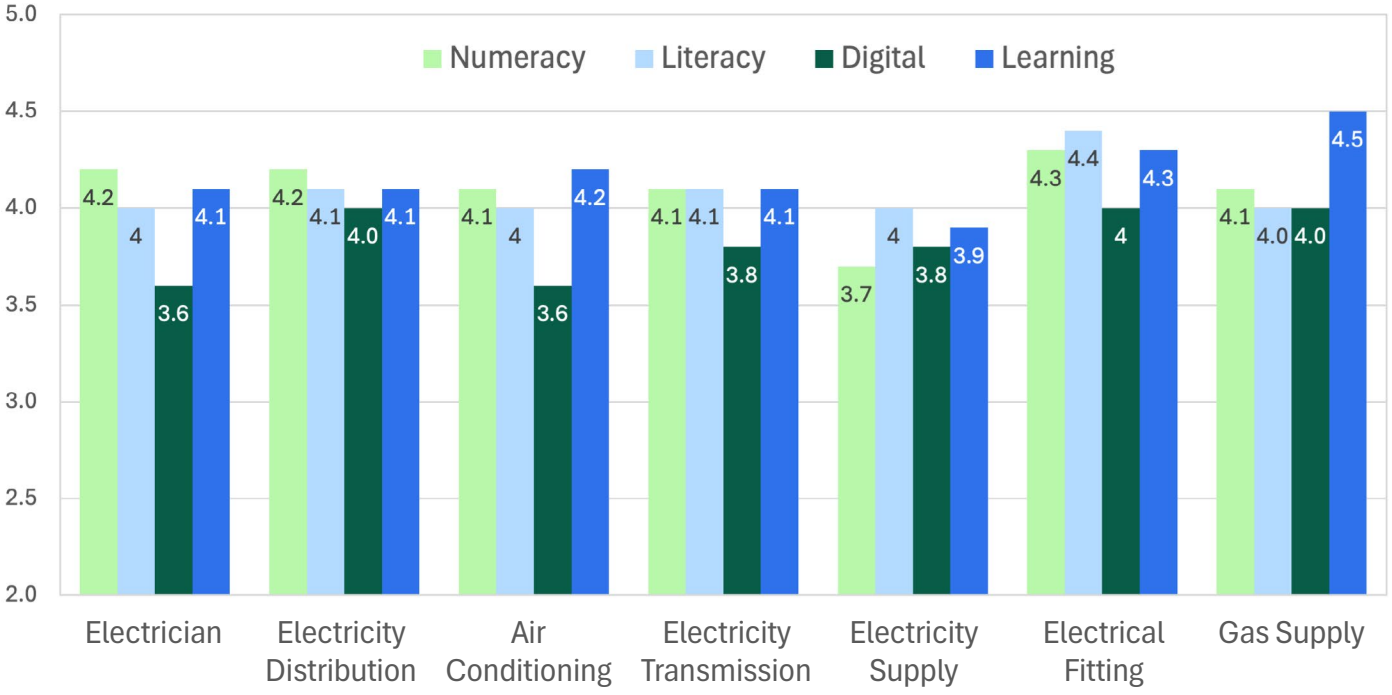
Over half of all survey respondents (more than 55%) were Electricians, reflecting their predominance in the energy sector (**Figure 5**). The remaining responses were distributed across the range of other industry occupations, indicating broad engagement throughout the sector.

Figure 5: Occupational representation of survey respondents.



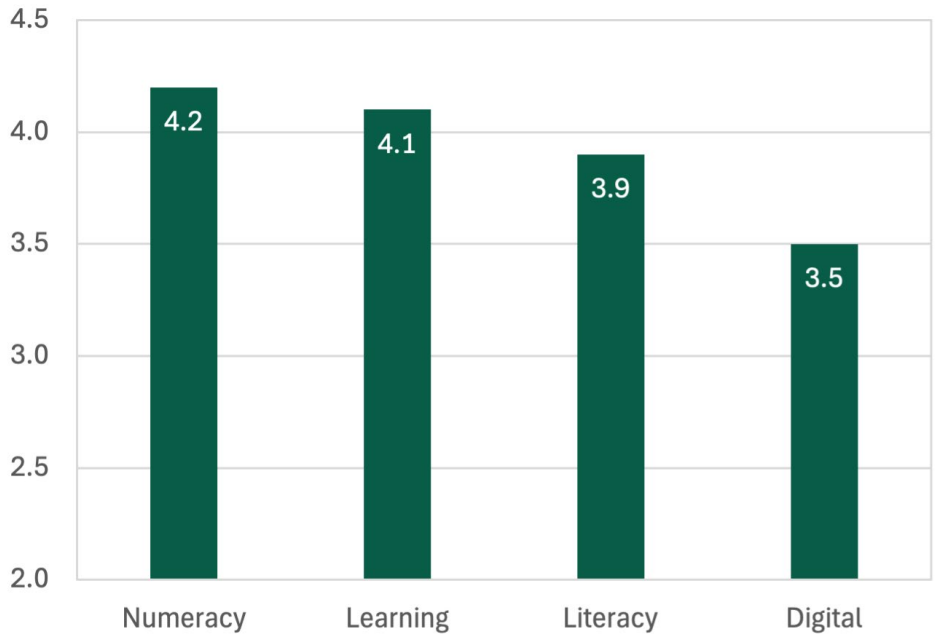
Analysis of occupational tasks demonstrated that energy sector roles place sustained demands on numeracy, particularly the ability to interpret symbols, diagrams and technical documentation, apply algebra and measurement in practical contexts, and solve problems accurately under safety critical conditions. Across occupations, these expectations are complemented by high demands for clear oral communication and the capacity to manage learning in dynamic work environments (**Figure 6**).

Figure 6: Priorities for apprentices by occupation.



Overall, the analysis indicates the importance of numeracy, followed by learning capability for apprentices in these occupations. **Figure 7** illustrates the overall average priorities for apprentices allocated across the four domains of Literacy, Numeracy, Learning and Digital Literacy.

Figure 7: Average priorities for apprentices across all surveyed energy occupations.



Mapping core skills to VET qualifications

The various core skills that were identified in the literacy and numeracy requirements analysis exercise for the selected energy sector occupations were mapped to related VET qualifications. This mapping of occupational core skills to VET qualifications revealed substantial alignment among core electrical trades (**Figure 8**). Electricians, electrical fitters, electrical distribution workers and lineworkers share a strong technical foundation and a common set of core competency units. As a result, the electrician trade frequently functions as a benchmark for skill and training expectations across the energy sector.

Figure 8: Units of Competency aligned to energy trades.

Energy Trade	VET Qualification	Core Units	Elective Units
Electrician (General)	UEE30820 – Certificate III in Electrotechnology Electrician	27	74
Air Conditioning and Refrigeration Mechanic	UEE32225 – Certificate III in Air Conditioning and Refrigeration	27	37
Electrical Fitter	UEE33020 – Certificate III in Electrical Fitting	21	82
Gas Service Technicians and Pipeline Technician Operators	UEG30122 – Certificate III in Gas Supply Industry Operations	6	137
Power Generation Plant Operator	UEP30322 – Certificate III in ESI Generations	9	101
Electrical Distribution Trades Worker	UET30621 - Certificate III in ESI Distribution Overhead	20	26
Electrical Lineworker	UET30521 – Certificate III in ESI Transmission Overhead	17	15

Learning capability was identified as a consistent requirement across all occupations examined. Apprentices are expected to operate as self managed learners, demonstrating initiative, adaptability and responsibility for their own development. These expectations align with ACSF Level 4 learning capability and are critical for safe and effective participation in energy sector training and employment.[19]

[19] Department of Employment and Workplace Relations (DEWR). (2025). Australian Core Skills Framework (ACSF). Australian Government. https://www.dewr.gov.au/foundation-skills/australian-core-skills-framework-acsf

Stage Three – Curriculum alignment findings

The Curriculum Analysis in Stage 3 of the Project detailed the systematic process undertaken to evaluate the alignment between secondary school curricula and the literacy and numeracy competencies required in the energy sector. This approach encompassed the development of a structured framework for comparison, the collection and analysis of curriculum content from multiple jurisdictions, and a thorough comparative assessment to identify alignment, gaps, and opportunities for improvement. By following this methodology, the analysis aimed to ensure that educational pathways effectively prepare students for further training and careers within the energy industry.

Energy trade analysis scope

Although a specific set of qualifications within the energy sector was identified for focused analysis, the findings from Stage 2 of the Project highlighted the interconnectedness among these qualifications (**Figure 9**).

Figure 9: Energy trade qualifications identified for analysis.

Trade Qualification	Core	Electives	Overlap %	Electrician Overlap %
Electrician (General) (UEE30820)	27	74	76%	
Air Conditioning and Refrigeration Mechanic (UEE32225)	27	37	34%	17%
Electrical Fitter (UEE33020)	21	82	83%	75%
Gas Service Technicians and Pipeline Technician Operators (UEG30122)	6	137	10%	1%
Power Generation Plant Operator (UEP30322)	9	101	12%	2%
Electrical Distribution Trades Workers (UET30621)	20	26	50%	24%
Electrical Lineworker (UET30521)	17	15	75%	25%

Due to the overlap between the Electrician and Air Conditioning and Refrigeration Mechanic trades and considering that the Air Conditioning and Refrigeration Mechanic trade is the only other trade with a significant number of apprentices, the analysis focused on a core set of units of competency rather than analysing the entirety of each trade.

Comparison framework

A structured approach was developed to systematically evaluate the alignment between secondary school curricula and the literacy and numeracy competencies required in the energy sector. This framework served as a foundation for mapping curriculum outcomes from Years 9 – 12 against the expectations of energy sector roles and related VET qualifications. By employing a matrix or rubric to facilitate direct comparison, the framework enabled the identification of strengths, gaps, and opportunities for improved alignment.

Use of the ACSF

Primary and secondary education serve to cultivate essential core skills, such as literacy and numeracy, alongside subject-specific competencies that support continued learning and effective participation within society. In contrast, VET focuses on the application of both core and specialised skills, equipping individuals with practical capabilities necessary for targeted workplace functions.

The ACSF, which covers learning, reading, writing, oral communication, and numeracy, and defines five performance levels with several variables, was selected as the benchmark for evaluating both secondary school subject outcomes and the requirements of VET units of competency.[20] This approach enabled a consistent assessment of the skill levels that secondary schools can support students in developing, as well as the skill levels required for students to successfully undertake trade-related VET units. Using a single benchmark for these dual purposes ensures comparability and clarity in determining preparedness for further vocational training.

[20] McLean, P., Perkins, K., Tout, D., Brewer, K., & Wyse, L. (2012). Australian Core Skills Framework. https://research.acer.edu.au/transitions_misc/12/

Numeracy analysis

The numeracy analysis applied a structured method to assess the numeracy demands embedded in selected senior secondary subjects and compared them with the numeracy requirements of entry-level VET pathways for energy sector roles. The ACSF was used as the common benchmark to support consistent coding and comparison across different jurisdictions and curricula. A key feature of the approach was the aggregation of detailed curriculum content into higher-level results that remain interpretable and useful for judging alignment between schooling outcomes and vocational expectations.

To better reflect realistic student capability, outcome levels derived from school curricula were adjusted to account for typical achievement patterns. Evidence from Queensland and Victoria indicated that only a portion of assessed curriculum content is mastered by a large share of students, supporting the use of a downward "achievement" adjustment factor. This adjustment is positioned as necessary for representing student proficiency more accurately than an assumption of full curriculum mastery, while also remaining open to refinement through further discussion.

Alignment to VET requirements was treated as more complex than a direct comparison of school subject levels. Research highlights a persistent disconnect between formal school mathematics performance and functional numeracy in trade contexts, and vocational tasks vary in both complexity and consequence.[21] In safety-critical domains such as electrical work, performance expectations are higher than for routine tasks, prompting consideration of an upward adjustment of VET requirement settings via a "criticality" factor to account for safety and non-routine demands.[22]

A weighted scoring approach was introduced to combine these considerations in a transparent calculation. This method was then applied across a defined set of mathematics and related subjects from ACARA jurisdictions, Victoria, NSW, WA, and Queensland, noting that higher-level mathematics participation is not compulsory in Years 11–12 across Australia.

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[21] Goos, M,. Geiger, V., & Dole, S. (2014). Transforming professional practice in numeracy teaching. In Y. Li, E. Silver, & S. Li (Eds.), Transforming mathematics instruction: Multiple approaches and practices (pp81-102). New York, NY: Springer.

[22] Safe Work Australia. (2025). Model Work Health and Safety Regulations. Part 4.7 General Electrical Safety in Workplaces and Energised Electrical Work. https://www.safeworkaustralia.gov.au/sites/default/files/2025-12/model-whs-regulations-5_december_2025.pdf

The analysis identified numeracy as the most significant area of misalignment between secondary schooling and energy sector vocational training. While a range of senior secondary mathematics and science subjects include numeracy content aligned to ACSF Levels 3 and 4, aggregation and scaling analysis demonstrated that effective numeracy achievement is often lower than curriculum intent once realistic student performance and skill retention are taken into account.

Appendix 7.1 presents the numeracy aggregation model output of the school curricula analysis, providing ACSF-based numeracy indicators for various subjects based on the aggregation model. The analysis highlights that many commonly selected senior secondary pathways develop effective numeracy capability at or below ACSF Level 3, whereas energy sector vocational education and training requires ACSF Level 4 or higher.[23] This mismatch relates primarily to complexity and transferability rather than absence of numeracy content in school curricula.[21]

Literacy analysis

The literacy analysis focused on the core literacy capabilities apprentices require to successfully complete complex written tasks and interpret technical materials, including industry Standards (e.g., AS/NZS 3000 Electrical Installations) and trade texts (e.g., Electrotechnology Principles and Practice).

The analysis assumes literacy is retained and adapted over time rather than readily lost, consistent with the view of literacy as a social practice.[24] Ongoing participation in community and workplace contexts is treated as supportive of literacy maintenance. Accordingly, the project applied no scaling factors or alternative adjustments when carrying literacy levels from secondary schooling into VET expectations.

Literacy content was aligned to the ACSF by documenting the ACSF level for relevant content areas in reading and writing, with the analysis limited to foundational processes. In particular, the mapping emphasises ACSF performance indicators ".04 Reading strategies" and ".06 The mechanics of writing".[20]

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[23] Department of Employment and Workplace Relations (DEWR). (2025). Australian Core Skills Framework (ACSF). Australian Government. https://www.dewr.gov.au/foundation-skills/australian-core-skills-framework-acsf

[24] Perkins, K. (2009). Adult Literacy and Numeracy: Research and Future Strategy. An Adult Literacy National Project Report. National Centre for Vocational Education Research (NCVER).

The method was applied consistently across multiple secondary English subjects from key Australian jurisdictions. Final aggregation outputs were derived by assigning ACSF levels and calculating overall averages for each course and for selected VET focus units of competency (**Figure 10**).

Figure 10: ACSF Reading and Writing level outcomes for literacy courses.

Course	ACSF Reading Level	ACSF Writing Level
VET Focus Units of Competency	4.1	3.6
Essential English	3.3	3.4
English Foundation	3.1	2.7
VCE Vocational Major (VM) Literacy	3.5	3.4
VCE Foundation English	3.3	3.3
English Studies	3.1	3.4
English General	3.9	3.9
English	4.7	4.6
English ATAR	4.4	4.3
VCE English	4	4
English Standard	4	3.9

Reported outcomes indicate average ACSF reading and writing levels ranging from approximately Level 2.7 - 4.7 across courses, with the VET focus units averaging around Reading 4.1 and Writing 3.6. Higher outcomes are observed in advanced secondary pathways (e.g., English/ATAR streams), while foundation courses show lower averages.

Overall, core literacy outcomes show stronger alignment. Literacy skills developed through senior secondary English pathways generally correspond with the reading and writing demands of energy sector training and support engagement with technical texts and standards. However, within the scope of the project, literacy was not identified as the primary constraint on entry to energy sector apprenticeships.

Learner analysis

The Learner analysis highlights learning capability as a critical enabling factor for successful transition. Energy sector apprentices are expected to demonstrate self management, reflective learning and adaptive strategies aligned with ACSF Level 4 Learning indicators.[23]

In relation to secondary schooling, the analysis finds that "learning to learn" is rarely taught as a standalone subject, making direct curriculum-based analysis difficult. Instead, learning capability is treated as being developed through embedded curriculum elements, particularly the Australian Curriculum General Capabilities, which support students' progression from teacher-directed learning (pedagogy) toward more learner-directed approaches (andragogy).[25] The analysis also highlights the influence of changing teaching practices and technology, including inquiry-based approaches, which emphasise learner empowerment and effective use of familiar technologies.

For VET (with a focus on energy trades), the analysis outlines a competency-based training (CBT) model delivered through both off-the-job training qualifications via Registered Training Organisations (RTOs) and on-the-job training with employers/industry in real workplace contexts. It argues that training packages have historically embedded core skills in numeracy and literacy (reading, writing) and that the ACSF provides a national framework for defining and developing these capabilities. Within the ACSF, the core skill of learning is described through two indicators: self-awareness as a learner and practical learning strategies, which are essential for entry and success in VET training and employment.

The analysis also addresses ACSF level determination for the learning core skill. Due to a lack of scalable data, a direct comparison between school subjects and VET units for learning cannot be made using the same approach used for numeracy. However, based on evidence from prior training package settings (with literacy and numeracy skills often set at Level 4) and industry feedback valuing learning capability, the analysis concludes that ACSF Learning Level 4 is a reasonable and consistent expectation for energy sector training. It also notes the growing shift to online and blended delivery and cautions that many VET learners may lack readiness for flexible learning, reinforcing the need to strengthen adult-learning characteristics and self-direction to improve training outcomes.

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[25] Australian Curriculum, Assessment and Reporting Authority (ACARA). (2026). General Capabilities. https://www.australiancurriculum.edu.au/f-10-curriculum/general-capabilities

Stage Four – Pathway mapping and risk points

Stage 4 of the project maps the pathways from education to employment in energy sector occupations, pinpointing where literacy and numeracy skills are developed, where they may lapse, and where interventions can help reduce the risk of disengagement. This pathway analysis follows students' progression from Year 9 through Year 12, into VET, and ultimately into employment. It emphasises that successful outcomes are influenced by students' subject choices, level of engagement, and access to guidance and support from schools, families, and the broader community.

The pathway mapping exercise aims to visually illustrate the transitions from schooling to employment, focusing on key points where literacy and numeracy skills are either strengthened or may decrease. The analysis tracks the development of these skills from Year 9 through Year 12, into VET, and eventually into roles within the energy sector. It also highlights critical intervention points along the pathway to inform strategies for targeted support. The pathway mapping analysis recognises that literacy and numeracy requirements vary along the educational and vocational journey, yet both skill sets are essential for successful outcomes. Ensuring students acquire sufficient literacy and numeracy skills is contingent upon their individual pathways, as well as external influences that may impact skills development beyond the school environment.

For instance, a student who does not excel academically may benefit from a supportive home environment where trades professionals emphasise the value of hard work. In such cases, the student may leave school after Year 9, enrol in an RTO, seek support both from the RTO and family, and ultimately pursue a career in a trade.

In situations where this level of support and guidance is not available, students must rely on advice provided within the school setting and insights gained from their community. It is recommended that students take an active role in their learning, strive for self-motivation, and engage in school subjects that align with their interests to further develop essential skills.

Within this project's framework, a "pathway" is a structured route with all necessary supports needed to reach a goal, while a "bridge" addresses a specific obstacle along that route, offering temporary help but not ensuring ongoing progress.

Literacy Pathway

Literacy development is anchored in secondary English offerings analysed against ACSF Reading and Writing expectations across jurisdictions. **Figure 11** provides a list of English courses offered at secondary schools in various jurisdictions, which were analysed for alignment of content with ACSF Reading and Writing levels.

Figure 11: Secondary school English subjects analysed for alignment of content with ACSF Reading and Writing levels.

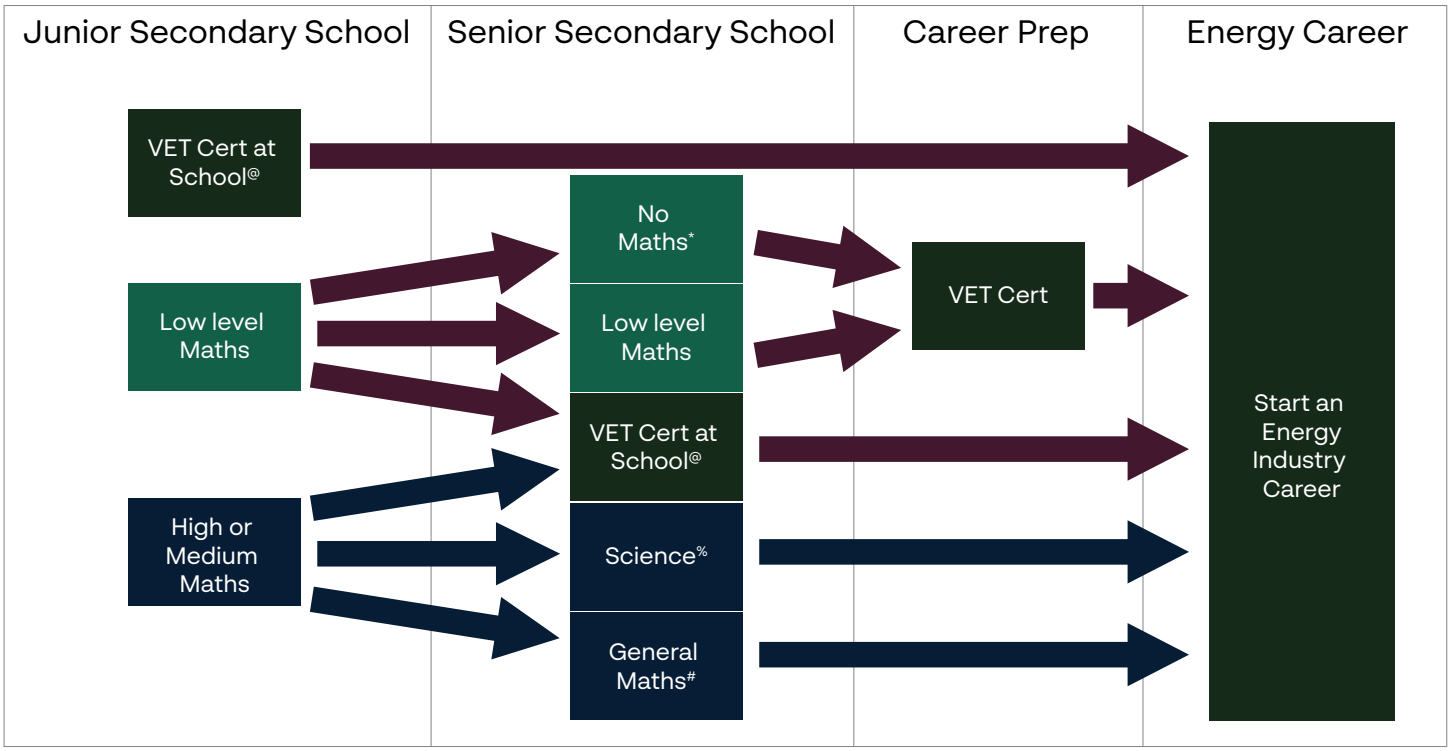
Curriculum Authority	Jurisdiction	Secondary Subject
Australian Curriculum, Assessment and Reporting Authority (ACARA)	QLD, SA, NT, ACT, TAS	English
		Essential English
Victorian Curriculum and Assessment Authority (VCAA)	VIC	VCE English
		VCE Foundation English
		VCE VM Literacy
NSW Education Standards Authority (NESA)	NSW	English Standard
		English Studies
School Curriculum and Standards Authority (SCSA)	WA	English ATAR
		English General
		English Foundation

Strong English participation is positioned as essential for VET readiness because technical training requires sustained reading, comprehension, and interpretation of numeracy embedded in text.

Numeracy pathway

Figure 11 presents a simple depiction of the pathways from Year 9 through to early employment to identify where literacy and numeracy skills are consolidated, challenged or lost. The pathway analysis demonstrates that capability development is not linear, and that risk concentrates at specific transition points (see Appendix 7.2 for a more detailed diagram).

Figure 11: Numeracy skills acquisition pathways from secondary school to energy sector career.



General Maths refers to Australian Curriculum General Maths, NSW Maths Standard 2, VCE General Maths, WA Mathematics Applications

* No Maths is allowed in all jurisdictions except for students in the VCE VM pathway

@ Rules for access to VET vary across jurisdictions with some allowing access from Year 9 while others requiring Year 10 or Year 11 level

% Science subjects vary across jurisdictions however Physics and/or Chemistry in Year 11 and Year 12 have been identified as developing strong Numeracy skills

To ensure prospective energy sector employees possess the required numeracy skills, it is important to recognise and accommodate the variety of educational routes available to students. As demonstrated in Figure 3.6 and Appendix 7.2, multiple pathways are available including traditional mathematics sequences and VET-in-schools options, and as various national jurisdictions have established distinct regulations and expectations.

Alternative Pathways

Figure 12 lists VET certificates from training.gov.au, ranked by priority according to their effectiveness in developing energy sector skills. These priorities help students identify which certificates best support skills acquisition for energy industry careers, based on industry stakeholder feedback. The rankings are intended to guide skill development, not influence personal interests.

Figure 12: Recommended VET certificates for Literacy and Numeracy skills development.

Priority	VET Certificate
Very High	Certificate II in Engineering Studies
Very High	Certificate II in Engineering
Very High	Certificate II in Engineering Pathways
Very High	Certificate II in Electrotechnology
High	Certificate II in Skills for Work and Vocational Pathways
High	Certificate II in Construction
High	Certificate II in Construction Pathways
High	Certificate II in Building and Construction
High	Certificate II in Resources and Infrastructure
High	Certificate II in Electronics
High	Certificate II in Plumbing
Medium	Certificate II in Sampling and Measurement
Medium	Certificate II in Automotive Vocational Preparation

Priority	VET Certificate
Medium	Certificate II in Automotive Servicing Technology
Medium	Certificate II in Automotive Electrical Technology
Medium	Certificate II in Supply Chain Operations
Medium	Certificate II in Rail Infrastructure
Medium	Certificate II in Agriculture
Medium	Certificate II in Horticulture
Medium	Certificate II in Surveying and Spatial Information Services
Low	Certificate II in Drainage
Low	Certificate II in Cookery
Low	Certificate II in Public Safety
Low	Certificate II in Health Support Services
Low	Certificate II in Financial Services

As students progress through their chosen pathways, they develop skills in numeracy, literacy, and digital literacy. Those who select lower-level English courses, such as Essential, Foundational, or courses below Standard, may benefit from extra support, and are advised to consider a VET certificate to enhance their learning.

To support equity and persistence during key transitions, free and low cost bridging resources such as Studiosity, RESN, Wootube, Khan Academy, and AMSI Calculate have also been identified to complement school and RTO assistance. These services are presented as practical options for students experiencing gaps, particularly where paid support is not feasible.

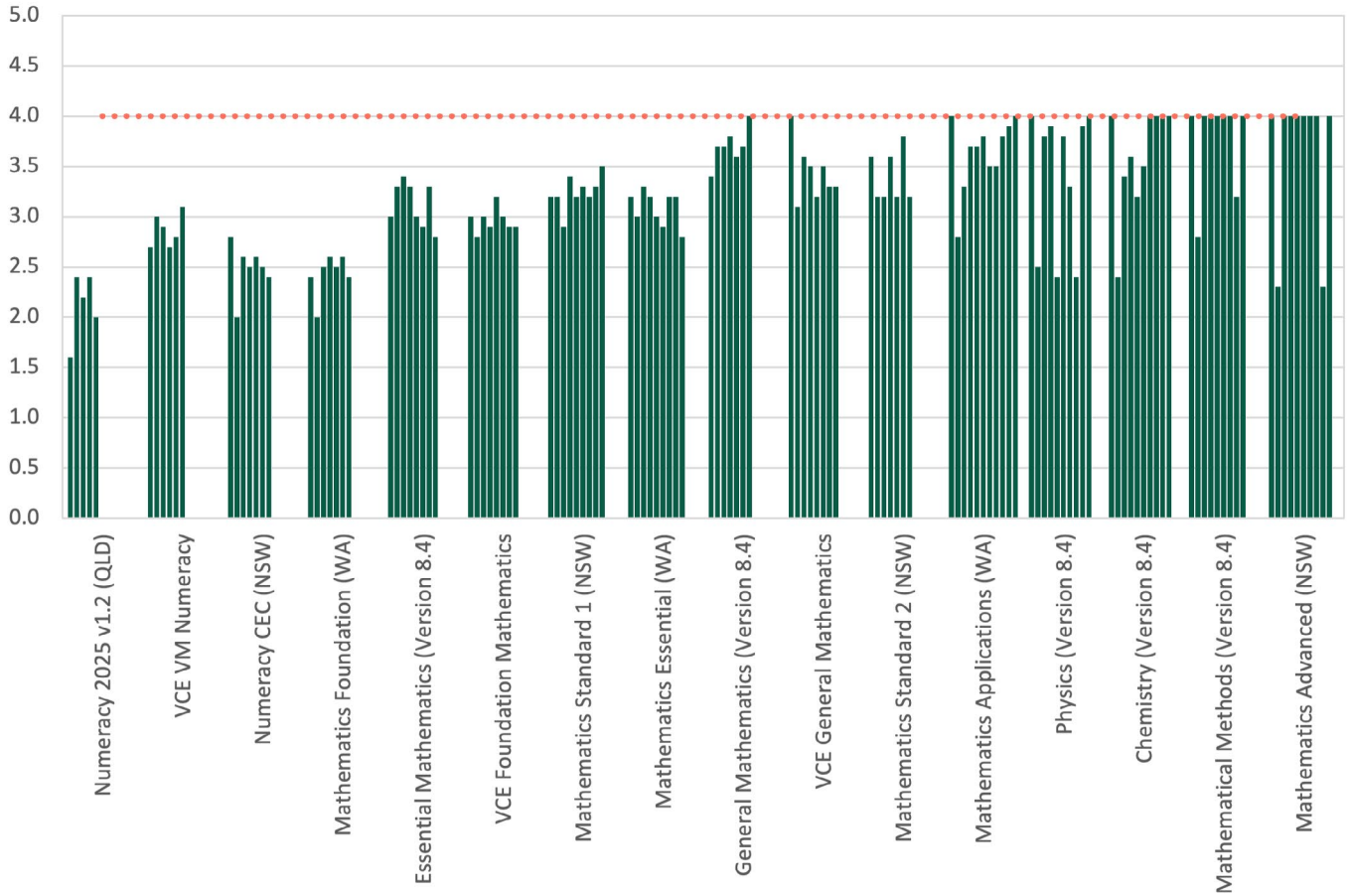
Gap Identification

Gap identification utilised stakeholder feedback, apprentice performance data, and expert interviews to pinpoint transitions where students are most at risk of disengagement or failure, particularly during subject selection and the Year 10-to-VET transition. Monitoring and supporting students through these critical stages is essential to improving engagement and outcomes.

Impact of Subject Selection

Subject selection during the middle secondary years emerged as a critical early influence on numeracy development and subsequent readiness for vocational entry. **Figure 13** demonstrates that Victorian senior secondary students who are guided into the VCE VM Numeracy pathway typically develop numeracy skills slightly above ACSF Level 3 (derived from analysis conducted in Stage 3 of the Project). However, the numeracy analysis of the Certificate III in Electrotechnology Electrician indicates that proficiency in numeracy at Level 4 or higher is required (**Figure 13, orange broken line**). This raises the question of how students can be supported to reach these higher levels.

Figure 13: Numeracy ACSF level outcomes for secondary school courses across jurisdictions (national).



According to the diagram in Appendix 7.2, it is recommended that students who have already chosen this pathway consider enrolling in a VET certificate program as an additional means to enhance their literacy and numeracy skills.

Impact of Transition from School to VET

According to data from the National Centre for Vocational Education Research (NCVER), the following insights on Certificate III in Electrotechnology Electrician apprenticeship commencements and outcomes based on highest secondary school education level have been established (**Figure 14**).[26]

Figure 14: Certificate III in Electrotechnology Electrician apprentice outcomes based on highest school level completed, national, 2015 - 2019 commencing cohort.

Highest school level completed	Total commencements	% Attrition rate	% Completion rate
Year 9 or lower	575	45.7%	51.6%
Year 10	5,695	42.1%	54.9%
Year 11	5,495	31.7%	65.7%
Year 12	30,865	23.6%	74.4%

The apprenticeship attrition rate represents the proportion of commencements with an unsuccessful status at the point of comparison. This does not mean permanent withdrawal; apprentices and trainees may recommence later. Completion rates show the proportion of apprenticeships or traineeships that are completed, which may have involved one or more training contracts and employers.

Figure 14 shows that around two-thirds of apprentices commencing the Certificate III in Electrotechnology Electrician nationally had Year 12 as their highest school level completed.

[26] NCVER 2025, Apprentices and trainees: December quarter 2024 - apprenticeship-level completion rates to date DataBuilder. Filters applied: Program cluster: UEE30807,UEE30811,UEE30820; Commencing Year: 2015, 2016, 2017, 2018, 2019. Data extracted 16/6/2026. Commencement numbers are rounded to the nearest 5.
https://vocstats.ncver.edu.au/webapi/jsf/login.xhtml

Apprentices also entered from lower school attainment levels, including Year 9 or lower, Year 10 and Year 11, demonstrating that trade entry occurs through multiple pathways. However, outcomes vary substantially by school attainment level. Completion rates increase progressively with higher levels of schooling, from 51.6% for those who completed Year 9 or lower, to 54.9% for Year 10, 65.7% for Year 11 and 74.4% for Year 12. Attrition rates show the inverse pattern, declining from 45.7% for Year 9 or lower to 23.6% for Year 12. Together, these results suggest that while entry into the trade is possible from a range of educational stages, stronger outcomes are associated with higher levels of completed schooling, particularly completion of Year 12.

Though outcomes are influenced by jurisdictional regulations on school leaving age, individual circumstances also play a significant role. Strong support networks can enable successful outcomes even for those leaving school earlier, while less confident students or those with limited support may benefit from remaining in school through Year 12 to gain additional learning and experience.

Students leaving school before Year 12 who recognise gaps in their literacy and numeracy skills may be advised to seek employment with larger organisations, as apprentices in small businesses (fewer than 100 employees) account for a significant proportion (60%)[27] of cancellations among Year 10 and Year 11 leavers. The concentration of apprenticeships (40%)[28] in small business settings can make access to support networks more challenging.

Outcomes vary by jurisdiction, with differences potentially linked to employers, training organisations, student characteristics, and support networks. Communication gaps about pathways and bridges further contribute to these disparities. Targeted interventions, such as improved information sharing, tailored guidance, and comprehensive assessment tools, are necessary to promote consistency, equity, and preparedness among trade learners nationally.

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[27] NCVER 2025, Apprentices and trainees: December quarter 2024 - apprenticeship-level completion rates to date DataBuilder. Filters applied: Program cluster: UEE30807, UEE30811, UEE30820; Commencing Year: 2015, 2016, 2017, 2018, 2019. Data extracted 16/6/2026. Commencement numbers are rounded to the nearest 5. https://vocstats.ncver.edu.au/webapi/jsf/login.xhtml

[28] Australian Small Business and Family Enterprise Ombudsman (ASBFEO). (2024, September). Apprentices and Employees Trained by Small Business. https://www.asbfeo.gov.au/small-business-data-portal/apprentices-and-trainees-employed-small-business

Non-completion in energy apprenticeships

Non-completion is a persistent feature of energy sector apprenticeships. PSO's 2025 Workforce Plan reports that completion rates across energy trades sit at approximately 68%, meaning around three in ten apprentices who commence do not finish.[29] The reasons are varied: employer-apprentice mismatch, financial pressures, poor workplace support, personal circumstances and geographic isolation all feature in the data. Women face additional barriers, with lower completion rates and higher post-apprenticeship dropout than their male counterparts. Non-completion is therefore not a single problem with a single cause.

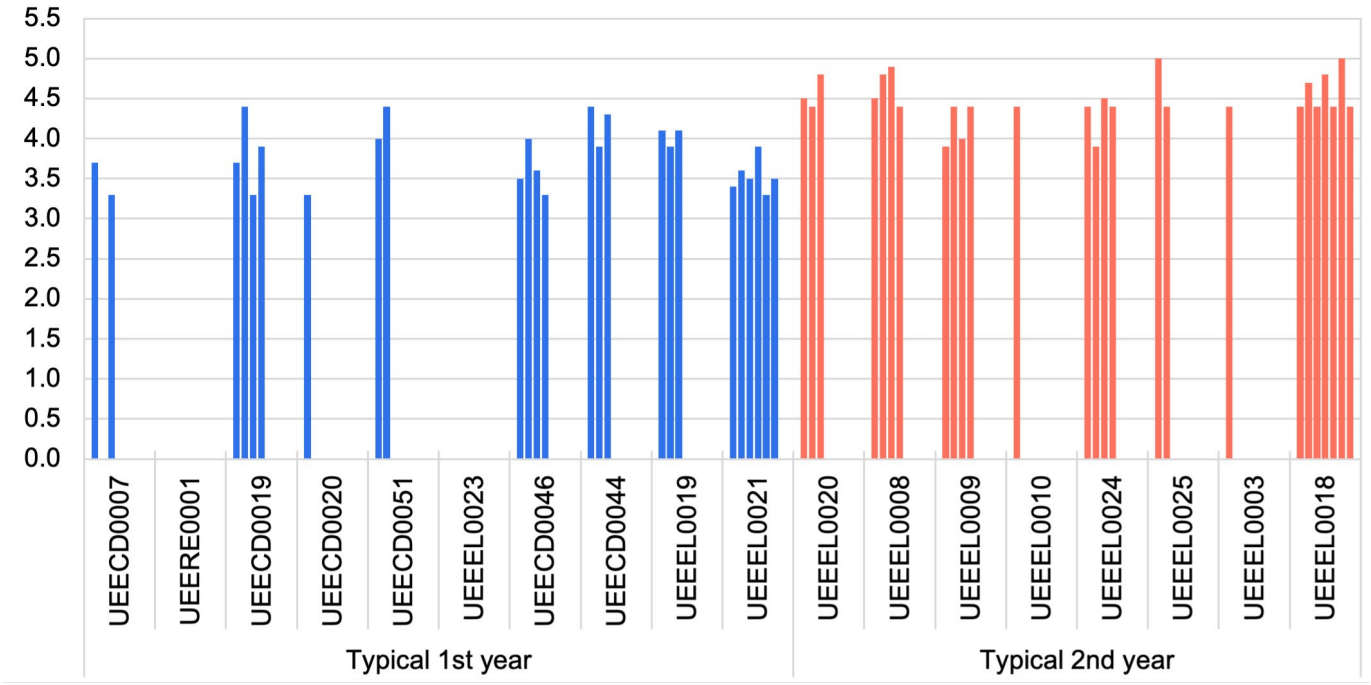
Within this broader picture, foundation skills and numeracy are a contributing factor. The concentration of cancellations in the first two years of the Certificate III in Electrotechnology, explored further in the following section, coincides with the point at which numeracy demands in the qualification escalate sharply. This does not mean literacy and numeracy gaps explain all non-completions; they do not. But they are a factor that can be addressed upstream, before an apprentice reaches that point of risk.

[29] PSO (2025). Workforce Plan 2025 – High Load, Short Supply. https://poweringskills.com.au/wp-content/uploads/2025/08/PSO_2025_WorkforcePlan_v24_WEB.pdf

Impact of Numeracy Skills Requirements on VET Outcomes

The Curriculum Analysis in Stage 3 of the Project also involved the use of the ACSF to conduct Numeracy assessments to determine the ACSF levels for Numeracy skills required to undertake core electrotechnology units delivered in the first two years of the Certificate III in Electrotechnology Electrician. The core electrotechnology units are depicted in the typical sequence in which they are usually delivered from left to right (**Figure 15, blue bars first year, orange bars second year**).

Figure 15: ACSF levels for Numeracy required for core electrotechnology units.



This shows while first-year units offer few opportunities for numeracy practice, advanced numeracy skills are increasingly required in later core units, particularly UEECD0044 and UEEEL0020.

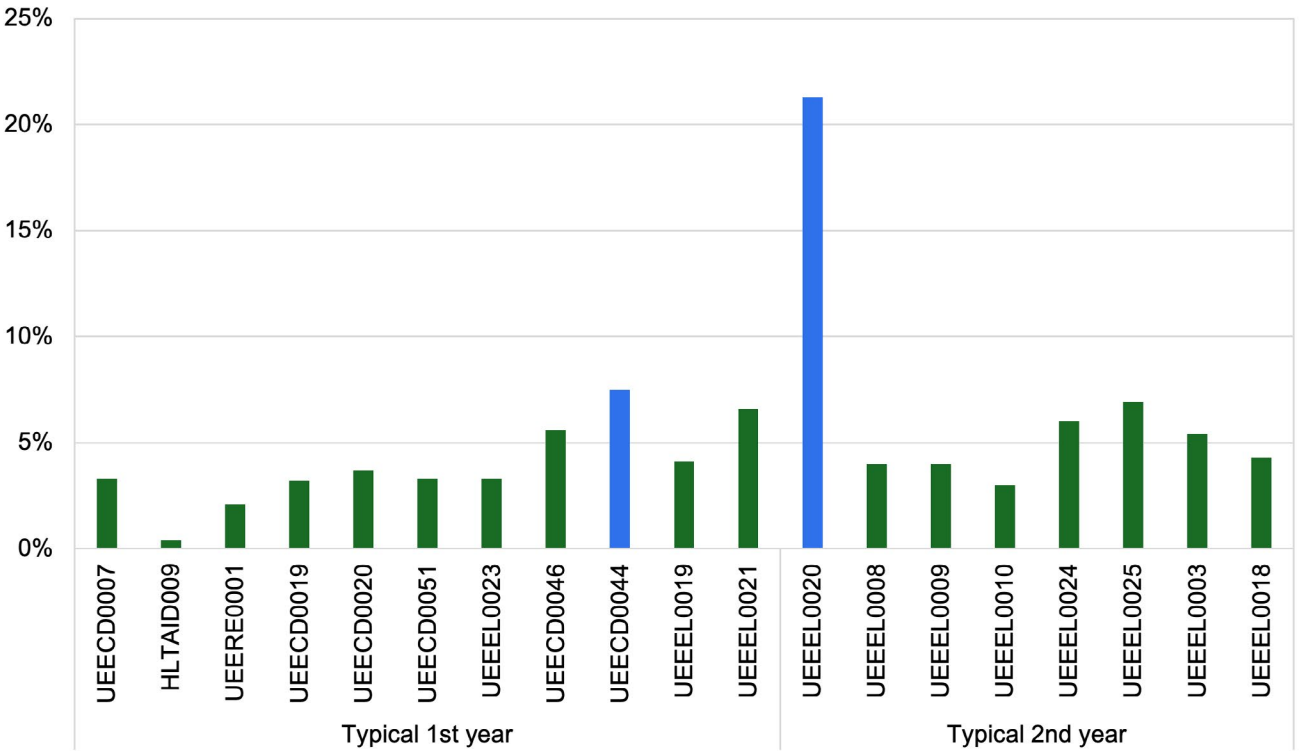
The rising numeracy demands in these units stem from their technical complexity and the cumulative nature of the electrical concepts, as evidenced by a higher proportion of assessments needing advanced mathematical skills. In UEECD0044, 30% of the unit involves interpreting complex mathematical information at Level 4, and 22% addresses Number and Algebra problems at Level 4, requiring calculations and measurements in series and parallel

DC circuits. Similarly, UEEEL0020 demands Number and Algebra calculations at Levels 4 and 5 for 25% of the content, with 18% on interpreting complex mathematical information and 12% on simpler mathematical interpretation at Level 4. Students must use algebra and trigonometry for conversions and to calculate electrical parameters in circuits with resistive, inductive, and capacitive elements. These numeracy skills are essential for accurate analysis, safe operation, and compliance with technical and regulatory requirements in electrotechnology.

The increased numeracy demand leads many students to require multiple attempts to pass assessments, with the highest reattempt rates in UEEEL0020 and UEECD0044, according to de-identified data from Exemplar Services (**Figure 16**).

Assessment reattempt data were calculated by determining the percentage of reattempts in each state, aggregating these across jurisdictions, and then expressing each unit's share of total reattempts. This approach ensures outcomes from smaller jurisdictions are weighted equally with those from larger cohorts. While this method may seem complex, it accurately represents reattempt rates across all regions. Figure 16 visually summarises these results.

Figure 16: Unit assessment reattempts for core electrotechnology units.



While **Figure 15** and **Figure 16** do not directly link numeracy challenges to apprenticeship withdrawals, NCVER data from 2022 to 2024 shows that 85% of electrotechnology apprenticeship cancellations happen in the first two years, with 59% in the first year and 26% in the second.[26] This pattern aligns with the increased demand for advanced numeracy skills as students progress to the second year, suggesting that the sharp rise in numeracy requirements coincides with the peak in cancellations and withdrawals, pointing to a critical need for additional support at this stage.

In summary, while the importance of Literacy and active student engagement is acknowledged, the analysis identifies that the most significant gap lies in Numeracy skills.

Project Insights on System Alignment

The pathway mapping and gap identification findings reveal common misconceptions among educational authorities. Some of these misconceptions include trade careers seen as suitable for less academically inclined students, Level 3 skills assumed as adequate for trade careers when Level 4 is needed, and students are thought to bypass assessments. Yet in reality students are tested upon entry into apprenticeships. The project recommends a developmental approach to skill acquisition, enabling learners to gain necessary competencies at each stage.

These misconceptions exist alongside evidence that electrician is already a highly aspirational career choice among Australian school students. The Year13 Careers Index[30] based on the career intention data of more than 45,000 high school students, ranks electrician third among the most popular career choices for male school students nationally, behind only mechanical engineer and sports agent/manager. Electrician also features in the top 20 most popular careers in every state except the ACT, making it the most popular trade career with school students nationally.[29] This is a significant finding for this project. It suggests the aspiration to enter the trade is not the barrier; the barrier is whether students are being guided toward the mathematics subjects that would prepare them for it. Young people who list electricians as a career goal but are not studying higher-demand mathematics are, in effect, limiting their own pathway without knowing it. Targeted career advice at the subject selection stage, making explicit the mathematical requirements of the trade could help convert genuine interest into better-prepared candidates, streamlining entry and improving prospects of completion.

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[30] Year13. (2024). Year13 Careers Index 2024 reveals the Most popular Jobs for School Students. https://year13.com.au/business/media-centre/year13-careers-index-2024-most-popular-jobs-for-school-students

The South Australian model, while imperfect, is viewed as best practice, allowing Year 10 students to choose VET courses that integrate contextual learning and require Language, Literacy and Numeracy (LLN) assessments.[31] This system supports students within mainstream education and uses a "No wrong door" approach for comprehensive skill development.[32] Victoria's framework is similar in structure but less academically rigorous and separated from mainstream education, though clearly communicated to families.

Project insights on structure of curricula

Although secondary schools provide ample opportunities to develop Numeracy skills, the gap analysis shows that VET curricula in electrotechnology impose inconsistently rising numeracy demands, particularly in the second year of Certificate III Electrotechnology. This misalignment corresponds with higher student withdrawal rates, highlighting the need for targeted support at this critical stage.

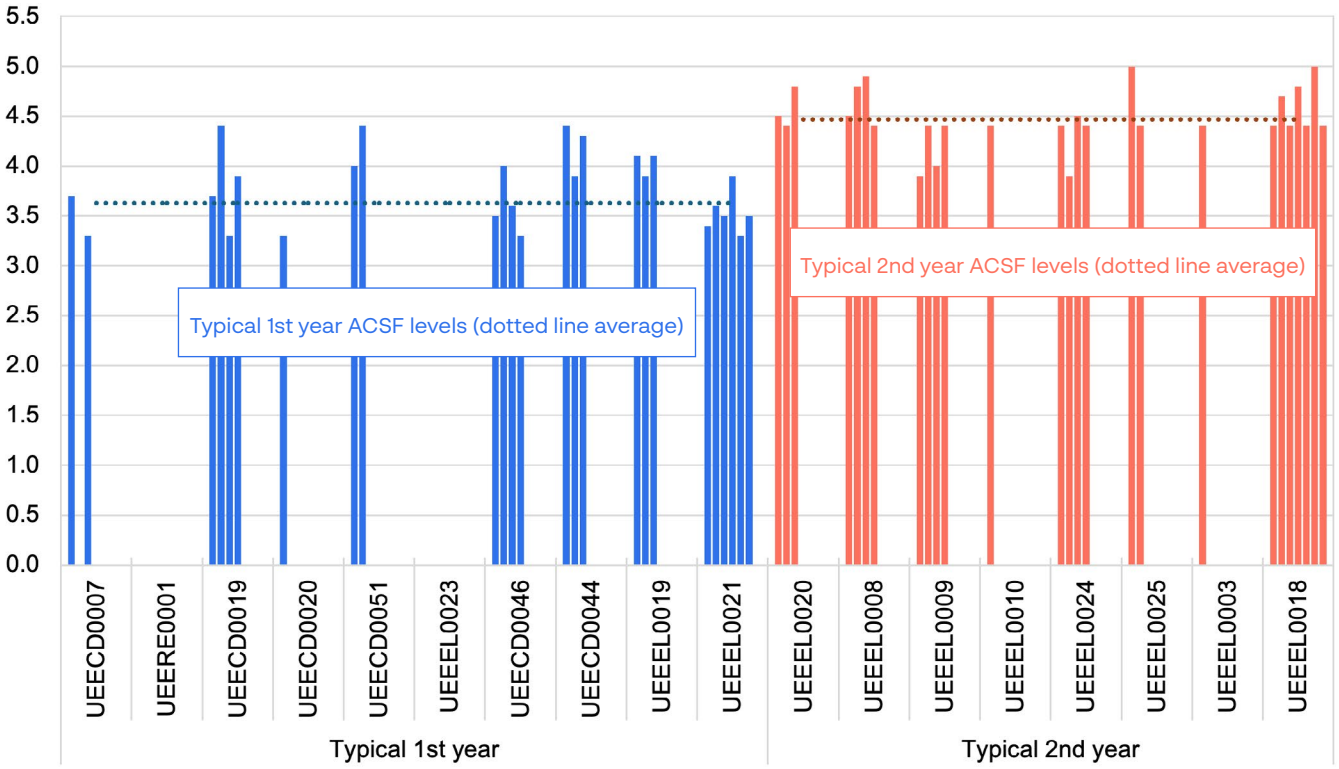
Stage 2 Project feedback reveals that much instructional time is spent on teaching mathematical concepts rather than core electrical principles.

Figure 17 demonstrates that, throughout the first two years of Certificate III, especially in the first year, the application and development of numeracy skills is inconsistent across competency units.

[31] South Australian Certificate of Education (SACE) Board of South Australia (SACE Board of SA). (2026). VET in SACE. https://www.sace.sa.edu.au/web/vet/what-is-vet/vet-in-sace#VET-in-SACE

[32] Department of Employment and Workplace Relations (DEWR). (2023, November). Australian Government response to the House of Representatives Standing Committee on Employment, Education and Training report: 'Don't take it as read': Inquiry into adult literacy and its importance. Australian Government. https://www.dewr.gov.au/download/15870/australian-government-response-house-representatives-standing-committee-employment-education-and/35501/australian-government-response-house-representatives-standing-committee-employment-education-and/pdf

Figure 17: ACSF levels for Numeracy required for core electrotechnology units showing increases in required Numeracy skills.



The jump from first to second year depicted in the referenced graph illustrates two critical aspects: a rapid rise in Numeracy skills requirements and the stage within the qualification where most apprentices must retake assessments or leave the program. That is, the data reveals that skills demands increase sharply at specific stages, leading many apprentices to reattempt assessments or withdraw.

Numeracy requirements spike at the end of the first year, coinciding with apprentices' engagement in more advanced electrical learning. These factors influence how often students must retake assessments to prove competency, as shown in **Figure 3.9**. Although RTOs' specific reasons aren't detailed, reattempts are generally required when apprentices don't demonstrate competency. This suggests that the qualification structure could be improved to better build on school-acquired skills and support gradual advancement toward higher skill requirements.

Findings and implications

Consolidated findings

Across all four stages, the project confirms that numeracy capability presents as misalignment for successful progression into and completion of energy sector trades. Although literacy is essential for engaging with training materials and workplace documentation, core literacy skills developed through secondary schooling is broadly aligned with energy sector requirements and is not the primary limiting factor.

Structural misalignment between school based numeracy outcomes and energy sector vocational training requirements is evident. As demonstrated through comparative analysis, many school pathways develop effective numeracy capability below the ACSF Level 4 required for successful participation in energy sector training.

This misalignment reflects differences in complexity, application and task criticality rather than shortcomings at the level of individual students.

Occupational analysis reinforces the centrality of applied numeracy and learning capability across energy sector roles. Across the occupations examined, numeracy and learner self management are consistently high demand capabilities, underpinned by clearly defined Certificate III qualifications.

Pathway mapping shows that risk is concentrated at predictable transition points, including subject selection, school to VET transition and early apprenticeship, where numeracy demands escalate and attrition risk increases.

Implications and recommendations

The findings imply that improving outcomes for energy sector pathways requires coordinated, pathway wide alignment rather than reliance on late or isolated interventions. Clear articulation of numeracy expectations is particularly important prior to secondary subject selection, given the central role of numeracy readiness in later vocational success.

Applied and vocationally oriented pathways have the potential to support engagement but must explicitly target the capability levels required for energy sector training across numeracy and learning dimensions. Bridging supports are most effective when embedded within coherent pathways and activated at clearly identifiable risk points, such as the transition to advanced numeracy intensive trade units.

Equity considerations remain central. Workforce participation data shows persistent gender imbalance across energy sector roles, while pathway analysis indicates that uneven access to guidance and support increases vulnerability at key transition points. Addressing these challenges requires shared understanding and alignment across schooling, VET and employment systems.

Conclusion and future steps

This Final Report synthesises evidence from Stages 1–4 of the Foundations for Energy: Literacy and Numeracy for Energy Jobs project to provide a coherent picture of pathway alignment, capability requirements and systemic risk points affecting entry into energy sector careers.

The project demonstrates that Australia's energy workforce challenge is not driven by a lack of educational options, but by misalignment between schooling outcomes and the functional demands of vocational training and employment. Within energy trades, ACSF Level 4 numeracy is not an aspirational benchmark, it is a functional requirement, and the gap between what schooling commonly produces and what the trade demands is both demonstrable and addressable. Literacy supports participation and progression, while learning capability enables persistence when learners encounter increased technical complexity.

Evidence shows that capability gaps accumulate at identifiable transition points, including subject selection, school to VET transition and early apprenticeship. Where these gaps are not identified and addressed, they contribute to assessment difficulty, delayed progression and attrition, particularly in the first two years of training.

By applying a consistent ACSF based framework across schooling, VET and occupational analysis, the project provides a shared evidence base for understanding readiness and transition risk. Strengthening clarity, continuity and alignment across systems will be essential for building a safe, capable and future ready energy workforce.

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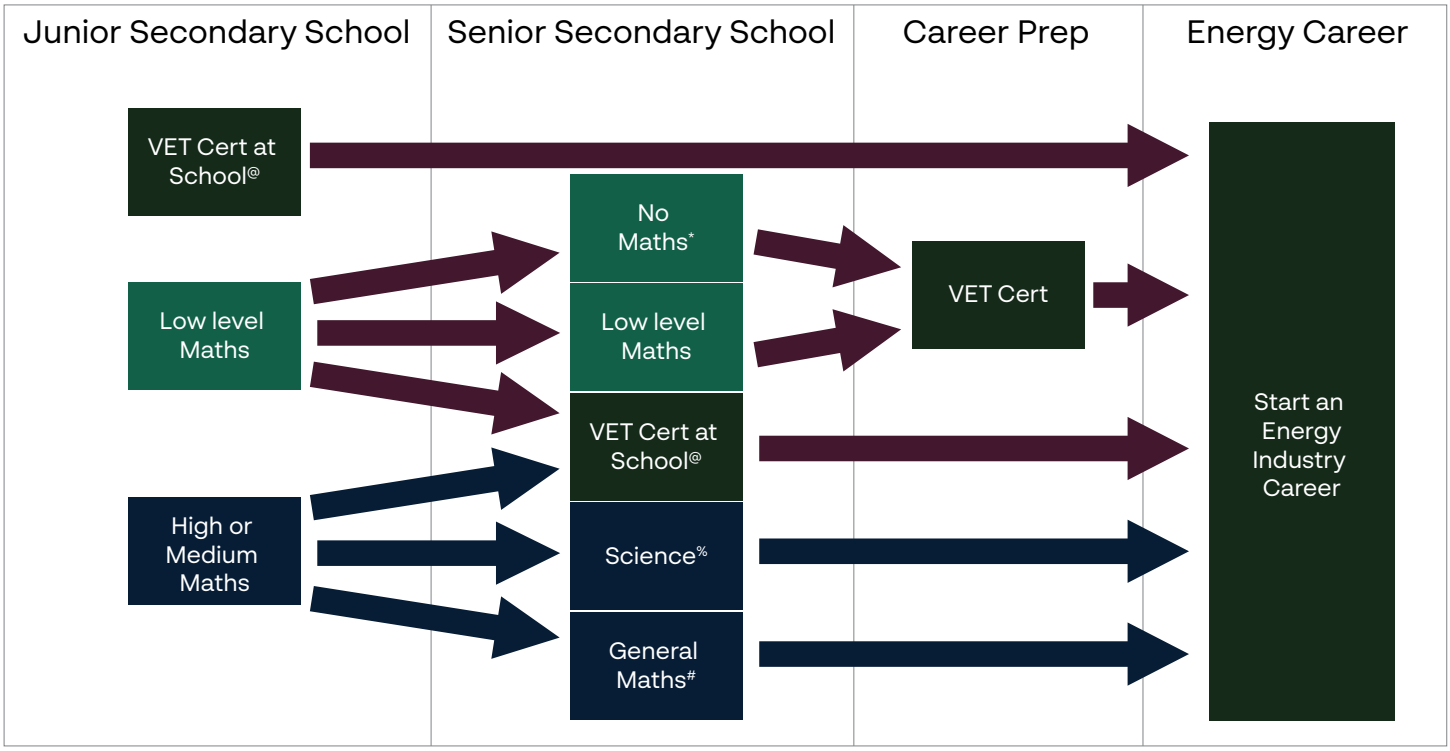
Appendices

Final Numeracy Aggregation Model Output

Numeracy indicators for various subjects based on aggregation model.

	Identifying mathematical information and meaning in activities and texts			Using and applying mathematical knowledge and problem-solving processes				Communicating and representing mathematics		
	.09.1	.09.2	.10.1	.10.2	.10.3	.10.4	.10.5	.11.1	.11.2	.11.3
Focus Area	Explicitness of mathematical information	Complexity of mathematical information	Problem solving processes including estimating and reflecting	Mathematical methods and use of tools	Mathematical knowledge and skills: number and algebra	Mathematical knowledge and skills: measurement and geometry	Mathematical knowledge and skills: statistics and probability	Written mathematical language	Oral mathematical language	Complexity of mathematical symbolism,
General Mathematics (Version 8.4)		3.4	3.7	3.7	3.8	3.6	3.7	4		4
VCE General Mathematics		3.6	3.5	3.2	3.5	3.3	3.3			3.6
Mathematics Standard 2 (NSW)		3.3	3.7	3.2	3.6	3.2	3.8			4
Mathematics Applications (WA)		3.3	3.7	3.7	3.8	3.5	3.9	4		4
Physics (Version 8.4)		3.8	3.9		3.8	2.4	4	4		4
Chemistry (Version 8.4)		3.2	3.6	3.2	3.6	4	4	4		4
Mathematical Methods (Version 8.4)		4	4		4	4	4			4
Mathematics Advanced (NSW)		4	4	4	4	4	4			4
Essential Mathematics (Version 8.4)		2.9	3.4	3.3	3	2.9	3.3	2.4		3
VCE Foundation Mathematics	2.8	3	2.9	3.2	3	2.9	2.9		3.2	3.2
Mathematics Standard 1 (NSW)		3.1	3.4	3.2	3.3	3.2	3.5			3.2
Mathematics Essential (WA)		2.9	3.3	3.2	3	2.9	3.2	3.2		3
Numeracy 2025 v1.2 (QLD)	1.6	1.6		2.4	2.2	2.4	2			
VCE VM Numeracy		2.7	3	2.9	2.7	2.8	3.1			2.8
Numeracy CEC (NSW)	2	2.6	2.6	2.5	2.5	2.6	2.5	2.4		2.4
Mathematics Foundation (WA)	2	2.5	2.6	2.5	2.5	2.6	2.5	2.4		
VET Focus Units of Competency	4.2	4.1	4.3	4.1	4.2	3.8	4.1	4.3		4.2

Numeracy skills acquisition pathways from secondary school to energy sector careers.



General Maths refers to Australian Curriculum General Maths, NSW Maths Standard 2, VCE General Maths, WA Mathematics Applications

* No Maths is allowed in all jurisdictions except for students in the VCE VM pathway

@ Rules for access to VET vary across jurisdictions with some allowing access from Year 9 while others requiring Year 10 or Year 11 level

% Science subjects vary across jurisdictions however Physics and/or Chemistry in Year 11 and Year 12 have been identified as developing strong Numeracy skills

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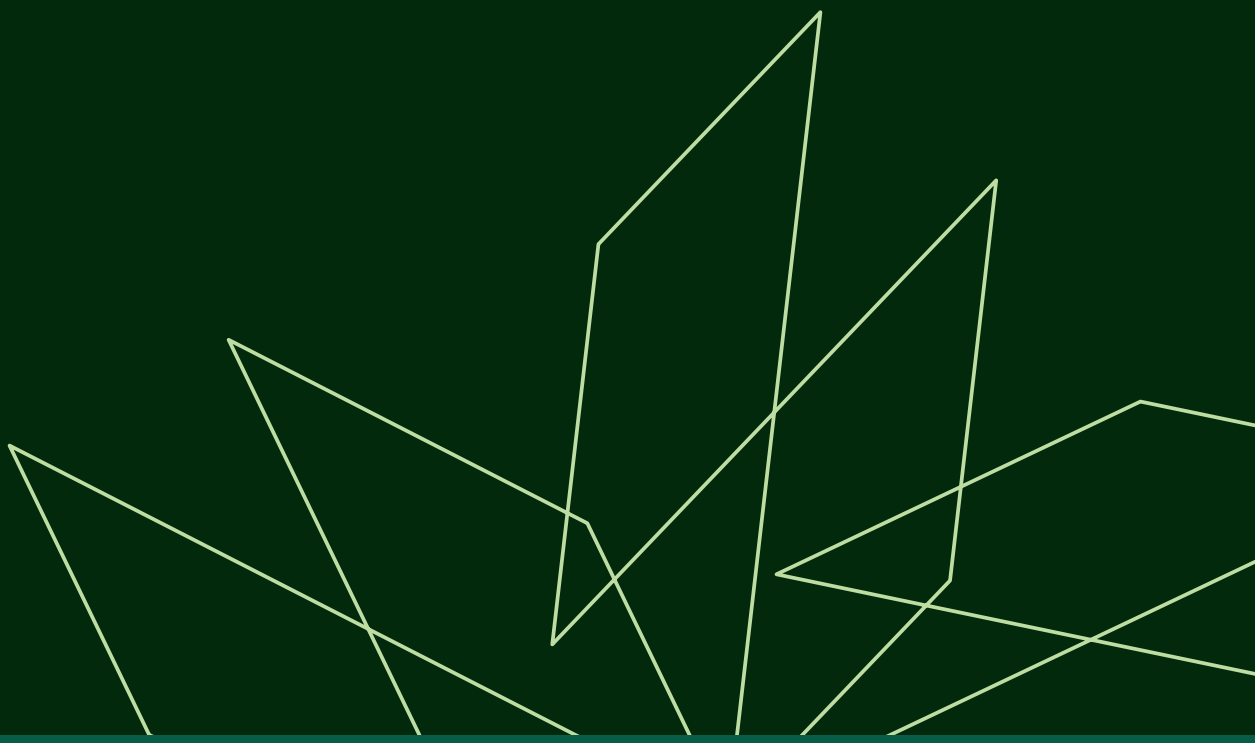

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