Australia's Clean Energy Workforce Discussion Paper

Submission

Contents

Working within broader workforce systems reform

JSA's Clean Energy Workforce Discussion Paper brings together the main considerations in garnering a collective effort to build a future-focussed clean energy workforce across the nation. The Discussion Paper has proposed a clean energy workforce definition; clarified parameters of the clean energy workforce; summarised the range of activity in Australia and internationally which informs the study; outlined transition scenarios for workforce planning; and identified challenges around collection of data to inform strategy and measurement.

While this work on workforce capabilities is specific to clean energy, many of the solutions to challenges in this sector can be facilitated and achieved only through broad workforce planning initiatives and education and training system structural change. Therefore Ai Group believes actions developed by the clean energy study must be considered through a system-wide lens.

With the establishment of the JSA to oversee and improve all skills development, and the Universities Accord to enhance the university system, there is the potential for clean energy workforce needs to be nurtured as a result of structural improvements across the whole knowledge and skills spectrum.

In its remit, JSA has a whole-of-workforce role to enhance skills data and determine priority skills. It is further developing the Australian Skills Classification, rolling out major VET sector reforms and working with the Universities Accord. It is currently undertaking a number of other priority studies addressing Tech Skills, Foundation Skills, the VET Workforce and Apprenticeships Support. All of this activity is relevant to the clean energy workforce study which will only be maximised through the prism of these major structural reforms and studies.

Ai Group has advocated the need for a number of system-wide education and training changes over the past year that will underpin a right-sized and capable workforce in clean energy. These reforms include a fully implemented, revised Australian Qualifications Framework; a comprehensive and accessible skills classification system; ongoing data collection and analysis of Australia's skill needs; a strengthened apprenticeship system and a better-connected tertiary education system. The way these reforms can benefit the clean energy sector are discussed in this response.

Working with industry to quantify and measure the clean energy workforce

Notwithstanding previous state and agency-based initiatives to gather data which inform clean energy workforce needs, there is broad agreement that improved national data and coordination are needed on the skills being used, those in demand, and those projected for the clean energy workforce.

Current clean energy workforce pressures exist from greater demand for higher-level, flexible skills, especially in key STEM areas. The clean energy industry needs a larger degree-qualified engineering, technical and digital workforce as well as a VET-qualified workforce in skilled trades, traditional industry and utilities.[1]

Achieving the right volume of graduates with the right level of skills needed by the clean energy workforce begins with a long-term commitment to examining current, emerging and future workforce needs. The **crucial JSA function** to provide timely data and analysis on the state of Australia's skills landscape should be a basis for clean energy-specific identification of emerging skills and occupations, demand and supply to drive policy settings for student intakes and migration. These data will become key to both industry and education and training providers and will be a mechanism to create alignment and avoid skill shortages.

The roll out of the Australian Energy Employment Report (AEER) has been a significant step towards collecting specific clean energy data and should be **progressed and well-funded** as a permanent data source. It begins the gathering of national information on size and activities of the sector; range of occupations and time spent on energy activities; gender and EFT status of employees; and increases in employees working in specific sectors of the industry.

Coordination with JSA's broader role must be established and collaboration with the states and territories secured in order to synchronise individual data sets and projections and determine workforce needs from major new projects and operations.

The work by JSA on a fully developed **Australian Skills Classification** is another timely function that can assist with the quantification and description of current and emerging skills that serve clean energy. This single taxonomy, in effectively and coherently describing skills, can help industry identify transferrable skills between jobs, workforce skills gaps, identify training needs, and through shared understandings of skill descriptors, assist employers to work with education and training providers. It will be useful, for example, in transitioning workers reliant on high-emissions intensity industries. It will need to be well-supported to incorporate regular updates that reflect the fluid nature of clean energy workplace skills.

This skills taxonomy also creates a common language for both VET and higher education, an important consideration in evolving towards a **more coherent and connected tertiary education** system, that reflects the continuation of knowledge and skills development and the increasing nature of hybrid occupations.

To enable cooperation in ensuring the timeliness and reliability of data, skill descriptors and classifications for clean energy, **JSA should establish a national collaborative group on clean energy skills entrenchment**, that includes industry, governments, and tertiary education and

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[1] State of Australia's Skills 2021: now and into the future, National Skills Commission, 2021 and Our STEM skilled future: An education roadmap for an innovative workforce, Australian Academy of Technological Sciences and Engineering, 2022.

training sector representatives. The group would oversee the charting of supply and demand issues and consider responses through long term policy, planning and investment.

Identifying emerging skills and occupations in the clean energy workforce

The clean energy workforce spans engineers, managers, technicians, electricians and other tradespersons, managers, machine operators and civil workers across a range of specialist areas. A number of other professional services occupations support the industry. Dynamic growth in the sector means that **new and hybrid roles** will continue to emerge that require new skills. Other roles, such as those in operation and maintenance, will grow and be re-shaped by new technologies in areas such as wind, solar and hydropower.

With the clean transformation becoming a digital transformation, the clean energy workforce is facing an increasingly technology-augmented world. There are known areas of change such as electrification and offshore wind, but also emerging areas, such as renewable hydrogen and clean energy technologies where the output of materials, products and services will ramp up dramatically.

Ai Group's 2022 skills survey found that 24% of businesses already have either emerging or increased skill needs as a result of the clean transition.[2] The World Economic Forum's (WEF) 2023 Future of Jobs report[3], released in May, has found that investment in the green transition and climate-change mitigation are driving industry transformation and opening new opportunities in the labour market. It found the strongest net job-creation effects are expected to be driven by investments that facilitate the green transition. Renewable energy engineers and solar energy installation and systems engineers include those roles found to be in high demand. Ai Group was the WEF's Australian partner, collecting Australian companies' perspectives which contributed to the data from 803 companies, employing 11.3 million workers, across 45 economies.

The rapidly developing industry is accelerating the evolving, emerging and hybrid occupations that are mixing up the new with the traditional. Existing occupations such as electrical engineers are evolving, throwing up the need, for example, for engineers in renewable-rich power systems; wind reliability engineers; and geomatics engineers. Emerging skills are clearly evident within a growing number of roles, for example:

Carbon Capture and Storage Specialists

Renewable Energy Technicians

Grid Modernisation Specialists

Hydroelectric Plant Technicians

Green Hydrogen Specialists

Battery Storage Technicians

Electric Vehicle Technicians

Energy Data Analysts

Renewable Energy Project Developers

Sustainable Building Designers.

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[2] 2022 Skills Survey: Listening to Australian businesses on skills and workforce needs, Australian Industry Group, 2022

[3] The Future of Jobs Report 2023, World Economic Forum, May 2023 https://www.weforum.org/reports/the-future-of-jobs-report-2023/in-full

As noted in the Discussion Paper, emerging industries and occupations present challenges for measurement of the current and future clean energy workforce, with ANZSIC and ANZSCO categories not able to be fully reflective of the changes. Working through this hurdle by developing comprehensive measurement approaches is supported as a fundamental step.

Other skills and occupations will take shape in ways that are not yet apparent which is why it is so important to build multi-layered skills profiles for the clean energy industry – needed are deep, technical skills but also generic/transferable skills (e.g. adaptability, collaboration, risk and change management, digital literacy, data analytics).

In 2022, Ai Group asked Australian businesses if the need for generic capabilities had changed in their organisations in the last 12 months. Employers indicated an increased need for these skills in all occupational categories. To create well-rounded, valuable workers these capabilities need to be cultivated alongside technical skills and knowledge. The OECD cites skills such as co-operation, empathy, and tolerance as key to achieving sustainable development goals[4] and the ILO Global framework on core skills for the 21st century recognises the importance of social and emotional skills.[5]

The **incorporation of these generic capabilities** should be encouraged in clean energy, as with all disciplines. The tertiary education sector would benefit from an ongoing process that ensures future-oriented generic capabilities are reviewed with industry to provide guidance to higher education and VET in teaching and learning. Widespread **co-design, co-development and co-delivery of courses will facilitate development of the generic capabilities** so valued by employers, as will **more work-based and work-integrated learning** - discussed further in the next section.

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[4] Global framework on core skills for life and work in the 21st century, ILO, July, 2021.

[5] Beyond Academic Learning: First Results from the Survey of Social and Emotional Skills, OECD, 2021.

Addressing barriers to employers recruiting and retaining workers for the clean energy transition

A lack of available skills and experience in clean energy continues to plague employers when recruiting. Labour and skill gaps for entry level positions combine with re-skilling needs for existing workers. The skills quest is hampered by a large part of the industry's structure: large projects with time-limited employment contracts driving itinerant workers, often in regional locations; and smaller businesses with less sway to attract and retain workers who have similar skills to those needed for large scale projects and operations.

In 2022, the Clean Energy Council's Skilling the Energy Transition demonstrated where demand by employers was not being met across a broad range of clean energy occupations, including engineers, technicians and managers.[6]

A number of other sources support this. Ai Group's 2022 skills survey found that 24% of businesses already have either emerging or increased skill needs as a result of the clean transition. Ai Group members are reporting skill shortages across a number of occupations, for both skilled tradespeople and energy professionals. Occupations needed for clean energy are on the National Skills Priority List: Construction/Engineering/Production Managers; Material/Civil/Chemical/ Geotechnical/ Electrical/Structural/Mechanical/Plant Engineers; Electricians, Plumbers; Plant Operators. Looking ahead, projections showing large shortages of tech-based professionals in coming years are well publicised [7] as are shortages of engineers.[8]

Barriers to employers in recruiting and retaining both entry level workers and existing workers are entrenched by low levels of partnership with industry; insufficient information to attract workers to the industry; limited levels of work integrated learning opportunities to nurture talent; and lack of access to training to reskill and upskill employees.

The general low level of partnership between the clean energy industry and education and training providers affects the volume of graduates, knowledge and skills taught, skills alignment and the readiness of graduates. **Embedding collaborative cultures for skills development** will help to ensure that available training meets the needs of relevant employers and is updated or developed where required. Providers will be better able to **co-design flexible training solutions** that can respond to local and emerging needs and be implemented quickly. They need the support of governments through investment and programs to enable this.

Exemplars are useful, and there are initiatives where (mainly larger) companies have formed strategic alliances with universities to develop and deliver new programs that align with their future business requirements. One example is BAE Systems Australia's Request for Information which was circulated to other companies, universities and TAFEs to collaborate on innovative education and training initiatives to nurture talent for their industry. Such **collaborative activity now needs to be widespread**, including support provided to smaller sized companies to recognise the benefit of, and establish relationships with, larger employers and providers. These alliances would guide the learning in tertiary education, explore new skilling models, and help to build learning into the everyday business of companies.

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[6] Skilling the Energy Transition, Clean Energy Council, 2022.

[7] For example: Roadmap to Deliver One Million Tech Jobs, Technology Council of Australia, October 2021.

8 Strengthening the engineering workforce in Australia: Solutions to address the skills shortage in the short, medium, and long term, Engineers Australia, 2022

The clean energy industry would also benefit from a stronger system of **collaborative metropolitan and regional hubs**, learning from the Centres of Vocational Excellence model in Europe by developing strategies to meet local skill needs and assist large and small employers create innovative solutions to clean energy skill challenges. Funding and support for these initiatives can range from financial incentives, education vouchers, training grants and scholarships and general tax deductions.

Barriers to employers in recruiting and retaining workers for clean energy fields can also be improved at scale by **incorporating student placements and projects** more broadly into qualifications. Work-integrated learning (WIL) suits today's workplaces. It allows students to be immersed in real work environments and assists in developing work and career readiness. In a skill shortage environment, some employers are finding their WIL engagements become a useful way to identify student talent early and employ students after graduation.

While there are many examples of employers partnering in a variety of WIL activities, and there is recognition among employers of the benefits, there are significant barriers from the employer's point of view. These include time involved preparing for, supervising and mentoring students and administrative costs. These could be met through university funding arrangements; tax incentives to ensure Australia's businesses (particularly small to medium enterprise) are able to effectively and equitably engage with WIL programs and also share in the benefits and outcomes; **wage subsidies for employment-based WIL**, such as degree apprenticeships; and partnership opportunities to support WIL. A 2020 Mitchell Institute proposal for a **national cadet program** provides a good model with support provided to employers.[9]

Clean energy employers need increased access to shorter programs developed at a range of skill levels to support their re-skilling and up-skilling of existing workers. In particular there must be ongoing activity to **reskill transitioning existing workers from emission-intensive sectors quickly**. This involves both the higher education and VET sectors. Ai Group's research shows that short courses are the most used form of education and training by employers, ahead of formal qualifications, conferences and microcredentials. Yet universities are the least used provider for short courses and microcredentials.[10] Funding to universities must remove barriers to their provision and encourage an increase in the delivery and integration of shorter training options specific to re-skilling and upskilling needs. This would be assisted by **incentives for businesses to encourage upskilling, and incentives for individuals to redirect labour** from transitioning industries into high priority expansionary clean energy fields.

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[9] *Averting an Escalating Labour Market Crisis for Young People in Australia: A Proposed National Job Cadet Program*, Mitchell Institute, 2020.

[10] *2022 Skills Survey: Listening to Australian businesses on skills and workforce needs*, Australian Industry Group, 2022

Addressing barriers to students and prospective workers in accessing clean energy education and training

The range of barriers existing for workers moving into clean energy fields means the potential talent for this burgeoning workforce is not being realised. As discussed in other sections of this response, a more comprehensive range of qualifications (and supplemented qualifications) and short courses must be developed and marketed to students. At the same time existing workers face barriers to transition and more focus is needed to encourage under-represented cohorts to take up careers in, or transition to this sector. Skilled migrants with relevant skills and experience need to be better recognised.

It is well documented that women are under-represented in STEM related occupations, especially professional, para-professional and trade occupations. Incentives to study in STEM fields at the tertiary level are harder to present if students have not been engaged in STEM subjects in secondary school. Ai Group has been delivering the Women in STEM Apprenticeships and Traineeships Program in Victoria with positive outcomes and support for diverse groups. However **more exposure to and exploration of STEM-field occupations** and industries as early as practicable at school would assist with the interest in this learning and employment pathway.

There have been attempts to create employment opportunities for women and other under-represented groups, but the solution is beyond the immediate offer of a job.

A significant barrier for individuals to participation in higher education is the opportunity cost of not working while studying. This includes wages not earned and the cost of a FEE-HELP debt. For some this may be offset by taking a part-time job, however not everyone can support themselves with part-time work while studying. Women and other underrepresented groups often face these circumstances. Additionally, cultural barriers exist for some groups. Some cultures do not place a high importance on undertaking higher level studies, instead preferring paid employment be taken up.

While these cohorts need to be encouraged to consider STEM-based careers much earlier in their education journey, there is an opportunity to assist such groups access higher education by combining it with relevant full-time work. **Degree-level apprenticeships** have proved successful in other countries and Ai Group is involved with pilots in Australia. They have the benefit of combining study towards a degree with work that is relevant to the studies. At the very least **governments should fund further student work integrated learning opportunities** (placements and projects) and **graduate programs** in clean energy shortage occupations, with some programs targeting under-represented groups.

Barriers for existing workers wanting to transition to a trade at later stages of their working lives, can be alleviated through the introduction of new **mature-age apprenticeship** models in clean energy that would attract wage subsidies for mature-age workers.

More information needs to be available for existing workers who have **close skill matches** with clean energy occupations, and who may need only limited re-skilling to transition into new roles. The establishment of a dynamic **national framework for skills transferability** in which relevant skills from other occupations are cross-mapped with clean energy skills will be useful to multiple stakeholders – existing workers, employers, education and training providers.

A further barrier exists because of the disconnectedness of the higher education and VET sectors - hinders students in their efforts to acquire the combination of knowledge and skills they need for work, and this could constrain the development of skills for clean energy sector.

Reinforcing this divide is the framework for student funding. The ecosystem of policies that determine and provide student funding across the tertiary system is dysfunctional. This has its roots in the structure of federation, with different levels of government having primary responsibility for the different sectors. However, the result is two distinct student funding frameworks which appear to have no consistency when viewed as a whole. These arrangements can distort student choices and serve to channel students towards higher education without considering vocational options. Student funding - including direct funding, student subsidies, income-contingent loans and other incentives – must be equitable, and facilitate student choice among a range of high quality pathways to the clean energy industry.

Additionally, the AQF and student funding models lock in old ways of thinking, giving a better deal to a young person pursing a knowledge-based pathway than one pursuing a skills-based option, and prohibiting young people from combining the two. This is holding us back, and must change if we are to develop the workforce we need to meet the many challenges faced.

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Addressing barriers education and training providers face in delivering courses specific to clean energy

The dynamism of the clean energy sector means it is challenging for tertiary education and training providers to keep pace with the new and changing skills needed. Without involvement in industry planning for large-scale renewable energy projects and initiatives, it can be challenging for universities to develop and deliver the right qualifications and work within their funding envelopes. In clean energy this is a particular issue in regional areas where these projects often locate.

VET provision has relied on the qualifications developed through the VET system's training product development model, notwithstanding the ability of providers to offer localised short courses and microcredentials.

Both VET and higher education face a further barrier through a lack of teachers and trainers with new knowledge and experience in new clean energy concepts and technologies, and therefore a lack of knowledge to identify the potential for cross-skilling. In the case of VET, governments should **support the movement of industry personnel into teaching positions** through more flexible pathways into teaching.

Increasingly industry is an essential partner to the quality of the learning environment that students experience. Indeed, increasingly industry must *be* the learning environment that students experience. This is key to linking learning with current industry strategies and practice, knowledge and skill needs.

Universities should be encouraged and incentivised to **involve industry in multiple aspects of the learning framework**: co-design, co-development of content, co-delivery, co-credentialling and co-assessment, in addition to work integrated learning activities. Students, teachers and industry representatives all bring different perspectives which in combination result in relevant and richer learning experiences.

There is a need for much **greater consultation with industry** to build education pathways. In recent years Ai Group has been working with companies and the tertiary education sector to pilot new VET/higher education hybrid models that meet industry's higher level skill needs. Through this work we have noticed a tendency for higher education providers to focus on large businesses who are more likely to provide the volume of student numbers needed to make a program viable. However, the clean energy sector requires skills for smaller businesses focused on rooftop solar systems as well as skills for large scale, complex industry operations.

To engage with SMEs, universities would benefit from **outreach staff** who can meet with businesses to establish their emerging needs. Further, universities could work with industry associations who can act as aggregators for small businesses requiring new skills and knowledge through innovative programs. Governments should **incentivise partnerships**, and plan closely with industry and tertiary education and training providers, the need for skills for large scale clean energy projects, and **allocate specific support for local education and training providers**.

Addressing accredited clean energy pathways through reform in the tertiary education system

With its need for a breadth of occupations to run it, the clean energy industry will continue to depend on both sectors within tertiary education, along with other specialist providers, for its supply of entry level workers and to assist with the upskilling and reskilling of existing workers. The reasons for a lack of supply are multi-faceted and in most part **related to broader system issues.** To build the size and quality pipeline of workers, and to ensure the right qualifications and short courses are offered, **improvements are needed at structural, governance and organisational levels.**

The pressing need for projections on the number and types of jobs will provide more certainty for university and VET sector planning, however the targets are likely to provide challenges. Enabling funding settings must underpin providers' clean energy offerings.

Skills acquired for clean energy through vocational education and training (mainly Certificate III and IV qualifications) are required for larger scale energy projects as construction takes place, and then for operation and maintenance of systems. These qualifications are also required in the industrial/commercial/residential solar sector of the industry.

In the VET sector, the training products that address clean energy concepts could be more comprehensive, and where training products have been developed there is often a lack of training resources and trainers to deliver the training. For example, there are training gaps for workers who are required to install, operate and maintain clean energy systems. Further, where units are electives and not core components there is no guarantee they will be undertaken by a volume of students. Some organisations are addressing the gap by developing their own short courses or microcredentials to train workers in the skills they need.

The new **Jobs and Skills Councils** (JSCs) covering STEM skill industries have been charged with working closely with industry on workforce planning in order to determine those new qualifications needed for clean energy, and to bolster existing qualifications with new clean energy knowledge and skills. These new JSCs are a vital component in building the right skills in the right numbers for the clean energy industry.

JSCs' expanded roles, involving implementation and monitoring and industry stewardship, must affectively align skills with industry's needs. They should work with industry to identify, forecast and respond to clean energy skill needs; develop rapid fit-for-purpose training products and enable rapid implementation and review.

The future clean energy workforce will be partly dependent on an effective **apprenticeship system** to help lay the foundations for an enduring skills pipeline. The apprenticeship model is becoming an even more important lever for the clean energy industry as rapidly changing work environments benefit from work-based learners who experience change first-hand. There are a number of improvements that can be made, via JSA, that will support the apprenticeship system, some of which are underway, for example, reviews into completion rates.

Ai Group has been piloting **higher apprenticeship models** for over five years in response to industry needs for hands-on tradespeople with higher skill levels based around new technologies. The clean energy sector is likely to have the need for the new models of higher apprenticeships and degree apprenticeships currently being piloted. Some current pilots include the disciplines of Electrical Engineering, Software Engineering, Systems Engineering, Industry 4.0 Applied Technologies.

There are many challenges in implementing these qualification models due to the **disconnectedness of the VET and higher education sectors**. Delivery issues have arisen where programs involve a combination of competency-based learning through a VET Diploma and a curriculum-based model of an Associate Degree. Places are funded differently for learners moving through the two sectors, and current legislation provides a barrier to the employment-based learning model in higher education, with declaration of apprenticeships and the use of national training contracts restricted to VET qualifications.

Universities need to be incentivised to review relevant qualifications or develop new ones to fill gaps in learning and integrate clean energy concepts. In some cases this should result in elective subjects becoming core curriculum. A role of the **Universities Accord** should be to re-caste funding models to encourage the offering of qualifications in demand for the sector, such as engineering, using JSA's enhanced national data analysis and planning function encouraged in this response.
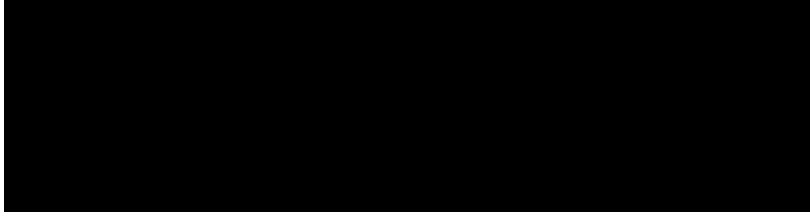
Closer industry and university partnerships should be encouraged through incentives from governments. These partnerships should increase the co-design and co-delivery of clean energy qualifications, unearth opportunities for work integrated learning, foster collaborative research ventures and encourage more graduate research students. Government should prioritise research scholarships with a focus on clean energy transition and technologies.

Due to the newness of the clean energy sector, the **tertiary education teaching workforce** needs support to develop greater capability – including high level technical knowledge and expertise and working across disciplines as the clean energy sector requires.

Many of the actions suggested in this response will be hampered without further deep structural reforms. For the future supply of clean energy-specific and broader skills in fields required for clean energy to be ensured into the future, the framework for qualifications, both VET and higher education, must be renewed. Fully implementing reforms from the Noonan Review of the **Australian Qualifications Framework** will allow for more flexibility in the teaching of skills and knowledge and a deeper understanding of the importance of context and application in education and training.

Further, barriers to the right clean energy skills are caused by the **disconnectedness of Australia's two sectors within tertiary education.** Industry increasingly requires skills development that straddles both the VET and higher education sectors as combinations of skill sets shift and incorporate higher level skills. Achieving the right skills equation can only be deeply effective given a more coherent and connected tertiary education system with structures that facilitate student movement between the sectors.

There are a number of ways in which common policies could operate across both VET and higher education. **Public funding for the tertiary education system** should be at a level that enables quality outcomes across VET and higher education, and be equitable across the sectors and between levels of government. It must be sufficient to deliver access and diversity principles, practices and programs.